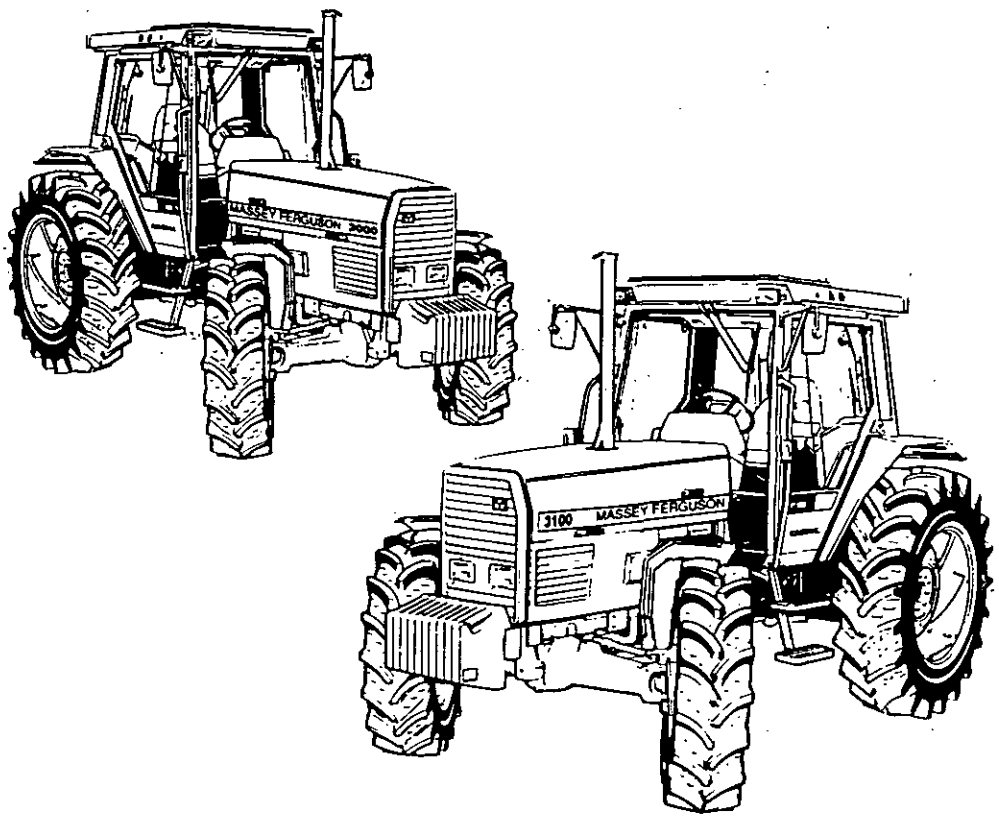
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WORKSHOP SERVICE MANUAL

Part 1

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Massey Ferguson Manufacturing
Beauvais France

Publication Nº 1646915 M1

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1 A01 Introduction

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Introduction

A . Using the manual

General

The purpose of this manual is to assist Distributors and Dealers in the efficient installation, maintenance and repair of MASSEY FERGUSON machinery. Carrying out the procedures as detailed, together with the use of special tools where appropriate, will enable the operations to be completed within the time stated in the repair time schedule.

Page numbering

Example : 7C01-3

This manual is divided into parts and sections. Each page contains the following information :

7 = Section
C = Part
01 = Sequence number within the Part
3 = Page number within the Part

The issue number and the date are indicated at the bottom of the page.

Using the manual

To assist with locating information, each section of the manual is preceded by an index listing the Parts contained in that section.

The preliminary operations to be carried out in order to reach the item involved are listed at the beginning of each Part.

Items are indicated by means of identification marks (circles, squares, triangles).

Meaning of identification marks

circle	○	(..)	identifies part only
square	□	[..]	identifies part and indicates an adjustment
triangle	Δ	/..\	identifies part and indicates an important point to be noted during removal or refitment

Amendments

Amended pages will be issued carrying the same page number as previous pages : only the issue number and the date will change.

Old pages should be destroyed.

Special tools

Where the use of a special tool is necessary in an operation, the tool number is shown following the instruction requiring its use.

Repairs and replacements

When parts have to be replaced, it is essential that only genuine MASSEY FERGUSON parts are used.

Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

Safety features embodied in the tractor may be impaired if other than genuine parts are fitted.

In certain territories, legislation prohibits the fitting of parts not to the tractor manufacturer's specification.

Torque wrench setting figures given in the Workshop Manual must be strictly adhered to. Locking devices must be fitted where specified. If the efficiency of a locking device is impaired during removal it must be renewed.

The tractor warranty may be invalidated by the fitting of other than genuine MASSEY FERGUSON parts. All MASSEY FERGUSON replacement parts have the full backing of the manufacturer's warranty. MASSEY FERGUSON Distributors and Dealers are obliged to supply only genuine service parts.

Repair time schedule

The sections in the repair time schedule are identical to those in the workshop manual. The Repair Time Schedule is available, under publication number 1646918M1.

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B . Specifications

Engine

	3050	3060	3065	3070	3080	3095	3115/20	3125/40
PERKINS Model	A 4.236	A 4.248 S	C 4.236	A T4.236	A 6.354.4	1006-6 HR	1006-6LR	1006-6T7
Number of cylinders	4	4	4	4	6	6	6	6
Turbocharger	-	-	yes	yes	-	-	-	yes
Bore (mm)	98.47	100.96	98.47	98.47	98.47	100	100	100
Stroke (mm)	127	127	127	127	127	127	127	127
Cubic capacity (cm^3)	3860	4060	3860	3860	5800	6000	6000	6000
Maximum engine power DIN (kW)	52	59	62.5	68.5	73.5	78.5	84.5	92.5
Maximum torque (Nm)	269	280	319	343	374	415	436	474
Engine speed at maximum torque	1400	1400	1400	1400	1200	1200	1100	1200
Idling speed (rev/min)	850	850	850	850	850	850	850	850
Maximum rated speed (rev/min)	2200	2200	2200	2200	2200	2200	2200	2200
Torque at rated speed (Nm)	230	260	276	303	325	348	367	401
Maximum no load speed rev/min	2310	2310	2310	2310	2310	2310	2310	2310
PTO power DIN (kW)	47	53	57	62	68	72	78	86
At engine speed of rev/min	2200	2200	2200	2200	2200	2200	2200	2200
Permissible front PTO power DIN (kW)	52	59	62.5	68.5	69	75	75	75
Front PTO maximum permissible torque (all speeds) Nm	Same as engine power				300	328	328	328
Lubrication	Gear type pump : - strainer on suction side and external canister type filter (s)							
Valves	Overhead, push-rod operated							
Valves clearances	(Cold)							
- Inlet mm	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
(in)	(0.012)	(0.012)	(0.012)	(0.012)	(0.008)	(0.008)	(0.008)	(0.008)
- Exhaust mm	0.30	0.30	0.30	0.30	0.45	0.45	0.45	0.45
(in)	(0.012)	(0.012)	(0.012)	(0.012)	(0.018)	(0.018)	(0.018)	(0.018)
Engine oil cooler	no	no	yes	yes	yes	no	no	yes

Fuel system and air cleaner

	3050	3060	3065	3070	3080	3095	3115/20	3125/40
Lift pump	AC DELCO						AC DELCO Type LU	
Pre-filter						C A V		
Fuel filter with sediment bowl	C A V							
Number of elements	1	1	1	1	2	2	2	2
Fuel injection pump	C A V rotary with mechanical governor							
Injection timing	23°	24°	28°	16°	23°	18°	22°	18°
Injectors and nozzle holders	C A V							
Cold weather starting	Thermostart or ether, according to market							
Air cleaner	Two-stage, dry element, with centrifugal prefilter and blockage indicator							

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Electrical system

Voltage :	12 volt, negative earth
Batteries : - 3050-3060-3065	1 12 volt maintenance free battery or 2 12 volt maintenance free batteries (cold climates)
- 3070-3080-3095-3115/20-3125/40	2 12 volt maintenance free batteries.
Safety start :	operated by the clutch pedal.
Bulbs :	
headlights :	European code 40/45W
sidelights :	5 W
rear/brake lights :	21/5 W
direction indicators :	21 W
number plate light :	10 W
work lamps :	55 W - H3
instrument panel lighting and warning lights :	3 W - 2 W - 1.2 W
roof lights :	2 x 10 W

Cooling system

Operation :	*Pressurized system with centrifugal pump.* Thermostat opening temperature : 83°C (182°F) Centrifugal water pump : - belt driven (3050-3060-3065-3070-3080) - gear driven (3095-3115-3120-3125-3140)
Fan :	belt driven
Belt deflection : (on the longest span)	10 mm (3/8") (6 cyl. engine) 19 mm (3/4") (4cyl. engine)

Transmission

Clutch :	single disc, dry, 330 mm (13 in). diaphragm type automatic adjustment. push-type (3000) pull-type (3100)
Gearbox :	- 8 - 16 or 32 front speed - with creeper gearbox (ratio 4 to 1) : 24 speed (16 speed gearbox) 48 speed (32 speed gearbox) - reverse shuttle

Final reduction units

Reduction unit :	epicyclic, in the rear axle housings.	
Reduction ratios :	MF 3050-3060-3065	4,714 to 1
	MF 3070-3080-3095-3120	5,077 to 1
	MF 3115-3125-3140	5,571 to 1

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ROAD SPEEDS AT 2200 rev/min
MF 3050/3060/3065 TRACTORS - 16.9 - 34 TYRES
GEARBOX 4 x 4 (16 speed)

Speed	A/B Range	RANGE	Speed-shift	30 KPH GEARBOX								40 KPH GEARBOX			
				6 SPEED				32 SPEED				32 SPEED			
				FORWARD		REVERSE		FORWARD		REVERSE		FORWARD		REVERSE	
				KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH	
1	A	LOW TORTOISE	Slow	-	-	-	-	1.76	1.09	1.87	1 16	2.22	1.38	2.35	1.47
			Fast	2.22	1.38	2.35	1.46	2.22	1.38	2.35	1 46	2.79	1 74	2.97	1.86
2			Slow	-	-	-	-	2.07	1.29	2.20	1.37	2.68	1 67	2.86	1.79
			Fast	2.68	1. 67	2.86	1.78	2.68	1 67	2.86	1 78	3.39	2 12	3.61	2.26
3			Slow	-	-	-	-	2.49	1 55	2.64	1 64	3.15	1 97	3.34	2.09
			Fast	3.15	1.96	3.34	2.08	3 15	1 96	3.34	2 08	4 00	2.50	4.22	2.64
4			Slow	-	-	-	-	2.93	1.82	3.12	1 94	3 69	2.30	3.94	2.46
			Fast	3.70	2.30	3.94	2.45	3.70	2.30	3.94	2 45	4 66	2.91	4 97	3 11
1	B		Slow	-	-	-	-	3.56	2.21	3.32	2.06	4 49	2.81	4 18	2.61
			Fast	4.49	2.79	4.18	2.60	4 49	2.79	4.18	2.60	5 66	3.54	5.28	3.30
2			Slow	-	-	-	-	4.25	2.64	3.96	2 46	5 37	3 36	5.02	3 14
			Fast	5.37	3.34	5.02	3.12	5.37	3.34	5.02	3 12	6 78	4 23	6.34	3.96
3			Slow	-	-	-	-	4 97	3.09	4.64	2.88	6 29	3.93	5 87	3.67
			Fast	6.69	3.91	5.87	3.65	6.29	3.91	5.87	3.65	7 94	4 96	7 41	4.63
4			Slow	-	-	-	-	5.85	3.64	5.46	3.39	7.41	2.94	6.93	4.33
			Fast	7.41	4.60	6.93	4.31	7.41	4.60	6.93	4 31	9.35	5 84	8 76	5.48
1	A	HIGH HARE	Slow	-	-	-	-	7.11	4.42	7.57	4 70	9.00	5.62	9.59	5.99
			Fast	9.00	5.59	9 59	5.96	9.00	5.59	9.59	5.96	11.35	7 09	12.12	7.58
2			Slow	-	-	-	-	8.49	5.28	9.06	5.63	10.71	6.69	11 44	7.15
			Fast	10.73	6.67	11.48	7 14	10 73	6.67	11.48	7 14	13.53	8 46	14 45	9.03
3			Slow	-	-	-	-	9.57	5.95	10.63	6 61	12.61	7 88	13 42	8 39
			Fast	12.61	7.84	13.42	8.34	12.61	7.84	13.42	8 34	15.93	9 96	16.96	10.60
4			Slow	-	-	-	-	11 75	7.30	12.54	7 79	14 85	9.28	15.84	9.90
			Fast	14.85	9.23	15.89	9.88	14.85	9.23	15.89	9 88	18 77	11 73	20.02	12 51
1	B		Slow	-	-	-	-	14 28	8 87	13.33	8 28	18 04	11 23	16.85	10.53
			Fast	18.04	11.21	16.85	10.47	18.04	11.21	16.85	10 47	23.23	14 52	21.30	13.31
2			Slow	-	-	-	-	17.03	10.58	15.91	9.89	21.49	13 43	20.06	12.54
			Fast	21.49	13.35	20.06	12.47	21.49	13.53	20.10	12 49	27 15	16 97	25.37	15.86
3			Slow	-	-	-	-	19.98	12.42	18.66	11 60	26.25	16 41	25.08	15.68
			Fast	26.21	16.29	24.49	15.22	26.21	16.29	24.49	15.22	33.18	20 74	31.70	19.81
4			Slow	-	-		-	23.66	14.70	22.11	13.74	29.77	18.61	27.81	17.38
			Fast	29.77	18.50	27.81	17.28	29.77	18.50	27.81	17.28	37.62	23.51	35.16	21.98

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ROAD SPEEDS AT 2200 rev/min
MF 3070/3080/3095/3120 TRACTORS - 16.9 - 38 TYRES
GEARBOX 4 x 4 (16 speed)

Speed	A/B Range	RANGE	Speed-shift	30 KPH GEARBOX								40 KPH GEARBOX			
				16 SPEED				32 SPEED				32 SPEED			
				FORWARD		REVERSE		FORWARD		REVERSE		FORWARD		REVERSE	
				KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH		KPH - MPH	
1	A	LOW TORTOISE	Slow	-	-	-	-	1.76	1 10	1.88	1.17	2.22	1.40	2.38	1 50
			Fast	2.22	1 39	2.37	1.48	2.22	1 39	2.37	1.48	2.79	1.76	2.99	1 88
2			Slow	-	-	-	-	2.09	1 30	2.24	1 40	2.64	1.66	2.82	1 78
			Fast	2.66	1 66	2.85	1.78	2.66	1 66	2.85	1.78	3.34	2.10	3.56	2.24
3			Slow	-	-	-	-	2.46	1 54	2.63	1 64	6 82	4.30	3.30	2 08
			Fast	3.11	1 64	3.33	2.08	3 11	1 64	3.33	2.08	3.92	2.47	4 18	2.63
4			Slow	-	-	-	-	2.90	1 81	3.10	1 94	3.67	2 31	3.92	2 47
			Fast	3 67	2 29	3 93	2 45	3.67	2.29	3.93	2.45	4 64	2.92	4.95	3 12
1	B		Slow	-	-	-	-	3 48	2.16	3.23	2.01	4 44	2.80	4.14	2.61
			Fast	4 44	2 76	4 14	2.57	4 44	2 76	4 14	2.57	5.61	3.53	5 21	3 28
2			Slow	-	-	-	-	4.20	2.61	3.92	2.44	5.30	3.34	4.95	3 12
			Fast	5.30	3.29	4 95	3.08	5.30	3.29	4.95	3.08	6.71	4 23	6 25	3 94
3			Slow	-	-	-	-	4.93	3.06	4.60	2.86	6.23	3 92	5.81	3 66
			Fast	6.23	3 87	5.81	3.61	6.23	3 87	5.81	3.61	7.88	4.96	7.35	4 63
4			Slow	-	-	-	-	5.81	3.61	5.43	3.37	7.35	4 63	6.86	4.32
			Fast	7.35	4 57	6.86	4.26	7.35	4 57	6.84	4.25	9.28	5.85	8.67	5 46
1	A	HIGH HARE	Slow	-	-	-	-	7.04	4 37	7.50	4.66	8.91	5.61	9.50	5 99
			Fast	8.91	5 54	9.50	5.90	8.91	5.54	9.50	5.90	11.26	7.09	12.01	7.57
2			Slow	-	-	-	-	8.40	5.22	8.95	5.56	10.63	6.70	11.33	7 14
			Fast	10.63	6 61	11.33	7.04	10.63	6.61	11.33	7 04	13.42	8 45	14.32	9.02
3			Slow	-	-	-	-	9.88	6 14	10.54	6.55	12.50	7.88	13.31	8.39
			Fast	12.50	7 77	13 31	8.27	12.50	7 77	13.31	8.27	15.80	9.95	16.83	10 60
4			Slow	-	-	-	-	11.64	7 23	12 41	7 71	14 72	9.27	15.69	9.88
			Fast	14.79	9 15	15 69	9.75	14.72	9 15	15.69	9.75	18 61	11.72	19.82	12 49
1	B		Slow	-	-	-	-	14.12	8 77	13.20	8.20	17 86	11.25	16 68	10 51
			Fast	17 86	11 10	16.68	10.36	17.86	11 10	16.68	10.36	22.57	14.22	21.08	13.28
2			Slow	-	-	-	-	16.85	10 47	15.73	9.77	21.32	13.43	19.91	12.54
			Fast	21.32	13.25	19.91	12.37	21.32	13.25	19.91	12.37	26.95	16.98	25.17	15.86
3			Slow	-	-	-	-	19.95	12.40	18.63	11.58	25.01	15.76	23.34	14.70
			Fast	25.01	15.54	23.34	14.50	25.01	15.54	23.34	14.50	31.61	19.91	29.50	18.59
4			Slow	-	-		-	23.34	14.50	22.78	13.50	29.48	18.57	27.54	17.35
			Fast	29.48	18.32	27.54	17.11	29.48	18.32	27.54	17.11	37.27	23.48	34.83	21.94

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Introduction

ROAD SPEEDS AT 2200 rev/min - MF 3115 - 3125 - 3140 20.8 - 38 TYRES

Speed	Range	Speed-shift	8 SPEED 30 KPH				16 SPEED 30 KPH				16 SPEED 40 KPH			
			FORWARD		REVERSE		FORWARD		REVERSE		FORWARD		REVERSE	
			KPH	MPH	KPH	MPH	KPH	MPH	KPH	MPH	KPH	MPH	KPH	MPH
1	LOW TORTOISE	Slow	-	-	-	-	2.54	1.57	2.53	1.57	2.54	1.57	2.53	1.57
		Fast	3.22	2.00	3.20	1.99	3.22	2.00	3.20	1.99	3.22	2.00	3.20	1.99
2		Slow	-	-	-	-	3.84	2.38	3.82	2.37	3.84	2.38	3.82	2.37
		Fast	4.86	3.02	4.83	3.00	4.86	3.02	4.83	3.00	4.86	3.02	4.83	3.00
3		Slow	-	-	-	-	5.32	3.30	5.29	3.28	5.32	3.30	5.29	3.28
		Fast	6.73	4.18	6.69	4.15	6.73	4.18	6.69	4.15	6.73	4.18	6.69	4.15
4		Slow	-	-	-	-	7.12	4.42	7.66	4.76	7.12	4.42	7.66	4.76
		Fast	9.74	6.05	9.69	6.02	9.74	6.05	9.69	6.02	9.74	6.05	9.69	6.02
5	HIGH HARE	Slow	-	-	-	-	10.22	6.35	10.16	6.31	10.22	6.35	10.16	6.31
		Fast	12.91	8.02	12.84	7.98	12.91	8.02	12.84	7.98	12.91	8.02	12.84	7.98
6		Slow	-	-	-	-	15.43	9.59	15.34	9.53	15.43	9.59	15.34	9.53
		Fast	19.51	12.12	19.39	12.05	19.51	12.12	19.39	12.05	19.51	12.12	19.39	12.05
7		Slow	-	-	-	-	21.36	13.27	21.23	13.19	21.36	13.27	21.23	13.19
		Fast	27.00	16.78	26.84	16.68	27.00	16.78	26.84	16.68	27.00	16.78	26.84	16.68
8		Slow	-	-	-	-	30.92	19.21	30.74	19.10	30.92	19.21	30.74	19.10
		Fast	-	-	-	-	-	-	-	-	39.09	24.29	38.86	24.15

Power take off

Independent power take off (IPTO)

Proportional to the engine speed.
Hydraulic clutch.

PTO ratio

540 rev/min at 1980 engine rev/min - 3.667 : 1.
1000 rev/min at 2000 engine rev/min - 2 : 1.

Speed changing
(according to model)

Either by changing shafts, or by lever selection.
- 540 rev/min shaft, 35 mm (1.3/8 in) diameter, 6 splines.
- 1000 rev/min shaft, 35 mm (1.3/8 in) diameter, 21 splines

"Economy" Independent power take off
(optional extra)

The normal 540 and 1000 rev/min PTO speeds can be obtained at the above stated engine speeds or at 1550 engine rev/min by selecting the "Economy" ratio.

Control

Lever in the cab.

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Ground speed PTO
(optional extra)

An addition to the independent PTO

Control

From the normal IPTO operating lever.

Speed	MF 3050-3060-3065	540 rev/min - 7.87 revolutions of the PTO shaft for one revolution of the rear wheel. 1000 rev/min - 14.83 revolutions of the PTO shaft for one revolution of the rear wheel.
	MF 3070-3080-3095	540 rev/min - 8.48 revolutions of the PTO shaft for one revolution of the rear wheel. 1000 rev/min - 15.54 revolutions of the PTO shaft for one revolution of the rear wheel.
	MF 3115-3120-3125-3140	540 rev/min - 8.23 revolutions of the PTO shaft for one revolution of the rear wheel. 1000 rev/min - 15.08 revolutions of the PTO shaft for one revolution of the rear wheel.

Front power take off (optional extra)

Control

Hydraulic clutch mechanism controlled by a button in the cab.

Ratio

1000 rev/min at 2040 engine rev/min. - 2.04. : 1

Four wheel drive front axle

Clutch mechanism

Hydraulic, electrically actuated by push button in the cab

Differential Lock

Front and rear differential lock-hydraulic with electrical control.

Hydraulics

Two stage gear pump, driven directly by the engine, supplies :

1 st Stage
This circuit supplies 29 l/min (6.4 Imp. gal/min) (7.6 US gal/min) at maximum engine speed.
Maximum pressure : 17 bar

1. Hydrostatic steering
   A/B range gear
   Hare/Tortoise range gear
   Differential lock
   IPTO clutch
   PTO brake
   Front PTO (if fitted)
   Four-wheel drive (if fitted)
   Hydraulic brakes
   Clutch
   Lubrication of gearbox, PTO and Rear Axle

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2nd Stage This circuit supplies 50 l/min (11 Imp. gal/min) (13.2 US gal/min) Maximum pressure : 185 bar	2. Trailer brake supply Auxiliary hydraulic system Hydraulic lift.
Filtration (2 filters)	-One external 150 micron throwaway, canister type filter on the suction circuit. -One external 15 micron high pressure filter on the low flow circuit.

Brakes

Main brake

Type	Oil-immersed single disc per wheel, 355 mm (13.9 in) outside diameter. Inside diameter of lining : 3050-3060-3065 : 310 mm (12.20 in) 3070-3080-3095-3115/20-3125/40 : 290 mm (11.41 in)
Operation	Hydraulic, from two master cylinders, automatic adjustment.
Handbrake	Operates on the rear axle bevel drive pinion.
Trailer brake	According to model by hydraulic valve.

Differential lock - Rear axle

Type	Positive clutch
Control	Hydraulic, with electrical control.

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Introduction

Hydraulic lift

Type : 3-point, Category 2, with fixed, telescopic or quick attach hook ball ends (according to model).
Rams : Twin externally mounted
Lifting force (see charts)

MF 3050 - 60 - 65 - Ram diameter 50 mm (1.96 in) or 57 mm (2.24 in)

Position of lift rod on lower links mm	Length of lift rods mm	Ram diameter 50 mm				Ram diameter 57 mm			
		Lower links horizontal		Lower links full raised		Lower links horizontal		Lower links full raised	
		Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb
508	565 765	2207 2302	4870 5080	2926 2421	6457 5343	2885 3010	6367 6643	3825 3165	8441 6985
608	565 765	- 2623	- 5788	3205 2666	7073 5883	- 3430	- 7570	4190 3485	9247 7694

MF 3070 - 80 - Ram diameter 57 mm (2.24 in)

Position of lift rod on lower links mm	Length of lift rods mm	Lower links horizontal		Lower links full raised	
		Kg	Lb	Kg	Lb
550	595 827	3192 3138	7044 6925	3812 3162	8413 6978
650	595 827	- 3514	- 7755	4175 3452	9214 7618

MF 3070 - 80 - 95 - Ram diameter 66 mm (2.60 in)

Position of lift rod on lower links mm	Length of lift rods mm	Lower links horizontal		Lower links full raised	
		Kg	Lb	Kg	Lb
550	595 827	4350 4276	9600 9437	5194 4308	11463 9507
650	595 827	5740 4788	12668 10567	5689 4703	12555 10379

MF 3115/20 - 3125/40 - Ram diameter 73 mm (2.87 in)

Position of lift rod on lower links mm	Length of lift rods mm	Lower links horizontal		Lower links full raised	
		Kg	Lb	Kg	Lb
550	595 827	5425 5000	11975 11037	6510 5087	14370 11230
650	595 827	8130 5727	17950 12640	7117 5595	15710 12350

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Steering

Type — Hydrostatic
Fixed or tiltable telescopic steering column.
One double action central ram

Front axle (2 WD)

TRACTOR MODEL	3050-3060-3065-3070		3070-3080-3095-3115/20-3125/40		
CHARACTERISTICS	**NORMAL DUTY**		**HEAVY DUTY**		
Steering ram					
- Ram diam. (mm)	57		68		
- Rod diam. (mm)	40		45		
- Total stroke (mm)	236		236		
- Volumetric displacement (cc)	306		482		
Steering pressure (bar)					
- at steering valve	160		166		
- at return port	16		16		
- effective	150		150		
Steering valve					
- Make	Danfoss		Danfoss		
- Volumetric displacement (cc)	80		125		
- Check/safety valve	with		with		
Steering wheel					
- Diameter (mm)	400		400		
- Nb of turn (lock to lock)	3.80		3.86		
Steering angle					
- Inner wheel	56°		56°		
- Outer wheel	43°		43°		
Turning circle	3050/60/65	3070	3070	3080/95/3115/20	3125/40
- Without braking (mm)	3700	3750	3850	4320	4320
- With braking (mm)	3250	3300	3400	3750	4000
Angle					
- Axle swinging (max)	11°		11°		
- Wheel castor	0		0		
- Wheel camber	3°30		5°10		
Maximum permissible load capacity (Kg) at track setting	3900 1383 mm		7900 1484 mm		

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Front axle (4WD)

TRACTOR MODEL	3050	3060-3065	3080-3070 3095-3115/20	3125 3140
4 WD axle	1	2	2.5	3
Steering ram				
- Ram diam. (mm)	57	57	63	68
- Rod diam. (mm)	32	32	32	45
- Ram stroke (mm)	2 x 117	2 x 117	2 x 119	2 x 139
- Volumetric displacement (cc)	408	408	550	567
Steering pressure (bar)				
- At steering valve	166	166	166	166
- At return port	16	16	16	16
- effective	150	150	150	150
Steering valve				
- Make	Danfoss	Danfoss	Danfoss	Danfoss
- Volumetric displacement (cc)	100	100	125	125
- Check valve	with	with	with	with
Steering wheel				
- Diameter (mm)	400	400	400	400
- Nb of turn (lock to lock)	4.08	4.08	4.4	4.5
Steering angle				
- Inner wheel	50°	50°	50°	50°
- Outer wheel	38.5°	38.5°	38.5°	38.5°
Turning circle			3070 / 3080/95	
- Without braking (mm)	4200	4200	4300 / 4700	4800
- With braking (mm)	3800	3800	3900 / 4300	4400
Angle				
- Axle swinging (max)	11°	11°	11°	11°
- Wheel castor	2°30	2°30	2°30	2°30
- Wheel camber	1	1	1	1
Maximum permissible load capacity (Kg) at track setting	4500 1416 mm	4500 1416 mm	5570 1566 mm	6640 1686 mm

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Introduction

Wheels

FRONT	2-wheel drive	pressed steel
	4-wheel drive	pressed steel or cast with power adjust variable track (PAVT) or fixed cast type
REAR		pressed steel with manual adjustment or cast with power adjust variable track (PAVT), or manual adjustment.

Tyres

Compatibility of front/rear tyres of 4-wheel drive tractors.

MF 3050 up to 3095			
Front	**Rear**	**Front**	**Rear**
11.2 - 24	16.9 - 30	11.2 - 28	13.6 - 38
12.4 - 24	16.9 - 30		16.9 - 34
	18.4 - 30		15.5 - 38
13.6 - 24	18.4 - 34	12.4 - 28	15.5 - 38
	13.6 - 38	13.6 - 28	16.9 - 38
	16.9 - 34	14.9 - 28	18.4 - 38
14.9 - 24	18.4 - 34		
	15.5 - 38		
	16.9 - 34		

MF 3115 - 3120 - 3125 - 3140			
Front	**Rear**	**Front**	**Rear**
11.2 - 28	13.6 - 38	13.6 - 28	16.9 - 38
	16.9 - 38		18.4 - 34
	18.4 - 34		18.4 - 38
12.4 - 28	16.9 - 38	14.9 - 24	16.9 - 38
	18.4 - 34		18.4 - 34
	18.4 - 38		18.4 - 38
	13.6 - 38	14.9 - 28	16.9 - 38
13.6 - 24	13.6 - 38		18.4 - 38
	16.9 - 34		20.8 - 38
	16.9 - 38		18.4 - 34
	18.4 - 34	16.9 - 22	20.8 - 38

Water Ballasting
(75% fill)

	Tyre Size	litre	Imp. gal	US gal	kg	lb
Front Tyres	11.2-24	82.5	18.2	21.8	82.5	182
	12.4-24	109	23.9	28.8	109	239
	13.6-24	150	33.0	39 6	150	330
	14.9-24	180	39.6	47.6	180	396
	11.2-28	97.5	21.5	25.8	97.5	215
	12.4-28	124	27.2	32.8	124	272
	13.6-28	157.5	34.6	41.6	157.5	346
	14 9-28	191 3	42.1	50.5	193.3	421
	16.9-28	250	55.0	66 0	250.0	552
Rear Tyres	14.9-38	235	51.7	62.0	235.0	519
	16.9 30	277 5	61	73 2	277.5	610
	18.4-30	322.5	71	85 2	322.5	710
	16.9-34	307 5	67.7	81.2	307.5	676.5
	18.4-34	337.5	74.25	89.2	337.5	742.5
	13.6-36	195	42.9	51.5	195	429
	13.6-38	202.5	44.6	53.5	202.5	445.5
	15.5-38	232.5	51.1	61 4	232.5	511
	16.9-38	315	69.3	83.2	315	693
	18 4-38	367.5	80.9	97 1	367.5	809
	20.8-38	525	115.5	138.5	525	1159

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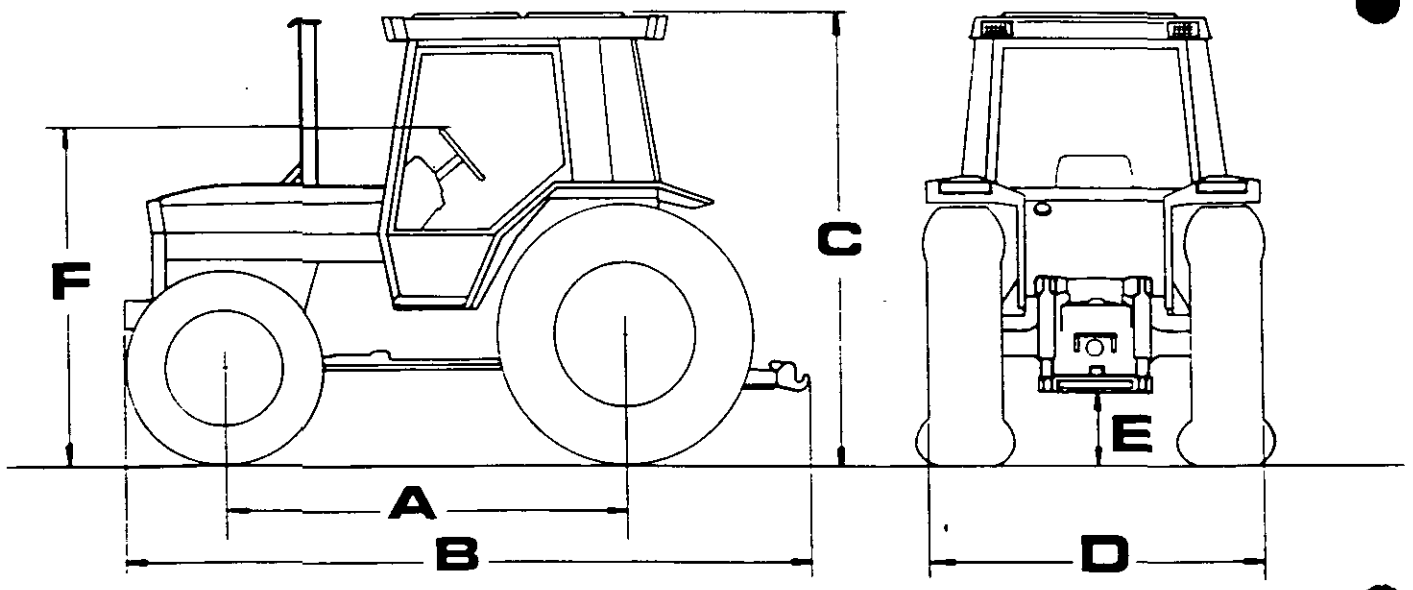
Introduction

Dimensions and weights

	MF 3050		MF 3060 MF 3065		MF 3070		MF 3080		MF 3095	
	2WD	4WD	2WD	4WD	2WD	4WD	2WD	4WD	2WD	4WD
A Wheelbase-mm(in)	2371 (93.34)	2375 (93.5)	2371 (93.34)	2375 (93.35)	2460 (96.85)	2464 (97.0)	2696 (106 1)	2699 (106 25)	2696 (106.1)	2699 (106.25)
B Overall length with drawbar mm (in)	3995 (117.9)	4069 (160.2)	3995 (117.9)	4069 (160.2)	4084 (160.8)	4208 (165.7)	4320 (170)	4472 (176)	4320 (170)	4472 (176)
C Height to roof - mm (in) (cab tractor)	2627 (103.4)	2627 (103.4)	2627 (103.4)	2627 (103.4)	2724 (107.2)	2724 (107.2)	2724 (107.2)	2724 (107.2)	2755 (108.5)	2755 (108.5)
D Overall width (*)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)	2570 (101.2)
E Ground clearance (under drawbar Frame)	1971 (77.6)	1971 (77.6)	1971 (77.6)	1971 (77.6)	2023 (79.6)	2023 (79.6)	2068 (81.4)	2068 (81 4)	2068 (81.4)	2068 (81 4)
F Height to steering wheel - mm (in) (platform models)	385 (15.2)	385 (15.2)	385 (15.2)	385 (15.2)	385 (15.2)	385 (15.2)	385 (15.2)	385 (15.2)	445 (17.5)	445 (17 5)
Total weight (with full tank, without extra weight steel wheels) - kg (lb)	3565 (7859)	3840 (8465)	3565 (7859)	3840 (8465)	3855 (8499)	4100 (9039)	4185 (9226)	4420 (9744)	4440 (9800)	4675 (10320)
Rear tyre dimensions	16.9-34		16.9-34		16.9-34		16.9-34		18 4-38	

	MF 3115/3120		MF 3125/3140	
	2WD	4WD	2WD	4WD
A Wheelbase-mm(in)	2696 (106.1)	2699 (106.2)	2696 (106.1)	2699 (106.2)
B Overall length with drawbar mm (in)	4402 (173.3)	4402 (173.3)	4527 (178.2)	4527 (178.2)
C Height to roof - mm (in) (cab tractor)	2768 (109)	2768 (109)	2908 (114.5)	2908 (114.5)
D Overall width (*)	2733 (107.6)	2733 (107.6)	2832 (111.5)	2832 (111.5)
E Ground clearance (under drawbar Frame)	442 (17.4)	442 (17.4)	502 (19.8)	502 (19.8)
F Height to steering wheel - mm (in) (platform models)	2110 (83	2110 (83)	2250 (88.6)	2250 (88.6)
Total weight (with full tank, without extra weight steel wheels) - kg (lb)	4190 (9249)	4590 (10132)	4805 (10607)	5040 (11126)
Rear tyre dimensions	16.9-38		20.8-38	

These dimensions are for a tractor set at maximum track.



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Capacities

Description		Litre	Imp. Gal	US Gal
Fuel tank	MF 3050/3060/3065	148	32.56	39.10
	MF 3070/3080/3095/3115/3120	173	38.10	45.60
	MF 3125/3140	220	48.5	58
Cooling system	MF 3050/3060/3065	16	3.5	4.2
	MF 3070	20	4.4	5.3
	MF 3080/3095/3115/3120/3125/3140	25	5.5	6.6
Engine sump	MF 3050/3060/3065/3070	7.5	1.65	2
	MF 3080/3090/3115/3120/3125/3140	16.5	3.6	4.3
Transmission / Rear axle *	MF 3050 to 3095	60	13.2	15.9
	MF 3115/3120/3125/3140	64	14.1	16.9
Front axle assembly	MF 3050/3060/3065	5.8	1.3	1.5
	MF 3070/3080/3095/3115/3120	6.5	1.4	1.7
	MF 3125/3140	11	2.4	2.9
Front final reduction units (each)	MF 3050/3060/3065	1.4	0.3	0.4
	MF 3070/3080/3095/3115/20/25/40	1.8	0.4	0.5

* When working on steep slopes 10 l (2.2 Imp Gal) (2.7 Us Gal) of oil must be added.

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C . Chassis dimensions and mounting points

	3050/3060 3065	3070	3080/3095 3120	3115 3125/40
1	301.50	301.50	301.50	301.50
2	20.00	20.00	20.00	20.00
3	101.60	101.60	61.60	61.60
4	44.45	44.45	-	-
5	60.30	60.30	-	-
6	101.60	101.60	-	-
7	481.00	570.00	621.40	621.40
8	112.40	201.40	49.60	49.60
9	25.25	25.25	6.30	6.30
10	70.00	70.00	101.60	101.60
11	-	-	44.45	44.45
12	-	-	60.30	60.30
13	-	-	101.60	101.60
14	698.00	787.00	736.80	736.80
15	340.00	429.05	370.60	370.60
16	571.75	571.75	771.50	771.50
17	896	896	896	896
18	890	890	890	890
19	567	567	567	567
20	-	-	94	94
21	267	267	267	267
22	127	127	127	127
23	53	53	53	53
24	101.60	101.60	101.60	101.60
25	31.40	31.40	31.40	31.40
26	101.60	101.60	101.60	101.60
27	100	100	100	161
28	260	260	260	280
29	43	43	43	43
30	106	106	106	106
31	224	224	224	224
32	128	128	128	128
33	1774	1774	1774	1835
34	-	-	-	2228
35	-	-	-	2870
36	155	155	155	155

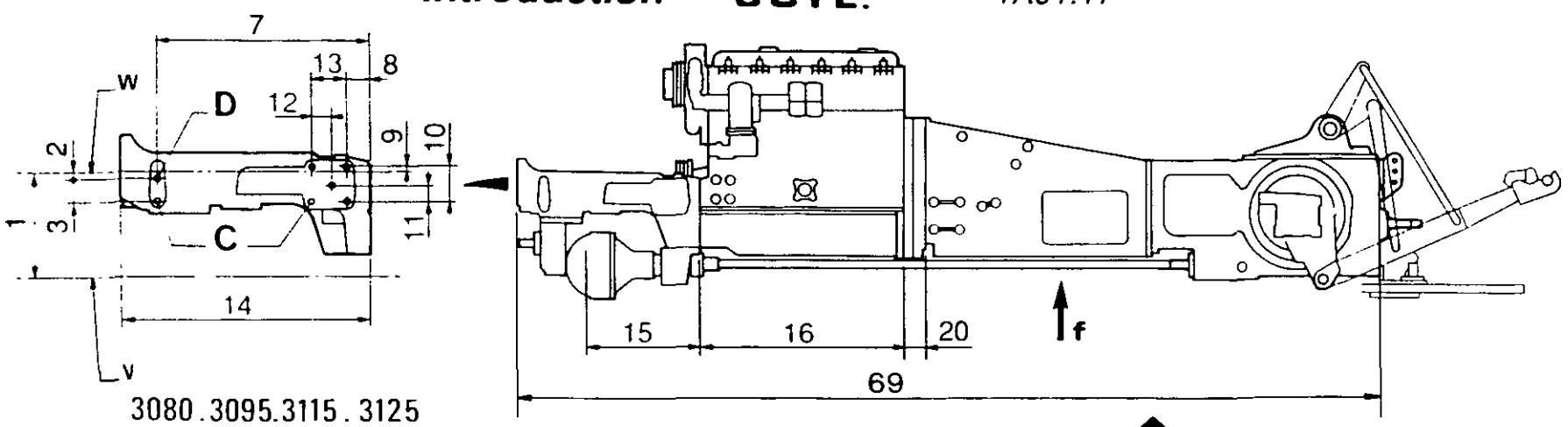
	3050/3060 3065	3070	3080/3095 3120	3115 3125/40
37	155	155	155	155
38	125	125	125	125
39	125	125	125	125
40	52	52	52	52
41	52	52	52	52
42	79.5±2	79.5±2	79.5±2	96.5±2
43	46	46	46	46
44	190	190	190	190
45	100	100	100	100
46	226	226	226	226
47	92	92	92	123
48	Ø149.35	Ø149.35	Ø149.35	Ø149.35
49	371	371	371	371
50	320	320	320	320
51	110	110	110	110
52	130	130	130	130
53	65	65	65	65
54	142.75	142.75	142.75	142.75
55	20	20	20	20
56	817	817	817	817
57	310	310	310	310
58	142.75	142.75	142.75	142.75
59	223	223	223	223
60	315	315	315	324
61	100	100	100	
62	65	65	65	
63	65	65	65	
64	40 or 66	40 or 66	40 or 66	40 or 66
65	-	-	-	323.90
66	-	-	-	76.20
67	-	-	-	120.60
68	-	-	-	241.30
69	3056	3142	3388	3388
70	Ø203.2±0.3	Ø203.2±0.3	Ø203.2±0.3	Ø203.2±0.3

A : 6 holes M20 through
B : 8 holes M20 x 38 deep
C : 12 holes M20 x 38 deep
D : 2 holes M20 through
E : 8 holes M16 x 25 deep
F : 2 holes diam. 37 - 37.16
G : 8 holes M18 x 31 deep
H : 8 studs M18 - 1.5
I : 4 holes M16 x 25 deep
J : 5 holes M20 x 35 deep
K : 4 holes M16 x 30 deep
L : 4 holes diam. 20.70 ± 0.12 through
v : 4 WD centerline
w : Crankshaft centerline
x : Differential centerline
y : Trumpet centerline
z : PTO centerline

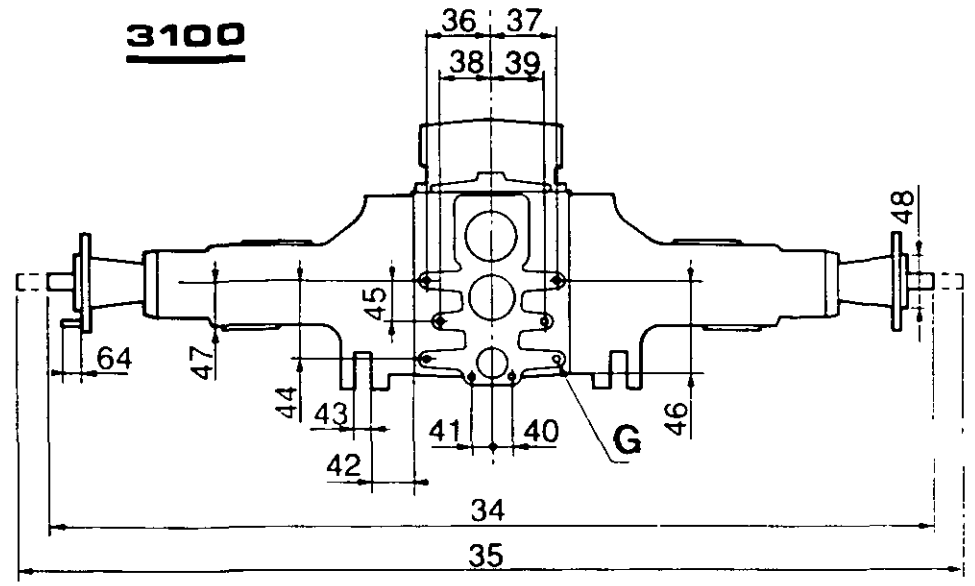
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Introduction

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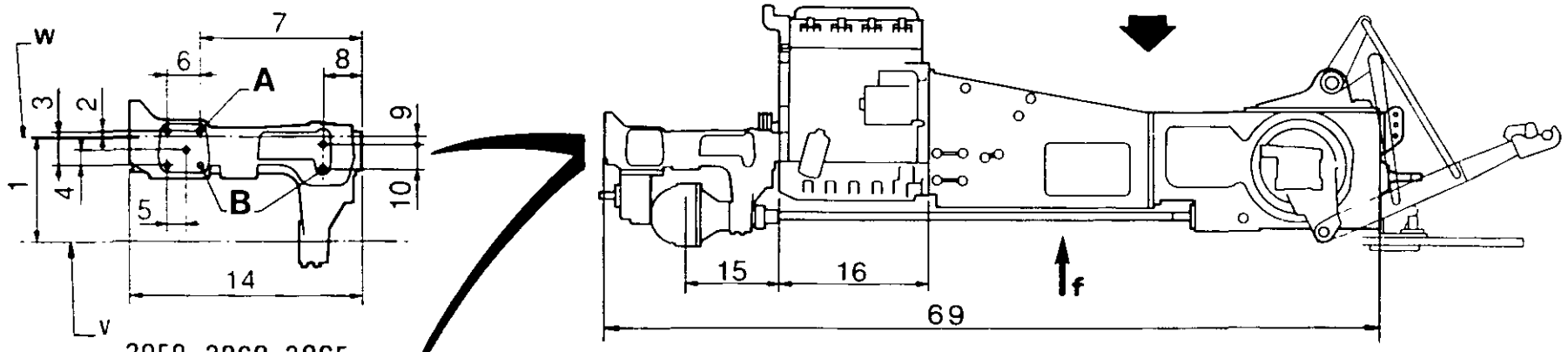


3080 . 3095 . 3115 . 3125

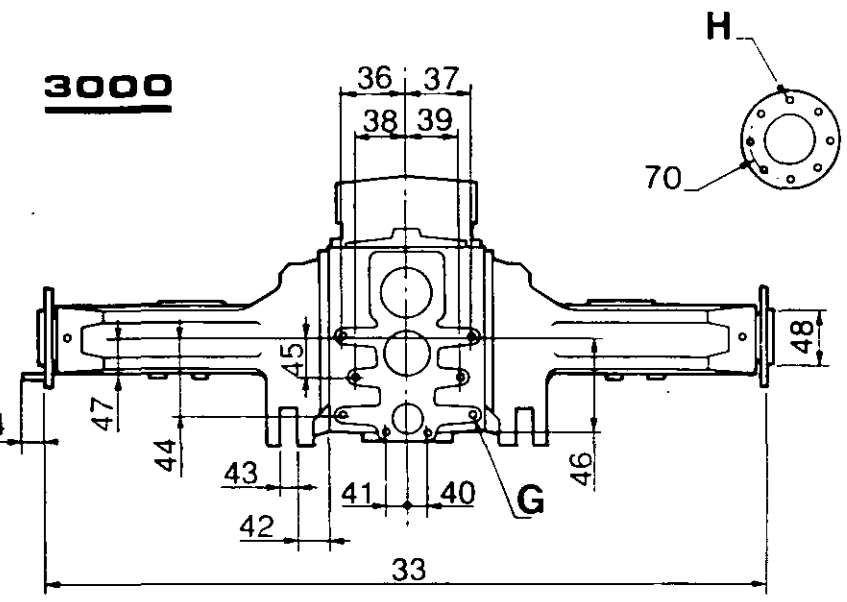


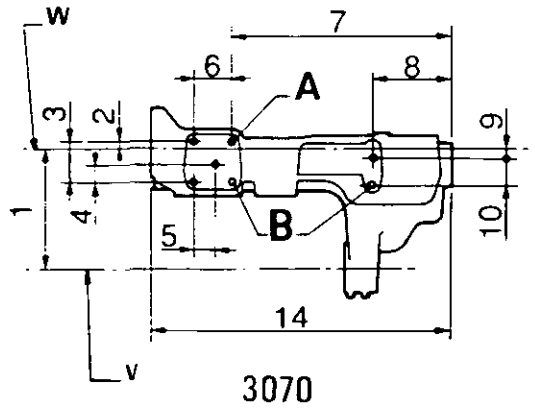
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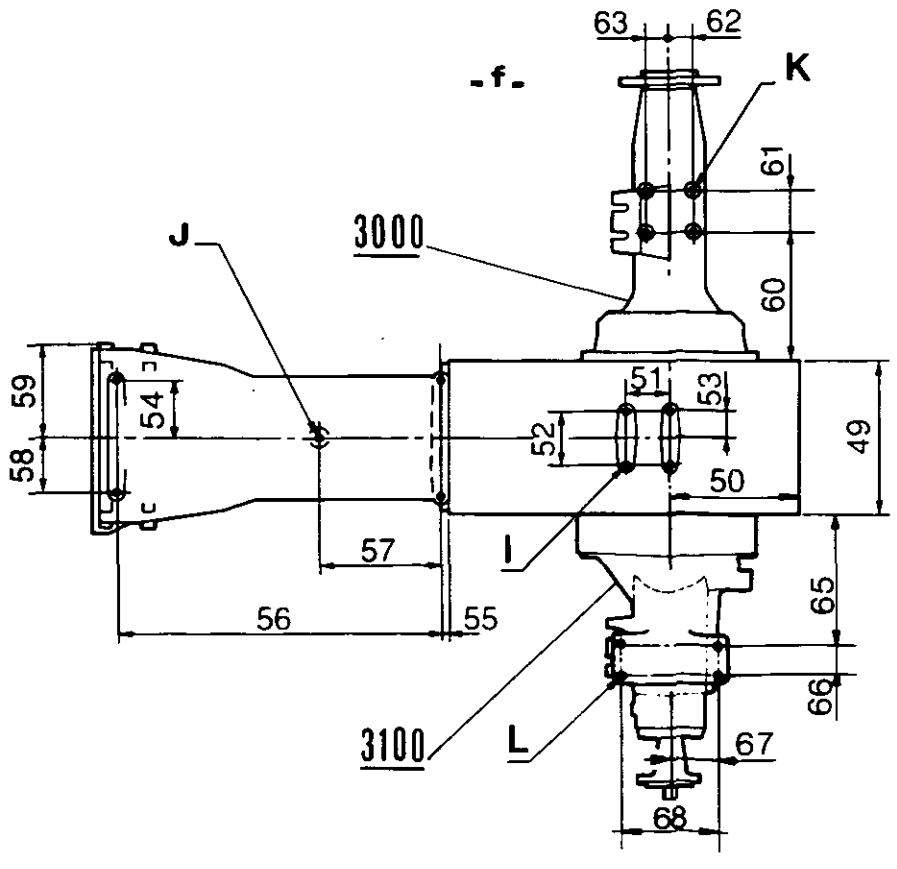


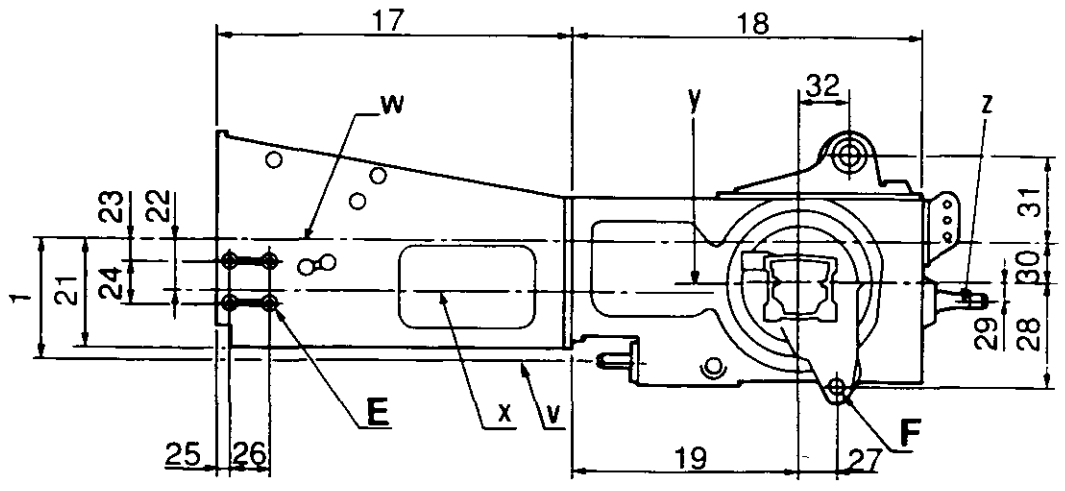
3050 . 3060 . 3065





3070

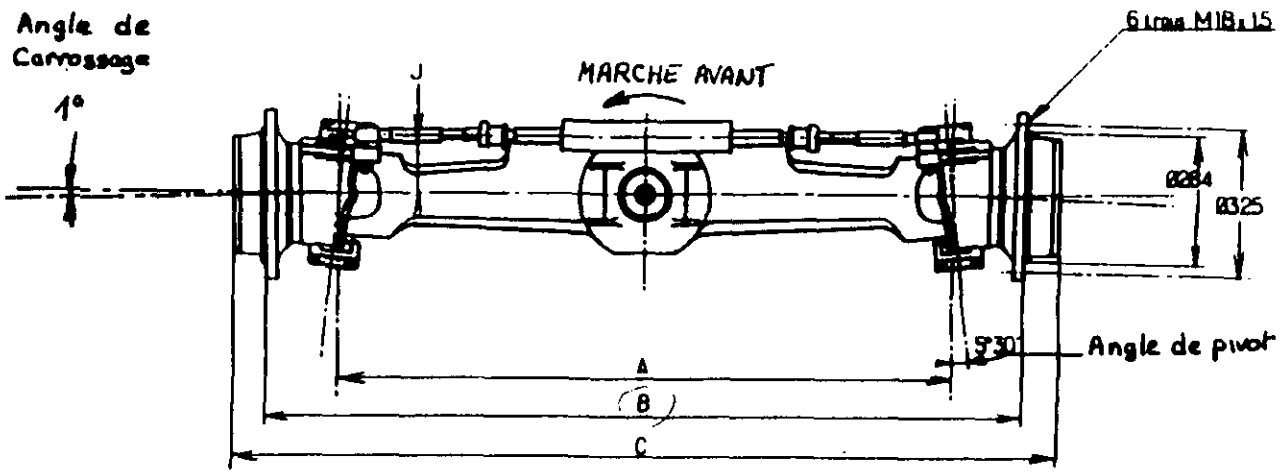


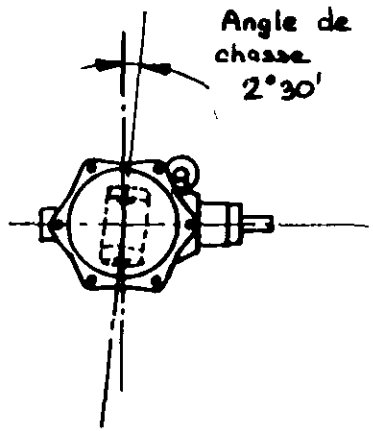


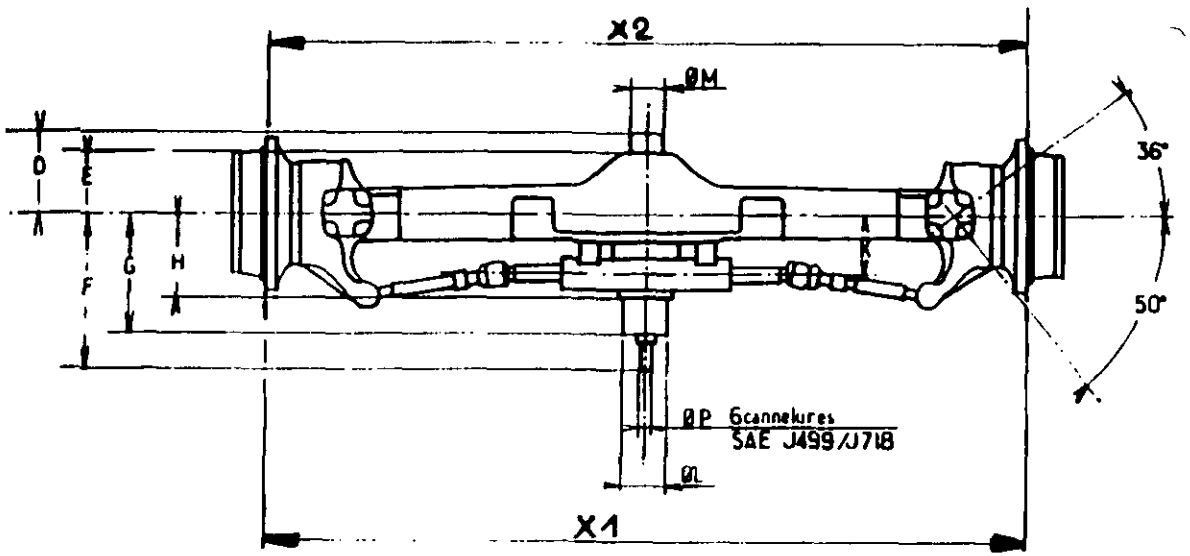
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PINCEMENT : X2-X1 = 0 ± 3mm

Rep.	Cat. 1	Cat. 2	Cat. 2.5	Cat. 3
A	1330	1330	1450	1570
B	1689	1689	1800	1920
C	1792	1810	1971	2111
D	180	180	180	205
E	135	135	135	155
F	328	328	328	365
G	255	255	255	287
H	180	180	180	185
J	125	125	125	125
K	125	125	125	145
L	95 f8	95 f8	95 f8	110 f7
M	70 f7	70 f7	70 f7	80 f7
P	1-1/8"	1-1/8"	1-3/8"	1-3/8"

TECHNICAL DATA

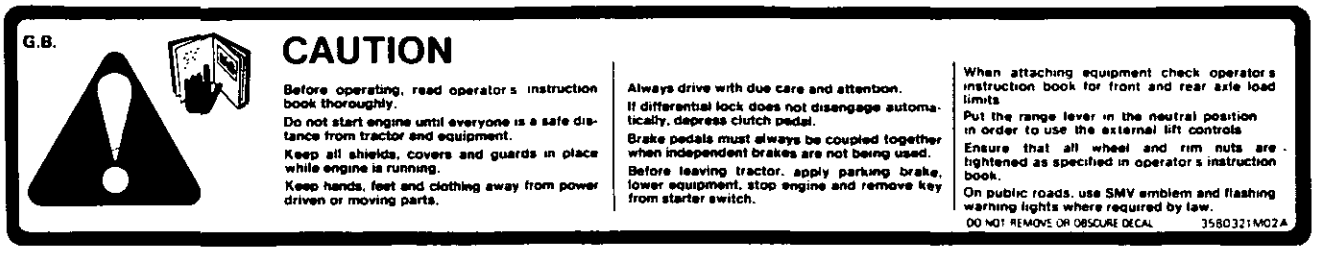
Prepared by : P
Date : 9 dec. 87

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D . Safety precautions

Do not remove or obscure Caution, Warning or Instruction Decals (Yellow). Replace any Caution, Warning or Instruction Decals that are not readable or are missing. See here under the actual location of these decals.



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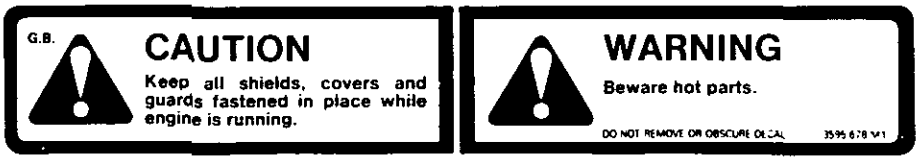




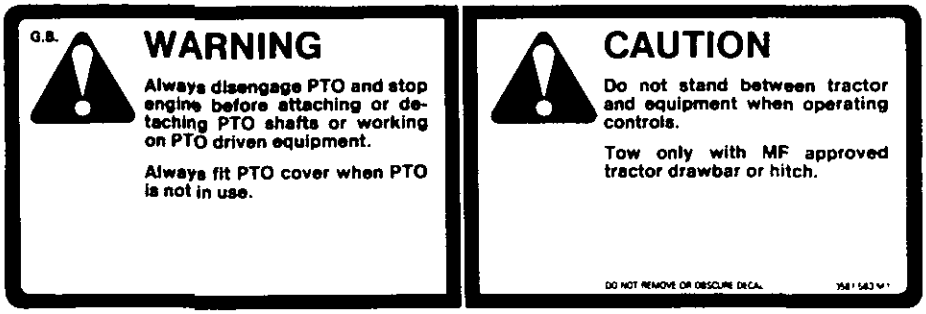
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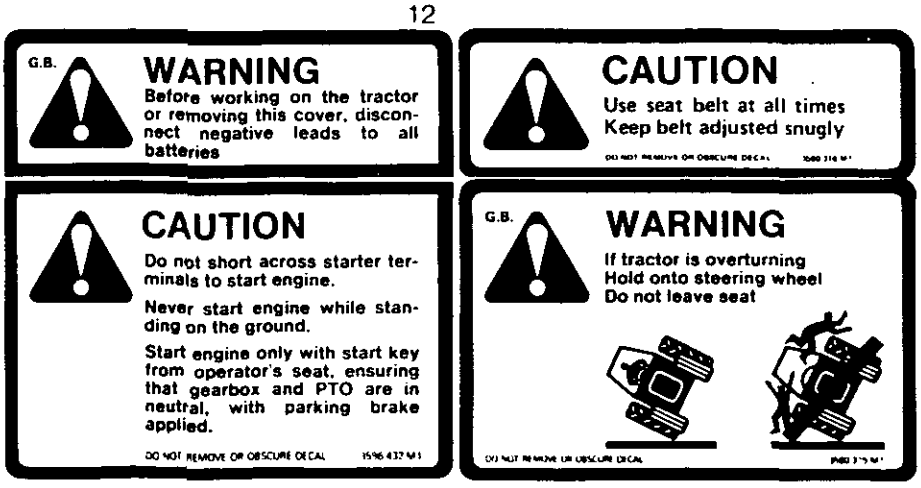


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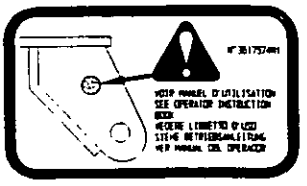
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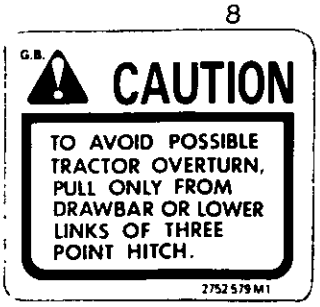
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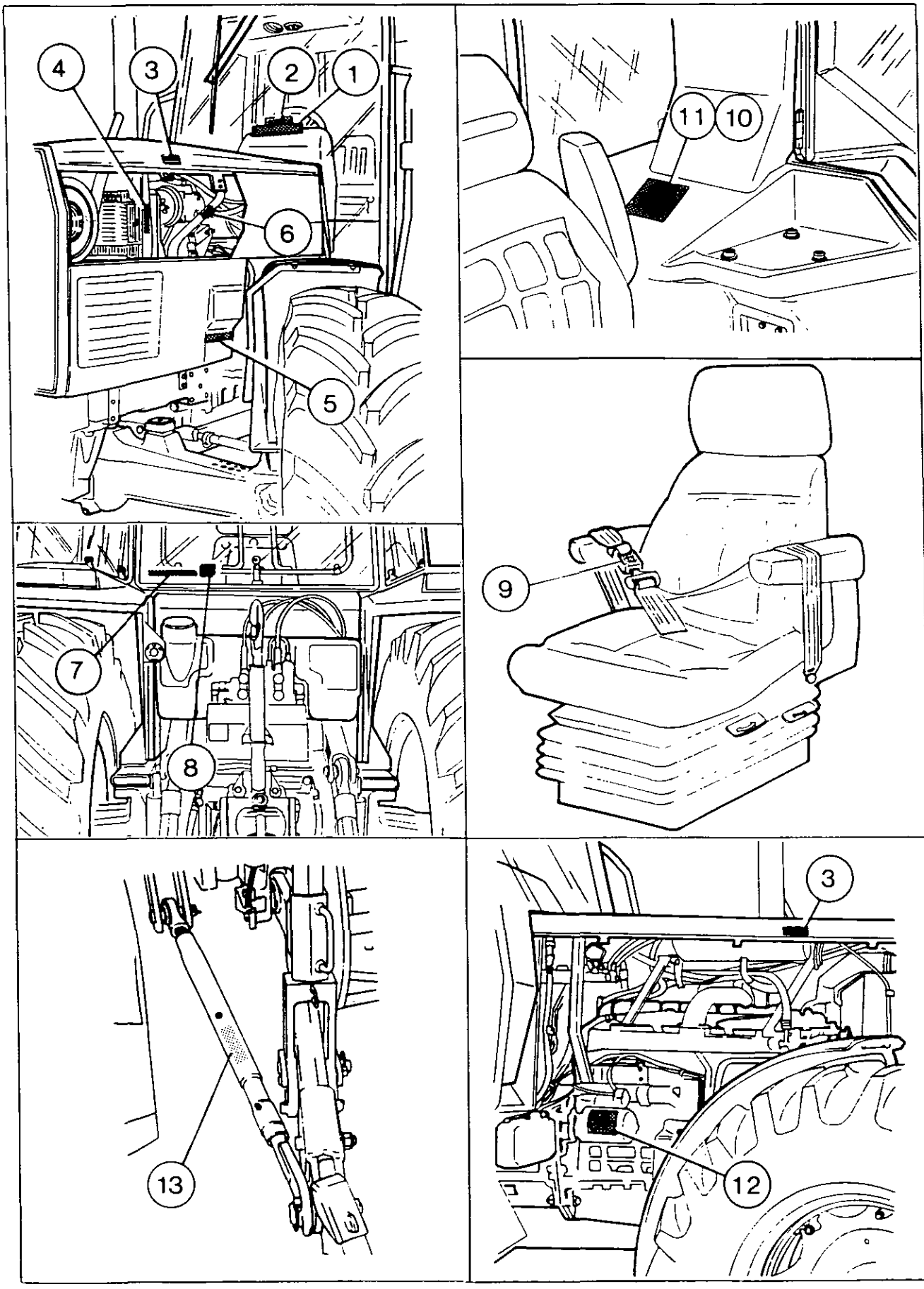


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E . Practical advice

Safety

Your safety and that of others must always be the first consideration when working around machines of any type.
Safety is a matter of thoroughly understanding the job to be done, the correct use of tools and equipment, and the application of good common sense.

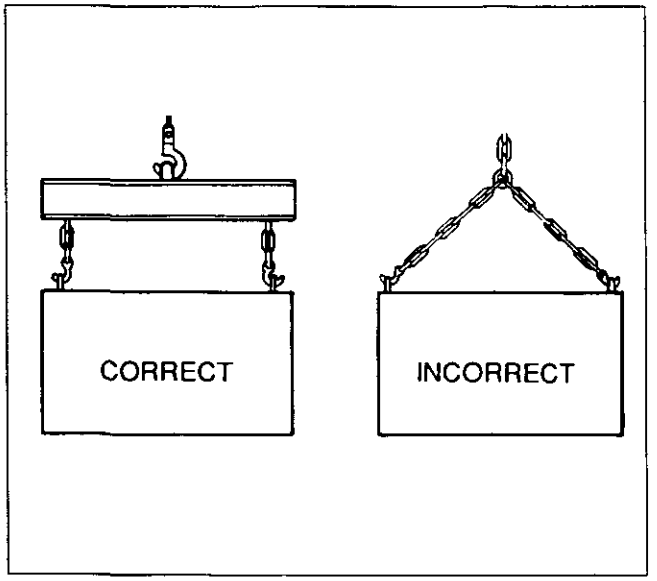
Trouble-shooting

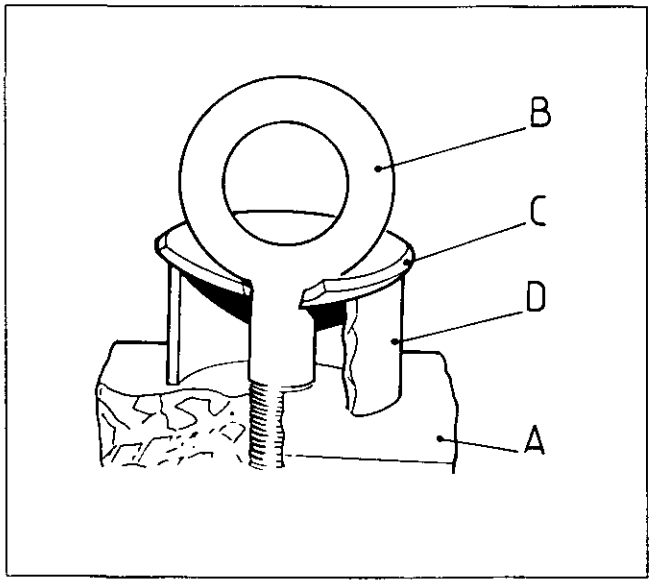
The following procedure, combined with the information contained in the workshop manual will be helpful in tracing faults accurately.
It consists of following a number of logical steps to locate and correct the problem.

1. Determine the problem.
2. List possible causes.
3. Differentiate the causes.
4. Conduct checks in logical order to determine the exact cause.
5. Consider approximate remaining service life against cost of parts and labour.
6. Make any necessary repair.
7. Recheck the parts and functions for correct operation.

Handling of heavy components

Unless otherwise specified, all removals should be accomplished using adjustable lifting equipment. All supporting slings must be parallel to each other and as near vertical as possible in relation to the object being lifted.However, where slings are of a far greater capacity than the weight of the load to be lifted, a triangular lifting arrangement may be used (2, 3 or 4 strands from a single ring beneath the hoist hook). When removing a component at an angle, remember that the capacity of an eyebolt is reduced when the angle between the supporting members and the object becomes less than 90° (correct and incorrect method of lifting).
Eyebolts and brackets must never be bent and must only work under tension. A length of pipe and a washer may be used to reduce tension on eyebolts.





Forged eyebolt support

A Load - B Lifting shackle - C Shackle retaining plate (3 mm thick) - D Sleeve (may or may not be welded to plate)
In some cases, special lifting fixtures are available to obtain correct balance and provide for safe handling. Consult the relevant section of the Workshop Manual.

Warning

If a part resists removal, check that all nuts and bolts have been removed and that there is no interference from adjacent parts.

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Cleanliness

To ensure long life of a machine, it is important to keep dirt and foreign material out of its vital working components. Precautions must be taken to safeguard against this. Enclosed compartments, seals and filters have been provided to keep the supply of air, fuel and lubricant clean. These protective devices must not be removed.

Whenever hydraulic fluid, fuel, lubricating oil or air lines are disconnected, clean the point of disconnection and the surrounding area. As soon as a line has been disconnected, cap, plug or tape the line or opening to prevent the ingress of foreign material.

The same cleaning and covering precautions should be taken when access covers or inspection plates are removed.

Clean and inspect all parts. Make sure that all passages and holes are clear. Cover all parts to keep them clean. Make sure parts are clean when they are reassembled. Leave new parts in their wrapping until they are actually needed for reassembly.

Assembly

When reassembling a machine, complete each step in sequence. Never partially assemble one part then start to assemble another. Make all recommended adjustments. Always check the job on completion to ensure that nothing has been overlooked.

Recheck the various adjustments before putting the machine back into service.

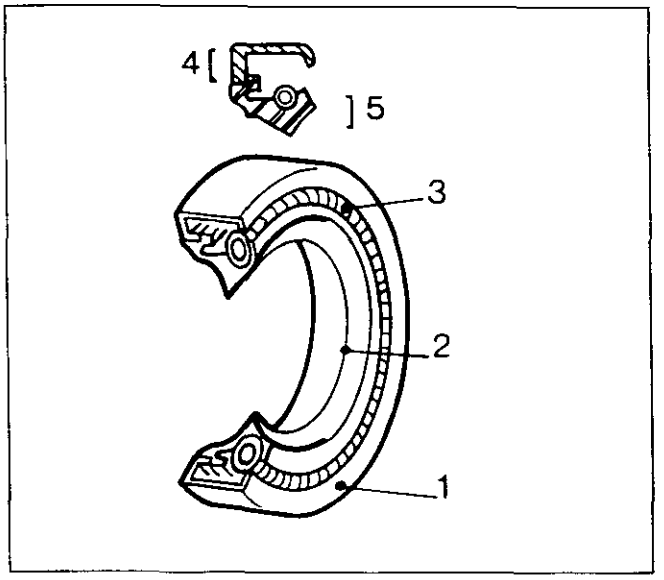
Note : Before fitting new parts, remove rust preventative compound from all machined surfaces (usually «peel-off» substances).

Lubrication

Where applicable, fill the compartments of repaired or renewed components with the quantity, type and grade of clean lubricant recommended in the routine maintenance section of the Operation Instruction Book.

Shims

When shims are removed, tie them together and identify their location. Keep shims clean and take care not to bend them before refitting them.



Gaskets

Make sure that the holes in gaskets line up with lubricating oil passages in the mating parts. If gaskets have to be made, use material of the correct type and thickness. Make sure that holes are punched in the right places.

Incorrectly punched gaskets can cause serious damage.

Lip type rubber seals.

Lubricate the lips of lip-type seals with oil before fitment. Do not use grease on seals, except for grease seals. The main parts of a lip-type seal are the case (1), the sealing element (2) and the ring spring (3). The figure shows the construction of a simple lip-type seal. The cross section shows the «heel» (4) and the «toe» (5), used to identify the sides of a single element seal. With a few exceptions, the toe of a single-lip seal is located on the lubricant side. Some seals have a second auxiliary lip which has no spring.

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Cables and wires

When removing or disconnecting a group of cables or wires, label each one to ensure correct refitment.

Locking devices

Slackening of nuts and bolts is prevented by mechanical means such as lockwashers, tab washers and cotter pins, or by Loctite-type locking agents.

Flat retainers must be installed properly to be effective.

Bend one end of the retainer against the edge of the part.

Bend the other end against one of the flats on the nut or bolt head.

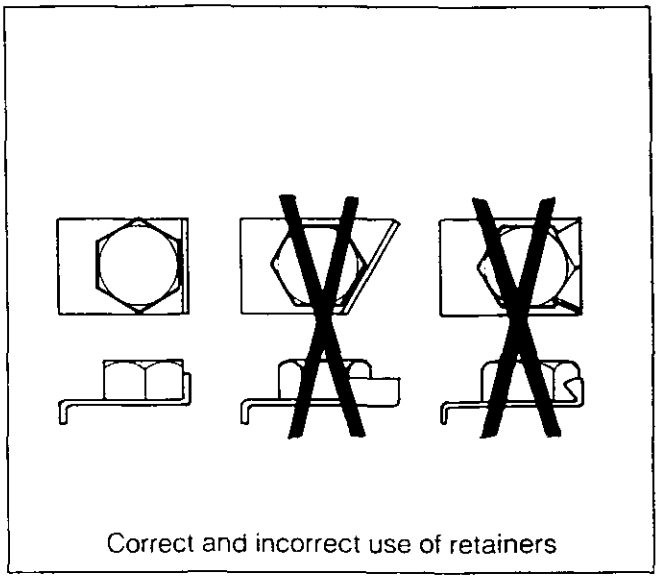
Always fit new retainers in compartments which house moving parts.

When fitting lockwashers on aluminium housings, place a flat washer between the lockwasher and the housing.

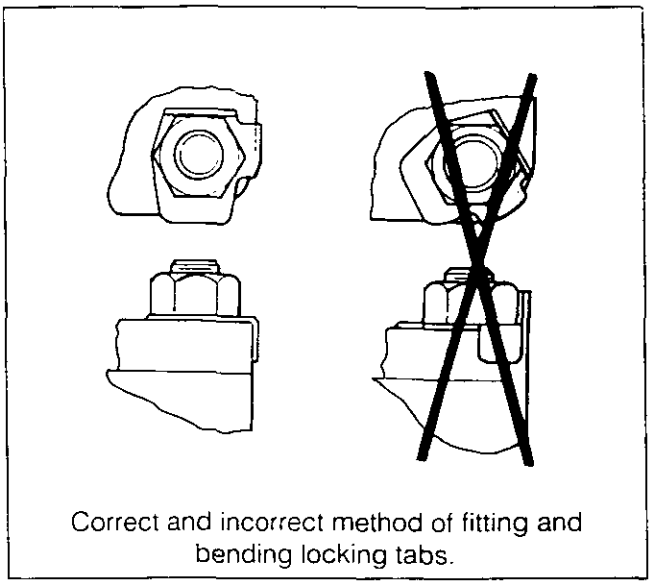
Note:

1) Never fit a lockwasher (Grower, fan, spring, etc..) under a nut or bolt to which a specified torque has to be applied (however, see Recommended Standard Torque charts).

2) Always thoroughly degrease components before applying Loctite type locking agents.



Correct and incorrect use of retainers



Correct and incorrect method of fitting and bending locking tabs.

Bushes and press fits

Do not fit bushes with a hammer alone. Use a suitable fitting tool and a hammer or, better still, a press if possible.

When using a press, ensure that pressure is applied directly in line with the bore. If the ring has an oil hole, take care to align it with the oil hole in the mating part.

When press fitting a part into another part, lubricate the mating surfaces. Tapered parts should be assembled dry.

Before assembly, check that the tapers are dry and free from burrs.

Fitting bolts in blind holes

Use bolts of the correct length. A bolt which is too long may «bottom» before the head comes into contact with the part it is to hold; this will cause damage to the threads. If a bolt is too short, there may not be enough threads engaged to hold the part securely.

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F . Installation instructions

Pre-delivery checks

The following items must be checked by the Distributor before delivery to a Dealer and by the Dealer before delivery to an Owner or Operator.

1 . General Installation

. Clean the battery top and smear the terminals with petroleum jelly.
. Charge the batteries if necessary.
. Check all electrical connections, cable and ducting clips and light fittings.
. Check and top up the engine and transmission housing oil levels.
. Lubricate all grease points.
. Check and adjust belt tensions as necessary (alternator, fan, auxiliary pump and air-conditioning compressor).
. Except when it contains antifreeze, flush the cooling system and refill with soft water.
. If the clutch pedal has been held down to prevent the disc sticking, remove the keeper.
. Check that the fuel tank contains a sufficient amount of fuel of the correct type.
. Remove air from the fuel system and tighten all fuel pipe connections.
. Check that the engine air filter hoses are secure.
. Check that engine control linkages are correctly adjusted and are operating freely.
. Start the engine.
. Check the instruments and warning lights for correct operation.
. Check engine speed at the tachometer with both hand and foot throttles.
. Attach a mounted implement and check the tractor hydraulics for correct operation.
. Check and adjust tyre pressures (road or field work).
. Check all nuts bolts, studs, pipe unions and clips for tightness.
. Check all pipes and hoses for leaks.
. Check and adjust headlamp alignment.
. Road test the tractor, checking the brakes and all instruments and services for correct operation.

2. Electronic systems

. Check the electronic linkage for correct operation.
. Carry out the quick check procedure in section 11B01.
. Check all the Autotronic functions, using the test procedure in 12B01.
. Check the on-board computer installation (Datatronic) using procedure 13A01.

3. Tightening Torques

. Check the torque of all chassis fixing nuts and bolt:
- Front axle/Engine
- Engine/Gearbox
- Gearbox/Rear axle
- Axle housings/Rear axle

. Check the torque of all wheel and rim nuts and bolts.

Instructions to the driver

Instructions must be given to the driver on the items listed below :

1. Safety precautions when starting the engine.
2. Location and significance of tractor and engine serial numbers.
3. Instruments and controls.
4. Running-in.
5. Starting and stopping the engine.
6. Selection of correct operating gear ratio and use of gearshift levers and reverse shuttle lever.
7. Danger of towing downhill without engine braking and correct use of gearbox.
8. Use and adjustment of brakes and brake pedal latch.
9. Use of clutch.
10. Use of hydraulic differential lock.
11. Use of hydraulically operated PTO - Clutch and brake.
12. Operation of hydraulic lift system.
13. Attaching and detaching towed implements.
14. Grease points.
15. Changing grades of oil.
16. Replacement of engine and transmission oil filter elements.
17. Operation of fuel system. Removal of air from the system. Air filter - clogging indicator.
18. Cooling system. Frost precautions. Tension of twin fan belts.
19. Maintenance of electrical equipment (batteries). Negative earth system.
20. Adjustment of front and rear track widths.
21. Tyre pressures.
22. Tightness of all nuts and bolts.
23. Fuel handling and storage.
24. Use of auxiliary hydraulic equipment.
25. Fill in tractor and engine serial number details in the Operator Instruction Book.
26. Read the Operator Instruction Book.

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G . Conversion table

Pressure units

1 PSI = 1 lbf/in² = 0,0689 bar
1 bar = 14,512 lbf/in² = 14,512 PSI

Bar	lbf / in²	Bar	lbf / in²	Bar	lbf / in²
0,5	7,256	9,5	137,9	35	508
1	14,51	10	145	40	588
1,5	21,77	11	159,6	45	653
2	29	12	174	50	726
2,5	36,28	13	189	60	871
3	43,54	14	203	70	1029
3,5	50,8	15	218	80	1161
4	58	16	232	90	1306
4,5	65,3	17	247	100	1451
5	72,6	18	261	200	2903
5,5	79,8	19	276	300	4354
6	87,1	20	290	400	5805
6,5	94,3	21	309	500	7257
7	101,6	22	319	600	8708
7,5	108,8	23	334	700	10160
8	116,1	24	348	800	11611
8,5	123,4	25	368	900	13235
9	130,6	30	435	1000	14514

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Torque units

1 Nm = 0,7376 lbf/ft
1 lbf/ft ≈ 1,3558 Nm

Nm		lbf/ft	Nm		lbf/ft	Nm		lbf/ft
1,3558	1	0,7376	46,0972	34	25,0784	90,8396	67	49,4912
2,7116	2	1,4752	47,4530	35	25,8160	92,1944	68	50,1568
4,0674	3	2,2128	48,8088	36	26,5536	93,5502	69	50,8944
5,4232	4	2,9504	50,1646	37	27,2912	94,9060	70	51,6320
6,7790	5	3,6880	51,5204	38	28,0288	96,2618	71	52,3696
8,1348	6	4,4256	52,8762	39	28,7664	97,6176	72	53,1072
9,4906	7	5,1632	54,2320	40	29,5040	98,9734	73	53,8448
10,8464	8	5,9008	55,5878	41	30,2416	100,329	74	54,5824
12,2022	9	6,6384	56,9436	42	30,9792	101,685	75	55,3200
13,5580	10	7,3760	58,2994	43	31,7168	103,041	76	56,0576
14,9138	11	8,1136	59,6552	44	32,4544	104,397	77	56,7952
16,2696	12	8,8512	61,0110	45	33,1920	105,752	78	57,5328
17,6254	13	9,5888	62,3668	46	33,9296	107,108	79	58,2704
18,9812	14	10,3264	63,7226	47	34,6672	108,464	80	59,0080
20,3370	15	11,0640	65,0784	48	35,4048	109,820	81	59,7456
21,6928	16	11,8016	66,4342	49	36,1424	111,176	82	60,4832
23,0486	17	12,5392	67,7900	50	36,8800	112,531	83	61,2208
24,4044	18	13,2768	69,1458	51	37,6176	113,887	84	61,9584
25,7602	19	14,0144	70,5016	52	38,3552	115,243	85	62,6960
27,1160	20	14,7520	71,8574	53	39,0928	116,600	86	63,4336
28,4718	21	15,4896	73,2132	54	39,8304	117,955	87	64,1712
29,8276	22	16,2272	74,5690	55	40,5680	119,310	88	64,9088
31,1834	23	16,9648	75,9248	56	41,3056	120,666	89	65,6464
32,5392	24	17,7024	77,2806	57	42,0432	122,022	90	66,3840
33,8950	25	18,4400	78,6364	58	42,7808	123,378	91	67,1216
35,2508	26	19,1776	79,9992	59	43,5184	124,734	92	67,8592
36,6066	27	19,9152	81,3480	60	44,2560	126,089	93	68,5968
37,9624	28	20,6528	82,7038	61	44,9936	127,445	94	69,3344
39,3182	29	21,3904	84,0596	62	45,7312	128,801	95	70,0720
40,6740	30	22,1280	85,4154	63	46,4688	130,157	96	70,8096
42,0298	31	22,8656	86,7712	64	47,2064	131,513	97	71,5472
43,3856	32	23,6032	88,1270	65	47,9440	132,868	98	72,2848
44,7414	33	24,3408	89,4828	66	48,6816	134,224	99	73,0224

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Introduction

Capacity units

1 litre = 0,2199 gallon imp.
1 gallon imp. = 4,5459 litres

Note :
1 US gallon = 3.79 litres

Imp. gal.		Litres	Imp. gal.		Litres	Imp. gal.		Litres
0,2199	1	4,5459	7,4766	34	154,561	14,733	67	304,575
0,4398	2	9,0918	7,6965	35	159,107	14,9532	68	309,121
0,6597	3	13,6377	7,9164	36	163,652	15,1731	69	313,667
0,8796	4	18,1836	8,1363	37	168,198	15,3930	70	318,213
1,0995	5	22,7295	8,3562	38	172,744	15,6129	71	322,759
1,3194	6	27,2754	8,5761	39	177,290	15,8328	72	327,305
1,5393	7	31,8213	8,7960	40	181,836	16,0527	73	331,851
1,7592	8	36,3672	9,0159	41	186,382	16,2726	74	336,397
1,9791	9	40,9131	9,2358	42	190,929	16,4925	75	340,943
2,1990	10	45,4590	9,4557	43	195,474	16,7124	76	345,488
2,4189	11	50,0049	9,6756	44	200,019	16,9323	77	350,034
2,6388	12	54,5508	9,8955	45	204,566	17,1522	78	354,580
2,8587	13	59,0967	10,1154	46	209,111	17,3721	79	359,126
3,0786	14	63,6426	10,3353	47	213,657	17,5920	80	363,672
3,2985	15	68,1885	10,5552	48	218,203	17,8119	81	368,218
3,5184	16	72,7344	10,7751	49	222,749	18,0318	82	372,764
3,7383	17	77,2803	10,9950	50	227,295	18,2517	83	377,310
3,9582	18	81,8262	11,2149	51	231,841	18,4716	84	381,856
4,1781	19	86,3721	11,4348	52	236,387	18,6915	85	386,402
4,3980	20	90,9180	11,6547	53	240,933	18,9114	86	390,947
4,6179	21	95,4639	11,8746	54	245,479	19,1313	87	395,493
4,8378	22	100,009	12,0945	55	250,025	19,3512	88	400,039
5,0577	23	104,556	12,3144	56	254,570	19,5711	89	404,585
5,2776	24	109,102	12,5343	57	259,116	19,7910	90	409,131
5,4975	25	113,648	12,7542	58	263,662	20,0109	91	413,677
5,7174	26	118,193	12,9741	59	268,209	20,2308	92	418,223
5,9373	27	122,739	13,1940	60	272,754	20,4507	93	422,769
6,1572	28	127,285	13,4139	61	277,299	20,6706	94	427,315
6,3771	29	131,831	13,6338	62	281,846	20,8905	95	431,861
6,5970	30	136,377	13,8537	63	286,392	21,1104	96	436,406
6,8169	31	140,923	14,0736	64	290,938	21,3303	97	440,952
7,0368	32	145,469	14,2935	65	295,483	21,5502	98	445,498
7,2567	33	150,015	14,5134	66	300,029	21,7701	99	450,044

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Capacity units

1 litre = 1.7599 pinte imp.
1 pinte imp. =0,5682 litre

Note :
1 Litre = 2.113 US pints

Imp. pt.		Litres	Imp. pt.		Litres	Imp. pt.		Litres
1.7599	1	0,5682	59,8366	34	19,3188	117,913	67	38,0694
3.5198	2	1,1364	61,5965	35	19,8870	119,673	68	38,6376
5.2797	3	1,7046	63,3564	36	20,4552	121,433	69	39,2058
7.0396	4	2,2728	65,1163	37	21,0234	123,193	70	39,7740
8.7995	5	2,8400	66,8762	38	21,5916	124,953	71	40,3422
10.5594	6	3,4902	68,6361	39	22,1598	126,713	72	40,9104
12.3193	7	3,9774	70,3960	40	22,7280	128,473	73	41,4786
14.0792	8	4,5456	72,1559	41	23,2962	130,233	74	42,0468
15.8391	9	5,1138	73,9158	42	23,8644	131,993	75	42,6150
17.5990	10	5,6820	75,6757	43	24,4326	133,752	76	43,1832
19.3589	11	6,2502	77,4356	44	25,0008	135,512	77	43,7514
21.1188	12	6,8184	79,1955	45	25,5690	137,272	78	44,3196
22.8787	13	7,3866	80,9554	46	26,1372	139,032	79	44,8878
24.6386	14	7,9548	82,7153	47	26,7054	140,792	80	45,4560
26.3985	15	8,5230	84,4752	48	27,2736	142,552	81	46,0242
28.1854	16	9,0912	86,2351	49	27,8418	144,312	82	46,5924
29.9183	17	9,6594	87,9950	50	28,4100	146,072	83	47,1606
31.6782	18	10,2276	89,7549	51	28,9782	147,832	84	47,7288
33.4381	19	10,7958	91,5148	52	29,5464	149,592	85	48,2970
35.1980	20	11,3640	93,2747	53	30,1146	151,351	86	48,8652
36.9579	21	11,9322	95,0346	54	30,6828	153,111	87	49,4334
38.7178	22	12,5004	96,7945	55	31,2510	154,871	88	50,0016
40.4770	23	13,0686	98,5544	56	31,8192	156,631	89	50,5698
42.2376	24	13,6368	100,314	57	32,3874	158,391	90	51,1380
43.9975	25	14,2050	102,074	58	32,9556	160,151	91	51,7062
45.7574	26	14,7732	103,834	59	33,5238	161,912	92	52,2744
57.5173	27	15,3414	105,594	60	34,0920	163,671	93	52,8426
49.2772	28	15,9096	107,354	61	34,6602	165,431	94	53,4108
51.0371	29	16,4778	109,114	62	35,2284	167,191	95	53,9790
52.7970	30	17,0460	110,874	63	35,7966	168,950	96	54,5472
54.5569	31	17,6142	112,634	64	36,3648	170,710	97	55,1154
56.3168	32	18,1824	114,394	65	36,9330	172,470	98	55,6836
58.0767	33	18,7506	116,153	66	37,5012	174,230	99	56,2518

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Length units

1m = 3,2808 ft
1 ft = 0,3048 m

m		ft	m		ft	m		ft
0,3048	1	3,2808	10,3632	34	111,549	20,4216	67	219,816
0,6096	2	6,5617	10,6680	35	114,829	20,7264	68	223,097
0,9144	3	9,8425	10,9728	36	118,110	21,0312	69	226,378
1,2192	4	13,1234	11,2776	37	121,391	21,3360	70	229,659
1,5240	5	16,4042	11,5824	38	124,672	21,6408	71	232,940
1,8288	6	19,6850	11,8872	39	127,953	21,9456	72	236,220
2,1336	7	22,9659	12,1920	40	131,234	22,2504	73	239,501
2,4384	8	26,2467	12,4968	41	134,514	22,5552	74	242,782
2,7432	9	29,5276	12,8016	42	137,795	22,8600	75	246,063
3,0480	10	32,8084	13,1064	43	141,076	23,1648	76	249,344
3,3528	11	36,0892	13,4112	44	144,357	23,4696	77	252,625
3,6576	12	39,3701	13,7160	45	147,638	23,7744	78	255,906
3,9624	13	42,6509	14,0208	46	150,919	24,0792	79	259,186
4,2672	14	45,9318	14,3256	47	154,199	24,3840	80	262,467
4,5720	15	49,2126	14,6304	48	157,480	24,6888	81	265,748
4,8768	16	52,4934	14,9352	49	160,761	24,9936	82	269,029
5,1816	17	55,7743	15,2400	50	164,042	25,2984	83	272,310
5,4864	18	59,0551	15,5448	51	167,323	25,6032	84	275,591
5,7912	19	62,3360	15,8496	52	170,604	25,9080	85	278,871
6,0960	20	65,6168	16,1544	53	173,885	26,2128	86	282,152
6,4008	21	68,8976	16,4592	54	177,165	26,5176	87	285,433
6,7056	22	72,1785	16,7640	55	180,446	26,8224	88	288,714
7,0104	23	75,4593	17,0688	56	183,727	27,1272	89	291,995
7,3152	24	78,7402	17,3736	57	187,008	27,4320	90	295,276
7,6200	25	82,0210	17,6784	58	190,289	27,7368	91	298,556
7,9248	26	85,3018	17,9832	59	193,570	28,0416	92	301,837
8,2296	27	88,5827	18,2880	60	196,850	28,3464	93	305,118
8,5344	28	91,8635	18,5928	61	200,131	28,6512	94	308,399
8,8392	29	95,1444	18,8976	61	203,412	28,9560	95	311,680
9,1440	30	98,4252	19,2024	63	206,693	29,2608	96	314,961
9,4488	31	101,7060	19,5072	64	209,974	29,5656	97	318,241
9,7536	32	104,9870	19,8120	65	213,255	29,8704	98	321,522
10,0584	33	108,2680	20,1168	66	216,535	30,1752	99	324,803

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Weight units

1kg = 2.2046 lb
1 lb = 0.4536 kg

kg		lb	kg		lb	kg		lb
0.4536	1	2,2046	15,4224	34	74,9564	30,3912	67	147,708
0.9072	2	4,4092	15,8760	35	77,1610	30,8448	68	149,913
1.3608	3	6,6138	16,3296	36	79,3656	31,2984	69	152,117
1.8144	4	8,8184	16,7832	37	81,5702	31,7520	70	154,322
2.2680	5	11,0230	17,2368	38	83,7748	32,2056	71	156,527
2.7216	6	13,2276	17,6904	39	85,9794	32,6592	72	158,731
3.1752	7	15,4322	18,1440	40	88,1840	33,1128	73	160,936
3.6288	8	17,6368	18,5976	41	90,3886	33,5664	74	163,140
4.0824	9	19,8414	19,0512	42	92,5932	34,0200	75	165,345
4.5360	10	22,0460	19,5048	43	94,7978	34,4736	76	167,549
4.9896	11	24,2506	19,9584	44	97,0024	34,9272	77	169,754
5.4432	12	26,4552	20,4120	45	99,207	35,3808	78	171,958
5.8968	13	28,6598	20,8656	46	101,412	35,8344	79	174,163
6.3504	14	30,8644	21,3192	47	103,616	36,2880	80	176,368
6.8040	15	33,0690	21,7728	48	105,821	36,7416	81	178,573
7.2576	16	35,2736	22,2264	49	108,025	37,1952	82	180,777
7.7112	17	37,4782	22,6800	50	110,230	37,6488	83	182,982
8.1648	18	39,6828	23,1336	51	112,435	38,1024	84	185,186
8.6184	19	41,8874	23,5872	52	114,639	38,5560	85	187,391
9.0720	20	44,0920	24,0408	53	116,844	39,0096	86	189,596
9.5256	21	46,2966	24,4944	54	119,048	39,4632	87	191,800
9.9792	22	48,5012	24,9489	55	121,253	39,9168	88	194,005
10.4328	23	50,7058	25,4016	56	123,458	40,3704	89	196,209
10.8864	24	52,9104	25,8552	57	125,662	40,8240	90	198,414
11.3400	25	55,1150	26,3088	58	127,867	41,2776	91	200,619
11.7936	26	57,3196	26,7624	59	130,071	41,7312	92	202,823
12.2472	27	59,5242	27,2160	60	132,276	42,1848	93	205,028
12.7008	28	61,7288	27,6696	61	134,481	42,6384	94	207,232
13.1544	29	63,9334	28,1232	62	136,685	43,0920	95	209,437
13.6080	30	66,1380	28,5768	63	138,889	43,5456	96	211,642
14.0616	31	68,3426	29,0304	64	141,094	43,9992	97	213,846
14.5152	32	70,5472	29,4840	65	143,299	44,4528	98	216,051
16.9688	33	72,7518	29,9376	66	145,504	44,9064	99	218,255

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	LENGTH 1 inch = 25,4 mm						TEMPERATURE			
Inches	Decimals	mm	Inches to mm		mm to inches		Fahrenheit to Celsius			
			Inches	mm	mm	Inches	° F	° C	° C	° F
1/64	,015625	0,3969					- 20	- 28,9	- 30	- 22
1/32	,031250	0,7937					- 15	- 26,1	- 28	- 18,4
3/64	,468750	1,1906					- 10	- 23,3	- 26	- 14,8
1/16	,062500	1,5875	0,0001	0,00254	0,004	0,00015	- 5	- 20,6	- 24	- 11,2
5/64	,078125	1,9844	,0002	,00508	0,005	,00019	0	- 17,8	- 22	- 7,6
3/32	,093750	2,3812	,0003	,00762	0,006	,00023	1	- 17,2	- 20	- 4
7/64	,109375	2,7781	,0004	,01016	0,007	,00027	2	- 16,7	- 18	- 0,4
1/8	,125000	3,1750	,0005	,01270	0,008	,00031	3	- 16,1	- 16	3,2
9/64	,140625	3,5719	,0006	,01524	0,009	,00035	4	- 15,6	- 14	6,8
5/32	,156250	3,9687	,0007	,01778	0,01	,00039	5	- 15,0	- 12	10,4
11/64	,171875	4,3656	,0008	,02032	0,02	,00079	10	- 12,2	- 10	14
3/16	,187500	4,7625	,0009	,02286	0,03	,00118	15	- 9,4	- 8	17,6
13/64	,203125	5,1594	,001	,0254	0,04	,00157	20	- 6,7	- 6	21,2
7/32	,218750	5,5562	,002	,0508	0,05	,00197	25	- 3,9	- 4	24,8
15/64	,234375	5,9531	,003	,0762	0,06	,00236	30	- 1,1	- 2	28,4
1/4	,250000	6,3500	,004	,1016	0,07	,00276	35	1,7	0	32
17/64	,265625	6,7469	,005	,1270	0,08	,00315	40	4,4	2	35,6
9/32	,281250	7,1437	,006	,1524	0,09	,00354	45	7,2	4	39,2
19/64	,296875	7,5406	,007	,1778	0,10	,00394	50	10,0	6	42,8
5/16	,312500	7,9375	,008	,2032	0,20	,0078	55	12,8	8	46,4
21/64	,328125	8,3344	,009	,2286	0,30	,01181	60	15,6	10	50
11/32	,343750	8,7312	,01	,254	0,40	,01575	65	18,3	12	53,6
23/64	,359375	9,1281	,02	,508	0,50	,01969	70	21,1	14	57,2
3/8	,375000	9,5250	,03	,762	0,60	,02362	75	23,9	16	60,8
25/64	,390625	9,9219	,04	1,016	0,70	,02756	80	26,7	18	64,4
13/32	,406250	10,3187	,05	1,270	0,80	,03149	85	29,4	20	68
27/64	,421875	10,7156	,06	1,524	0,90	,03543	90	32,2	22	71,6
7/16	,437500	11,1125	,07	1,778	1	,03937	95	35,0	24	75,2
29/64	,453125	11,5094	,08	2,032	2	,07874	100	37,8	26	78,8
15,32	,468750	11,9062	,09	2,286	3	,11811	105	40,6	28	82,4
31/64	,484375	12,3031	,10	2,540	4	,15748	110	43,3	30	86
1/2	,500000	12,7000	,20	5,080	5	,19685	115	46,1	32	89,6
33/64	,515625	13,0969	,30	7,620	6	,23622	120	48,9	34	93,2
17/32	,53125	13,4937	,40	10,160	7	,27559	125	51,7	36	96,8

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LENGTH 1 inch = 25,4 mm							TEMPERATURE			
Inches	Decimals	mm	Inches to mm		mm to inches		Fahrenheit to Celsius			
			Inches	mm	mm	Inches	° F	° C	° C	° F
35/64	,546875	13,8906	0,5	12,70	8	0,31496	130	54,4	38	100,4
9/16	,562500	14,2875	,6	15,24	9	,35433	135	57,2	40	104
37/64	,578125	14,6844	,7	17,78	10	,39370	140	60,0	42	107,6
19/32	,593750	15,0812	,8	20,32	11	,43307	145	62,8	44	112,2
39/64	,609375	15,4781	,9	22,86	12	,47244	150	65,6	46	114,8
5/8	,6250	15,8750	1	25,4	13	,51181	155	68,3	48	118,4
41/64	,640625	16,2719	2	50,8	14	,55118	160	71,1	50	122
21/32	,656250	16,6687	3	76,2	15	,59055	165	73,9	52	125,6
43/64	,671875	17,0656	4	101,6	16	,62992	170	76,7	54	129,2
11/16	,687500	17,4625	5	127	17	,66929	175	79,4	56	132,8
45/64	,703125	17,8594	6	152,4	18	,70866	180	82,2	58	136,4
23/32	,718750	18,2562	7	177,8	19	,74803	185	85,0	60	140
47/64	,734375	18,6531	8	203,2	20	,78740	190	87,8	62	143,6
3/4	,7500	19,05	9	228,6	21	,82677	195	90,6	64	147,2
49/64	,765625	19,4469	10	254	22	,86614	200	93,3	66	150,8
25/32	,781250	19,8437	11	279,4	23	,90551	205	96,1	68	154,4
51/64	,796875	20,2406	12	304,8	24	,94480	210	98,9	70	158
13/16	,812500	20,6375	13	330,2	25	,98425	212	100,0	75	167
53/64	,828125	21,0344	14	355,6	26	1,02362	215	101,7	80	176
27/32	,843750	21,4312	15	381	27	1,06299	220	104,4	85	185
55/64	,859375	21,8281	16	406,4	28	1,10236	225	107,2	90	194
7/8	,875000	22,2250	17	431,8	29	1,14173	230	110,0	95	203
57/64	,890625	22,6219	18	457,2	30	1,18110	235	112,8	100	212
29/32	,906250	23,0187	19	482,6	31	1,22047	240	115,6	105	221
59/64	,921875	23,4156	20	508	32	1,25984	245	118,3	110	230
15/16	,937500	23,8125	21	533,4	33	1,29921	250	121,1	115	239
61/64	,953125	24,2094	22	558,8	34	1,33858				
31/32	,968750	24,6062	23	584,2	34	1,37795				
63/64	,984375	25,0031	24	609,6	36	1,41732				
1	1,00	25,40	25	635	37	1,45669				
			26	660,4	38	1,49606				
					39	1,53543				
					40	1,57480				

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H . Sealants

The Loctite sealants quoted in this Workshop Service Manual are under their industrial names.
For repair use the commercial name according to the chart below or where applicable use the power part equivalent.

Loctite Industrial Name	Commercial Name	Part N°
221 - 241 242 - 542	Lock and Seal	3405350M1
270	Stud lock	3405352 M3
510 - 518	Instant Gasket	3405355 M2
638 - 648	Retainer	3405387 M1
Silicomet	Superflex sealant R.T.V. silicone sealant (clear)	

Note : Silicomet can be replaced by Hylosil (Powerpart). Use the product "Form A gasket 2" when sealing between plastic material and iron (or steel).
Example : PTO sensor, vehicle speed sensor,...

Loctite products may be ordered from Massey Ferguson Central Parts Operation.

Application method for Loctite sealants
1. Remove all traces of previous sealants or corrosion
- by mechanical process : wire brush or emery cloth
- by chemical application : use "Decaploc 88"
Leave the product to take effect then scrap off and wipe clean.
2. Degrease the components with a solvent. Preferably use the "Loctite 706 Dry Super Solvent" or power part safety solvent.
3. Allow the solvent to vaporize
4. Apply the recommended type of sealant
- for blind holes, coat only latest threads to the bottom of the hole.
- for components which need to be pressed together, apply sealant on mating surfaces only using a clean brush. Wipe off excess sealants.
- for gasket faces, apply a bead on one face only. Pass around the holes, then tighten as rapidly as possible.

IMPORTANT :
If the ambient temperature is below 10° C, in order to accelerate the action of the sealant (except for Silicomet) after operation 2, use Loctite activator T747 on at least one surface. Excess sealant, outside the joint will not harden (anaerobic curing of product) i.e. curing occurs only because of the absence of oxygen. Therefore wipe the excess off.

Note :
a) Do not attempt to retighten after 5 minutes of curing as this may break the bead of product.
b) Do not use too much product to avoid blocking of mating parts.

Grease
When grease is used in components which are in contact with transmission oil, use a grease which is miscible with oil to avoid blocking the hydraulic filters. Use "Amber Technical" grease supplied by WITCO company, 76320 Saint-Pierre des Elfes, France . or equivalent.

I . Tightening torques

When reassembling components, use the "standard Torque" charts as a general guide when tightening fasteners that DO NOT HAVE SPECIFIC TIGHTENING recommendations :
- 1 and 2 : for metric fasteners
- 3 and 4 : for inch fasteners
When a specific torque is necessary, it is mentioned in the text.

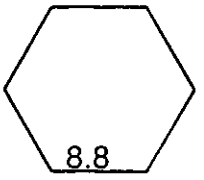
Charts **1** and **3** show normal torque loadings applied to galvanized threaded fasteners with normal nuts with a coarse or fine thread, with or without flat or lockwashers, and weld nuts deeper than 0,8 d.

Charts **2** and **4** show reduced torque loadings applied to threaded fasteners in assemblies with self-locking galvanized nuts, phosphated nuts or bolts, shallow nuts and weld nuts shallower than 0,8 d.

Torques recommended in these charts are for dry parts. If the threads are oiled, reduce the torque.

NOTE:
a) Read the strength classification on the bolt head and determine the torque loading required.
b) The size is the diameter of the shank - not the head width.

EG :



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Introduction

CHART 1

Standard torque values : zinc plated metric threads

Nominal Size	STRENGTH CLASSIFICATION ISO 8.8 (SAE 5 BS S) Torque N.m		STRENGTH CLASSIFICATION ISO 10.9 (SAE 8 BS V) Torque N.m	
	Max	Min	Max	Min
M3	1.7	1.3	2.4	1.8
M4	4.1	3.1	5.7	4.3
M5	8	6	11.5	8.5
M6	14	10	20	14
M8	35	25	46	36
M10	70	50	96	72
M12	120	90	160	120
M16	260	200	400	300
M20	560	420	800	600
M24	960	720	1300	1000
M30	1800	1400	2800	2100
M36	3300	2500	4800	3600

CHART 2

Standard reduced torque values : metric threads

Nominal Size	STRENGTH CLASSIFICATION ISO 8.8 (SAE 5 BS S) Torque N.m		STRENGTH CLASSIFICATION ISO 10.9 (SAE 8 BS V) Torque N.m	
	Max	Min	Max	Min
M3	1.4	1	1.9	1.5
M4	3.3	2.5	4.6	3.4
M5	6.4	4.8	9.2	6.8
M6	11	8	16	12
M8	28	20	37	29
M10	56	40	77	57
M12	96	72	130	100
M16	210	160	320	240
M20	450	340	640	480
M24	770	570	1040	800
M30	1400	1100	2200	1700
M36	2600	2000	3800	2900

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CHART 3

Standard torque values : zinc plated inch threads

Nominal Size	STRENGTH CLASSIFICATION SAE 5 (ISO 8,8 BS S) Torque N.m		STRENGTH CLASSIFICATION SAE 8 (ISO 10,9 BS V) Torque N.m	
	Max	Min	Max	Min
#6	2.4	1.8	3.3	2.5
#8	4.4	3.4	6.3	4.7
#10	6.3	4.7	8.9	6.7
1/4	15	11	22	16
5/16	30	22	43	31
3/8	53	39	75	55
7/16	86	64	120	90
1/2	130	100	180	140
5/8	260	200	370	280
3/4	460	350	660	490
7/8	760	560	1060	800
1	1120	840	1600	1200
1 1/8	1390	1050	2200	1700
1 1/4	2000	1500	3200	2400
1 1/2	3400	2600	5400	4100

CHART 4

Standard reduced torque values : inch threads

Nominal Size	STRENGTH CLASSIFICATION SAE 5 (ISO 8,8 BS S) Torque N.m		STRENGTH CLASSIFICATION SAE 8 (ISO 10,9 BS V) Torque N.m	
	Max	Min	Max	Min
#6	1.9	1.5	2.6	2
#8	3.5	2.7	5	3.8
#10	5	3.8	7.1	5.3
1/4	12	8.8	18	13
5/16	24	18	34	25
3/8	42	31	60	44
7/16	69	51	96	72
1/2	104	80	140	110
5/8	210	160	300	220
3/4	370	280	530	390
7/8	610	450	850	640
1	900	670	1280	960
1 1/8	1100	840	1760	1360
1 1/4	1600	1200	2560	1920
1 1/2	2700	2100	4320	3280

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2 A01 Air conditioning

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B. Safety and precautions ____ 4

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Cab and equipment

A . General

Suitable control of the internal environment of an agricultural implement cab requires that the temperature and humidity in the cab are within the range for human comfort, that an adequate volume of fresh filtered air is fed in to keep the cab under pressure and to prevent the ingress of impurities, and that the required steps are also taken to demist the windows to permit viewing in all directions.

Moreover, the distribution of air should be such that one is unable to perceive any appreciable difference in temperature within the cab, in particular over the body surface of the driver.

In addition, the unit must also be designed to stand up to the mechanical stresses brought about by the large number of impacts and vibration stresses associated with agricultural work.

Finally, sound operation in the muddy and dusty conditions associated with such agricultural work is necessary, and the equipment must be also capable of operating in positions which can reach angles of 16° tilt from the horizontal.

Principle of cooling

There is no known process for producing coldness ; there is only one for absorption of heat. Air conditioning is a process by which the heat is taken out of the air.

Temperature is measured by the quantity of heat in a material. Like water, which always runs from a high point towards a low point, heat always «runs» from a hot body to a cold body.

Hence, in order to condition the air or absorb the heat from the air in a cab, it is necessary to place hot air in contact with a cold surface.

There is also a physical property of substances which states that at a given pressure, there is a specific corresponding temperature to cause it to boil or evaporate.

In the vaporizing process which takes place at a constant temperature, the substance is able to absorb considerable heat. One example shows that at normal atmospheric pressure, water boils or vaporizes at 100°C (212°F).

A considerable quantity of heat can be absorbed by water, but the temperature will not rise. The same principles apply if heat is removed ; steam returns to the liquid state or liquids become solid.

Thus by controlling pressure in a closed circuit it is possible to nave a liquid at low pressure and a low boiling temperature.

During vaporization the liquid is able to absorb heat from its environment.

The cooling cycle

Air conditioning in the cab is obtained by means of a ventilation system which provides, after filtering, air reheated by pipes or hot water from the engine for cold days. If the ambient temperature, being too high, makes driving the tractor uncomfortable (in summer), a compressor cooling system allows to lower the temperature of several degrees in the cab.In an air conditioning unit, a refrigerant circulates in a closed circuit under pressure : this being freon R12. At properly specified points, this gas is subjected to modification of pressure and temperature.

A compressor , driven by the engine by means of a belt, sucks the vapour keeping low pressure on the upstream side, into the evaporator and compresses the gaseous freon obtained by this way, directing it to a cooling unit known as the condenser. The passage of air across the condenser located in front of the engine water radiator cools the gaseous freon and condenses it. The refrigerant which has become liquid is filtered. Humidity and impurities are picked up by a filter, which also has the function of acting as temporary reservoir ; this filter is known as the dehydrator reservoir.

The liquid freon R12 under high pressure is taken to the expansion valve, which governs the flow of fluid, and pressure is released ; this brings about a considerable fall in temperature and pressure. The liquid under low pressure starts boiling and evaporating in an exchanger or evaporator.

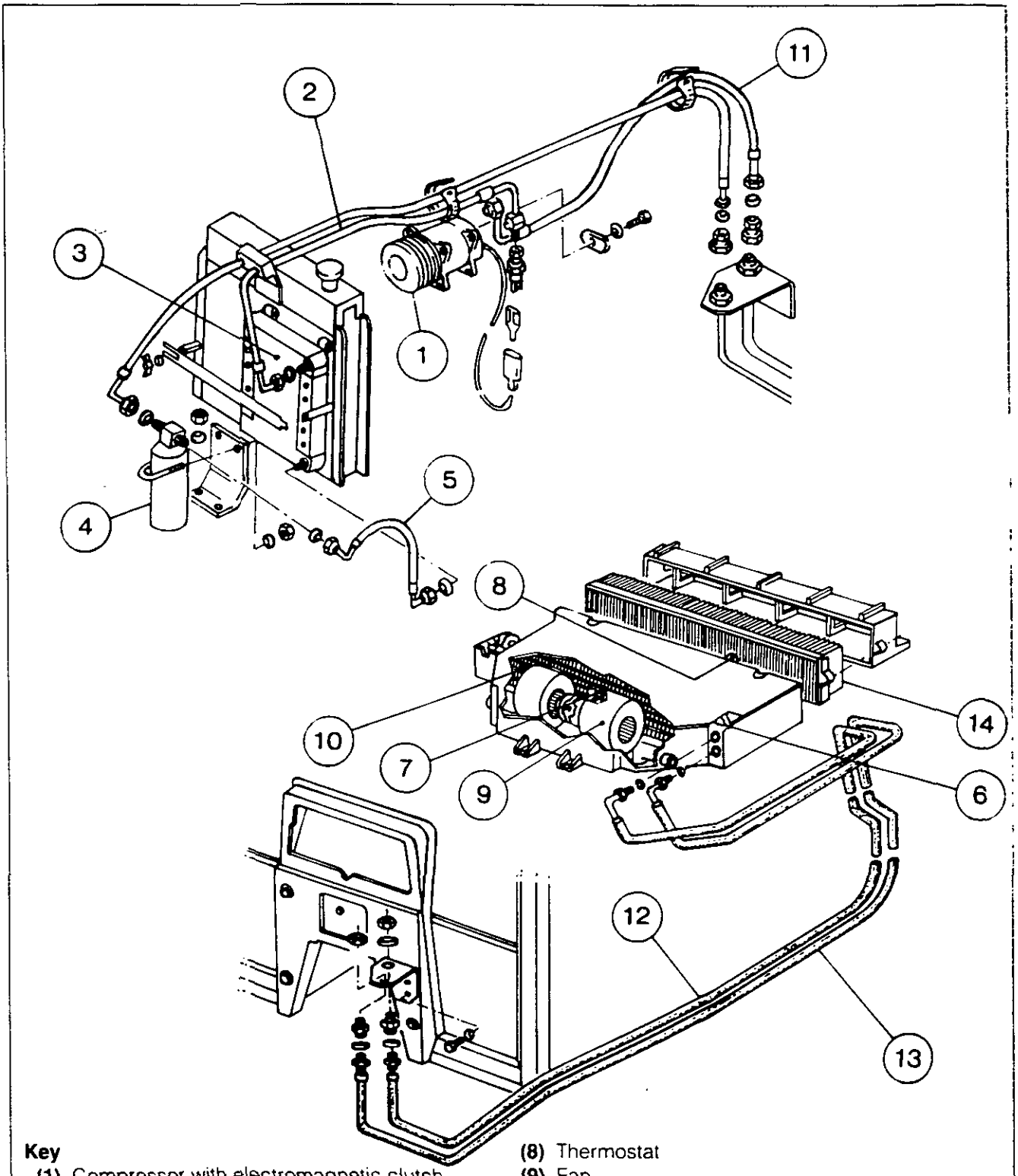
The warm humid air from the cab is passed across the evaporator by the turbines,fans, cools on contact and is forced back into the cab. The humidity in the air condenses in the evaporator and is discharged outside the cab through pipes. The cycle is completed when the gas is taken back to the compressor.

Depending upon the temperature desired in the cab, a thermostatic box or thermostat including a «OFF» setting initiates automatic switch off and switch on of the compressor by means of an electromagnetic clutch, thus regulating the temperature of the discharge air.

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Cab and equipment



Key

(1) Compressor with electromagnetic clutch
(2) Compressor outlet
(3) Condenser
(4) Dehydrator
(5) Condenser outlet
(6) Expansion valve
(7) Resistance for fan (2 speed)
(8) Thermostat
(9) Fan
(10) Evaporator
(11) Low pressure piping (compressor induction)
(12) Low pressure piping (evaporator outlet)
(13) High pressure piping (quick attach connection to expansion valve)
(14) Cab filter

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Cab and equipment

B . Safety and precautions

It is very important to work in a clean environment, in order to prevent ingress of dirt and moisture into the system.
Carefully clean connections, then oil them lightly with compressor oil before making the connections.
Avoid blowing compressed air through the pipes, to remove particles which might be there ; use only refrigerant in such circumstances.
Do not remove protective coverings, plugs, etc... until actually ready to install components.
Cut flexible piping using a knife, never a saw.
Plug pipes and openings carefully when components are removed or disconnected.
The oil contained in the air conditioning circuit is special refrigeration oil. This oil readily mixes with the freon.
Use only approved refrigeration oil.

Precautions to be taken

An air conditioning unit can be a dangerous piece of equipment. It could be compared to a high pressure steam boiler. The pressure of the refrigerant is always greater than its normal boiling point. If piping is split, the refrigerant will evaporate or boil very rapidly.
The forces resulting from expansion can be very dangerous. A refrigeration engineer must always work with precaution, in order to prevent uncontrolled escape of refrigerant. The refrigerant R12 is non-flammable, non-toxic (except when in contact with a flame) and non-corrosive (except on contact with water).
You should be very careful when handling R12 .It can freeze the skin or the eyes on direct contact. In contact with a flame or a high temperature, its decomposition gives phosgene gas.
Never handle freon without wearing safety goggles, as well as gloves.
Never attempt to empty a system by loosening off a connection. Slow emptying without danger can only be carried out using a manifold gauge set.
Do not empty the system in a room where there is a flame. Decomposition of R12 gives **phosgene gas which is deadly**. The same precautions must be taken if you are looking for leaks.
If it is necessary to retighten a connection, use two spanners for tightening, so as to prevent distortion which may give rise to leakage.
Never weld or clean with steam near a filled system; as excess pressure may be created with possible leakage.
Do not store R12 refrigerant in the sun or close to a source of heat: Always store the bottle safely items back when not in use.
Avoid subjecting the bottle to impact. Do not carry the bottle in the passenger compartment of a vehicle.
In the event of accident, proceed as follows :
If you get R12 in your eyes, wash them very carefully with a solution of mineral oil, and continue to wash them very carefully, with a solution of boric acid and water (1 teaspoonful of acid, diluted in a quarter of a cup of water).
Contact a doctor immediately.
Note :Freezing caused by liquid refrigerant can be treated by progressively thawing the injured area with cold water and then applying a dry skin cream. Contact a doctor immediately.

C . Maintenance

Very important

Before switching on the air conditioning system, **ensure that windows and doors are properly closed**.
The interior of the cab must be kept as clean as possible. If for any reason whatsoever the cab cannot be completely closed, the air recycling system must be switched off. If these few recommendations are not observed, there is a risk of clogging at the evaporator which will result in stoppage of the air conditioning system and risk of damage to the compressor.
In order to ensure operation of the system, it is necessary to check periodically the filter located at the back of the cab, the condenser as well as the fans and the evaporator. Any plugging results in increased high side and low side pressure and reduces the efficiency of cooling. The tension of the driving belt and its alignment must be checked.
Check the condition of the drain for removal of condensation from the evaporator tray. Any accumulation of water in the tray might result in icing of the evaporator and stop circulation of freon.
In order to keep the system in good condition, we recommend to operate the system for several minutes each month in order to lubricate all the components, since the oil contained in the compressor can be mixed with the freon.

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Cab and equipment

Electrical system

In regards to electrical checks, ensure that the fuses and pressure switch located at the rear of the compressor are in good condition. Low system charge or a damaged fuse will not allow current supply to the compressor clutch.

In order to check the action of the electromagnetic clutch, set the fan switch to «ON» position then move the air conditioning switch towards the maximum cold position : a click should be heard.

After several minutes operation, you should notice the successive switching on and switching off of the electromagnetic clutch as the cab cools.

The connecting wires must be in good condition.

Caution :

When restarting the compressor, specially if it has not operated for some time, proceed in the following manner to ensure lubrication right from the first rotations of the compressor :

a) Switch on the electro-magnetic clutch by switching the fan to «ON» and moving the thermostat to cold.
b) Crank over the tractor engine for a few seconds with the fuel stop button out or with the electrical stop control of the fuel injection pump disconnected (3095).
c) Then push in the fuel stop button or reconnect the electrical stop control of the fuel injection pump (3095), start the engine and allow to idle slowly for several minutes.

Check visually the quantity of refrigerant (absence of bubbles) and its colour through the observation window of the dehydrator tank,while operating the engine at a maximum revs. (with the fan and thermostat set at maximum cold).

Note : upon compressor cycling, some bubbles are usually present. If a brown or bluish colouring appears in the sight glass, the system should be emptied, the lubrificating oil in the compressor changed and the dehydrator filter and if necessary the expansion valve changed in that order.

Pre-season check and preventive maintenance

a) Carry out checks and maintenance as described in the preceeding paragraphs.
b) Check visually the evaporator, piping, condenser, the dehydrator, compressor connections, the belt and evaporator drain tray and hose.
c) Start the engine and set speed at 1500 rev/min. Switch fan to high speed and select thermostat to maxi cold.
d) Check temperature of components.
The outlet of the expansion valve (evaporator side) the evaporator, the low pressure piping and «delivery valve» on the compressor must be cold when touching.The condenser, the dehydrator tank/filter, the expansion valve inlet, the compressor, the «output valve», the high pressure piping must be warm when touching.
e) The dehydrator filter and oil should be changed at least each year, or after every one thousand hours and on any occasion when there is a major leakage and particularly if a brown or bluish colour is observed in the viewing window of the dehydrator filter.
f) Connect gauge set to provide internal system checks. Always connect the low pressure gauge (blue) to induction side of the compressor and high pressure gauge (red) to the discharge side.Always make connections with engine stopped.
g) If the circuit is overfilled more than 2kg(4.5 lbs) of R12 freon there is a risk of blockage at the dehydrator filter and the expansion valve.High and low pressure readings will be excessively high.
h) When the air conditioning unit is operating, if the high and low pressure are equal, this is an indication of a defective compressor.
i) If there is water in the circuit, the expansion valve (needle valve) will be blocked by a droplet of water which will change into ice. This will be indicated by a reduction of low pressure and high pressure.

11) Allow to dry for 48 hours (the higher the humidity level, the shorther the drying time).

12) Remove the strips of adhesive tape applied in point 4 and trim off any excess sealant projecting beyond the glass at both ends.

Health and safety

When exposed to moisture, SILICONE SEALANT may release small quantities of acetic acid. Avoid prolonged contact with the skin. If splashed in the eyes, wash out with water and seek medical attention. It is advisable to wear protective goggles.

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2 B01 Recharching the system with refrigerant

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B. Evacuating and flushing the system ____ 3

C. Recharging the system with liquid ____ 4

D. Checking the pressures ____ 5

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Cab and equipment

A . Discharging the system and checking for leaks

Discharging the system

Ensure that room in which this operation is carried out is adequately ventilated. Avoid any naked flames and do not smoke.

Prepare the system for discharging by running the engine for a few minutes at 1000 rev/min with the air conditioning set to maximum cooling.

Stop the engine and switch off the air conditioning.

Remove the pressure switch from the high pressure hose and shunt both wires (violet and black).

Connect the manifold kit to the compressor (Fig. 1).

- red hose (small diameter) in place of the pressure switch.
- blue hose to low pressure (large diameter hose)

Slowly open the Manifold **low pressure** valve.

Warning : If the system is discharged too quickly, compressor oil will be carried out with the refrigerant.

After a few minutes, when the pressure has dropped by 1,5 to 2 bar, **slowly** open the manifold high pressure valve to allow all the refrigerant to escape.

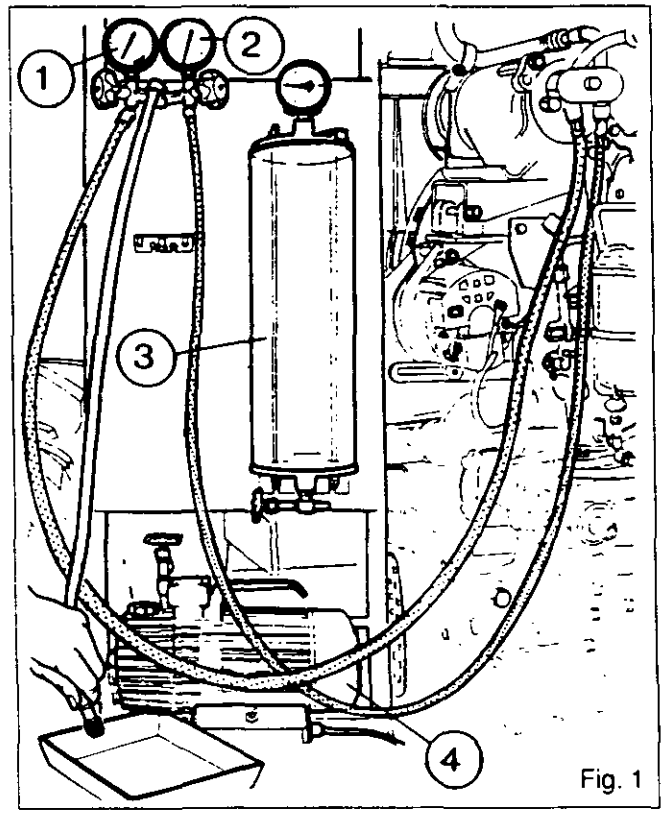


Fig. 1

1 Low pressure gauge
2 High pressure gauge
3 Measuring cylinder
4 Vacuum pump

Checking for leaks

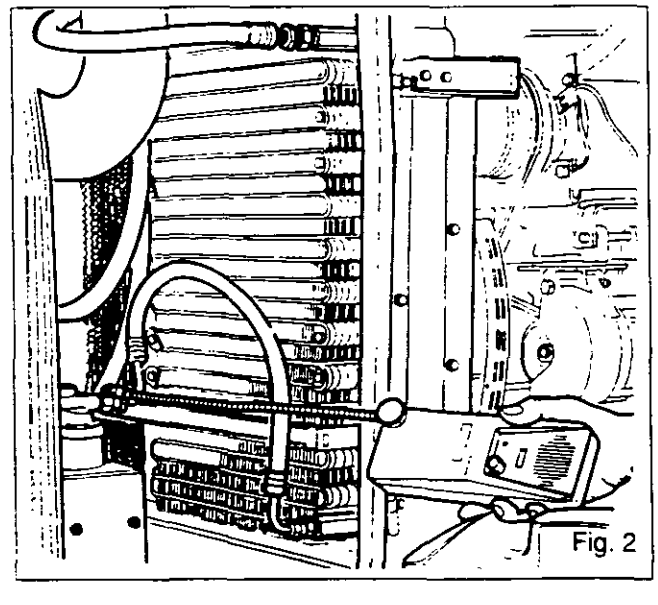
When the system is empty replace any faulty parts then flush the system with Freon R12 by filling to a pressure of 2.5 to 3 bar (36 to 50 P.S.I). To do this, connect the centre hose between the pressure gauges to the Freon cylinder (Fig. 4). Slightly slacken the centre by-pass hose connector to purge all air from the hose, then retighten it.

Open the taps on the high and low pressure gauges and allow the R12 gas to build up to a pressure of 2.5 to 3 bar (36 to 50 P.S.I)in the system. Close the taps and leave the system charged at this pressure for 15 to 20 minutes before checking for leaks.

Note : To avoid accidents, make sure that all taps are closed before handling the hoses.Do not start the engine.

Using an electronic leak detector, run the end of its hose over (Fig. 2) :

a) the compressor valve connectors
b) all the compressor seals : shaft seal - oil reservoir plug seal


Fig. 2

Discharging the system

Allow the gas to escape through the high and low pressure taps leaving a residual pressure of 0.2 to 0.3 bar (3 to 5 P.S.In) the system).

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B . Evacuating and flushing the system

Evacuating the system (Fig. 3)

When the system is no longer under pressure, connect the centre hose to the vacuum pump. Open the high pressure tap (low pressure tap already open). Open the tap on the vacuum pump and turn the pump on.

Note : At ambient temperatures above 20° (68°F) it will generally take 30 minutes, in 15 minutes periods, to create the necessary vacuum. If the temperature is below 20° (68°F) it will take at least 60 minutes, especially if humidity is high. At the end of the evacuating period, the low pressure gauge should indicate a partial vacuum of 635 to 711 mm 25 to 28 in of mercury.

Close the high and low pressure taps and the vacuum pump tap and switch off the pump.

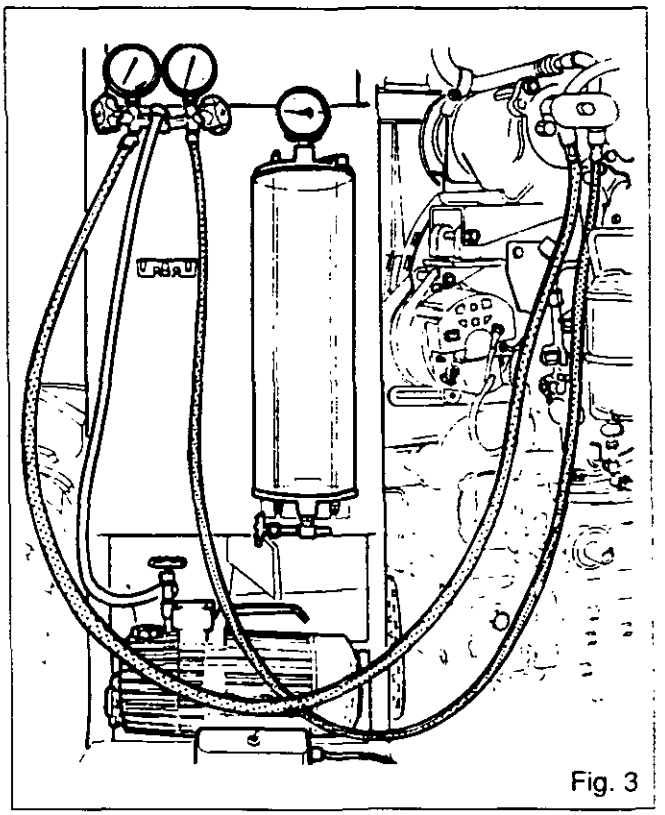


Fig. 3

Flushing the system (Fig. 4)

Disconnect the centre by-pass hose from the vacuum pump and connect it to the top of the measuring cylinder. Open the top tap on the measuring cylinder, slightly slacken the centre by-pass hose connector in order to purge any air from the hose and retighten the connector when R12 starts to escape from the hose.
Open the high and low pressure by-pass taps to obtain an R12 gas pressure of **2.5 to 3 bar (36 to 50 P.S.I)**.
Close the taps and leave the charged system for 20 minutes.
Using the leak detector, recheck the system for leaks (Fig. 2).

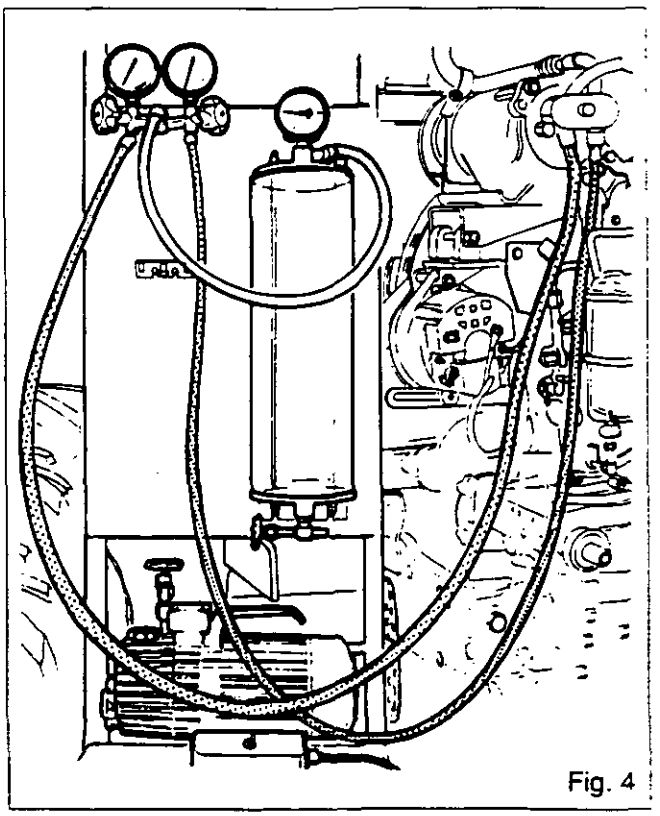


Fig. 4

Discharging and evacuating the system (Fig. 3)

Purge the system by slightly opening the low pressure by-pass tap and allowing R12 to escape.
Close the tap when a residual pressure of 0.2 to 0.3 bar (3 to 5 PSI) is obtained on both high and low pressure sides.
Connect the centre hose to the vacuum pump.
Open the high and low pressure taps and let the vacuum pump running for 20 minutes.
Close the high and low pressure taps, having checked that the low pressure gauge indicates a partial vacuum of 635-711 mm (25 to 28 in) of mercury.
Having completed all these operations, the system is ready for recharging with Freon R12.

Note : Air must be purged from the hoses each time they are connected to the pressure gauges and charging cylinder.

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C . Recharging the system with liquid (engine stopped)

The quantity of Freon required to charge the system correctly is 1.7 to 1.9 kg (3.7 to 4.2 lbs).

1 . Instructions for filling the charging cylinder from the freon gas bottle (Fig. 5)

Connect the freon bottle to the bottom of the charging cylinder and tip the bottle upside down. Open the taps.When pressures in the bottle and charging cylinder are equal, bleed gas from the charging cylinder through the top valve until the quantity of freon required for the system is obtained. Close all taps.

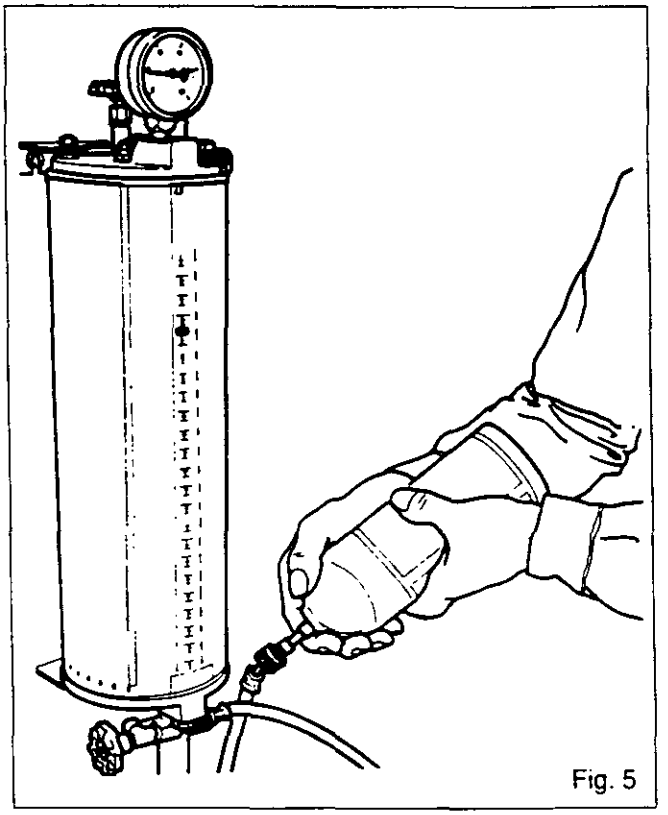


Fig. 5

2 . Connection for charging the system (Fig. 6)

Connect the bottom of the charging cylinder to the centre connector between the pressure gauges.
- *purge air from the hoses.*
- mark the level on the charging cylinder.
- slowly open the low and high pressure taps on the pressure gauges in order to charge the system.

Note : To allow complete charging with liquid, the pressure in the charging cylinder must be between 6 and 7 bar (87 and 100 P.S.I).

When a system is correctly charged and the pressures are equal, pressure on both low and high pressure sides should be 4 to 5 bar (58 to 73 P.S.I).
If the charging cylinder has no heater element, the system will have to be partially charged with liquid then topped up with gas.

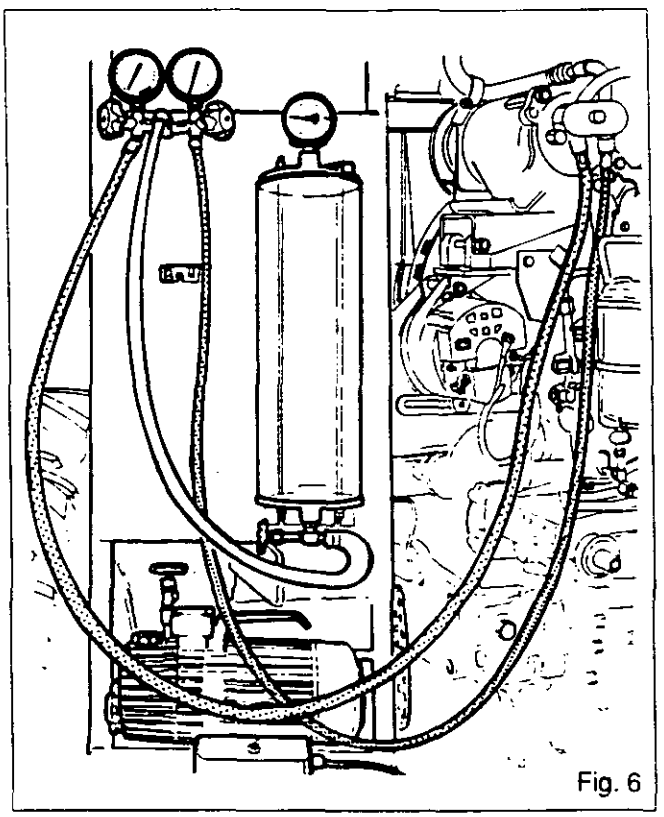


Fig. 6

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Partial liquid recharge with gas top-up (engine stopped, then running)

When pressures in the charging cylinder and system are equal, close the high and low pressure taps and the bottom tap on the charging cylinder.

To top up with gas, connect the centre hose between the pressure gauges to the top of the charging cylinder, then purge air from the hose (do this by slightly unscrewing the hose and allowing gas to escape for a few seconds) (Fig. 7).

For this operation, open the low pressure **tap only** and run the engine at 1000 - 1200 rev/min with the air conditioning set at maximum cooling and the fan on fast speed.

The system is correctly charged when the required level is obtained into the charging cylinder.

Close the taps on the charging cylinder and on the low pressure gauge.

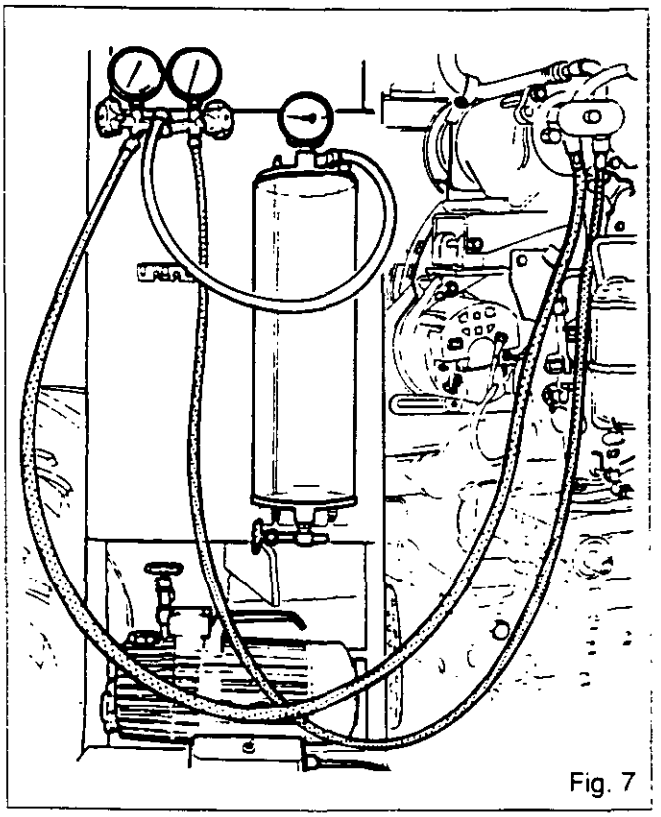


Fig. 7

D . Checking the pressures

Once charging has been completed, check the air conditioning system for correct operation.

With the pressure gauges already connected to the compressor (Fig. 8), start the engine and set the thermostat control to maxi cold and the fan to fast speed.

After a few times, **the high pressure hose should feel hot and the low pressure hose cold**.

No bubbles should be visible in the dehydrator sight glass.

Check the compressor cycles. The compressor should cycle «on» and «off» for approximately the same length of time once the cab temperature has stabilized, according to the thermostat setting.

When the air conditioning is off, pressures on the low and high pressure sides should be equal and between 4 and 5 bar (58 and 73 PSI) in a correctly charged system. **These figures will however vary according to the outside temperature**.

When the air conditioning is running low pressure should be between 0.2 and 1 bar (3 and 15 PSI) and high pressure between 8 and 15 bar (116 and 218 PSI). All these figures depend on the outside temperature. The system should cycle on and off in all cases.

Note :

- fan on fast speed and thermostat on coldest setting

- engine running at 1800 - 2000 rev/min.

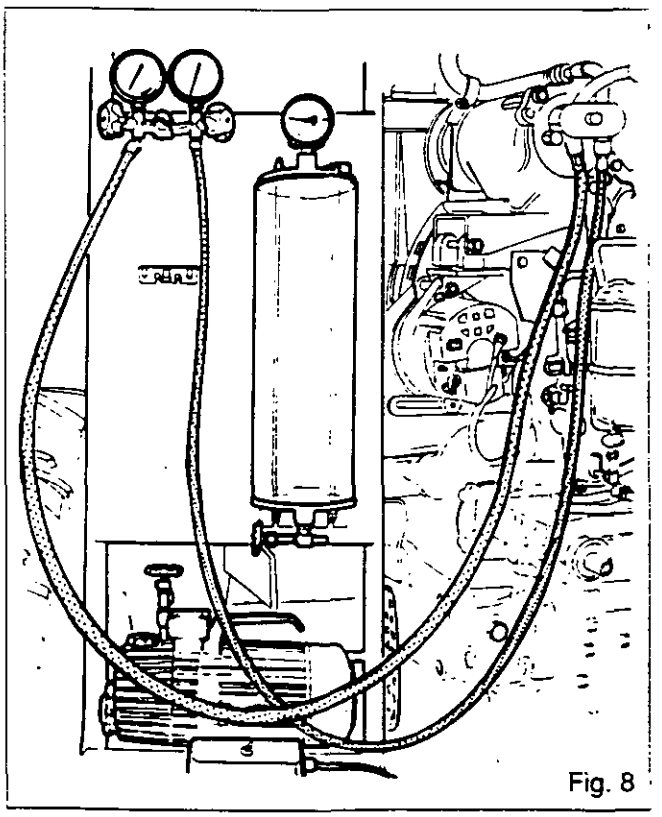


Fig. 8

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2 C01 Air conditioning system faults - Compressor

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B. Failure of air conditioning system itself ____ 2

C. Compressor ____ 4

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Cab and equipment

A . Diagnosis and fault analysis

Diagnosis

In general pressure readings are directly related to atmospheric conditions (pressure and temperature). At temperatures between 21° and 30° C (68° and 85° F) low pressure readings will vary between 0.2 and 1 bar (3 and 15 PSI) and high pressure readings between 8 and 15 bar (116 and 218 PSI). To detect faults, the pressure gauge kit must be connected to the compressor.

Fault analysis

Leaks in the system will lead to inadequate cooling and low and high gauge readings will be too low.
If the system is under-charged, bubbles will be permanentely visible in the dehydrator sight glass and both gauges readings will be low.
If the evaporator is dirty or an expansion valve is blocked or frozen up, there will be a partial vacuum on the low pressure side and insufficient pressure on the high pressure side.
An over- charged system, an expansion valve stuck open or a clogged condenser will cause excessive pressure on the low pressure side.
A clogged condenser, an over-charged system will cause excessive pressure on the high pressure side.

Overcharge

In a correctly charged system, R12 discharged from the compressor in the form of gas looses its excess heat, resulting from compression in the first coil of the condenser and condenses to a liquid in the subsequent coils. Before flowing to the reservoir, this liquid is held in the last condenser coil. If the system is overcharged, the liquid level builds up in the condenser, leaving fewer coils available to condense the gas. Both temperature and pressure then build up, causing hoses to burst in some cases.

Failure while engine is running

Overcharge
Worn hoses
Chaffed hoses
Hoses cut by sharp edges
Bends too tight
Hoses too close to battery (acid)
Plugged condensor fins

Failure when engine is stopped

Same reasons as when running plus stoppage of engine compartment cooling and engine «temperature surge» in the few moments after it stops.

The sudden temperature increase when the engine is stopped causes both the temperature and pressure in the air conditioning system hoses to rise. If a hose is only just holding, this heat will reduce its resistance to bursting.
This is particularly apparent in overcharged systems and where hoses are worn or badly positioned (hot spots).

B . Failure of air conditioning system itself

(The manifold kit must be connected to the compressor valves).

High pressure reading too high

1 - Refrigerant overcharge.
- Purge the system.
- Avoid leaving the system undercharged.

2 - Air in system, in spite of correct low pressure reading.
- Purge and recharge the system.

3 - Space between condenser fins clogged with insects.
- Clean the condenser.

4 - Refrigerant remains liquid in suction pipe, at the evaporator outlet.
This causes moisture or frost formation on the hose or on the compressor inlet valve.
- Check that the expansion valve sensing bulb is securely in contact with the suction pipe.

5 - Plug left in a pipe on assembly, revealed by a difference of temperature above and below the point where the plug is located.

6 - If high pressure reading is higher than the one obtained during normal operation with correct low pressure reading and charge but presence of bubbles in the dehydrator, the dehydrator hose connections have been reversed and fluid is flowing in the wrong direction.

7 - If high pressure reading is very high, low pressure reading normal, with bubbles in the dehydrator and frosting of dehydrator reservoir, there is a restriction at the dehydrator inlet, causing the dehydrator to act as an expansion valve.

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Cab and equipment

High pressure reading too low

1 - Incorrect charge. A lack of refrigerant causes bubbles which appear in the sight glass.

2 - Compressor gasket cracked or compressor valves leaking

Low pressure reading too low, together with insufficient cooling

1 - Restriction in a hose or in dehydrator. Revealed by a difference of temperature above and below the restriction, or by cooling of the dehydrator reservoir whilst the system is running.

2 - Insufficient charge in expansion valve sensing bulb.
- Heat the end of the thermostatic bulb by holding it. Intake pressure should rise quickly to at least 1.45 bar (21 PSI) with the engine at idling speed. If not, the expansion valve must be replaced.

3 - Expansion valve capilliary tube broken or leaking. The expansion valve stays closed, causing the system to operate at very low pressure.

4 - Formation of frost in expansion valve or jet
- The expansion valve or jet may be frozen up even though the pipes are barely frosted.

5 - Expansion valve stuck. Bits of rust in system.
- Heating the end of the sensing bulb has no effect on the low pressure reading.
- The expansion valve may open after a short rest, then stick again after some time in operation.

6 - Check that the evaporator air inlet is not clogged.

Low pressure reading too high

1 - Compressor belt too slack.

2 - Expansion valve sensing bulb incorrectly fixed.

3 - Expansion valve needle stuck open. Refrigerant flows too freely through the coils and cools or freezes the inlet pipe.

4 - Compressor inlet valve filter blocked.

5 - Low refrigerant charge.
- Check whether bubbles are visible in the sight glass when the system is operating with the fans switched on.

6 - Compressor inlet and outlet valves leaking.

7 - If high pressure reading is low, low pressure reading is high and the charge is correct, there are leaks at the compressor gasket or faulty valves.

Noisy expansion valve (persistent whistling)

1 - Low refrigerant charge, revealed by presence of bubbles in the sight glass.

Insufficient cooling

1 - Compressor not functioning properly.

2 - Expansion valve not functioning properly.

3 - High and low pressure readings low, tending towards partial vacuum, with correct charge. Temperature too low at evaporatoor outlet, causing the expansion valve to close and poor synchronization between thermostat cycling and expansion valve opening.

Formation of frost on evaporation fins

1 - Check thermostat electrical contacts.

2 - Check that the sensing bulb is in contact with the evaporator fins.

Intermittent operation of the compressor (irregular cycling)

- Check belt tension
- Check clutch drive plate clearance
- Check clutch coil voltage and current
- Check the compressor itself.

Unusual compressor noise

In engaged position :

- check :compressor mounting
  clutch and that there is no slipping
  clutch and compressor bearings
  the refrigerant charge (175 cm^3 + 15 cm^3)
  the compressor inlet and outlet valves.

In disengaged position :

- check clutch drive plate clearance.

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C . Compressor

Setting the drive plate clearance

Check the drive plate clearance with a feeler gauge. The clearance should be 0.4 - 0.8 mm (0.016 - 0.032 in)(Fig. 1).
If the clearance is not the same all the way round, lift slightly and tap gently where the clearance is greatest.

Note : Drive plate clearance is obtained by means of shims. When reassembling or fitting a new clutch, try fitting the original shims first.

When fitting a new clutch on a compressor which previously had no shims, use the following sizes :
1.02 mm - 0.05 mm - 0.12 mm
(.040 in) -(.00197 in) - (.00472 in)
Torque the nut to 40 Nm (30 lbf/ft)

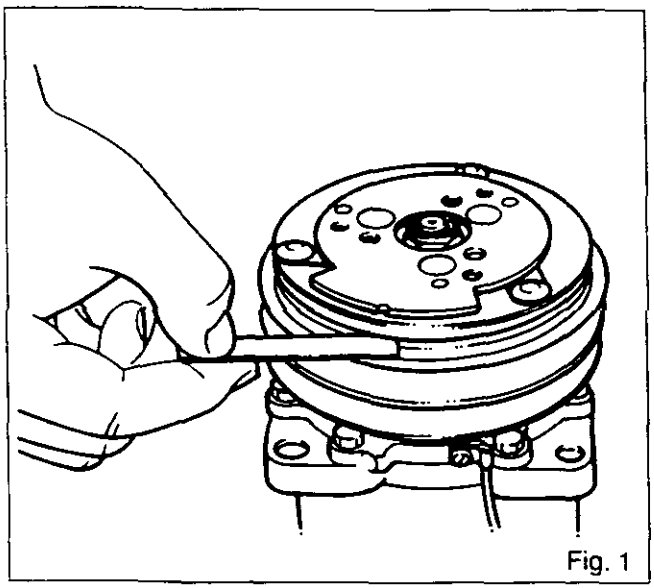


Fig. 1

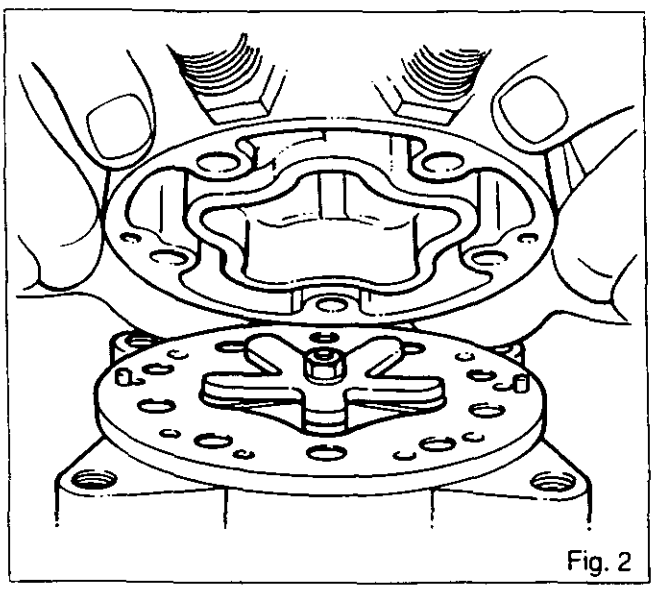


Fig. 2

Precaution to be taken when removing and refitting the compressor :

Note :
1) Run the air conditioning system for 5 to 10 minutes before removing the compressor in order to return all the refrigerant to the compressor.
2) The head connectors must face upwards or be in line with the oil filler hole (Fig. 2).

Locate the valve cover plate dowels in the correct holes in the block, then align the plate.
Torque to 30 - 34 Nm (22 - 25 lbf/ft) according to tightening sequence (Fig. 3).

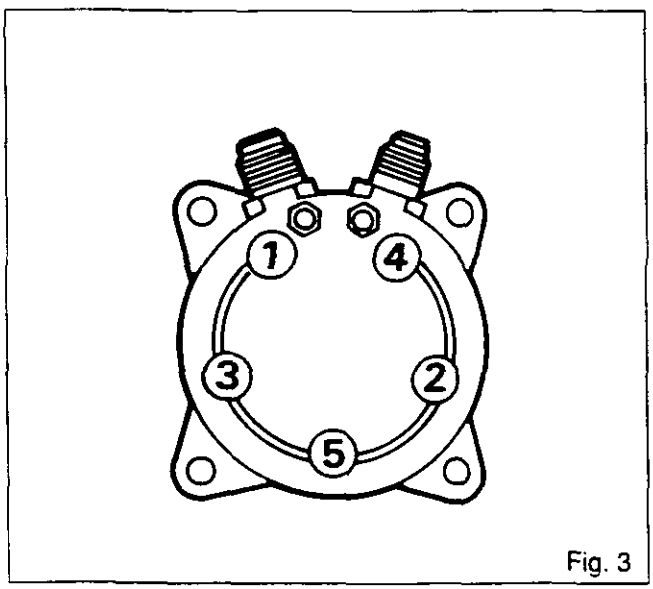


Fig. 3

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Filling with oil

1 - Discharge the R12 refrigerant.

2 - Always check the oil level whenever a system component is replaced or if there has been a leak.

3 - Determine the mounting angle.
Place the angle gauge on the flats of the two front fixing lugs. Centre the bubble. Make an accurate note of the mounting angle.

4 - Remove the plug. Look through the oil filler hole then rotate clutch plate to correctly position the internal parts of the compressor, aligning them as soon as they start to move towards the front of the compressor (Fig. 4).
Note : This operation is essential in order to release the dipstick from the internal parts so that it can be inserted to its full depth.

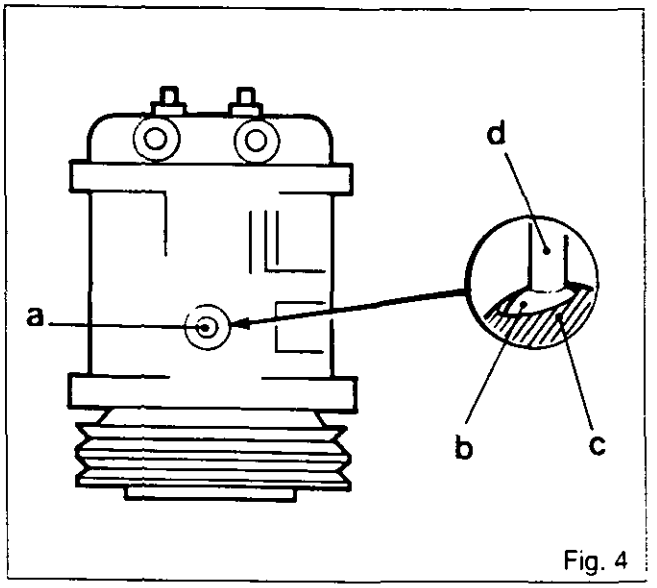


Fig. 4

a : filler hole
b : ball
c : ball joint
d : piston rod
e : dipstick
f : stop

5 - Insert the dipstick up to the stop (Fig. 5). The stop is formed by the bend at the top of the dipstick :
- the top of the bend must be on the left if the compressor is RH mounted.
- the top of the bend (stop) must be on the right if the compressor is LH mounted.
- in both cases, the bottom end of the dipstick bend MUST BE IN CONTACT WITH THE EDGES OF THE FILLER HOLE.

6 - Remove the dipstick and count the number of graduations covered by oil.

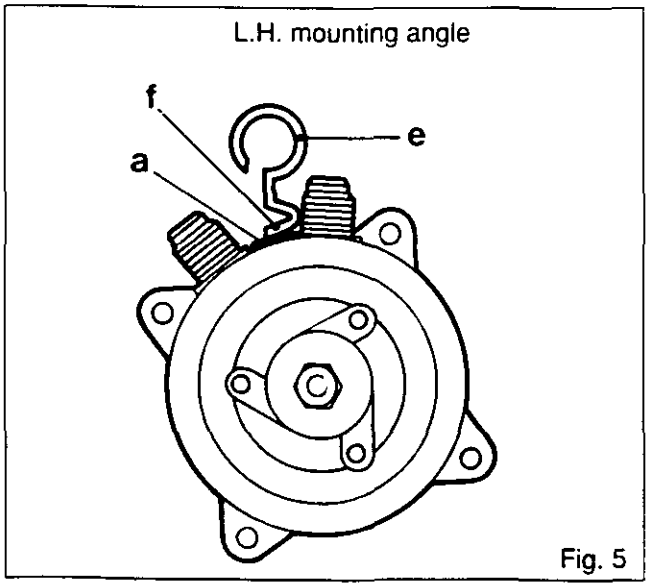


Fig. 5

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Cab and equipment

7 -Using the chart below, check the oil level according to the compressor mounting angle :

Mounting Angle	Acceptable oil levels (measured by notches on the dipstick)
0°	2 - 4
10°	4 - 5
20°	5 - 6
30°	6 - 7
40°	7 - 9
50°	9 - 10
60°	10 - 12
90°	12 - 13

8 -If the graduations noted on the dipstick do not agree with the chart, top up to the required level.
Note : Use only refrigeration oil. Close the container after use.

9 -Refit the filler plug.
- Check the condition of the «0» ring
- Check that the «0» ring and its seat are clean.

10 -Tighten the plug to a torque of 8 - 12 Nm (6 - 9 Lbf/ft). If there is a leak, do not tighten the plug any further : remove it and fit a new «0» ring.
Note : Regular checking of the oil level is unnecessary, unless there is good reason to suspect that the level is low or needs checking.

Recommended lubricants for SD.5 compressor filling, capacity : 175 cm³

Make	Name	Grade
Sun Oil Co	Suniso Sunbis	4 GS 5 GS 31/41/51
Caltex	Capella	WF100 WF68
BP	Enagole	LPT 100/150/185
Shell	Talpa Oil Bitoria Oil	20/30 33/41
Mobil	Gargoyle Artil	300
Castrol	Ice Matic	299/99

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2 D01 Replacement of glasses

CONTENTS

A . Replacement of seal (hinge) on cab door window ——— 2

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Cab and equipment

A . Replacement of seal (hinge) on cab door window

Product family

Silicone elastomer, vulcanizing at ambient temperature without having to add a catalyst.

Products used

RHODORSIL SILICONE SEALANT « B. or Rubson HP Translucid, or equivalent.
RHORDORSIL is manufactured by RHONE-POULENC, Silicones Dept.

Composition

- Reactive siloxanic polymethyl polymer : min. 85 %
- Reinforcing silica between 10 and 11 %
- Cross-linking agent between 3 and 4 %
- Pigment max 1%

Colour : translucid

Instructions

1) Carefully remove all traces of previous silicone sealant

2) Clean the sides of the windows with a dry cloth.

3) Thoroughly degrease the edges of the 2 windows with a dielectric solvent (trichloroethylene. Trichloroethane....).
Note : The surfaces must be allowed to dry before applying the sealant.

4) Apply three or four 20 mm strips of cellulose adhesive tape (A) to hold the 2 pieces of glass 4 to 5 mm apart (Fig. 1)

5) Turn the glass over (the strips of tape will then be on the bottom) (Fig. 2).

6) Stick a strip of cellulose tape (B) on the edge of each window to protect the area adjacent to the joint.

7) Sprinkle talc onto the groove (to neutralize the effect of the adhesive in the bottom of the groove). then blow clean.

8) Squeeze a continous strip of silicone sealant into the 4 - 5 mm groove (this is easier to achieve by applying the sealant from a cartridge with a compressed air gun).

9) Smooth the surface of the joint with a wet spatula, or with a wet rubber block, sliding it along the surface of the two windows.

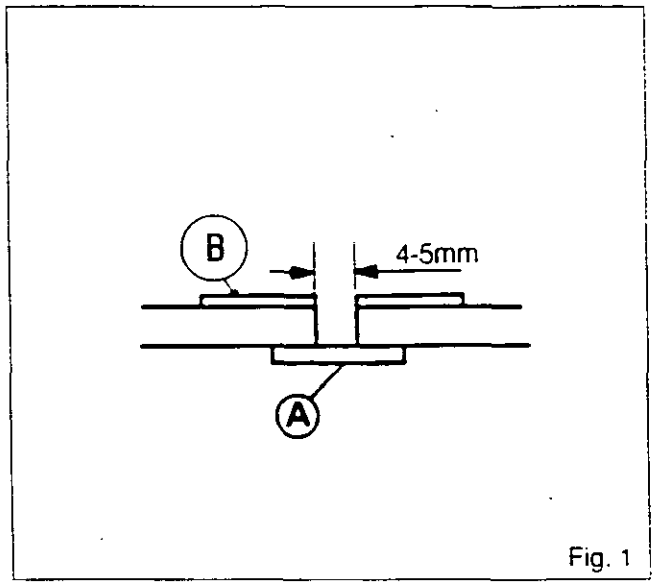


Fig. 1

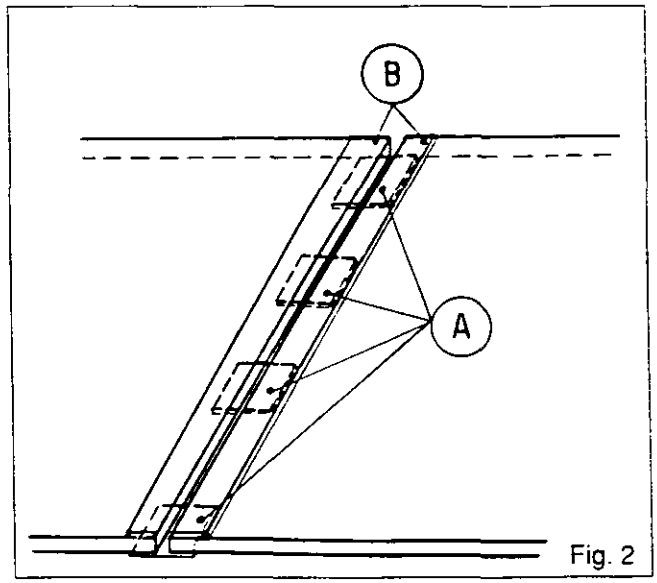


Fig. 2

10) Remove the 2 strips of tape applied in point 6.

11) Allow to dry for 48 hours (the higher the humidity level, the shorther the drying time).

12) Remove the strips of adhesive tape applied in point 4 and trim off any excess sealant projecting beyond the glass at both ends.

Health and safety

When exposed to moisture, SILICONE SEALANT may release small quantities of acetic acid. Avoid prolonged contact with the skin. If splashed in the eyes, wash out with water and seek medical attention. It is advisable to wear protective goggles.

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3 . SPLITTING THE TRACTOR

Contents

3 A01 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE GEARBOX - SPEEDSHIFT 3000

3 A02 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE GEARBOX - SPEEDSHIFT 3100

3 A03 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE GEARBOX - DAYNAHISFT 3000

3 A04 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE GEARBOX - DAYNAHISFT 3100

3 B02 SPLITTING THE TRACTOR BETWEEN THE GEARBOX AND THE REAR AXLE

3 C01 SPLITTING THE TRACTOR BETWEEN THE FRONT FRAME AND THE ENGINE

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3A01 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND THE GEARBOX
4 and 6 cylinder engines (3000)

CONTENTS

A. Removal ____ 2

B. Refitment ____ 3

C. Tightening torques ____ 4

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Splitting The Tractor

A. Removal

1. Disconnect the two front differential lock (4WD) control hoses.
   Plug the pipe connections.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the sheet metal panels.
4. Disconnect the earth cables only from the batteries.
5. Remove the hood rear bracket.
6. Disconnect and plug:
   - the two orbitrol steering ram hoses (mark their position).
   - the two air conditioning plugs and the bracket (if fitted).
   - the fuel return hose.
   - the two cooler hoses on the 17 bar valve (mark the positions).
   - the accelerator control on the injection pump.
   - the fuel cut-off control.
   - the flowmeter harness (if fitted).
   - the main wiring harness connections (on cab console or above engine depending on harness model).
   - the heater hoses on the RH rear side of the engine block (4 cyl.) on the water pump (6 cyl. - mark the position). Plug the connections to avoid draining the cooling system completely).
   - the 7.5 and 10 amp fuse harness (to release this, slightly slacken the straight rod above the radiator).
   - the fuel supply hose.
7. Immobilise the tractor:
   - apply the handbrake.
   - fit wedges between the frame and the front axle (Fig.1).
8. Support the tractor under the gearbox using a suitable stand.
9. Support the tractor under the sump using a suitable trolley jack.
10. Slacken the four 10 diam. bolts **(1)** (Fig.2) on the rubber dampers on the RH and LH cab supports, raise the cab slightly (low profile cab) and position chocks under it.
11. Remove the bolts attaching the engine to the gearbox.
12. Separate the gearbox from the engine.
    Note: As a safety measure, remove the front weights.

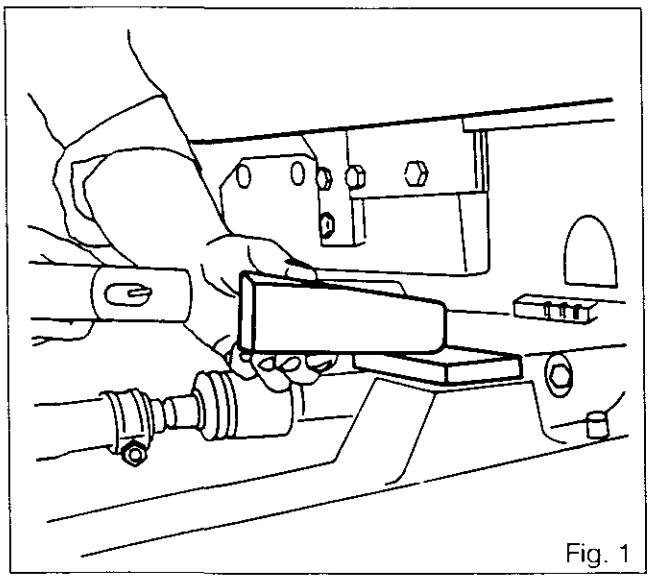


Fig. 1

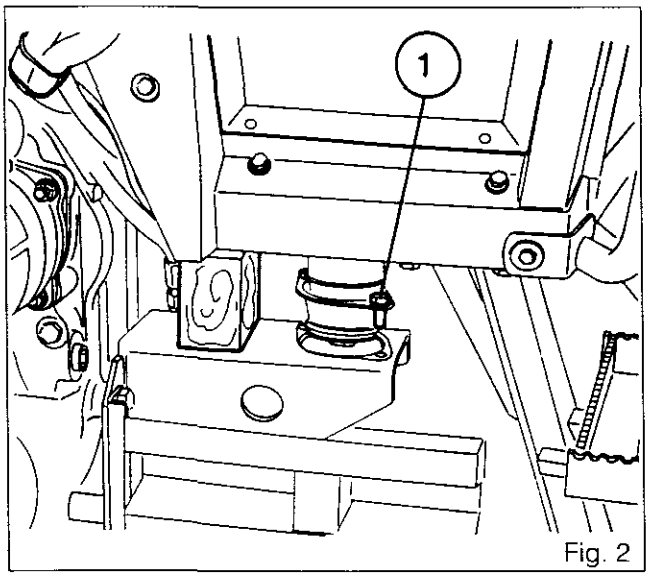


Fig. 2

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Splitting The Tractor

B. Refitment

13. Screw two dowel pins (made locally) into diametrically opposite positions on the gearbox.
14. Replace the seal /**1**\ on the input shaft **(2)** (Fig.3).
    a) withdraw the PTO shaft **(3)**.
    b) extract the seal /**1**\.
    c) replace the PTO shaft.
    d) remove the circlip **(4)** and the washer **(5)**.
    e) protect the splined end of the shaft **(3)**.
    f) fit a new seal /**1**\ using service tool 3376803 M1. (see 3A02)
    g) remove the protection from the splines.
    h) refit the washer **(5)** and the circlip **(4)**.
15. Lightly grease the gearbox input shaft splines with molybdenum disulphide grease.
16. Check that the two dowel pins are fitted on the engine.
17. Fit the engine to the gearbox by turning the flywheel ring gear with a screwdriver.
18. Fit the two attaching bolts. For 6 cylinder engines only, coat the bolts with Loctite 270. Tighten to the torque indicated in Figs. 5 and 6.
19. Carry out procedures 4 to 9 in reverse.
20. Carry out procedure 10 in reverse.
    Note: When replacing the cab on its supports, check that the balls (1) of the gear and reverser levers are correctly located in their respective housings (2) (Fig.4).
21. Top up the cooling system.
22. Carry out procedures 1 and 2 in reverse (4WD).
23. Start the engine.
24. Check the accelerator control and fuel cut-off setting.
25. Check:
    - the hydraulic circuits for leaks.
    - the operation of the electrical circuits.
26. Refit the sheet metal panels.
27. Road test the tractor.

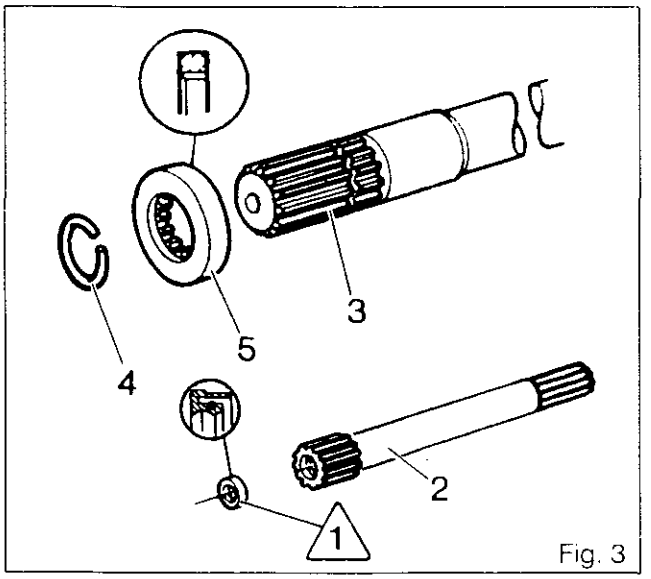


Fig. 3

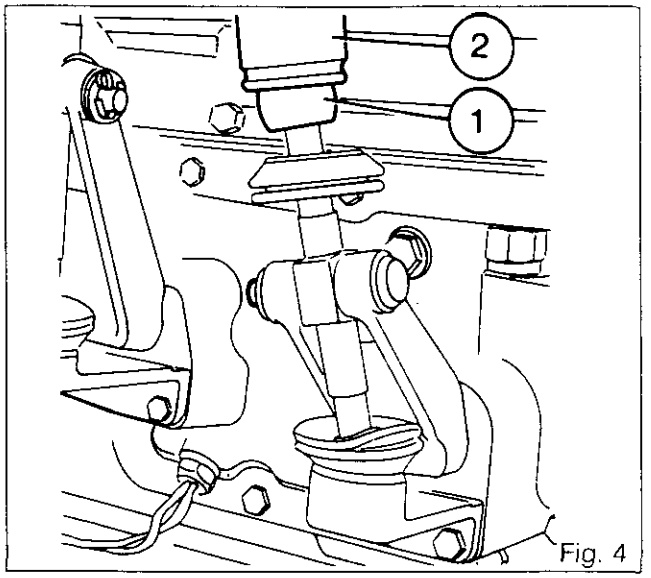


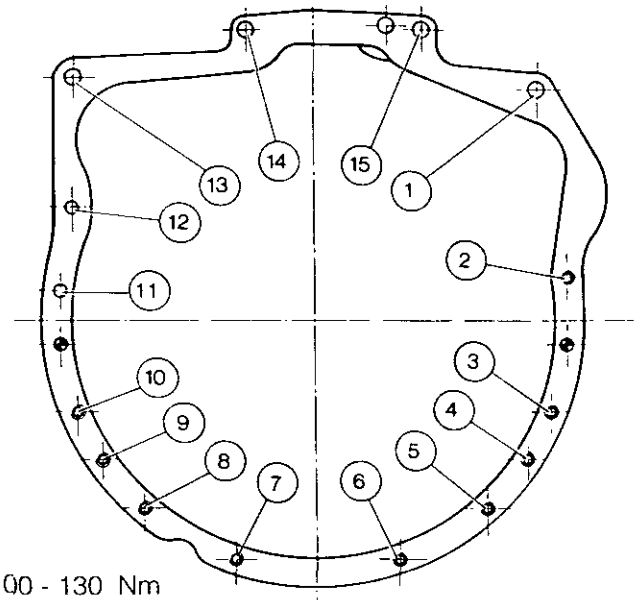
Fig. 4

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C. Tightening torques

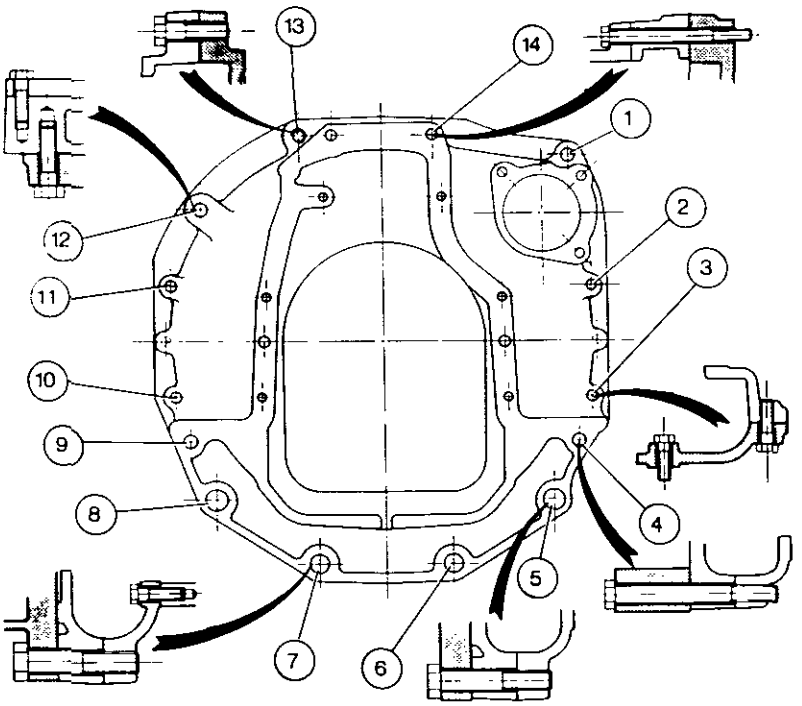
Engine to gearbox attachment (4 cylinder engines)



Tightening torques **(1)** to **(15)** 100 - 130 Nm

Fig. 5

Engine adaptor plate to gearbox spacer attachment (6 cylinder engines)



Tightening torques (Nm)

(1) 160-210
(2) 80-104
(3) 80-104
(4) 160-210
(5) 280-370
(6) 450-610
(7) 450-610
(8) 280-370
(9) 160-210
(10) 80-104
(11) 80-104
(12) 160-210
(13) 160-210
(14) 100-130

Fig. 6

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3 A02 Splitting the tractor between the engine and the gearbox

Pull-type clutch (3100)

CONTENTS

A. Removal ____ 2

B. Refitment ____ 3

C. Fitting engine adaptor plate/gearbox spacer ____ 4

D. Service tools ____ 5

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Splitting the tractor

A. Removal

Note: Plug or cover disconnected hydraulic pipe connections to prevent leaks and the ingress of foreign matter.

1. Disconnect the two front differential lock (4WD) control hoses.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the inspection plate under the clutch housing.
4. **Remove the pin /1\ connecting the clutch slave cylinder (2) to the release bearing (3) (Fig.1).**
5. Remove the sheet metal panels.
6. Remove the battery cover.
7. Disconnect the earth cables only from the batteries.
8. Remove the hood rear bracket.
9. Disconnect:
   - the two orbitrol steering ram hoses (**mark their position**).
   - the two air conditioning plugs and the bracket (if fitted).
   - the fuel return hose.
   - the two cooler hoses on the 17 bar valve (**mark the positions**).
   - the throttle control on the injection pump.
   - the flowmeter harness (if fitted).
   - the main wiring harness connections above the engine.
   - the heater hoses on the water pump and behind the fan pulley. (Plug the connections to avoid draining the cooling system completely).
   - the 7.5 and 10 amp fuse harness. To release this, slightly slacken the straight rod above the radiator.
   - the fuel supply hose.
10. Immobilise the tractor.
    Apply the handbrake.
    Fit wedges between the frame and the front axle (Fig.2).
11. Support the tractor under the gearbox using a suitable stand.

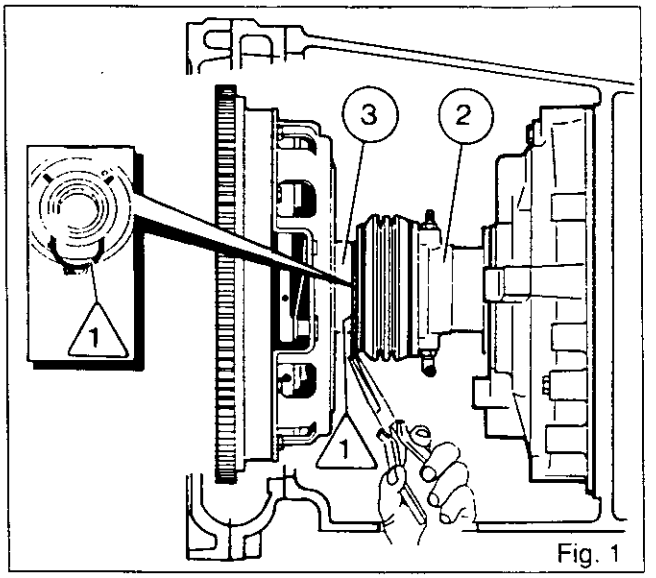
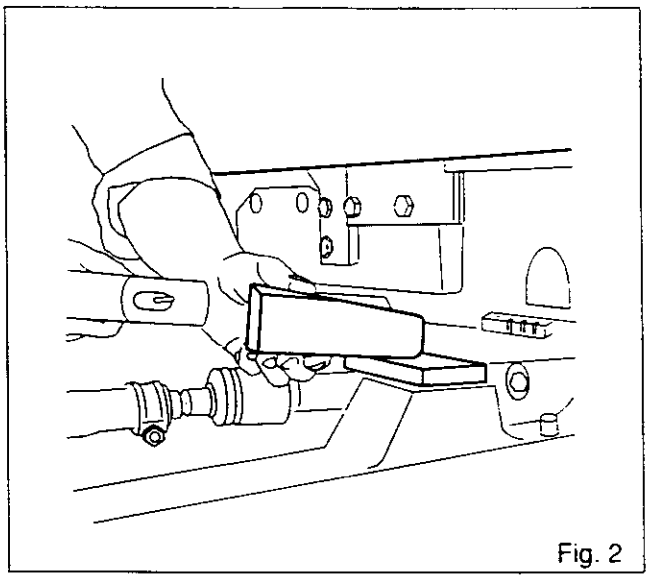


Fig. 1


Fig. 2

12. Support the tractor under the sump using a suitable trolley jack.
13. Slacken the bolts attaching the engine to the gearbox.
14. Separate the gearbox from the engine
    Note: As a safety measure, remove the front weights.

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Splitting the tractor

B. Refitment

15. Assemble the carrier **(3)** on the clutch slave cylinder **(2)** with the pin /**1**\ (Fig.3).
16. **Position service tool 3376802 M1 (36 mm shim) between the end of the guide-pin (4) and the face of the control cylinder (2) (Fig.3).**
17. Screw two dowel pins (use two bolts) into diametrically opposed positions on the gearbox.
18. **Replace the seal /1\ on the input shaft (2) (Fig.4).**
    a) withdraw the PTO shaft **(3)**.
    b) extract the seal /**1**\.
    c) replace the PTO shaft **(3)**.
    d) remove the circlip **(4)** and the washer **(5)**.
    e) protect the splined end of the shaft **(3)**.
    f) lubricate and fit a new seal /**1**\ using service tool 3376803 M1.
    g) remove the protection from the splines.
    h) refit the washer **(5)** and the circlip **(4)**.
19. Lightly grease the gearbox input shaft splines (using molybdenum disulphide grease).
20. Check that the two dowel pins are fitted on the engine.
21. Fit the engine to the gearbox by turning the flywheel ring gear with a screwdriver.
    Note : During assembly, the release bearing must be heard to engage in the clutch cover plate. Remove the service tool through the inspection hole (Fig.3).
    Check that the clip is correctly positioned on the cover plate.
    Remove the two dowel pins.
22. Clean the bolts attaching the engine to the gearbox and coat them with **Loctite 270** before fitting. See Section C for tightening torques.
23. Carry out procedures 6 to 12 in reverse.
24. Top up the cooling system.
25. Refit the guard and transmission shaft (4WD).
26. Reconnect the two front wheel differential lock control hoses (4WD)
27. Start the engine.
28. Check the accelerator control setting.

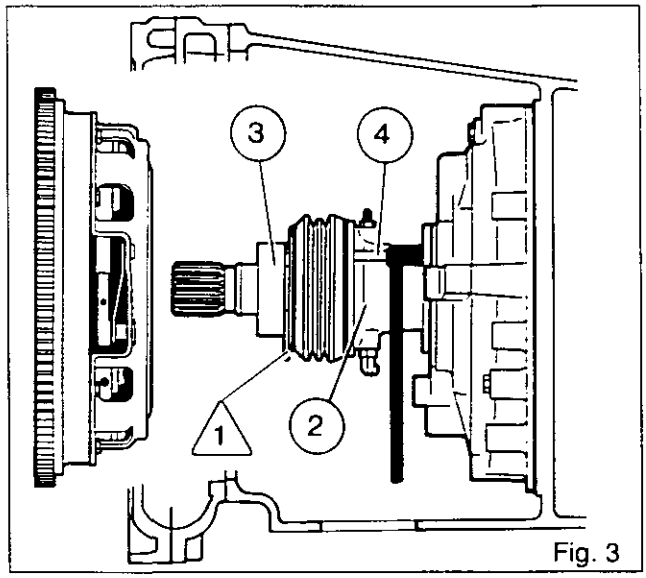


Fig. 3

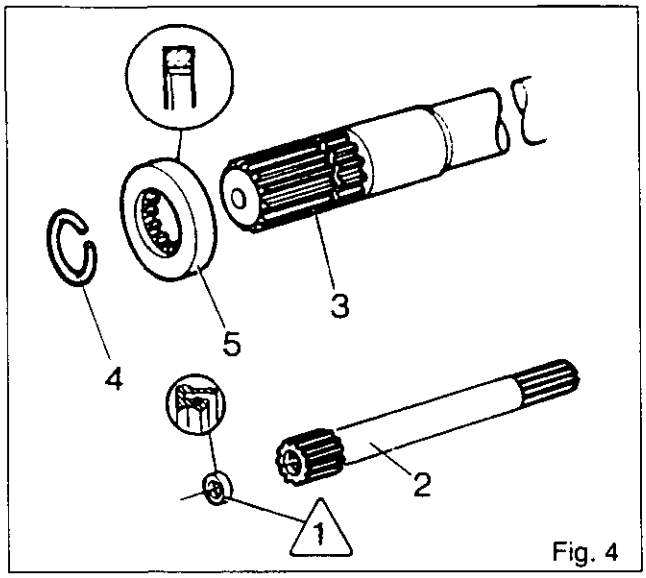


Fig. 4

29. Check:
    - all hoses and pipes for leaks
    - that the electrical circuits are working.
30. Refit the inspection plate under the clutch housing.
31. Refit the sheet metal panels.
32. Road test the tractor.

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C. Attaching engine adaptor plate/Gearbox spacer

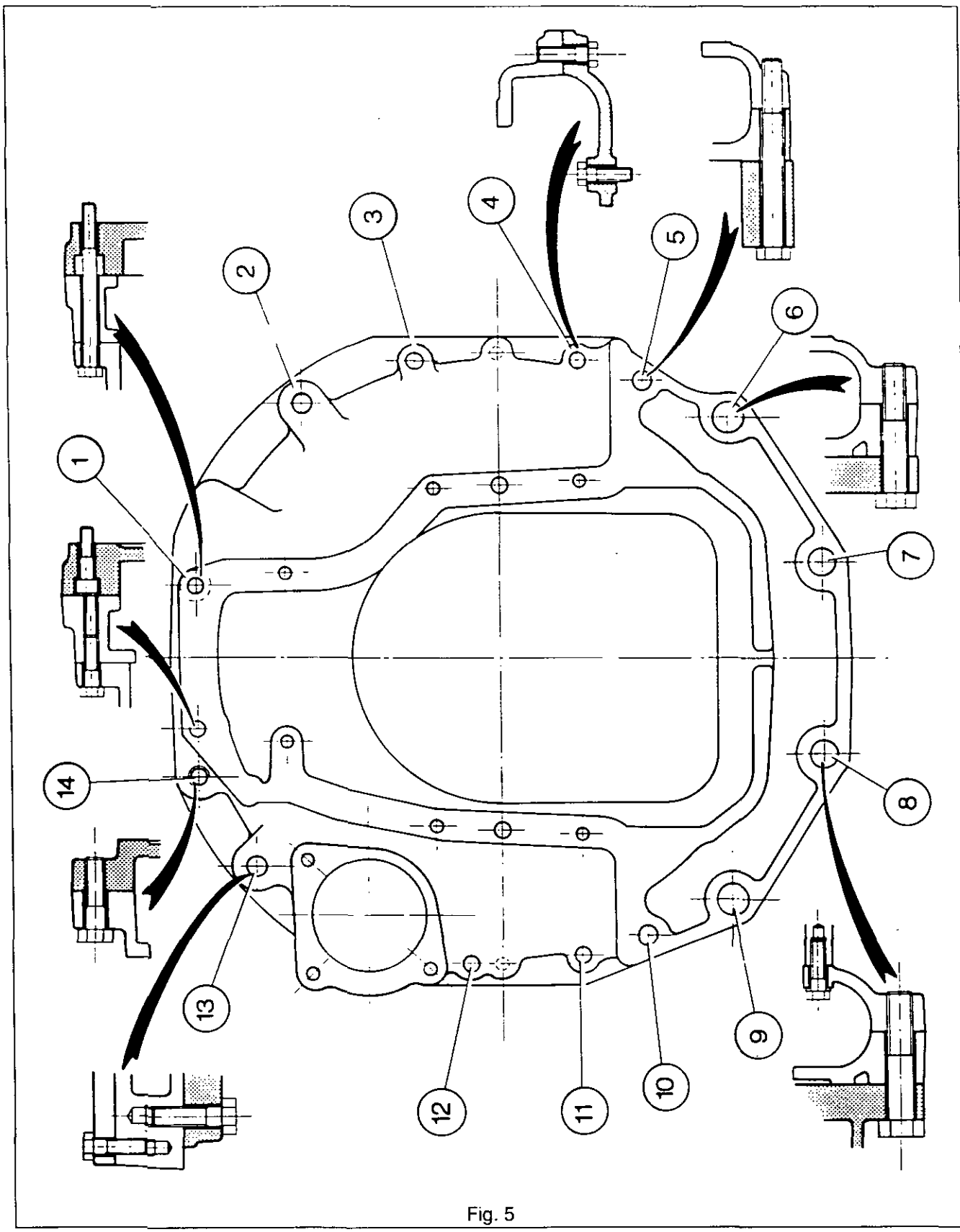


Fig. 5

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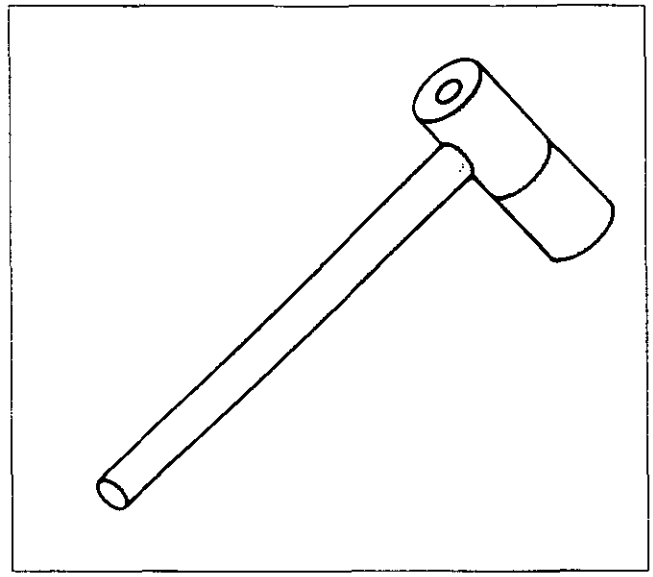
Splitting the tractor

Tightening torques (Nm)

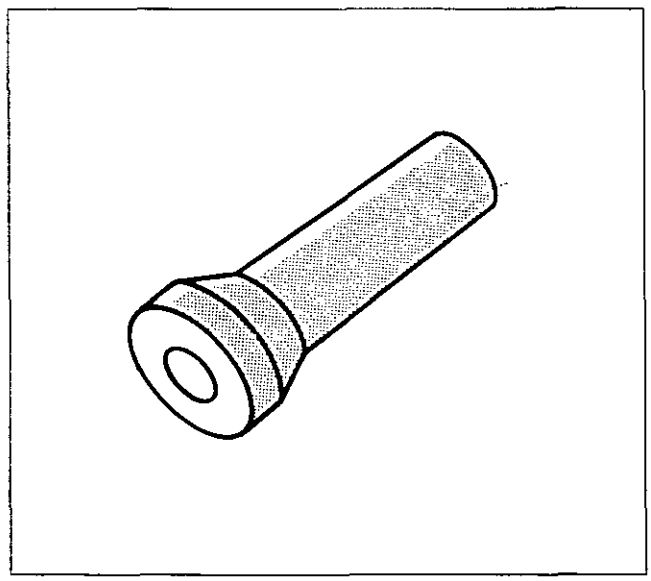
(1)	120-160	**(8)**	600-800
(2)	300-400	**(9)**	600-800
(3)	120-160	**(10)**	300-400
(4)	120-160	**(11)**	120-160
(5)	300-400	**(12)**	120-160
(6)	600-800	**(13)**	300-400
(7)	600-800	**(14)**	300-400

D. Service tools

3376802 M1
36 mm tool to connect engine and gearbox



3376803 M1
Input shaft seal fitting tool



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3A03 Splitting the tractor between the engine and the gearbox (3000)

CONTENTS

A. Removal ____ 2

B. Refitment ____ 2

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Splitting the tractor - Dynashift

A. Removal

1. Disconnect the two front differential lock (4WD) control hoses. Plug the pipe connections.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the sheet metal panels.
4. Disconnect the earth cables only from the batteries.
5. Remove the hood rear bracket.
6. Disconnect and plug :
   - the two orbitrol steering ram hoses (mark their position).
   - the two air conditioning plugs and the bracket (if fitted).
   - the fuel return hose.
   - the two cooler hoses on the 17 bar valve (mark the positions).
   - the accelerator control on the injection pump.
   - the flowmeter harness (if fitted).
   - the main harness connections above the engine.
   - the heater hoses on the thermostat block to the engine front and to the water pump. Plug the connections to avoid draining the cooling system completely).
   - the 7.5 and 10 amp fuse harness (to release this, slightly slacken the straight rod above the radiator).
   - the fuel supply hose.
7. Immobilise the tractor :
   - apply the handbrake.
   - fit wedges between the frame and the front axle (Fig.1).
8. Support the tractor under the gearbox using a suitable stand.
9. Support the tractor under the sump using a suitable trolley jack.
10. Remove the tool box.
11. Remove the bolts attaching the engine to the gearbox.
12. Separate the gearbox from the engine.

Note: As a safety measure, remove the front weights.

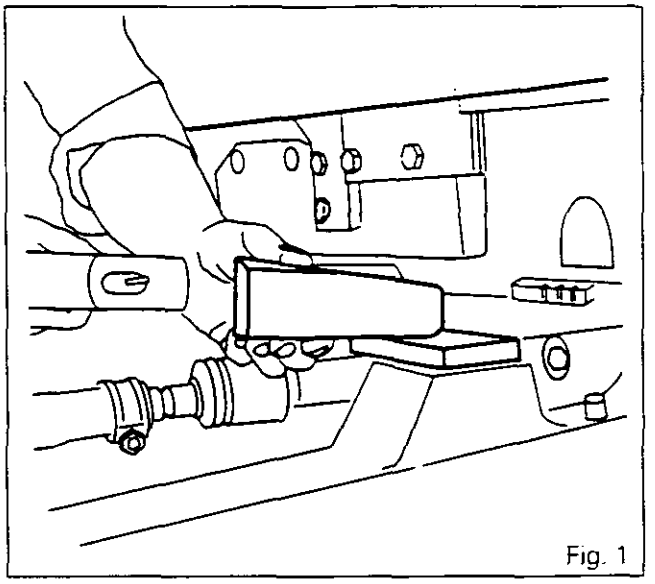


Fig. 1

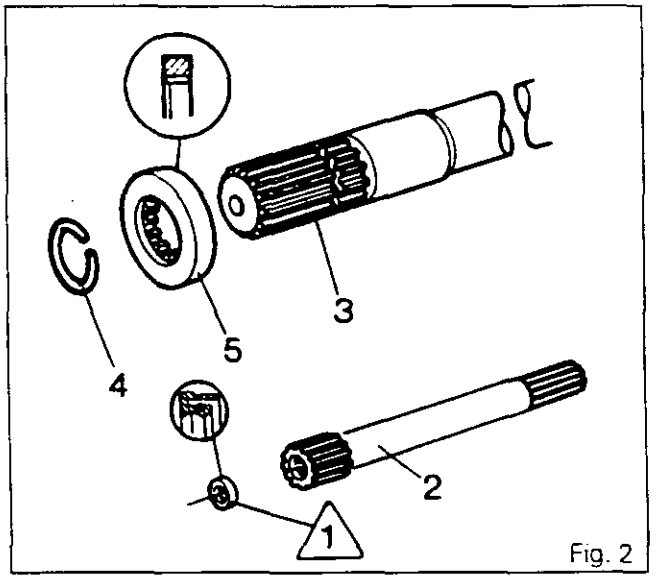


Fig. 2

B. Refitment

13. Screw two dowel pins (made locally) into diametrically opposite positions on the gearbox.
14. Replace the seal **/1** on the input shaft **(2)** (Fig.2).
    a) withdraw the PTO shaft **(3)**.
    b) extract the seal **/1**.
    c) replace the PTO shaft.
    d) remove the circlip **(4)** and the washer **(5)**.
    e) protect the splined end of the shaft **(3)**.
    f) fit a new seal **/1** using service tool 3376803 M1 (see 3A04)
    g) remove the protection from the splines.
    h) refit the washer **(5)** and the circlip **(4)**.
15. Lightly grease the gearbox input shaft splines with molybdenum disulphide grease.
16. Check that the two dowel pins are fitted on the engine.
17. Fit the engine to the gearbox by turning the flywheel ring gear with a screwdriver.
18. Fit the attaching bolts. Coat the bolts with Loctite 270. Tighten to the torque indicated in section 3A04.
19. Carry out procedures 4 to 9 in reverse.
20. Carry out procedure 10 in reverse.
21. Top up the cooling system.
22. Carry out procedures 1 and 2 in reverse (4WD).
23. Start the engine.
24. Check the accelerator control and fuel cut-off setting.
25. Check:
    - the hydraulic circuits for leaks.
    - the operation of the electrical circuits.
26. Refit the sheet metal panels.
27. Road test the tractor.

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3 A04 Splitting the tractor between the engine and the gearbox

Pull-type clutch (3100)

CONTENTS

A. Removal ____ 2

B. Refitment ____ 3

C. Fitting engine adaptor plate/gearbox spacer ____ 4

D. Service tools ____ 5

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B. Refitment

15. Fit the spring washer **(4)** and the release bearing **(7)** into the carrier **(2)** (Fig.3).
16. Fit the cover **(3)**, the stop bolt **(6)** (Fig. 3) into the release bearing carrier notch. Press on the spring washer and place pin **/1** its bend pointed downwards (Fig. 1 and 3). Check the free rotation and radial movement of the release bearing.
17. Position service tool 3376802 M2 between the end of the release bearing carrier **(2)** and the seal carrier **(5)** (Fig. 3).
18. Screw two dowel pins into diametrically opposed positions on the gearbox.
19. **Replace the seal /1\ on the input shaft (2) (Fig.4).**
    a) withdraw the PTO shaft **(3)**.
    b) extract the seal **/1**.
    c) replace the PTO shaft **(3)**.
    d) remove the circlip **(4)** and the washer **(5)**.
    e) protect the splined end of the shaft **(3)**.
    f) lubricate and fit a new seal **/1** using service tool 3376803 M1.
    g) remove the protection from the splines.
    h) refit the washer **(5)** and the circlip **(4)**.
20. Lightly grease the gearbox input shaft splines (using molybdenum disulphide grease).
21. Check that the two dowel pins are fitted on the engine.
22. Fit the engine to the gearbox by turning the flywheel ring gear with a screwdriver.
    Note : During assembly, the release bearing must be heard to engage in the clutch cover plate. Remove the service tool through the inspection hole (Fig.3).
    Check that the clip is correctly positioned on the cover plate.
    Remove the two dowel pins.
23. Clean the bolts attaching the engine to the gearbox and coat them with **Loctite 270** before fitting. See Section C for tightening torques.
24. Carry out procedures 6 to 12 in reverse.
25. Top up the cooling system.
26. Refit the guard and transmission shaft (4WD).
27. Reconnect the two front wheel differential lock control hoses (4WD)
28. Start the engine.
29. Check the accelerator control setting.

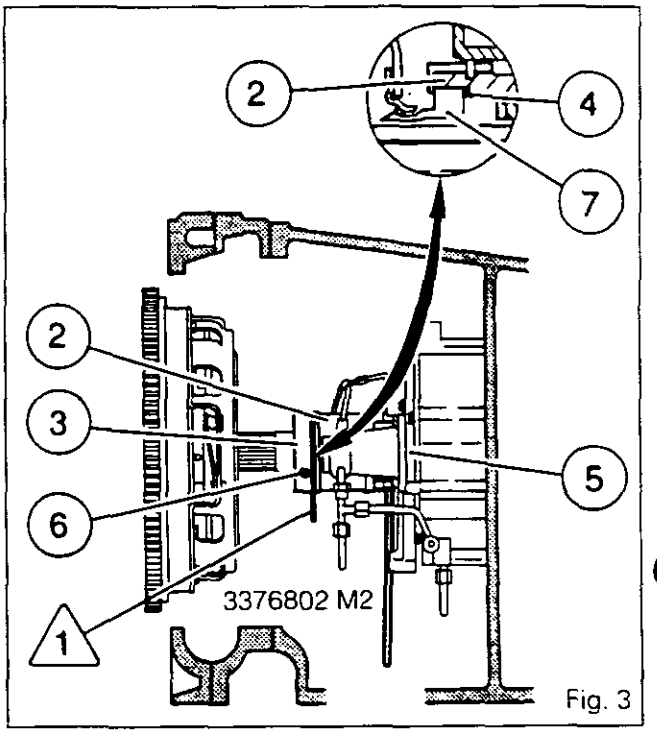


Fig. 3

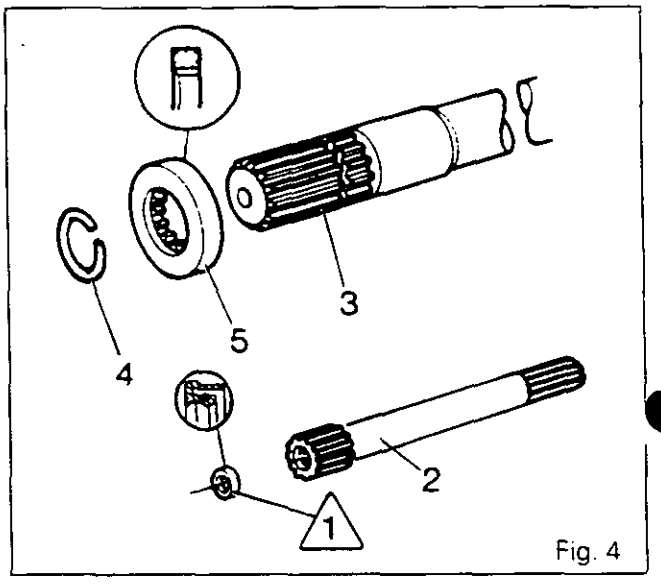


Fig. 4

30. Check:
    - all hoses and pipes for leaks
    - that the electrical circuits are working.
31. Refit the inspection plate under the clutch housing.
32. Refit the sheet metal panels.
33. Road test the tractor.

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Splitting the tractor - Dynashift

A. Removal

Note: Plug or cover disconnected hydraulic pipe connections to prevent leaks and the ingress of foreign matter.

1. Disconnect the two front differential lock (4WD) control hoses.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the inspection plate under the clutch housing.
4. **Remove the pin /1\ connecting the release bearing carrier (2) and the cover (3) (Fig.1).**
5. Remove the sheet metal panels.
6. Remove the battery cover.
7. Disconnect the earth cables only from the batteries.
8. Remove the hood rear bracket.
9. Disconnect :

- the two Orbitrol steering ram hoses (**mark their position**).
- the two air conditioning couplers and the bracket (if fitted). Protect both couplers using the plugs kit 3376935 M91.
- the fuel return hose.
- the two cooler hoses on the 17 bar valve (**mark the positions**).
- the throttle control on the injection pump.
- the flowmeter harness (if fitted).
- the main wiring harness connections above the engine.
- the heater hoses on the thermostat block to the front of the engine and on the water pump. (Plug the connections to avoid draining the cooling system completely).
- the 7.5 and 10 amp fuse harness. To release this, slightly slacken the straight rod above the radiator.
- the fuel supply hose.

10. Immobilise the tractor.

Apply the handbrake.

Fit wedges between the frame and the front axle (Fig.2).

11. Support the tractor under the gearbox using a suitable stand.

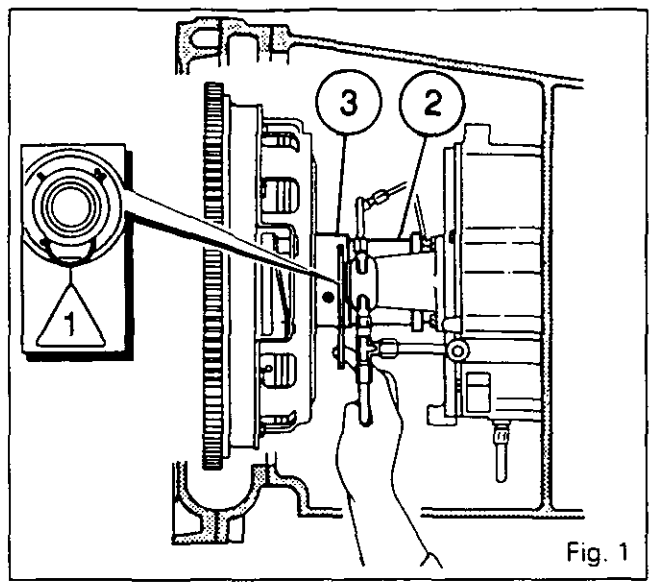
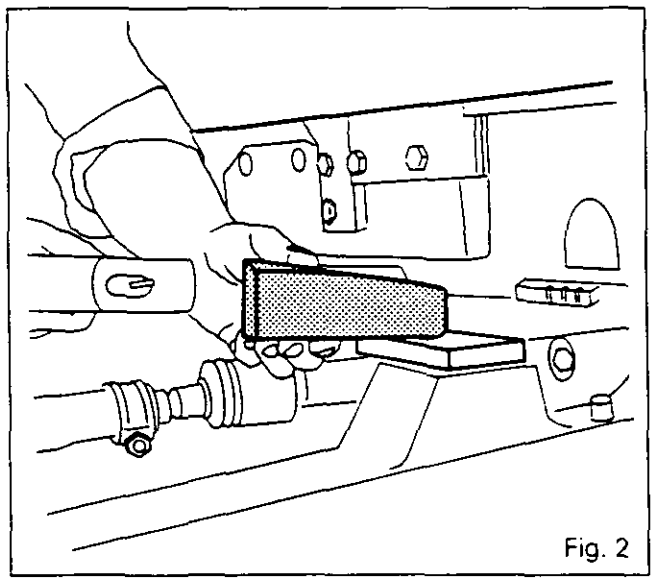


Fig. 1


Fig. 2

12. Support the tractor under the sump using a suitable trolley jack.
13. Slacken the bolts attaching the engine to the gearbox.
14. Separate the gearbox from the engine

Note: As a safety measure, remove the front weights.

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C. Attaching engine adaptor plate/Gearbox spacer

Tightening torques (Nm)

(1)	120-160	**(8)**	600-800
(2)	300-400	**(9)**	600-800
(3)	120-160	**(10)**	300-400
(4)	120-160	**(11)**	120-160
(5)	300-400	**(12)**	120-160
(6)	600-800	**(13)**	300-400
(7)	600-800	**(14)**	300-400

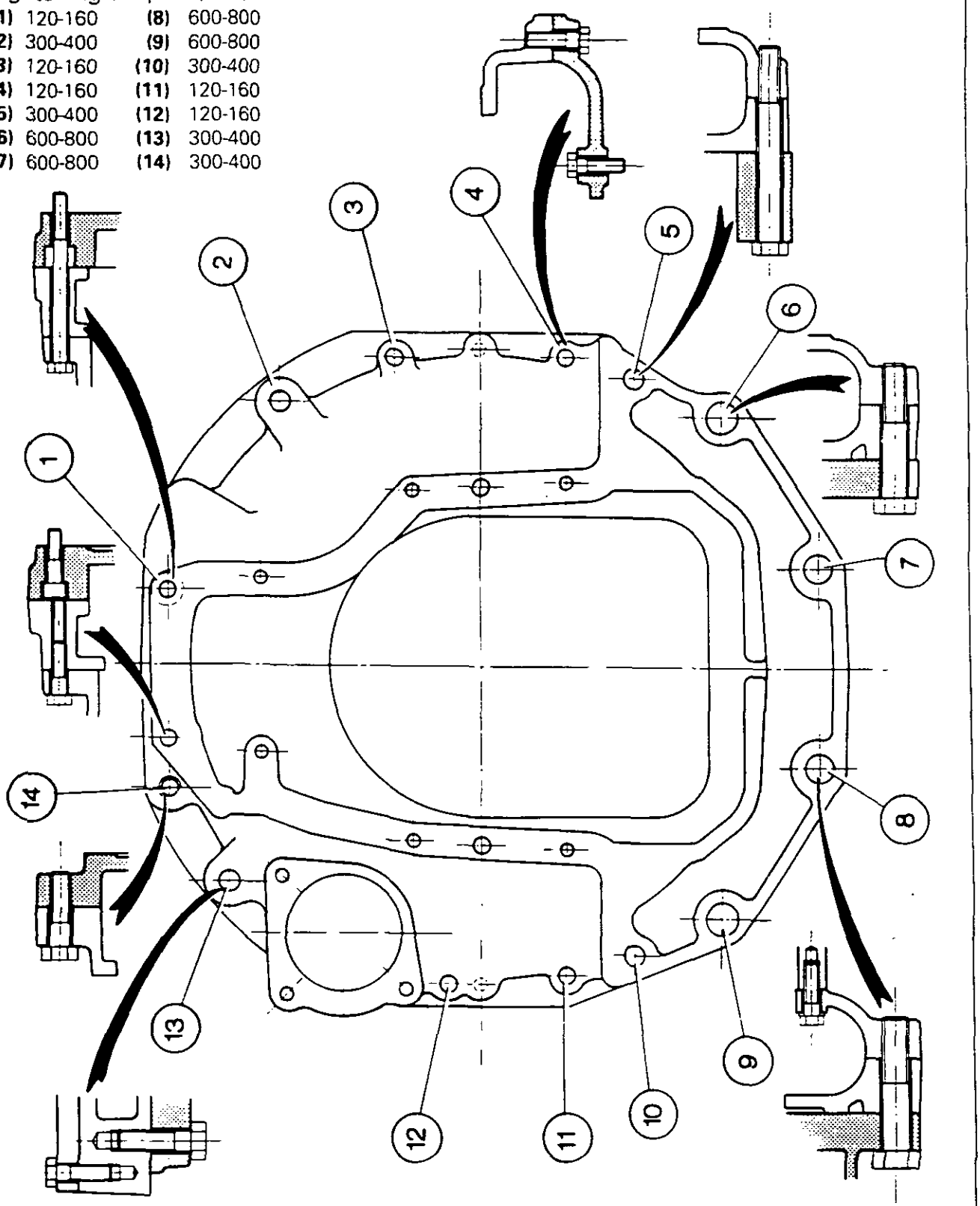


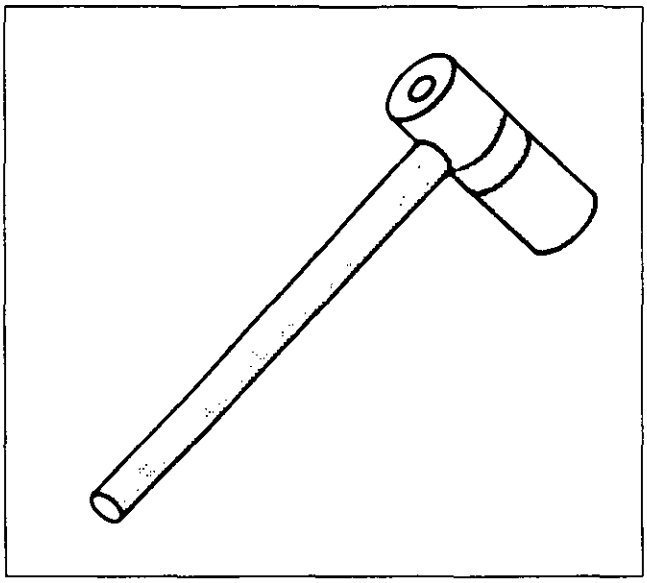
Fig. 5

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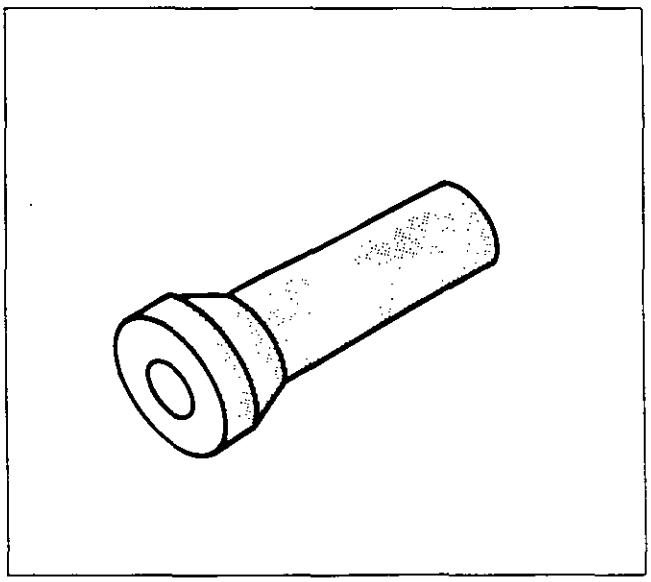
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D. Service tools

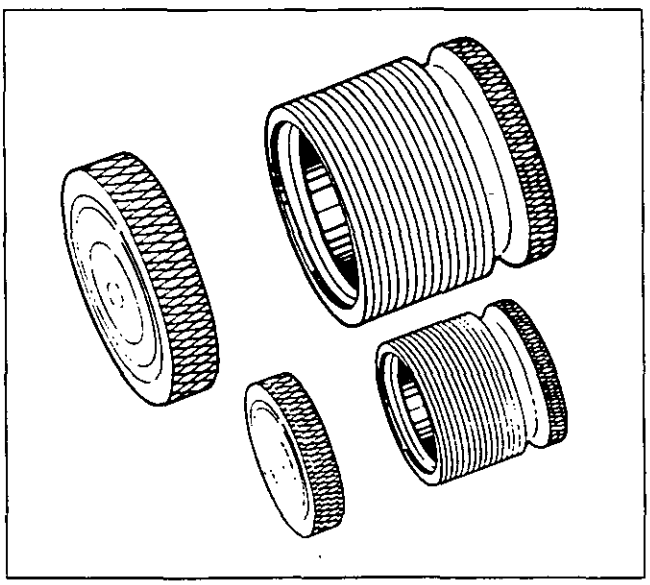
3376802 M2
Tool to connect engine and gearbox



3376803 M1
Input shaft seal fitting tool



3376935 M91
Plugs kit for air conditioning couplers



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3 B02 Splitting the tractor between the gearbox and the rear axle (cab integral with rear axle)

CONTENTS

A. **Removal** ____ 2

B. **Refitment** ____ 3

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Splitting the tractor

A. Removal

3000-3100 tractors

1. Drain the gearbox and rear axle of oil.
2. Disconnect and plug the following (on LH side of gearbox) (Fig.1).
   . the PTO clutch lubricating pipe **(1)** (at both ends)
   . the gearbox lubricating hose **(2)**
   . the return hose **(3)**
   . the hydraulic hose **(4)** supplying the clutch slave cylinder

3000 tractors

3. Carry out procedures 1 to 6 from Section 3 AO1.

3100 tractors

4. Carry out procedures 1, 2. and 5 to 9 from Section 3 AO2.

3000-3100 tractors

5. Disconnect the braided earth cable (from the cab support).

For tractors equipped with speedshift and speed limiting device :

6. Disconnect the harnesses from the speedshift solenoid valve and the limit switch.
7. Carry out procedure 9 from Section 5 KO1.
8. Carry out procedure 10 from Section 5 KO1.

N.B.: Do not remove the pipe.

9. Remove the harness guard attached to the RH side of the gearbox.
10. Disconnect the Hare/Tortoise harness.
11. **Remove**:
    . the two sheet-metal guards over the solenoid valves on the RH hydraulic cover.
    . the 17 bar pipe from the hydraulic cover and from the gearbox connection.
    . the pipe supplying the orbitrol from the hydraulic cover.
    . the sheet-metal guard over the Autotronic unit.
    . the screen washer reservoir (as dictated by type).
    Disconnect:
    . the earth cable from the selector cover.
    . the cable running from the radar (Datatronic).
12. Carry out procedures 3 and 4, Section 5 DO1.A (gearboxes with creeper gears)
13. Immobilise the tractor:
    . apply the handbrake
    . fit wedges between the frame and the front axle (Fig.2)
14. Position jacks:
    . at the front of the rear axle
    . at the rear of the hitch hook
    . at the rear of the gearbox (trolley jack).

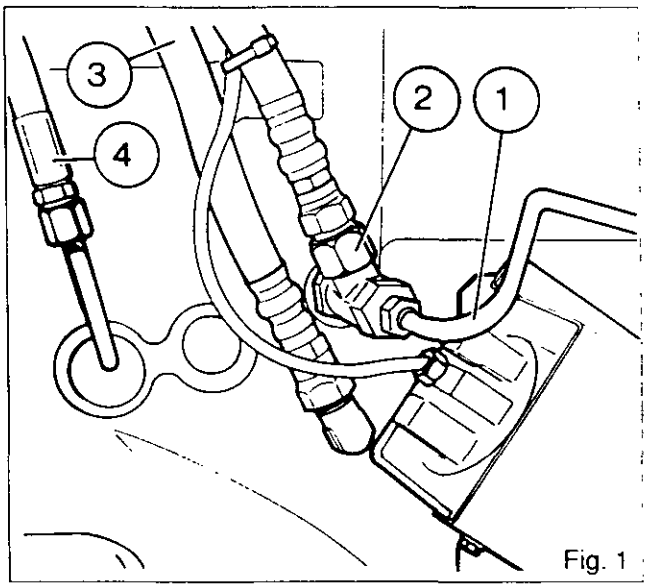
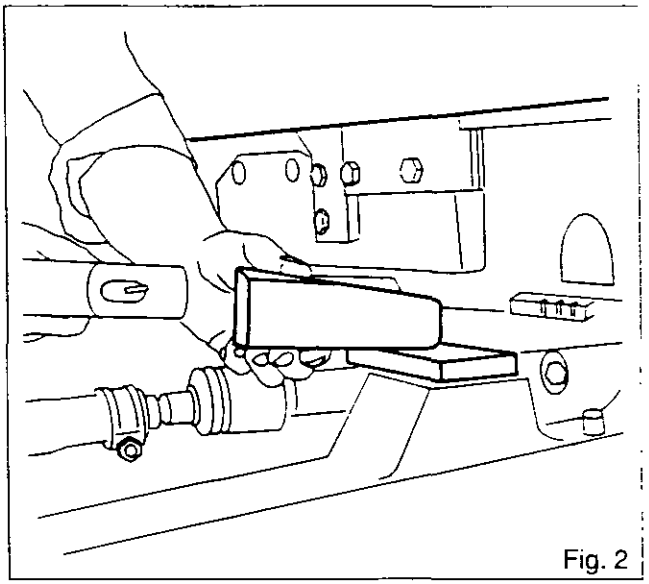


Fig. 1


Fig. 2

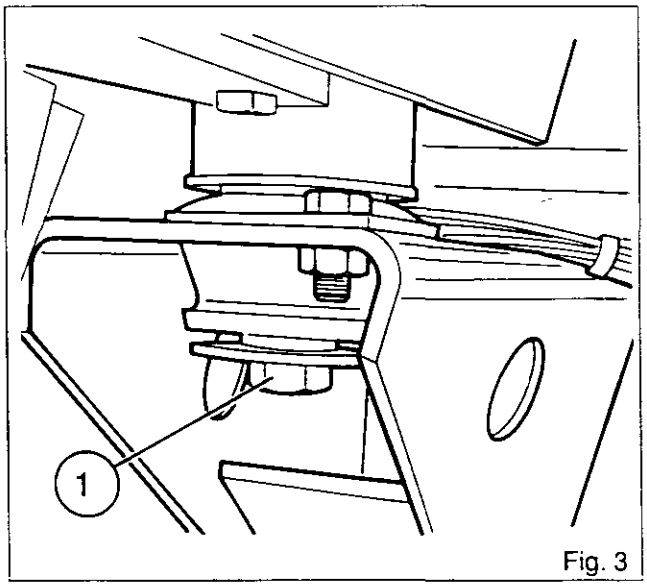


Fig. 3

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Splitting the tractor

15. Remove the bolts **(1)** through the shock absorbers on the RH and LH cab supports (Fig.3). Raise the cab **slightly**.
16. Support the cab under the RH and LH steps.
17. Unscrew the bolts securing the gearbox to the rear axle.
    N.B.: The bolts are of different lengths.
18. Split the tractor between the gearbox and the rear axle (Fig.5).

B. Refitment

19. Clean the mating faces of the gearbox and the rear axle centre housing.

At the rear axle

20. Fit:
    . (gearboxes without creeper gears) shaft **(1)**, with sleeves **(2)** and **(7)** connected to it by double pins **(5)** and **(6)**, to differential pinion **(3)** (Fig.4a).
    . (gearboxes with creeper gears) shaft **(1)**, with sleeve **(2)** connected to it by double pin **(5)**, to differential pinion **(3)** (Fig.4b).
    N.B.: Groove A in sleeve (2) should be towards the differential ring gear (4) (Fig.4).

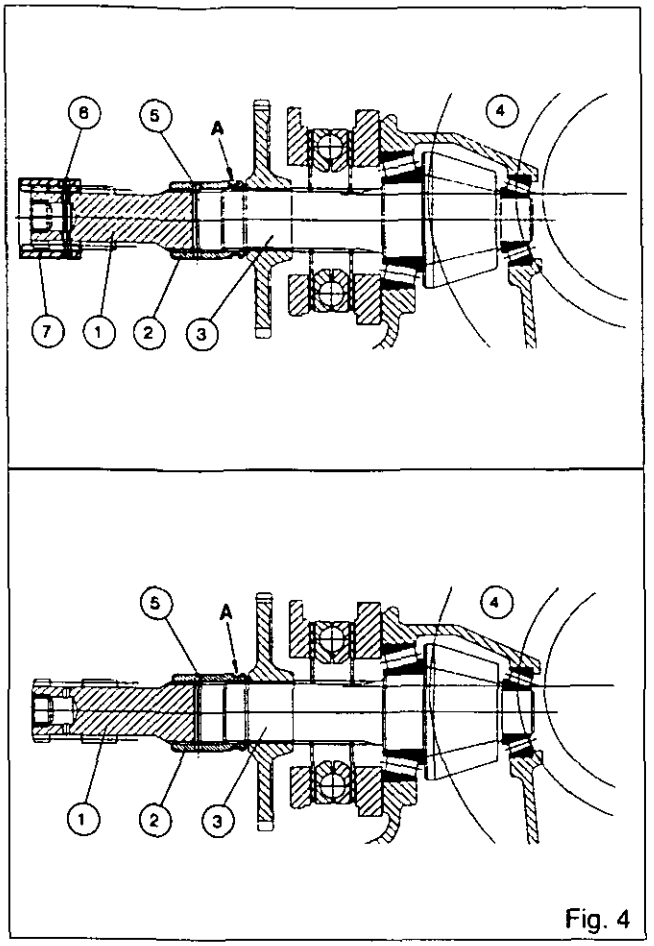


Fig. 4

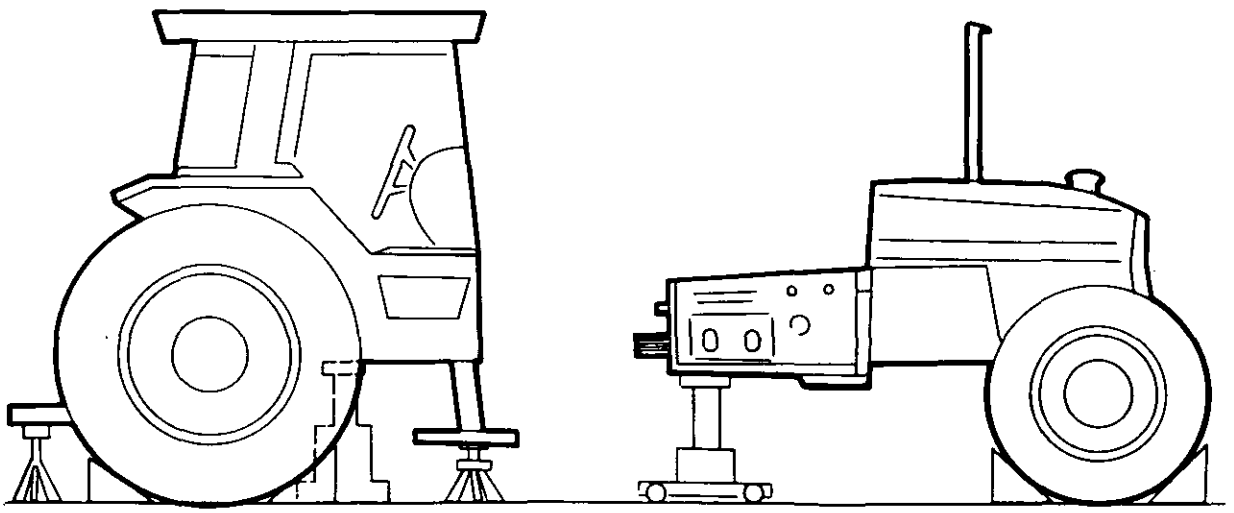


Fig. 5

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Splitting the tractor

21. Check that spring **(1)** is present in the PTO clutch housing (Fig.6).
22. Check that locating pins **(2)** are present (pins are a force fit in housing) (Fig.6).
23. Check that the control finger is pointing forward (gearbox with creeper gears) (Fig.7).
24. Apply a gasketing compound, Loctite 510 or equivalent, to the mating face of the rear axle centre housing.
25. Screw two pilot pins (b) into the housing (Fig.6).

At the gearbox

26. Replace the O-ring /1\ in the Hare/Tortoise passages (Fig.8).
27. Unite the tractor between the gearbox and the rear axle.
28. Fit the connecting bolts and tighten them to a torque of 155 - 195 Nm.
29. Remove the supports under the steps.
30. Lower the cab, fit the bolts through the shock absorbers **(1)** (Fig.3), and tighten the bolts to a torque of 200 - 270 Nm.
31. Carry out procedure 14 in reverse.
32. Carry out procedures 30 and 31, Section 5 DO1.A (gearboxes with creeper gears)
33. Carry out procedures 5 to 11 in reverse.

3000 tractors

34. Carry out procedures 1 to 6, Section 3 AO1, in reverse.
35. Carry out procedures 1 and 2 in reverse.

3100 tractors

36. Carry out procedures 1, 2 and 6 to 9, Section 3 AO2, in reverse.
37. Carry out procedures 1 and 2 in reverse.

3000-3100 tractors

38. *Bleed the clutch circuit, see Section 5 C01.G.*
39. Check:
    . that there are no leaks at the hydraulic unions
    . that the electrical circuits are working.
40. Refit the sheet metal
    Take out the wedges between the frame and the front axle, release the handbrake.
41. **Carry out road test on:**
    . clutch controls
    . controls for creeper gears (if fitted).
42. Check that there are no leaks at the joint between the gearbox and rear axle.

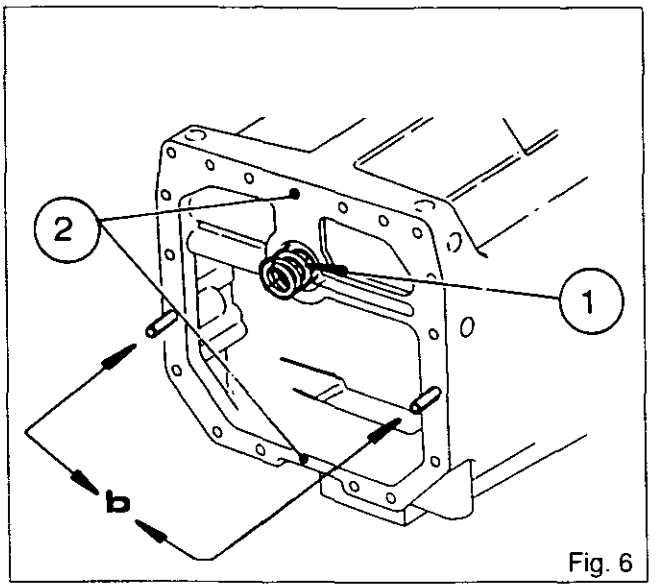
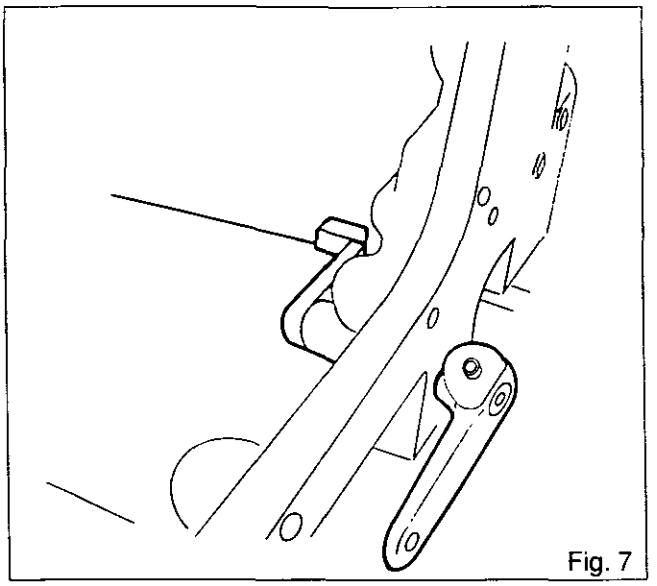


Fig. 6


Fig. 7

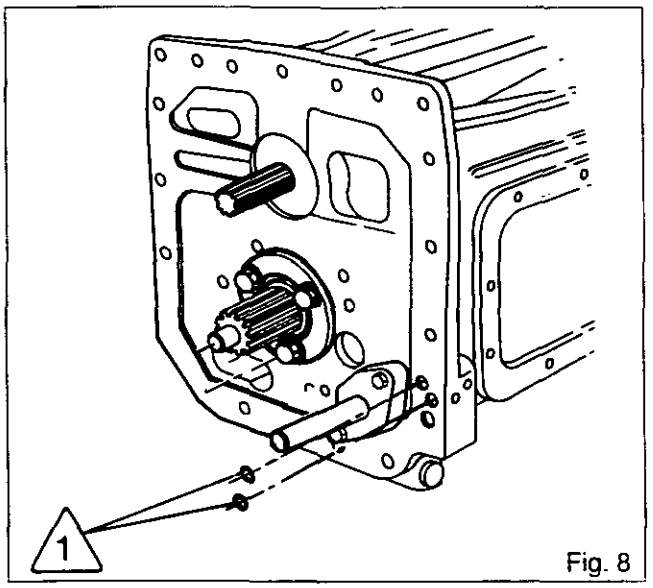


Fig. 8

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3 C01 Splitting the tractor between the front frame and the engine

CONTENTS

A. Uncoupling ——— 2

B. Recoupling ——— 3

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Splitting the tractor

A . Uncoupling

1. Disconnect the two 4WD front axle control hoses.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the sheet metal panels.
4. Disconnect the earth cables only from the batteries.
5. Disconnect and mark the positions of hoses and flexible connections, as follows :
   - the two Orbitrol steering hoses,
   - the hose from the cooler on the 17-bar valve,
   - the harness for the flowmeter and its three hoses located to the left of the fuel filter (3000 series, according to option),
   - the connectors for the main harness above the engine,
   - the positive cable on the starter,
   - the inlet sleeve between the turbocharger and the air filter,
   - the suction pipe between the air filter and the exhaust pipe.
6. Drain the cooling system. Disconnect the lower and upper hoses from the radiator.
7. Remove the upper attachment on the radiator.
8. Remove the air conditioning compressor and bracket assembly and tilt it forwards with its two hoses (according to option).

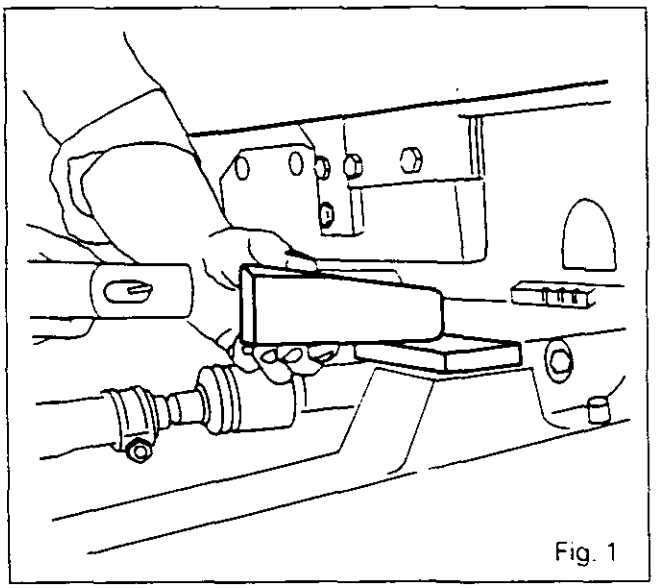


Fig. 1

9. Remove the front earth connections.
10. Immobilise the tractor. Apply the handbrake. Position wedges between the frame and the front axle (Fig. 1).
11. Loosen the bolts attaching the engine to the front frame.
12. Support the tractor under the frame using a trolley jack and separate the engine from the frame (Fig. 2).

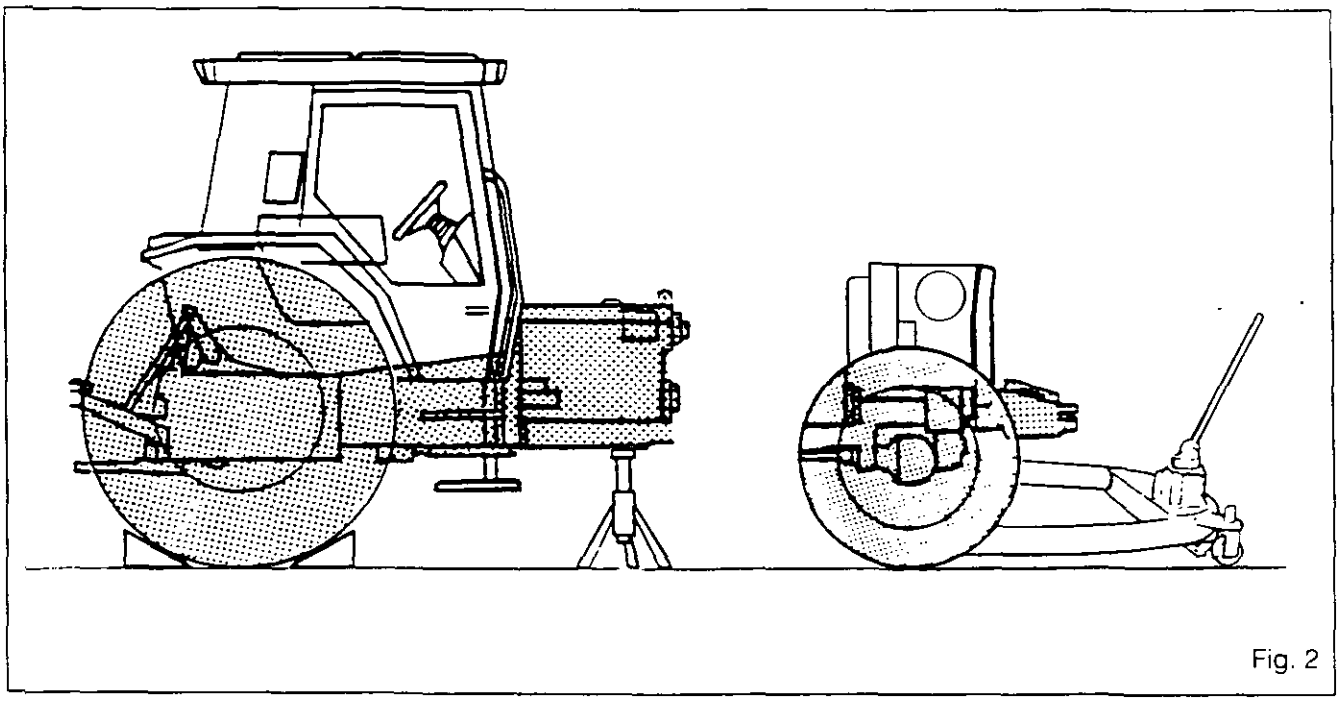


Fig. 2

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Splitting the tractor

B . Recoupling

13. Screw two dowel pins (locally made) into diametrically opposite positions on the front frame.
14. Fit the frame to the engine.
15. Install the bolts and tighten to the specified torque:
    - 4 cyl. engines : see Fig. 3,
    - 8 cyl. engines : see Fig. 4.
16. Remove the wedges between the frame and the front axle.
17. If the tractor is equipped with a flowmeter, purge the injection pump supply system (4 cyl. engines).
18. Start the engine and check:
    - the hydraulic systems for any leaks,
    - the correct operation of the electrical systems.
19. Carry out procedures 1 to 3 in reverse order.
20. Carry out road test.

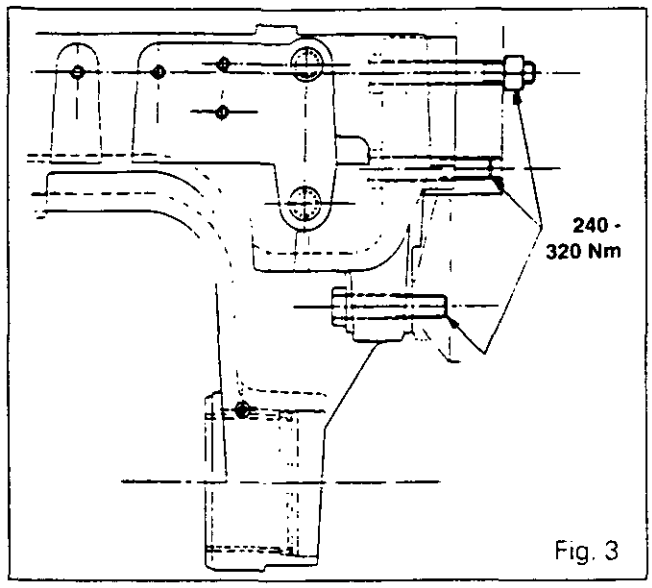


Fig. 3

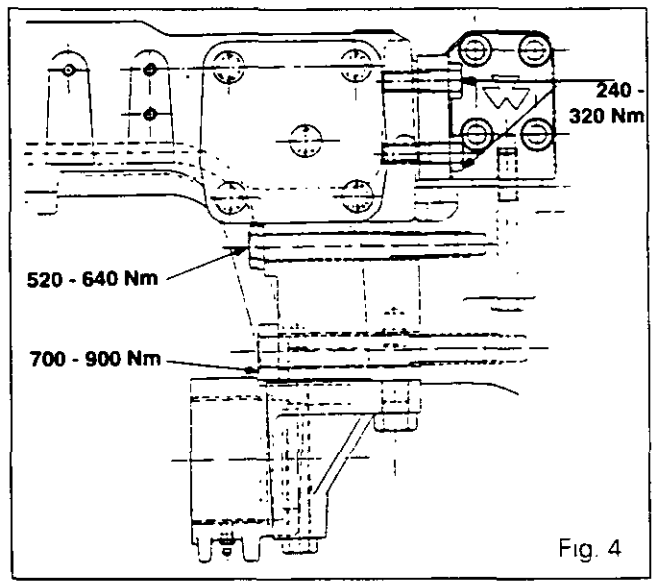


Fig. 4

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4 A01 General

CONTENTS

A. Introduction ____ 2

B. Main specifications ____ 2

C. Viscostatic fan ____ 3

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ENGINE - General

A. Introduction

The purpose of this section is to provide general information about the engines used for the 3000/3100 range.

For all information on: technical data, adjustments and removal and fitting procedures, refer to one or other of the publication listed opposite :

1. Workshop manual for all types of Perkins engines manufactured for MF tractors, published by Massey Ferguson under reference 1856562 M1.

2. Workshop manual specifically for the 1000 series engines published by Massey Ferguson under the reference 1646906 M1.

B. Main specifications

	3050	3060	3065	3070	3080	3095	3115/20	3125/40
PERKINS Type	A 4.236	A 4.248 S	C 4.236	A T4 236	A 6.354.4	1006-6 HR	1006-6LR	1006-6T7
Number of cylinders	4	4	4	4	6	6	6	6
Turbocharger	-	-	yes	yes		-	-	yes
Bore (mm)	98,47	100,96	98,47	98,47	98,47	100	100	100
Stroke (mm)	127	127	127	127	127	127	127	127
Cubic capacity (cc)	3860	4060	3860	3860	5800	6000	6000	6000
Compression ratio	16 to 1	16 to 1	16 to 1	15,5 to 1	16 to 1	16,5 to 1	16,5 to 1	16 to 1
Max. DIN Power (Kw)	52	59	62,5	68,5	73,5	78,5	84,5	92,5
PTO power (Kw)	47	53	57	62	68	72	78	86
At engine speed of (rpm)	2200	2200	2200	2200	2200	2200	2200	2200
Maximum torque (Nm)	269	280	319	343	374	415	436	474
Engine speed at max. torque (rpm)	1400	1400	1400	1400	1200	1200	1100	1200
Idling speed (rpm)	850	850	850	850	850	850	850	850
Engine speed at max. power (rpm)	2200	2200	2200	2200	2200	2200	2200	2200
Max. no load speed (rpm)	2310	2310	2310	2310	2310	2310	2310	2310
Torque at max. speed (Nm)	230	260	276	303	325	348	367	401
Firing order	1 - 3 - 4 - 2				1 - 5 - 3 - 6 - 2 - 4			
Lubrication *	Gear type pump minimum pressure 2.1 bar at max. speed and normal running temperature							
Valves	Overhead push-rod operated							
Valve clearances	(cold)							
- Inlet (mm)	0,30	0,30	0,30	0,30	0,20	0,20	0,20	0,20
- Exhaust (mm)	0,30	0,30	0,30	0,30	0,45	0,45	0,45	0,45
Engine oil cooler	no	no	yes	yes	yes	no	no	yes

* Turbocharged engines have piston cooling jets

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C. Viscostatic fan

Description

The 1000 series engines are fitted with a cooling fan with an Eaton viscous coupling. This device increases power by 2 to 3hp.

The viscous coupling is made up of three main parts:

- The driving part powered by the engine and composed of shaft **(1)** integral with plate **(2)** with annular grooves.
- The driven part composed of hub **(6)** on which are mounted the fan and body **(7)** also with annular grooves.
- The regulating part composed of thermostatic spring **(3)** controlling valve **(4)**.

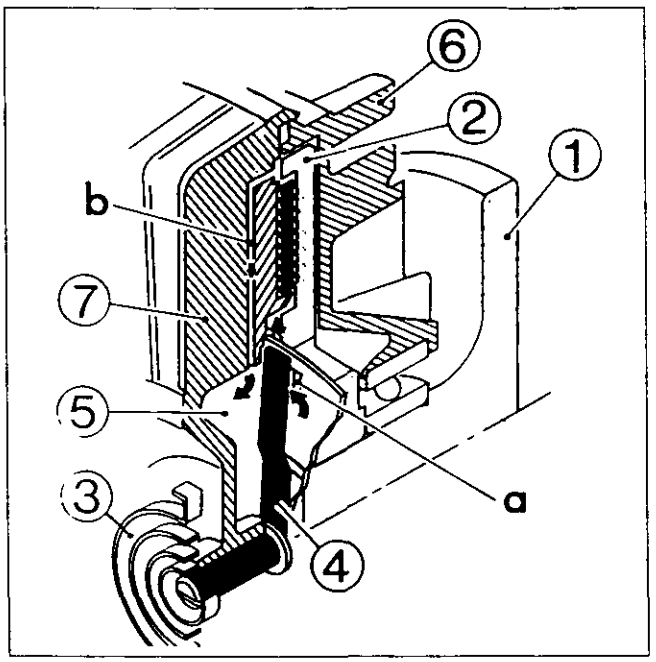
The centre of the device has a reservoir **(5)** filled with a viscous silicone fluid.

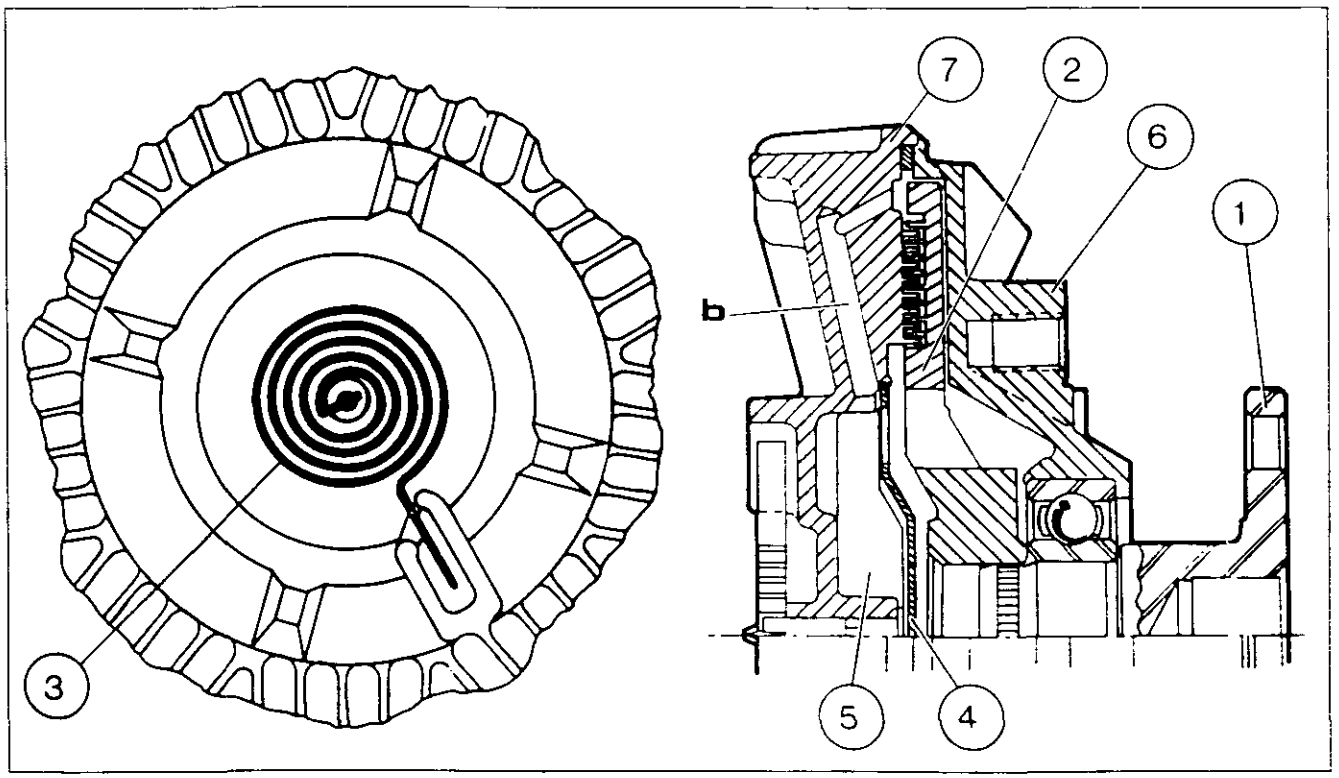
Method of operation

When the temperature of the air going through the radiator reaches a predetermined value, thermostatic spring **(3)** acts on valve **(4)** which opens orifice **a**. The liquid is driven towards the annular grooves on hub **(2)** and body **(7)** by centrifugal force. The torque is transmitted by the internal friction of the very viscous fluid and its adhesion to the walls. The fan is thus driven, thereby increasing airflow and overall cooling efficiency.

The speed of the fan varies continually over the whole regulatory range depending on the temperature.

When the temperature of the air going through the radiator decreases, the spring closes the valve and stops the liquid from coming into contact with the friction area. The fluid gradually returns to reservoir **(5)** via pipe **b**, the fan is disengaged, leaving only a slight residual torque.





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4 B01 Engine adaptor plate

CONTENTS

A. 3000 Tractor with 6 cylinder engine ——— 2

B. 3100 Tractor engine ——— 3

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ENGINE - Adaptor plate

A. 3000 Tractor with 6 cylinder engine

Disassembly

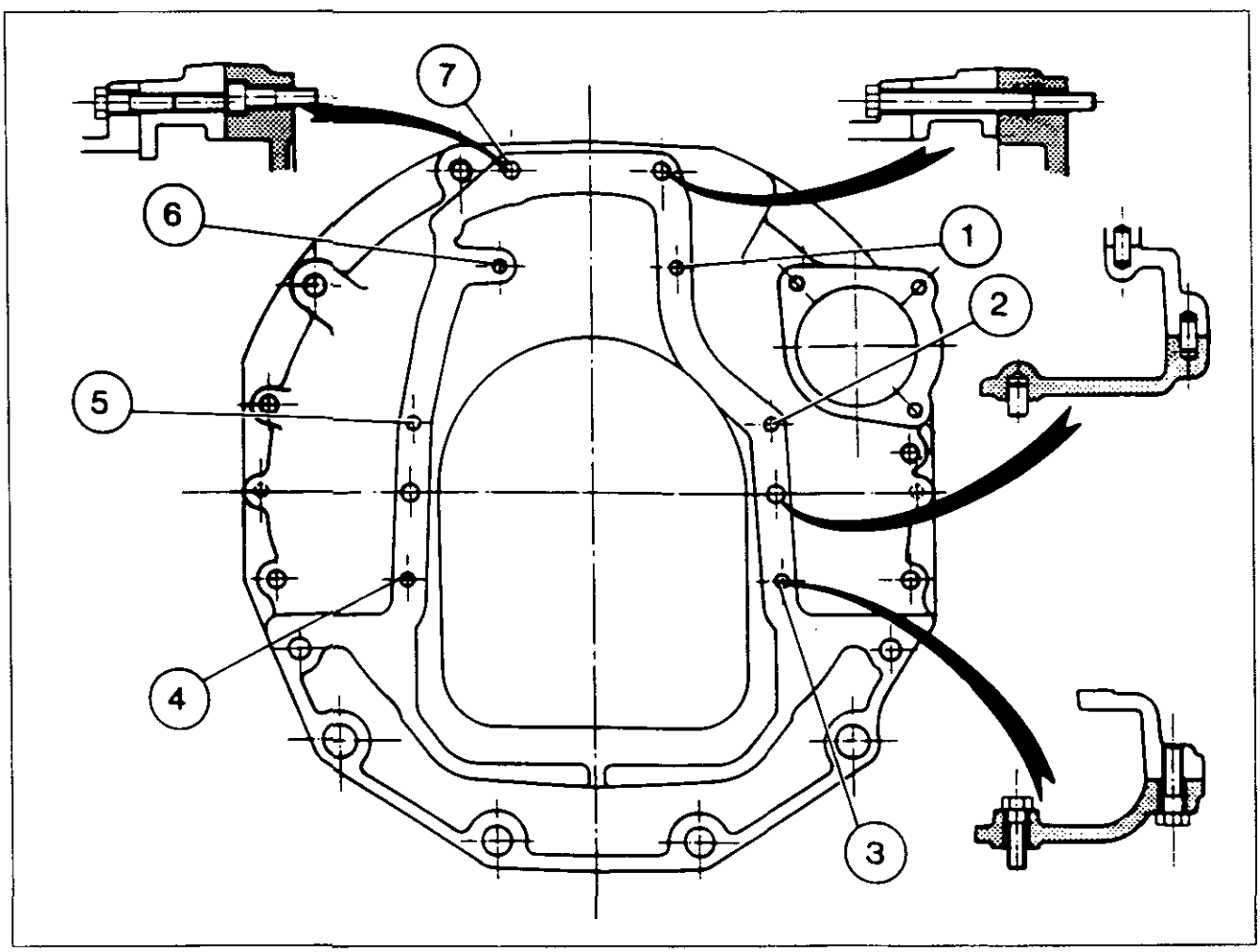
1. Split the tractor between the engine and the gearbox. Chapter 3 A01.
2. Remove the engine clutch. Chapter 5 B01.A.
3. Remove the starter motor attaching bolts. Withdraw the starter motor without disconnecting the cable.
   Note: Support the starter motor by suspending it to avoid its weight damaging the cable.
4. Remove the flywheel, chapter 5B01.B.
5. Remove two attaching bolts from the engine adaptor plate.
6. Screw two dowel pins into the holes vacated by the two bolts (two bolts can be used).
7. Remove the five bolts and the engine adaptor plate.
8. Remove the locating dowels.
9. Withdraw the three starter motor attaching studs on the engine adaptor plate.

Reassembly

10. *Clean the flanges between the engine and the* adaptor plate.
11. Carry out procedures 8 and 9 in reverse.
12. Carry out procedures 6 and 7 in reverse.
13. Fit the seven adaptor plate bolts on the engine. Tighten to the torque shown.
14. Carry out procedures 1 to 4 in reverse.

Tightening torque

(1) to **(7)** 39-53 Nm



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ENGINE - Adaptor plate

B. 3100 Tractor engine

Disassembly

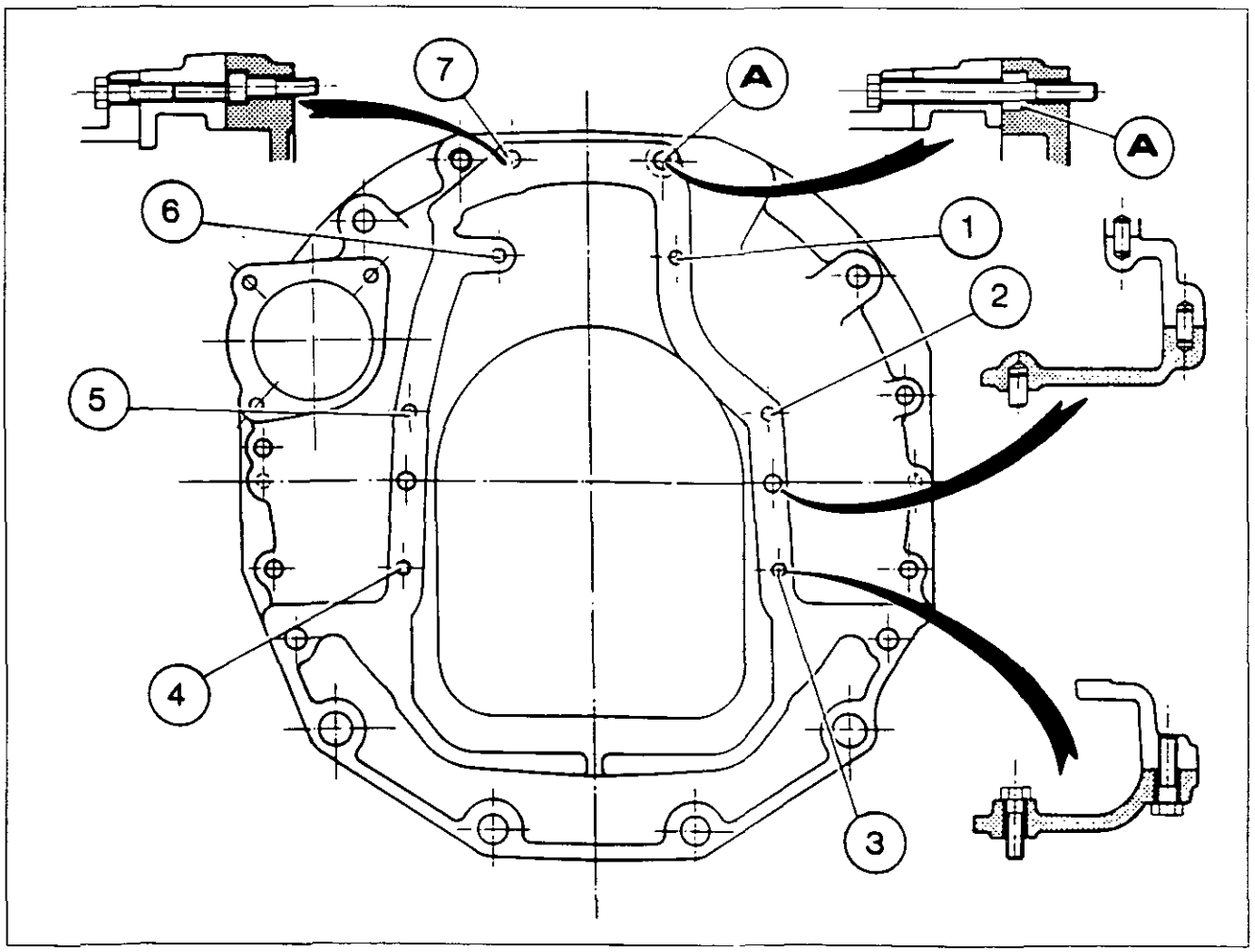
1. Split the tractor between the engine and the gearbox. Chapter 3 A02.
2. Remove the engine clutch. Chapter 5 C01.A.
3. Remove the starter motor attaching bolts. Withdraw the starter motor without disconnecting the cable.
   Note : Support the starter motor by suspending it to avoid its weight damaging the cable.
4. Remove the flywheel, chapter 5C01.B.
5. Remove two attaching bolts from the engine adaptor plate.
6. Screw two dowel pins into the holes vacated by the two bolts (two bolts can be used).
7. Remove the five bolts and the engine adaptor plate.
8. Remove the locating dowels.
9. Withdraw the three starter motor attaching studs on the engine adaptor plate.

Reassembly

10. Clean the flanges between the engine and the adaptor plate.
11. Carry out procedures 8 and 9 in reverse.
12. Carry out procedures 6 and 7 in reverse.
13. Fit the seven adaptor plate bolts on the engine. Tighten to the torque shown.
    Note: Do not insert a bolt into hole A.
14. Carry out procedures 1 to 4 in reverse.

Tightening torques

(1) to **(6)** 50-70 Nm
(7) 100-130 Nm



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5 . GEARBOX

Contents

SPEEDSHIFT GEARBOX		DYNASHIFT GEARBOX	
5 A01	TRANSMISSION ASSEMBLY		
5 A02	DISASSEMBLY AND REASSEMBLY		
5 B01	PUSH-TYPE CLUTCH (3000)		
5 C01	PULL-TYPE CLUTCH (3100)		
5 D01	SELECTOR RAIL AND FORKS	5 D01	SELECTOR RAIL AND FORKS
5 E01	INPUT UNIT		
5 E02	SPEEDSHIFT		
5 E03	REVERSE SHUTTLE		
5 F01	A/B RANGE GEARS AND SYNCHROMESH MECHANISM		
5 G01	MAINSHAFT		
5 H01	LAYSHAFT		
5 I01	OUTPUT SHAFT		
5 J01	CREEPER GEARS	5 J01	CREEPER GEARS
5 J02	SUPER CREEPER GEARS		
5 K01	SELECTOR COVER (4 X 4)		
5 K02	SELECTOR COVER (4 X 2)		
5 K03	ADJUSTING SELECTOR COVER		
5 L01	SPACER		
		5 L02	SPACER
5 M01	16TH GEAR LOCKOUT (3100)	5 M01	16TH GEAR LOCKOUT (3100)
		5 N01	DYNASHIFT TRANSMISSION ASSEMBLY
		5 P01	PUSH-TYPE CLUTCH (3000)
		5 Q01	PULL-TYPE CLUTCH (3100)
		5 R01	INPUT UNIT
		5 R02	DYNASHIFT INPUT UNIT
		5 R03	REVERSE SHUTTLE
		5 S01	MAINSHAFT
		5 T01	LAYSHAFT
		5 V01	OUTPUT SHAFT
		5 X01	SELECTOR COVER

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5 A01 Transmission assembly

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B. Gearbox assembly ____ 2

C. Main gearbox ____ 5

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Gearbox

A. General description

The 3000 and 3100 series tractors have a transmission which consists of five main housings :
- the gearbox assembly, which also serves as a clutch housing.
- the centre housing which includes the differential assembly, the power take off line and 4 wheel-drive clutch. It also holds the side hydraulic covers.
- the axle housings right and left.
- the lift cover.

These five parts are common to the whole series 3000 and 3100 range. The models fitted with 6 cylinder engines have an adapter plate located between the engine and gearbox.

Clutch

The clutch is a single-plate unit. The mechanism has a diaphragm which is hydraulically operated by a piston. For the 3000 models, the operating system is pushed and for the 3100 models it is pulled.
A shaft driven by a splined hub connected to the engine flywheel passes through the gearbox assembly and transmits rotation to the power take-off clutch. The power take-off clutch housing drives the hydraulic pump via drive gear.

B. Gearbox assembly

Main box

The main gearbox has eight basic speeds(2x4). It consists of a train of four gears to which a set of two gears is added so that a slow (Tortoise) range and a fast (Hare) range can be obtained.
All the gears are in constant mesh and the speeds are selected by synchro-mesh units, except the Hare/ Tortoise range. These eight speeds can be selected with a single lever.

Reverse gear assembly and A/B range

This consists of an assembly of two sets of gears placed in front of the main box; one driving, fitted on a hollow shaft, the other driven, fitted on the main box countershaft. The two ranges are selected by two synchro-mesh units operated by the reversing gear lever when it is moved to the neutral position. With this layout, the number of speeds can be doubled and 16 forward and reverse speeds can be obtained.
With a compound gear cluster located between the hollow shaft and the countershaft, the direction of rotation of the countershaft can be reversed.

In reverse, speed is :
. 7% faster than in forward in range A
- 7% slower than in forward in range B

Speedshift

In addition to the main box and the reversing assembly, by means of a hydraulic device with an epicyclic train placed before the reversing gear, operated by a solenoid, two input speeds can be added, taking the number of possible speeds to 32.

Creeper gear housing

By means of a housing fitted on the output shaft, after the main box, a range of greatly reduced travel speeds can be obtained. This housing consists of an epicyclic type reduction gear, with a ratio of 4:1, driven mechanically, which should be engaged only if the main box is in the slow (Tortoise) position.

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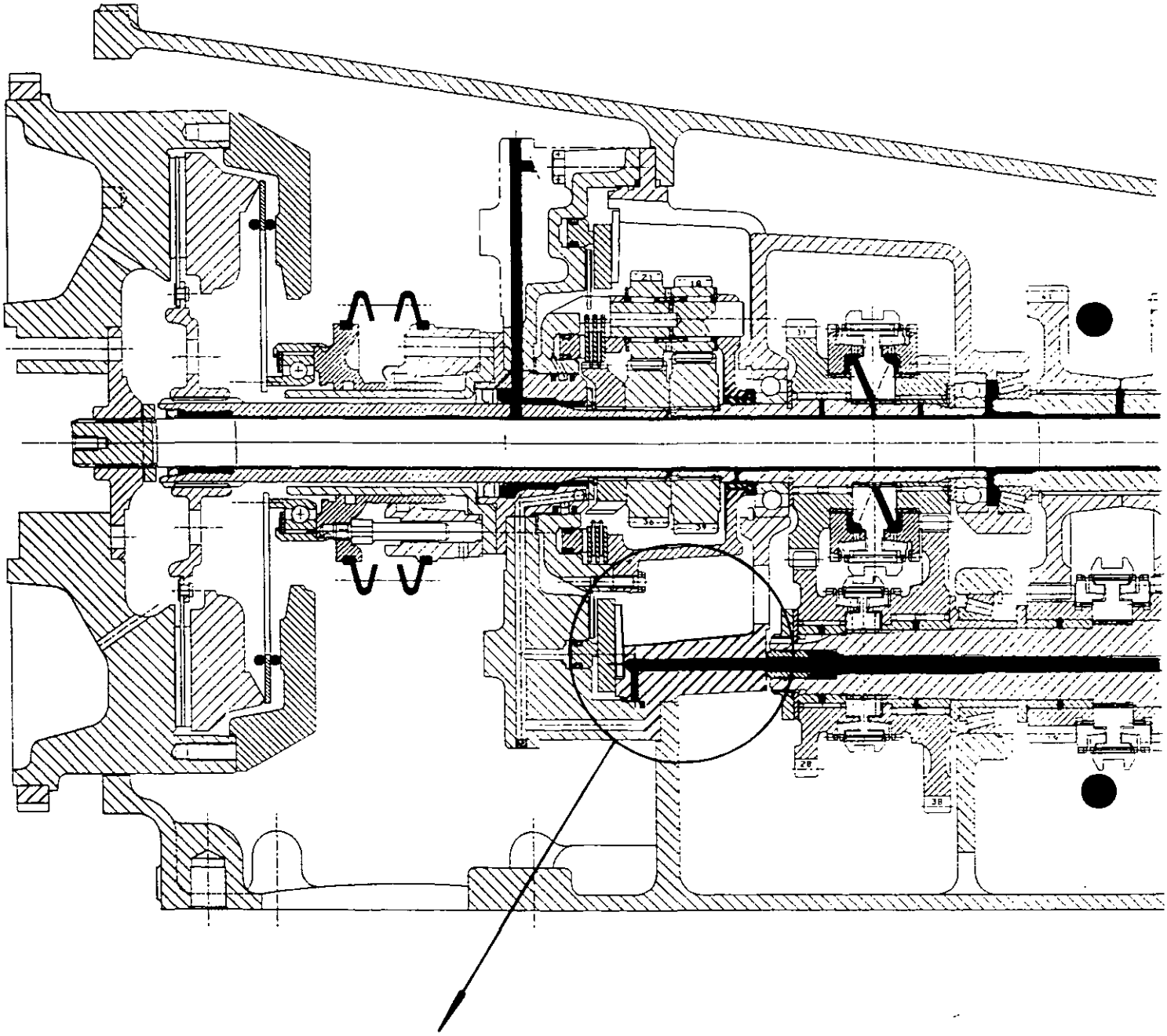
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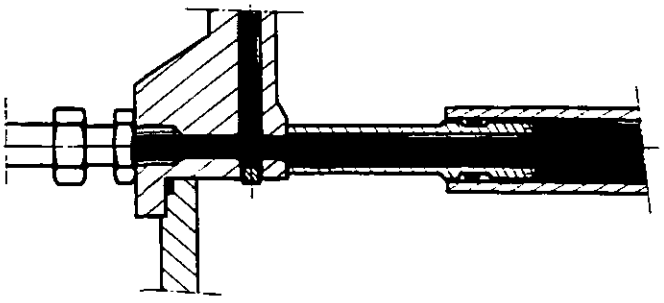
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TRANSMISSION ASSEMBLY WITH 4X4 BOX

(Longitudinal section)





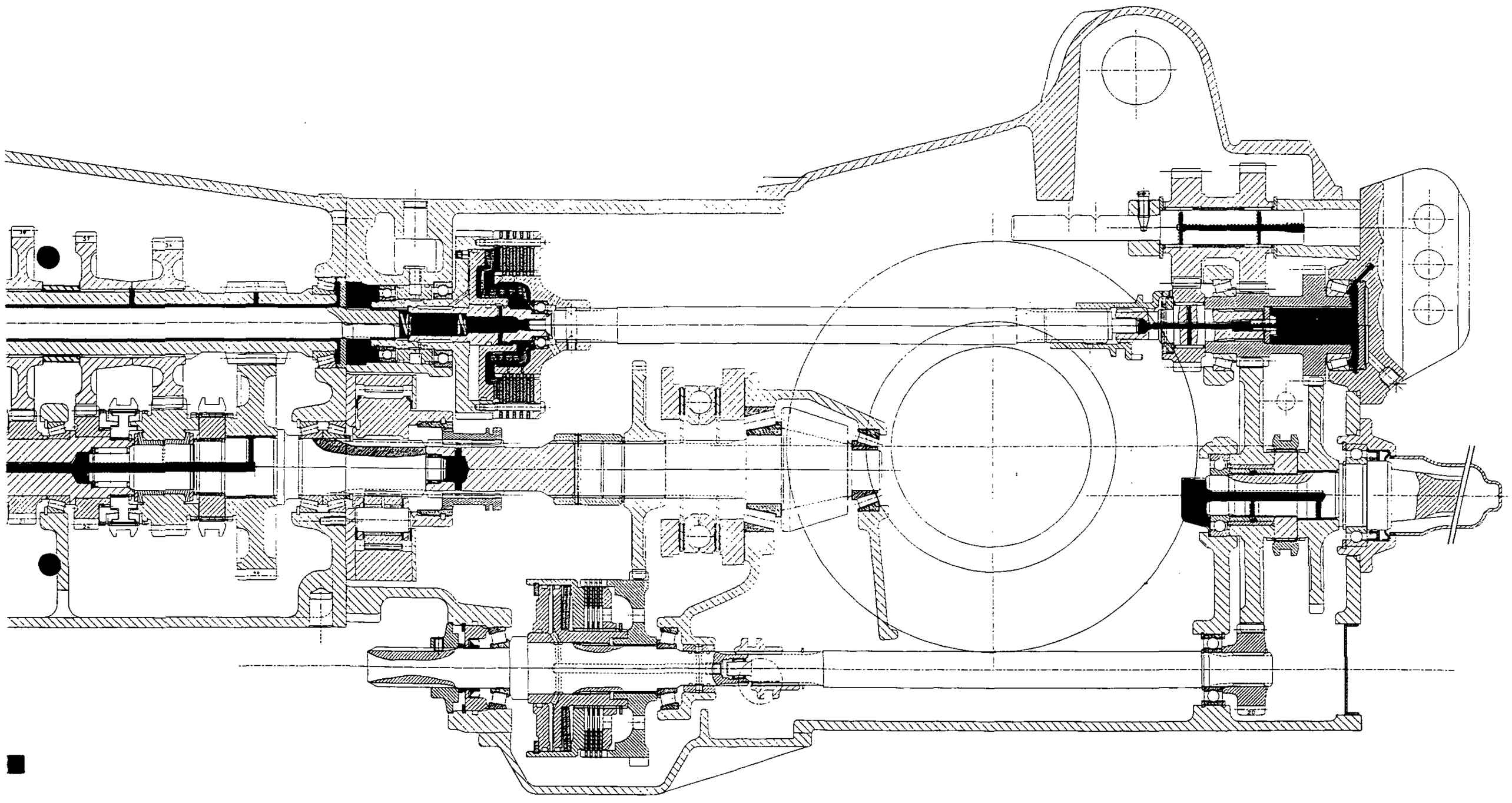
Pressure lubrication

Splash lubrication

4 x 2

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C. Main gearbox

General

In order, the gearbox housing has the following major components:
- the engine clutch operating device.
- the input housing enclosing the speedshift (if fitted) and the reverse gears.
- the main gearbox.
- the creeper gear housing (if fitted).

We will restrict ourselves to describing only the main box, as each major component is covered by an individual description in the section dealing with it.

Construction

The main gearbox has four synchro-mesh speeds. With a gear fitted free running on the output shaft, to which it can be locked by a coupler, the initial four speeds can be doubled to obtain the basic eight speeds. The mainshaft and layshaft are supported by taper roller bearings. The output shaft is fitted in two taper roller bearings and one needle roller bearing. All the gears are helical and in constant mesh.
The lubricating oil comes from the front housing and passes through an oilway drilled along the centre line of the mainshaft and output shaft. Radial oilways direct oil to the various different lubrication points of the gears, bearings and bushes.
The top shafts are lubricated by the film of oil circulating between the PTO shaft and the layshaft. This film lubricates the end taper roller bearings and the needle roller bearing **(62)**. Radial oilways in the shaft **(54)** and radial recesses on the driven gear make oil pass between all the gears. The contact area between teeth of the shaft **(54)** and the gear **(36)** is also lubricated by a radial hole drilled in the shaft. To ensure correct operation according to the forces to which the transmission is subjected, the bearings are fitted with preload (in the case of the mainshaft) or with end float (in the case of the layshaft). The output shaft can be shimmed with either a small amount of play or light preload.

Description

In the 16 speed (4x4) version, the main gearbox drive is taken by gear **(67)** or **(76)**, locked to the mainshaft **(69)** by the action of the synchromesh device **(78)** (see section 5 F01).
In the case of an 8 speed gearbox (4x2), gear **(67)** is fitted on shaft **(69)** by means of splines.
The two hubs of synchro-mesh devices **(11)** and **(23)** are locked to the mainshaft **(69)** by splines. The 1st speed driving gear **(7)** is fitted free-running on a bush **(8)**, the 2nd speed driving gear **(14)** and 3rd speed driving gear or 4th speed driving gear (4x2) **(18)** are fitted free running on the shaft direct. The 4th speed driving gear or 3rd speed driving gear (4x2) **(29)** is fitted on needle roller bearings **(28)** and **(30)**. These act as axial thrust bearings. The hub **(33)** of coupler **(31)** is solid with the output shaft **(44)**.
Driven gears **(55)**, **(56)**, **(59)** and **(60)** drive the layshaft **(54)** by splines. The teeth of shaft **(54)** is in constant mesh with the Tortoise gear **(36)**, fitted free-running on the output shaft.

Operation

Low (Tortoise) range

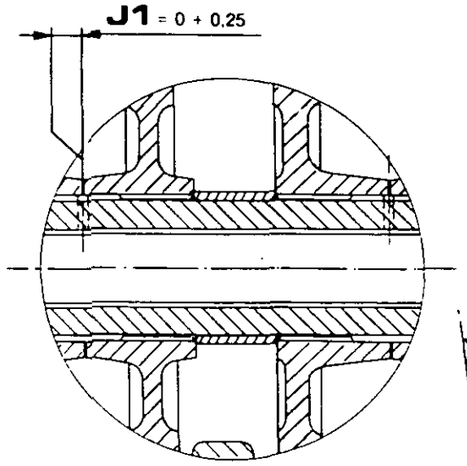
This speed is engaged by moving one of the couplers of the synchro-mesh devices **(11)** and **(23)** to link in rotation the countershaft **(69)** with one of the 4 gears fitted free-running. Which ever gear is selected, the movement is transmitted to the layshaft **(54)**. The output shaft **(44)** is driven by the layshaft machined teeth in constant mesh with the free-running gear **(36)** solid with the output shaft by moving the coupler **(31)** of hub **(33)** back.

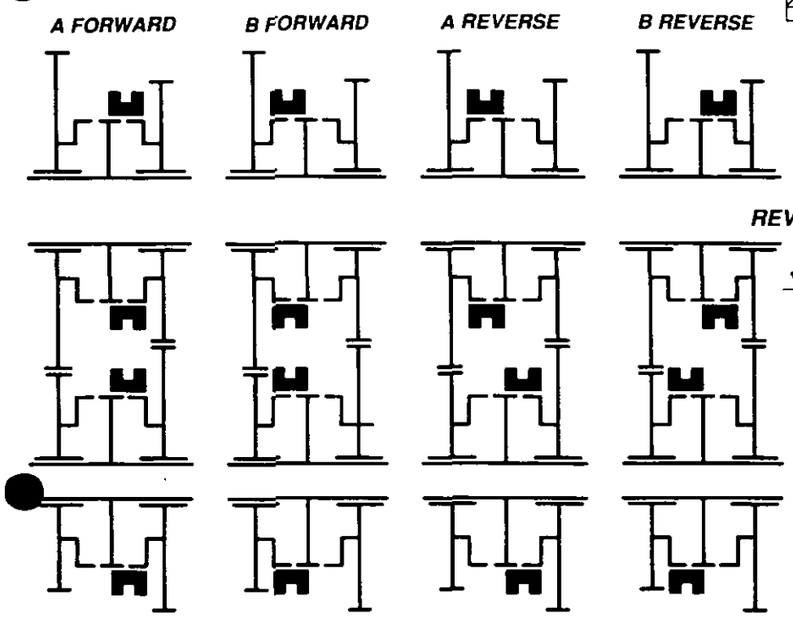
High (Hare) range

This range is selected by moving forward the coupler **(31)** which puts the driving gear **(29)** and the output shaft in direct mesh.
Therefore, in 4th speed (4x4) and in 3rd speed (4x2), the layshaft **(54)** is non-functional. The other speeds are obtained by movement of the couplers of the synchro-mesh devices **(11)** and **(23)** as in the Tortoise range. Movement is transmitted to the output shaft **(44)** by driven gears **(55)** and **(29)**.

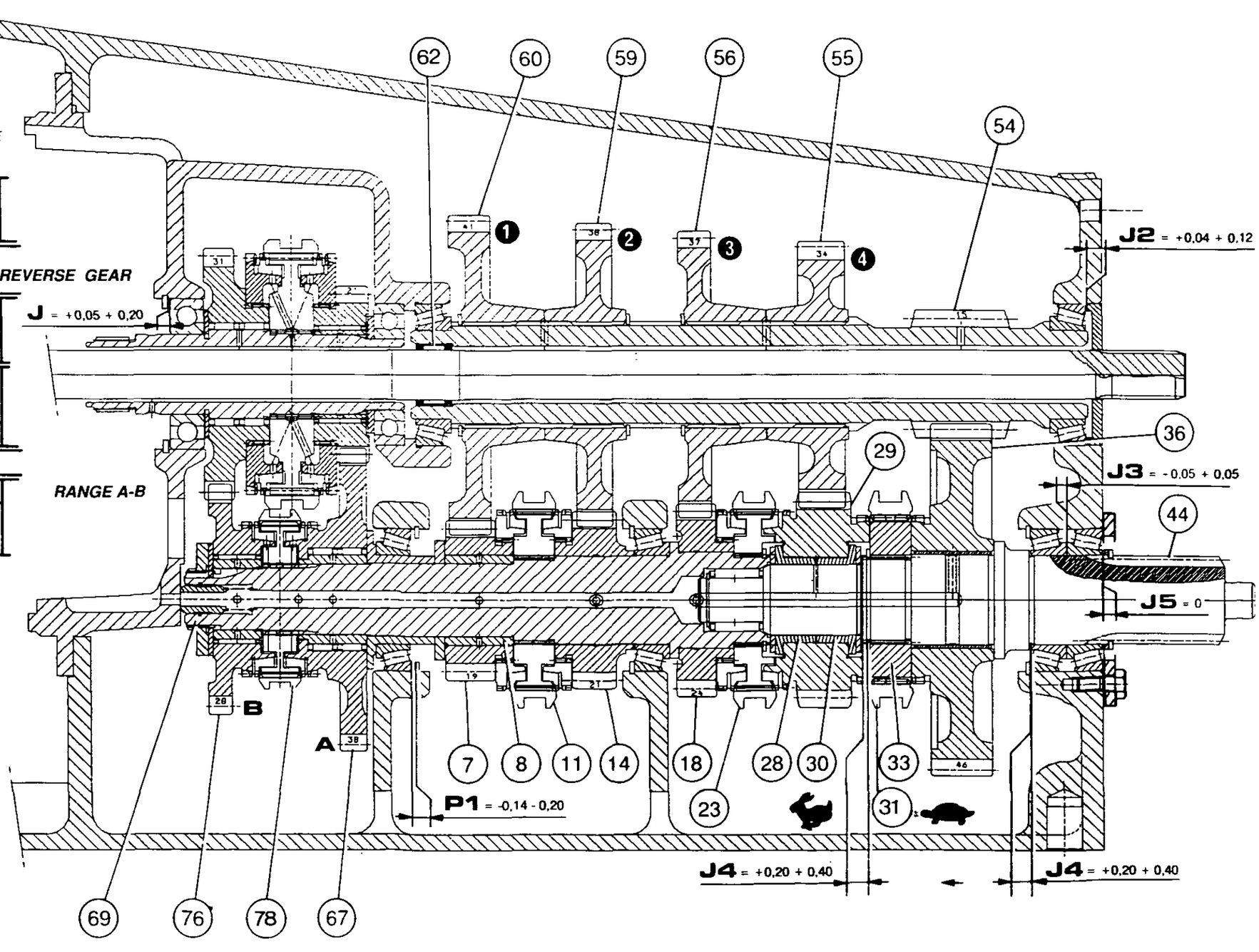
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16-SPEED (4X4) MAIN GEARBOX





Position of the synchro-mesh devices.



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Synchromesh units (Fig. 1)

Locking position

The axial displacement of the coupler **(A)** presses the synchro brake **(B)** against the friction cone of the flange **(C)** via the balls **(D)** and pressure elements **(E)**. The speed difference existing between the parts to be coupled creates a radial rotation limited by the pressure elements **(E)** which, in turn, cause pressure of the chamfered teeth of the synchro brake **(B)** against the coupler **(A)**, opposing any relative displacement of the latter. The pressure exerted by the coupler **(A)** and the angular staggering of the synchro brake **(B)** create axial pressure between the friction cones of the synchro brake **(B)** and the flange **(C)**, via the chamfers of the teeth, this axial pressure establishing synchronisation by the progressive reduction of the speed difference of the parts to be coupled.

Synchronisation having been established, the persisting pressure exerted by the coupler **(A)** against the synchro brake **(B)** causes the latter to go back until the teeth of the coupler **(A)** are in front of the tooth spaces of the synchro brake **(B)**. At this moment, the resistance which has, so far, been opposing displacement of the coupler **(A)** during shifting of the speed is overcome and the coupler **(A)** can then engage noiselessly with the teeth of the flange **(C)** of the gear to be engaged. The rigid connection between the shaft and the gear is established and the speed is shifted.

If, during shifting of the speed, the two elements come up against each other, tooth-to-tooth, the chamfers provided on the tooth flanks move the gear to be enganged until each tooth is in front of a tooth space.

Neutral position

The coupler **(A)** is in the middle position. The balls **(D)** are pushed back into the «V» groove of the coupler **(A)** by the pressure springs **(F)**. The gear can turn freely on the shaft.

Overhaul

In the event of removal of the synchro-mesh units **(11)**, **(23)** and **(78)** or the reversing gear, check the wear of the brakes **(B)**.

Place the flange **(C)** on a flat surface.

Correctly position the brake **(B)** by turning it through several revolutions and applying hand pressure to it. Using a set of gauges, measure dimension X at several places (Fig. 2). If it is less than 0.8 mm, fit a new synchro brake **(B)**, after checking the cone.

If new synchro brakes are being fitted, measure dimension X, which must be within the following limits:

- 1st/2nd speed synchro **(11)** = 0.9 to 1.5 mm
- 3rd/4th speed synchro **(23)** = 0.9 to 1.5 mm
- A/B speed synchro **(78)** = 1.1 to 1.6 mm
- Reversing gear synchro = 1.4 to 2.1 mm

Note: the Hare/Tortoise synchro-mesh unit was replaced by a coupler from serial number V252037. For tractors earlier than this number, refer to workshop manual 1646640 M1.

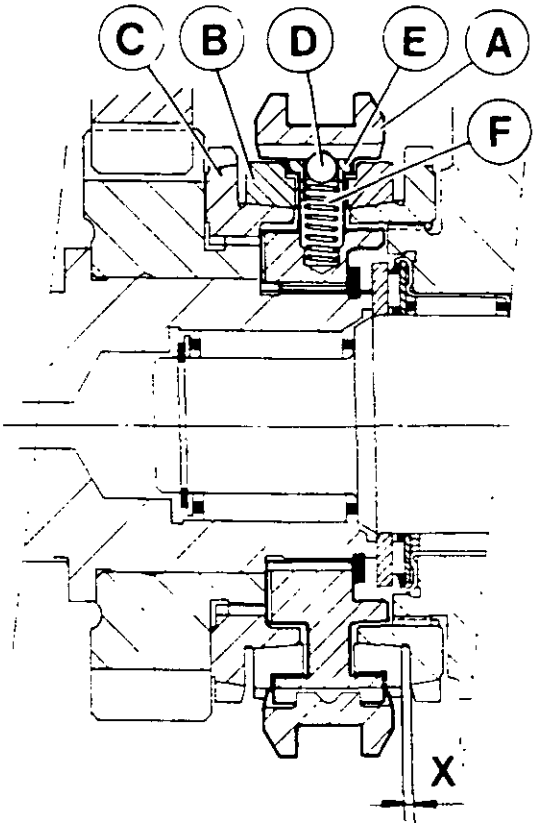


Fig. 1

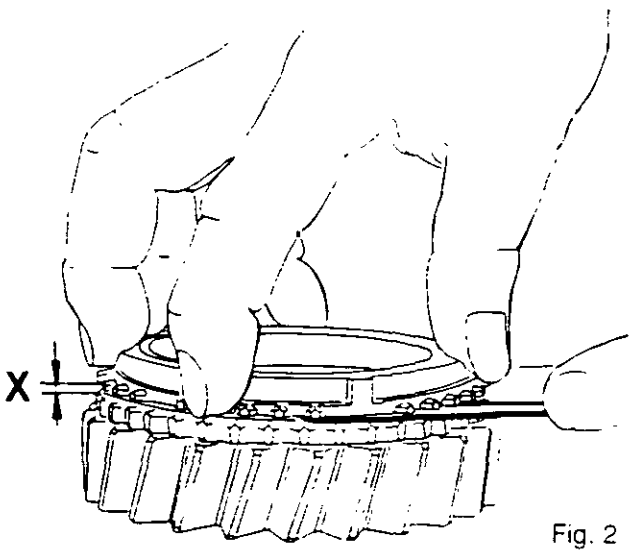


Fig. 2

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5 A02 Disassembly and reassembly

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Gearbox

General

This section concerns the procedures which require the gearbox to be completely disassembled. In these cases, the complete gearbox is removed from the tractor and placed on a work bench. For those procedures which can be carried out with the gearbox fitted to the tractor, see Sections 5 D01 to 5 M01.

A. Gearbox assembly - Removal and preparation

1. Split the tractor between the gearbox and the rear axle (See 3 B02).
2. **3000 Tractor:**
   Place a sling under the gearbox (Fig.1). Split the tractor between the gearbox and the engine (See 3 A01 Procedures 11 and 12). Remove the PTO shaft **(1)**. Fig.1).
   3100 Tractor:
   Place a sling under the gearbox (Fig.1). Separate the gearbox from the engine (See 3 A02 Procedures 3, 4, 13 and 14). Remove the PTO shaft **(1)**, (Fig.1).
3. (Fig.2) Remove:
   - the PTO clutch hydraulic feed pipe **(1)**,
   - the engine clutch slave cylinder supply pipe **(2)**,
   - the T-piece **(3)** and 1.5 bar valve **(4)**,
   - the 90° oil return pipe connection **(5)**,
   - the Datatronic sensor and its bracket **(6)** (if fitted),
   - the LH cab support **(7)**
4. Lay the gearbox on its LH side and lift it on to a suitable stand or work bench (Fig.3).

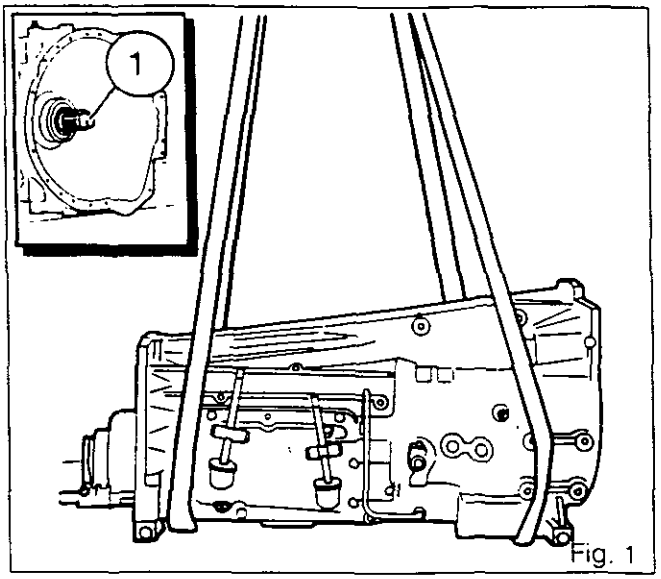


Fig. 1

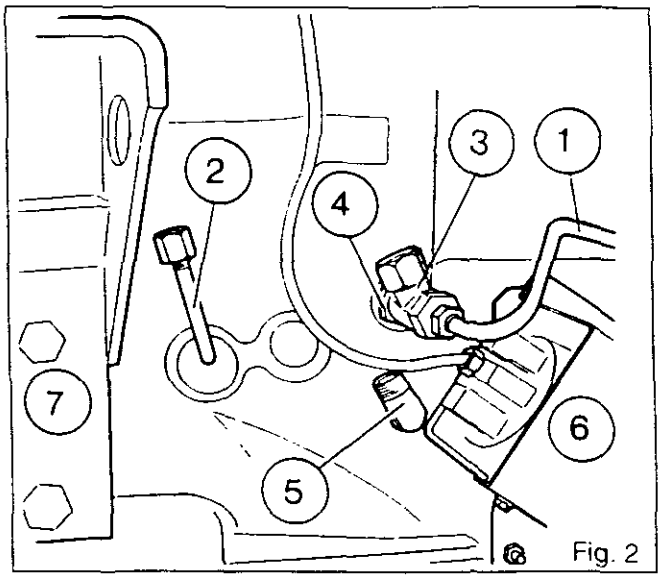
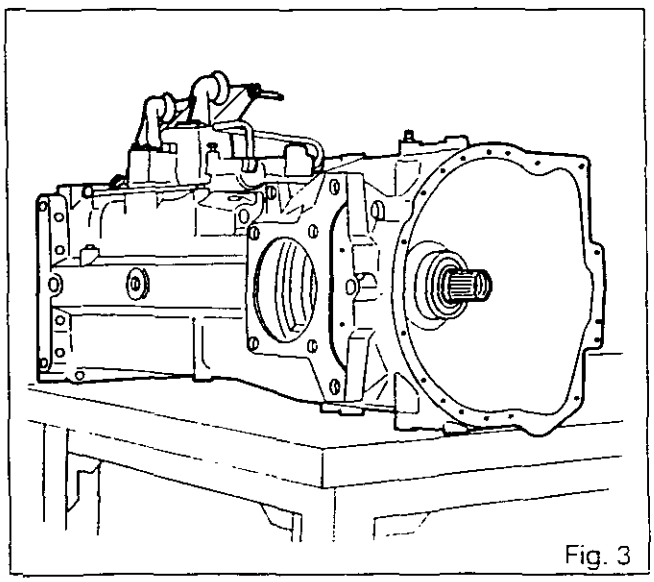


Fig. 2


Fig. 3

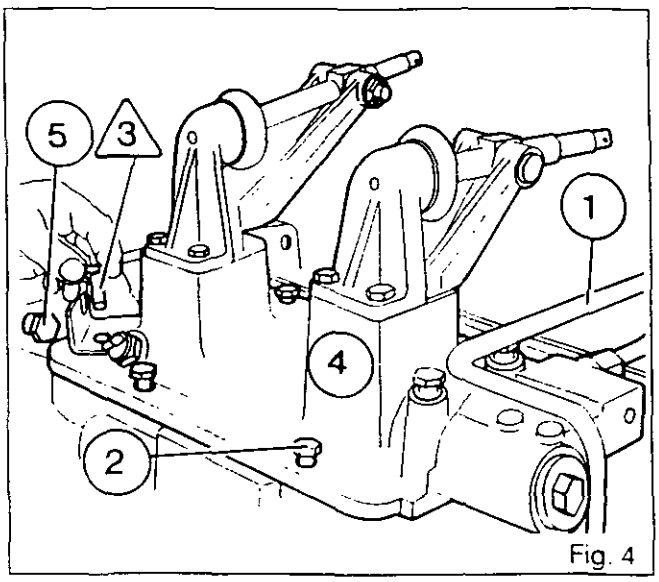


Fig. 4

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B. Selector cover - Removal

Note: Remove the A/B range (4 x 4 gearbox) feed pipe (1) (17 bar) (Fig.4).

5. Remove the bolts **(2)**. (Fig. 4)

Note: On gearboxes fitted with a creeper range, remove the control cable bracket and mark the position of the centring bolt /3\.

6. Remove the cover **(4)** and bolt **(5)**. (Fig. 4)

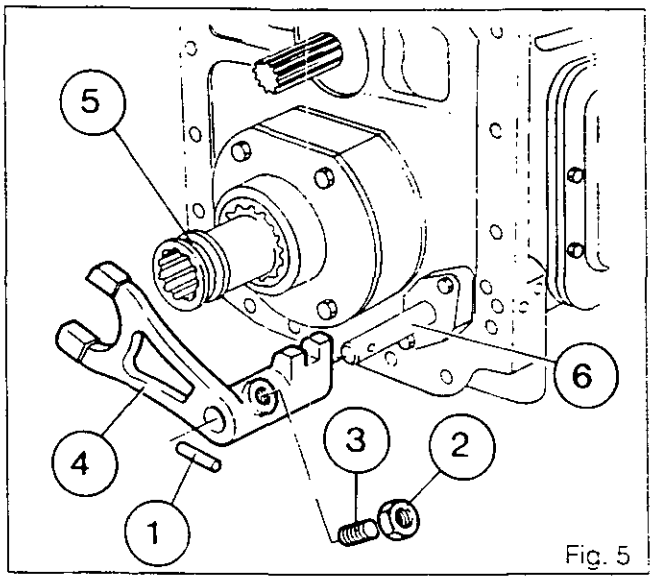


Fig. 5

C. Shifter rail and forks - Removal

Note:

1) Gearbox fitted with creeper range. Remove the pin (1), the locknut (2), the adjustable setscrew (3). the fork (4) with the sleeve (5). (Fig.5)

2) A mechanical locking device for the Hare/tortoise range cut into production from serial number P107048. For tractors prior to this number, see Workshop Manual 1646640 M1

7. Remove the plugs **(1)**, the springs **(2)** and locking plungers **(3)** from forks **(5)** and **(6)** (Fig.6)

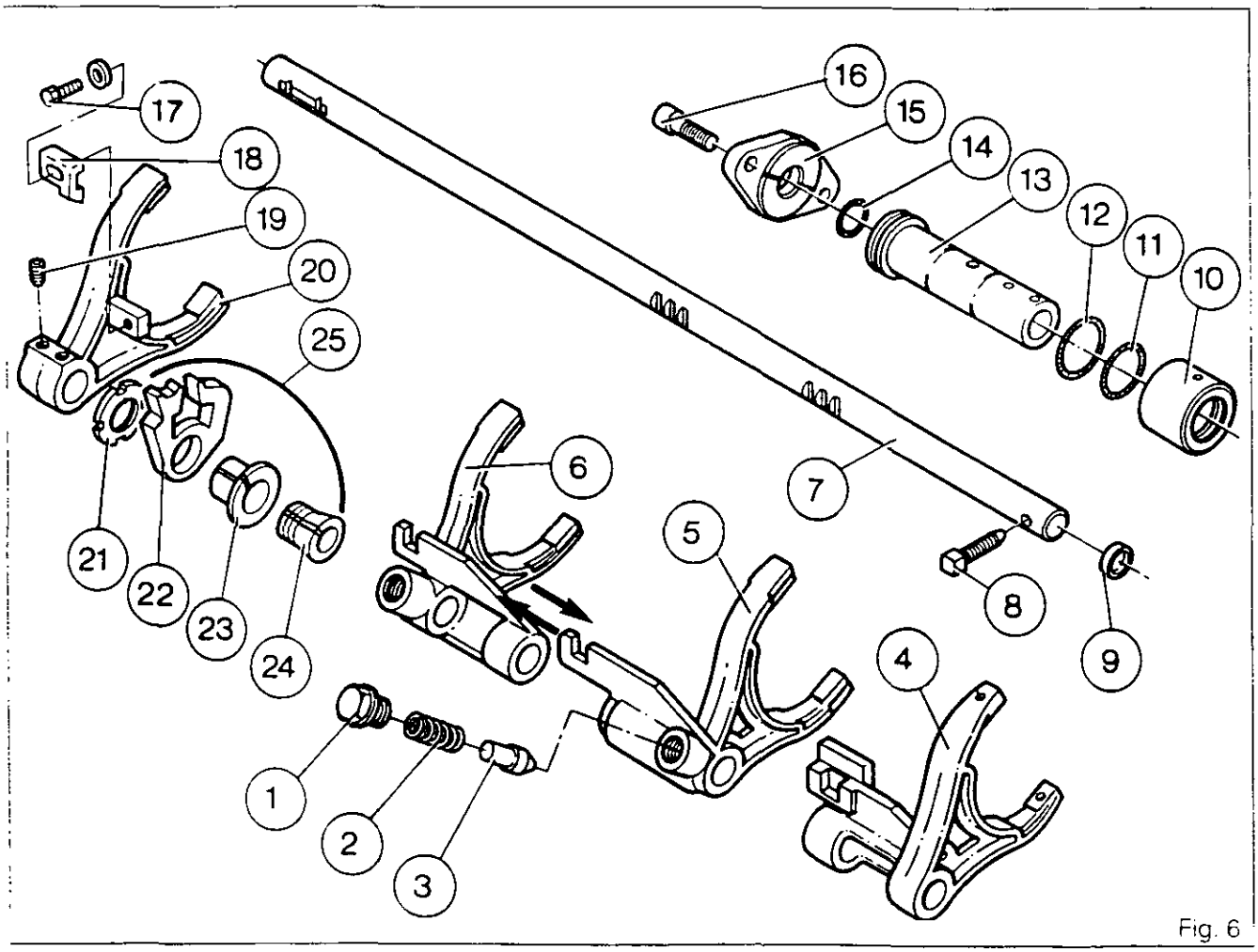


Fig. 6

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5A02.4

Gearbox

8. Slacken the castellated nut **(21)** using spanner 3615334 M01 (Fig.7) .
9. Engage 4th gear (4 x 2 gearbox) or 3rd gear (4 x 4 gearbox).
10. Release the cone **(24)** on the shifter rail **(7)** using a bronze drift (Fig.8).
11. Remove the setscrew **(8)**.
12. Eject the plug **(9)** forwards by tapping the end of the rail **(7)** (Fig. 9).
13. Remove:
    - -the bearing **(15)**
    - -the shifter rail **(7)** rearwards
    - -1st and 2nd gear fork **(5)** and 3rd and 4th gear fork **(6)**
    - -the lock assembly **(25)**
14. Disassemble:
    - -the castellated nut **(21)**
    - -the latch **(22)**
    - -the tapered bearing **(23)**
    - -the cone **(24)**

    Remove:
    - the screws **(19)**
    - the piston **(13)**
    - the High/Low range fork **(20)**
    - the bolt and washer assembly **(17)** and the guide **(18)**
    - the cylinder **(10)**

    Note: Discard the seals (12) and (14) from piston (13) and the seal (11) from the cylinder (10).

    The A/B fork (4) stays in the housing (4 x 4 gearbox).

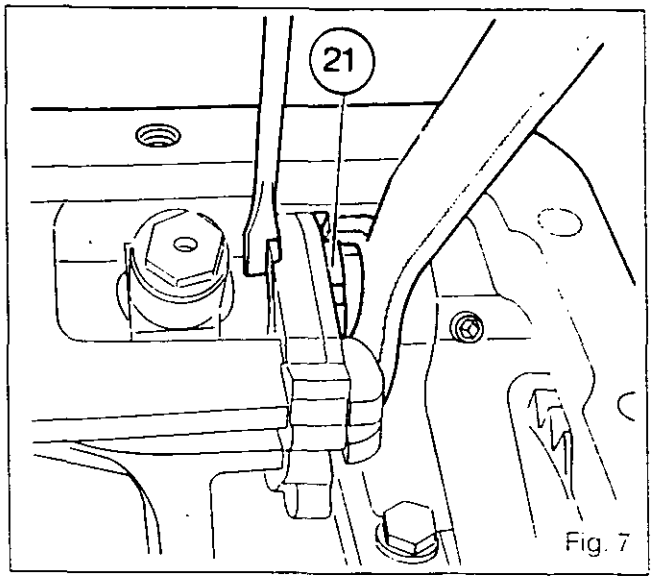


Fig. 7

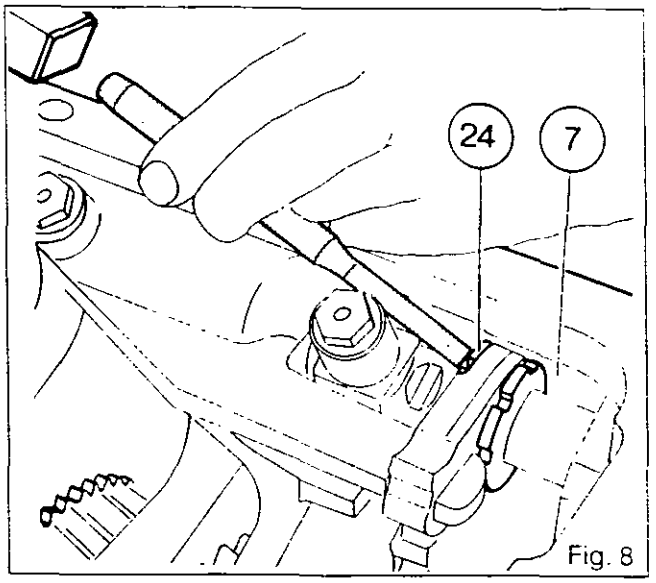


Fig. 8

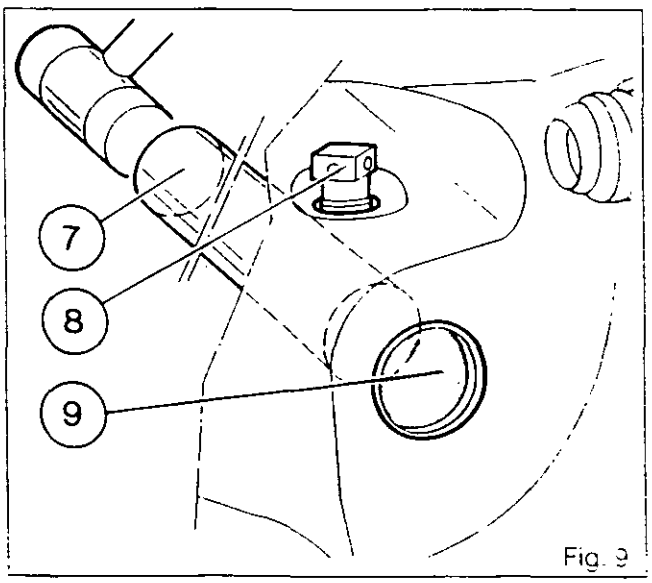


Fig. 9

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D. Input shaft housing - Removal

15. Immobilise the layshaft assembly using the locally made-up tool (See Section U) (Fig. 10).
16. Remove the drain pipe **(1)** from the clutch slave cylinder and the union **(2)** on the housing (Fig. 11).
17. Place a sling under the housing assembly, taking care to avoid damaging the needle roller bearing **(4)** (Fig. 12).
18. Remove the eight 10 mm diam.bolts **(3)** (Fig.11). ***Note: It is not necessary to remove the selector (5) (Fig.13) in order to remove the housing.***
19. Release and withdraw the housing assembly by tilting it to the left (Fig 12). ***Note: (Fig.13 and 14) Retrieve the locating dowel (8). Discard the oil seals (6) and (7).***

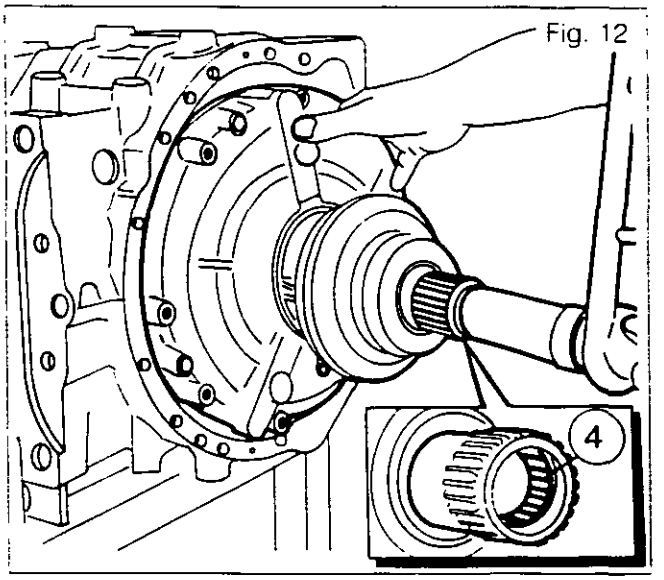
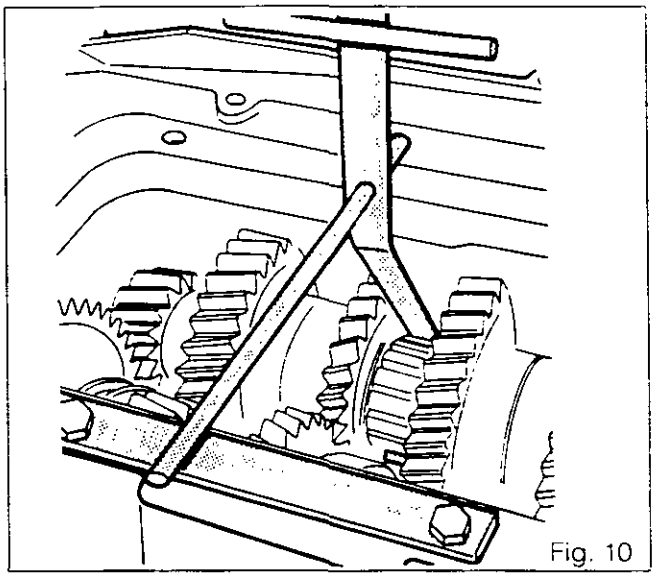


Fig. 12


Fig. 10

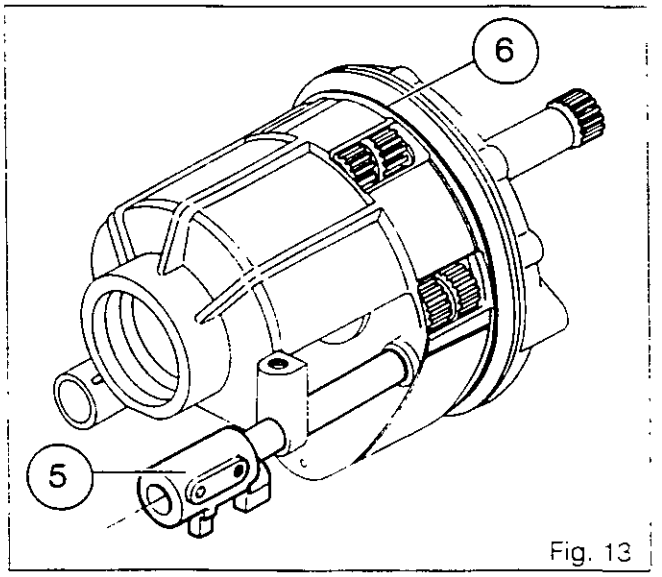


Fig. 13

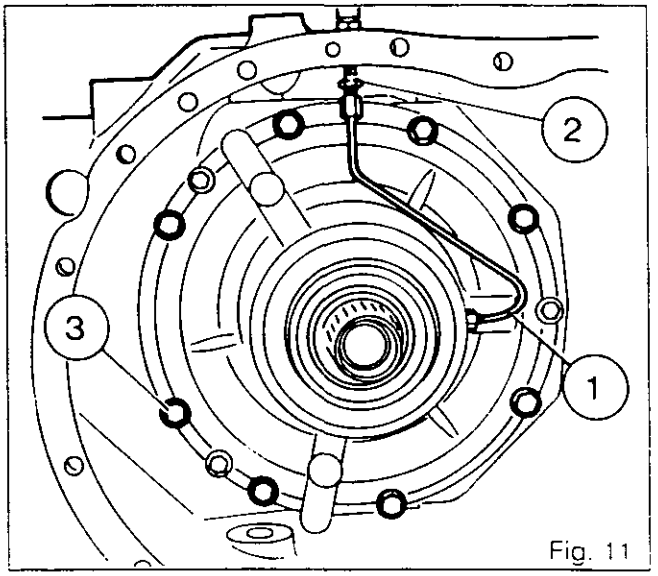


Fig. 11

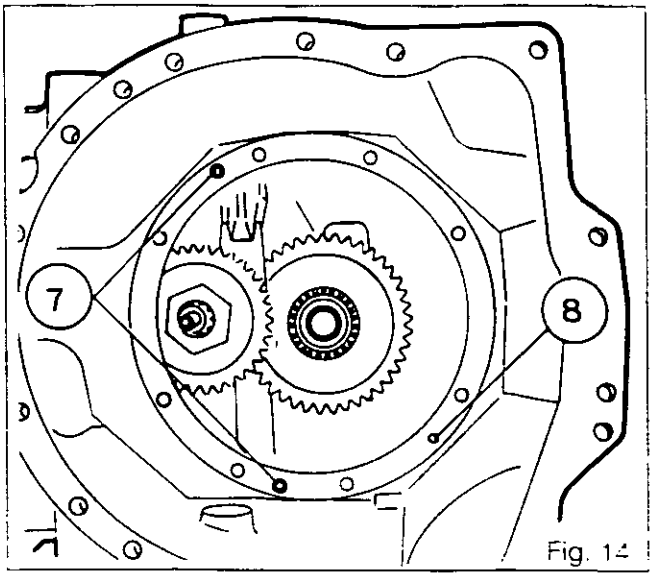


Fig. 14

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E. Layshaft - Disassembly

20. Withdraw the layshaft complete (Fig.15) .
21. Remove the washer **(50)**. See page 32.
22. Remove the shims **[51]**. See page 32.
23. Remove the cup **(52).**
    Disassembly of shaft (54) (Fig.16). A new shaft fitting was introduced from serial number P345012 (version b). Tractors prior to this number are fitted with version a.
24. Withdraw the taper roller bearings **(53)** and **(63)**.
    Note: Keep the bearings and cups in matched pairs for possible re-use.
25. Remove the circlip **(61)**.
26. **a)** Remove 1st gear **(60)** and 2nd gear **(59)**.
    b) Remove 1st gear **(60)**, the shims **[58]** and 2nd gear **(59)**.
27. **a)** Remove circlips **(58)** and **(57)** (Fig.16).
    b) Remove spacer **(57)**
28. Remove 4th gear **(56)** (4 x 2 gearbox) and 3rd gear **(55)** (4 x 2 gearbox)
29. Remove 3rd gear **(56)** (4 x 4 gearbox) and 4th gear **(55)** (4 x 4 gearbox).
30. Drift out the needle roller bearing **(62)** (Fig.17) and discard it.

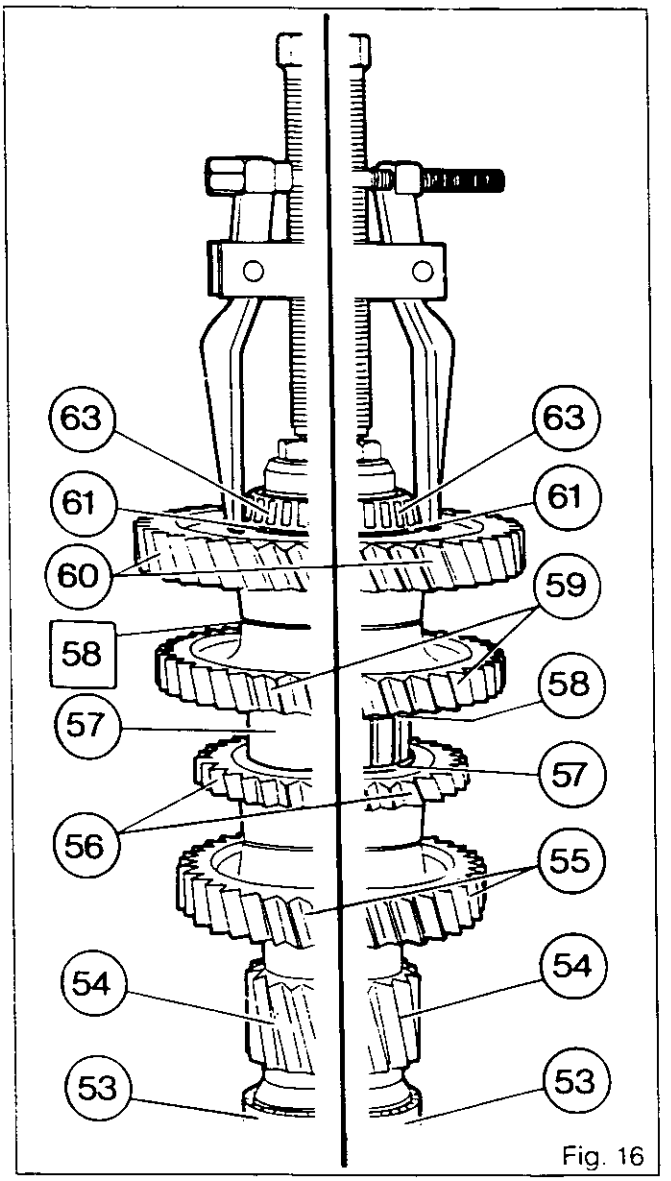
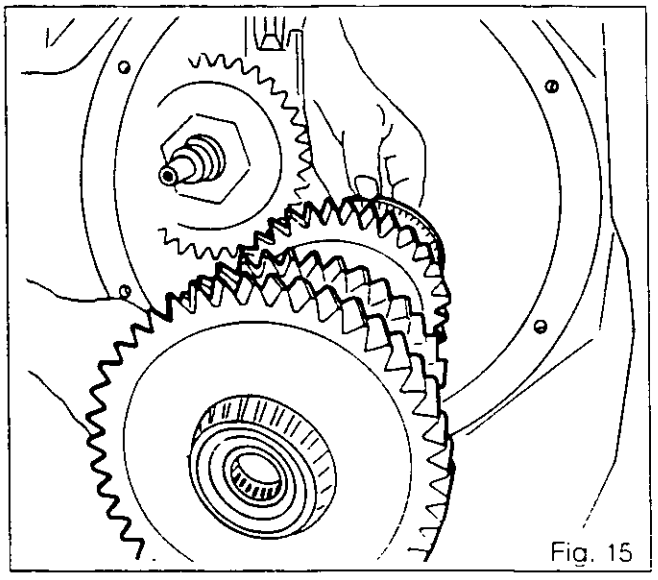


Fig. 16


Fig. 15

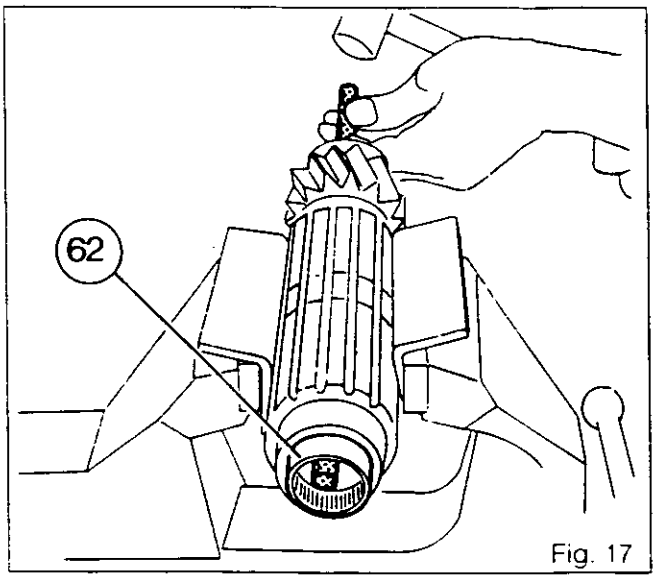


Fig. 17

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F. Creeper gearbox - Removal (Fig.18)

31. Remove the bolts **(1)**.
32. Remove the creeper gearbox assembly **(2)**.
Note: The locating dowels (3) are held in the gearbox.

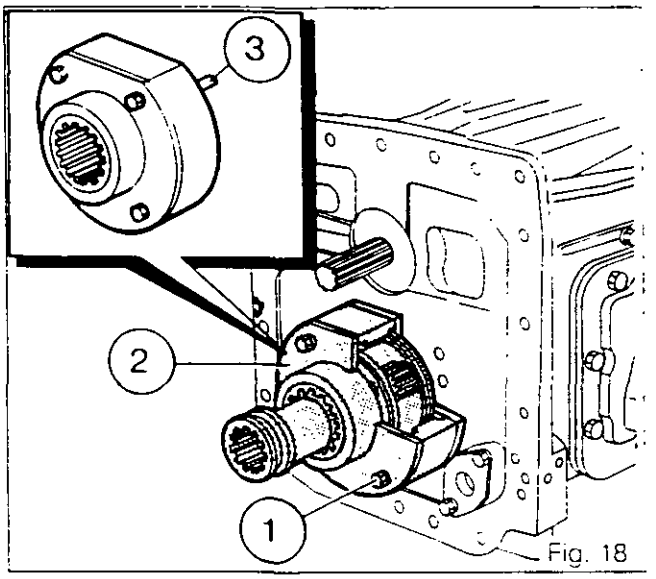


Fig. 18

G. Output shaft - Disassembly

Note: If the tractor is fitted with a creeper gearbox, see above.

33. Remove the 3 bolts **(41)** (see page 32).
34. Remove the lock plate **(46)**.
35. Remove the bearing cup **(48)**.
Note: Keep the bearings and cups in pairs for possible re-use.
36. Remove the circlip **(45)**.
37. Remove the spacer /**43**\ and shims **[42]**.
38. Remove the taper roller bearing **(40)**.
Note: Where shims have had to be inserted between bearings, remove the shim adjuster(s) [47]
39. Remove the roller bearing **(39)**.
40. Remove the shims **[38]**.
Note: On all types, the High/Low range synchromesh has been replaced by a coupler from serial number V252037. For tractors prior to this number see Workshop Manual 1646640 M1.
41. Engage the High/Low range coupler **(31)** (Fig.19) on the Low range pinion **(36)**
42. Withdraw the shaft **(44)** rearwards.
43. Remove the circlip **(34)** using tool MF 460 and discard it (Fig.19 and 20).
44. Remove the shaft.
45. Through the inspection panel in the selector rail mechanism cover, withdraw: the hub **(33)** and its coupler, the gear **(29)** (3rd gear 4 x 2 gearbox and 4th gear 4 x 4 gearbox), the synchromesh cup **(25)**, the two thrust washers **(32)**-**(27)** and the Low range gear **(36)**.
Note: Keep the synchro cup (25) with the pinion (29) for possible re-use.
46. Remove the cup **(37)**.
47. Remove the circlip **(49)**.
48. Remove the circlip **(19)**, the washer **(22)** and the needle roller bearing **(24)**

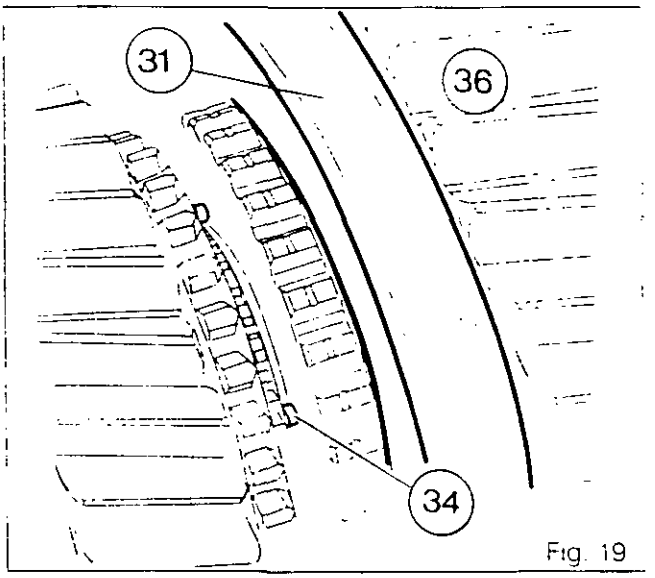


Fig. 19

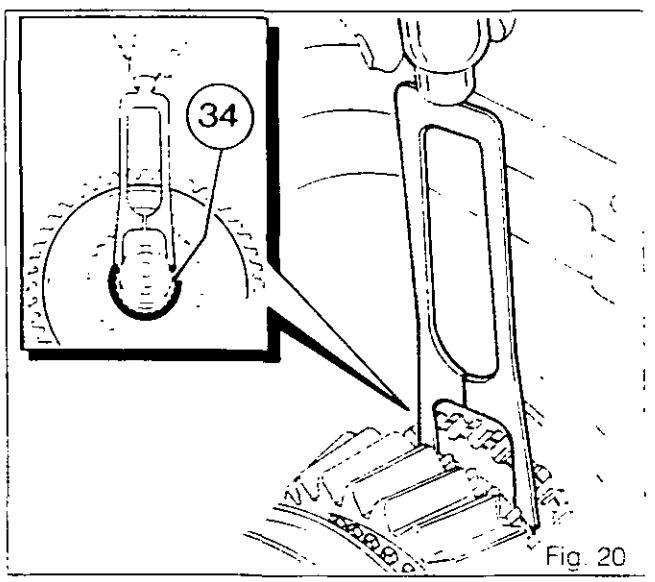


Fig. 20

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H. Mainshaft - 4 x 2 gearbox - Disassembly

49 Remove the circlip **(26)**.

50 Remove 3rd and 4th gear synchromesh **(23)**. Mark the direction of fitting.

51 Remove the synchromesh cup **(21)**

52 Remove the synchromesh cone **(20)** and the gear **(18)**.
Note: Retain the synchromesh cup and cone as a pair for possible re-use.

53. Position MF 458 locking tool (Fig.21) and the locally manufactured retainer sleeve for the mainshaft **(69)** (Fig.22) (See Section U).

54 Remove the oil feed pipe **(71)** and spring **(72)**.

55. Unlock the nut **(68)** and slacken it using tool 3376805 M1 (Fig.23).

56 Remove the input shaft gear **(67)** and cone **(1)**.

57 Remove the washer **(6)**.

58 Remove tool MF 458 and the sleeve (Fig.21 and 22)

59 Withdraw the shaft from the housing rearwards retaining 1st and 2nd gear train in place.

60 From inside the housing remove, in the following order, 2nd gear **(14)**, cone **(13)**, 2nd gear synchromesh cup **(12)**, 1st and 2nd synchromesh **(11)**, cone **(9)**, synchromesh cup **(10)**, 1st gear **(7)** and its bush **(8)**.

61 Withdraw the bearing cups **(16)** and **(2)**.
Note: Retain the cups and cones as a pair for possible re-use.

62 Remove the shims **[3]**, the shim **/4** and circlips **(15)** and **(5)**.
Note: Make a note of the thickness of the shims for use on the mainshaft during reassembly.

63. Remove the bearing cone **(17)** and circlip **(70)** from the shaft.

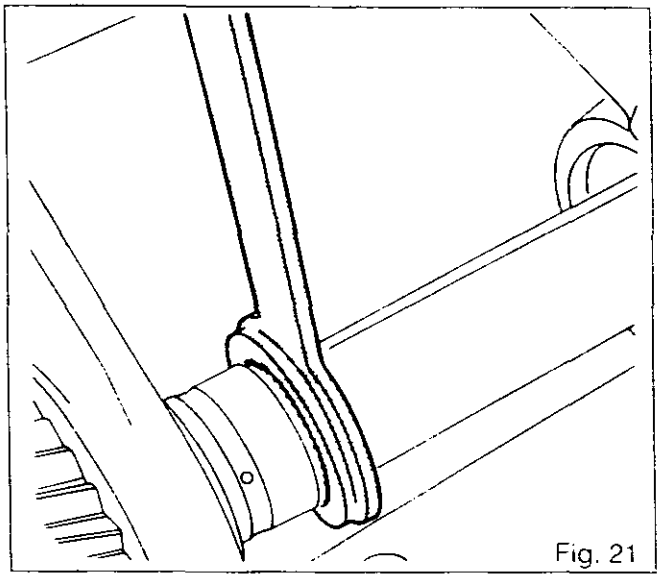


Fig. 21

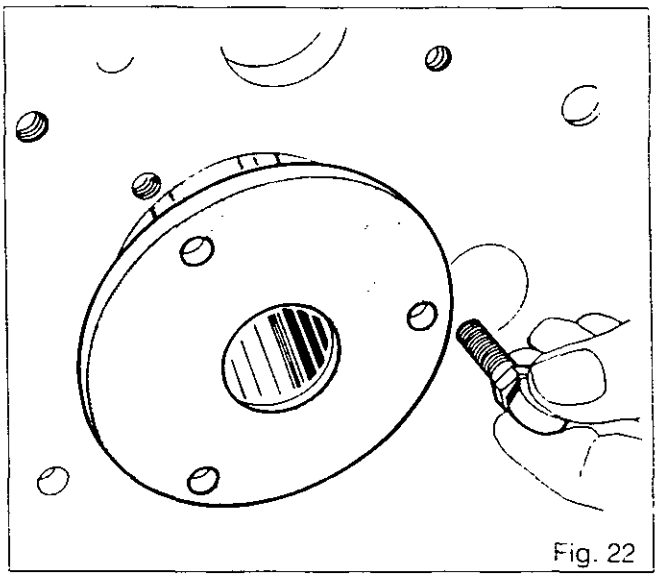


Fig. 22

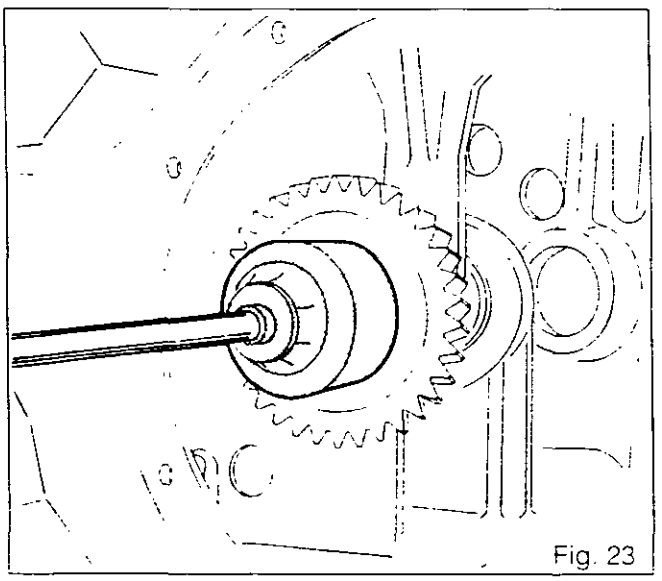


Fig. 23

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J. Mainshaft - 4 x 4 gearbox - Disassembly

64. Carry out procedures 49 to 54 in Section H.
65. Remove the lock from the nut **(68)** and slacken the nut using spanner MF 456(Fig.24)
    Note: A new A/B range synchromesh assembly fitted with sintered cone rings was introduced from the following tractor serial numbers:
    - 40 kph tractors: P089036
    - 30 kph tractors: P297030
66. Remove the spur washer /**73**\. B gear **(76)** with the needle roller bearing **(75)** and bush **(74)**
67. Slacken the two screws **(1)** attaching the pads **(2)** to the A/B fork **(3)** (Fig.25).
    Remove the A/B synchromesh **(78)** and the cups **(77)** and **(80)**.
    Note: Take care not to remove the synchromesh hub sliding block.
68. Move the A gear **(67)** slightly forwards to disengage the fork
69. Remove the fork.
70. Withdraw the A gear **(67)** with the double needle roller bearing **(79)** and the bush /**81**\.
71. Remove the sleeve **(82)** and the bearing cone **(1)**.
72. Carry out procedures 57 to 59.
73. Remove the 1st and 2nd gear train complete (Fig.26).
74. Carry out procedures 61 to 63

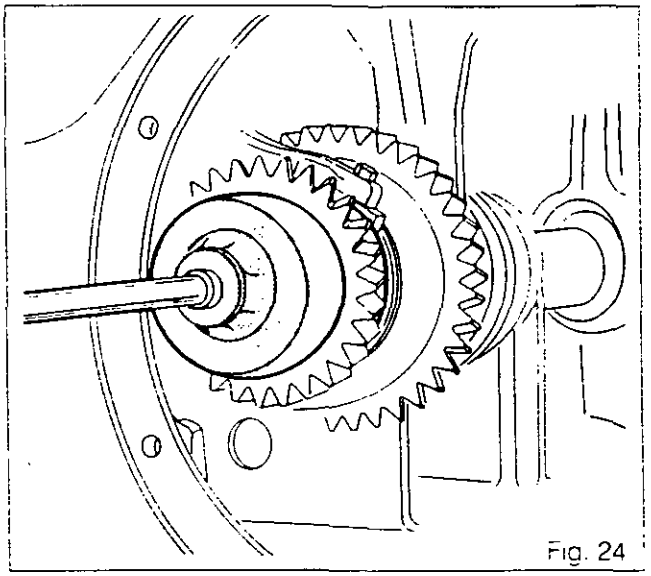


Fig. 24

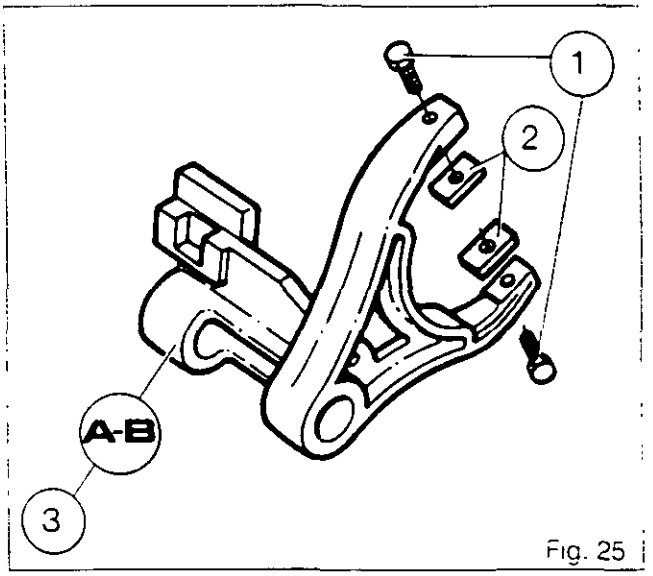


Fig. 25

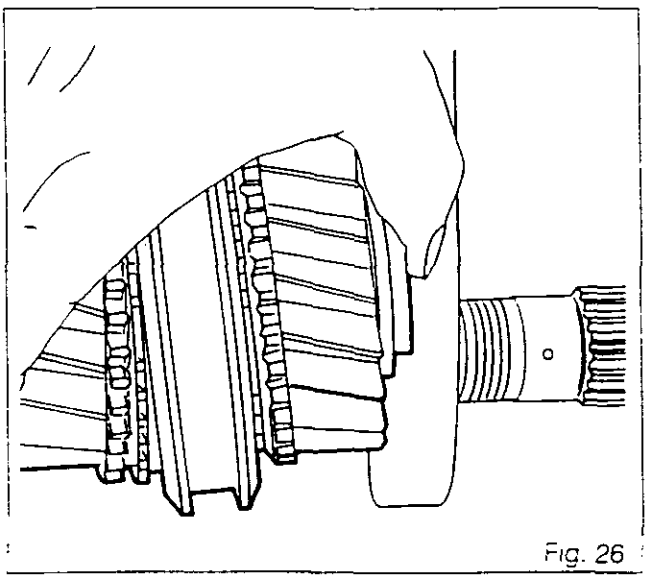


Fig. 26

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K. Mainshaft - 4 x 4 gearbox - Reassembly

75. The gearbox housing must be clean and free from swarf.
76. Mating faces must be scraped clean.
77. Use a jet of compressed air to check that all the hydraulic oilways in the gearbox and shafts are free of obstructions.
78. If the gearbox is fitted with Speedshift, fit the solenoid valve **(1)** and tighten to a torque of 18-20 Nm (Fig.27).
79. *Fit the T-piece* **(2)** *for the A/B feed pipe (Fig.27).*
80. Examine all parts for wear and discard any which are faulty.
81. Before assembling lightly lubricate the cones, cups, bearing bores, bushes, gaskets and needle roller bearings.
82. Using a press, fit the bearing cone **(17)** on to the shaft **(69)**.
83. Fit the circlip **(70)**.
84. Fit the circlips **(5)** and **(15)**.
85. Refit the shim **/4**.
Note: (Fig.28) Position the shim /4\ on the circlip (5) side.
86. Reduce the thickness of the shims **[3]** whose measurement was noted on disassembly (Section H Operation 62) by approximately 0.3 mm to obtain a shaft end play of 0.10 to 0.15 maximum to obtain an exact fit.
87. Fit the shims **[3]** and cups **(2)** and **(16)**.
88. Assemble 1st gear **(7)** and its bush **(8)**, the lock plate **(9)**, the 1st gear synchromesh cup **(10)**, the 1st and 2nd gear synchromesh **(11)**, the 2nd gear synchromesh cup **(12)**, the cone **(13)** and the 2nd gear **(14)**.
89. Refit the 1st and 2nd gear train assembly between the two partitions.
90. Insert the shaft through the rear of the housing retaining the synchromesh/gear assembly (Fig.29).
Note: Check that the bush (8) is correctly positioned in the gear (7).

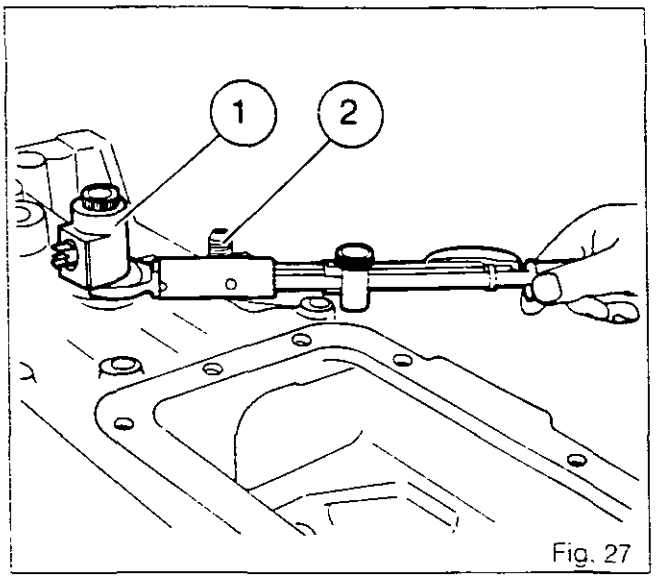


Fig. 27

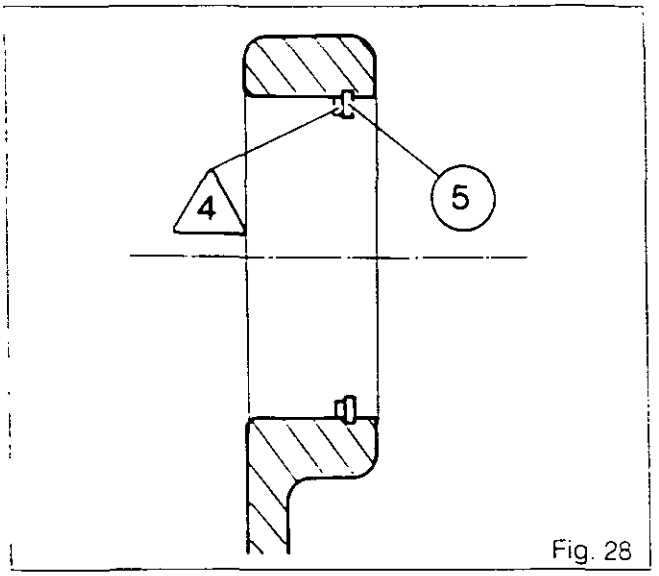
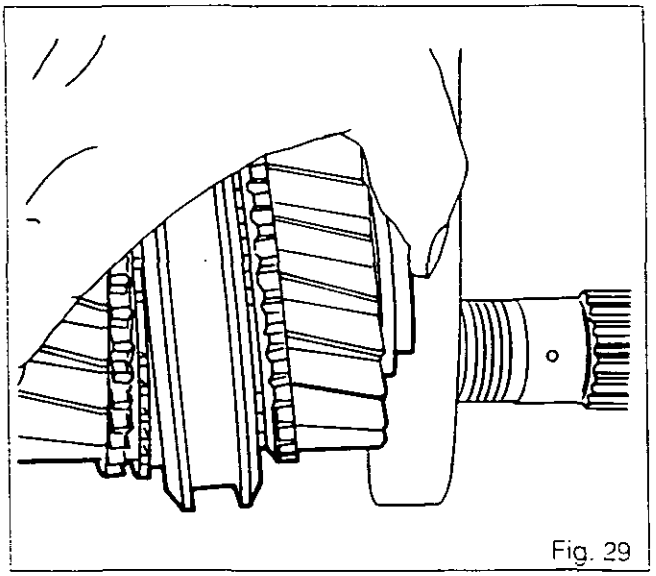


Fig. 28


Fig. 29

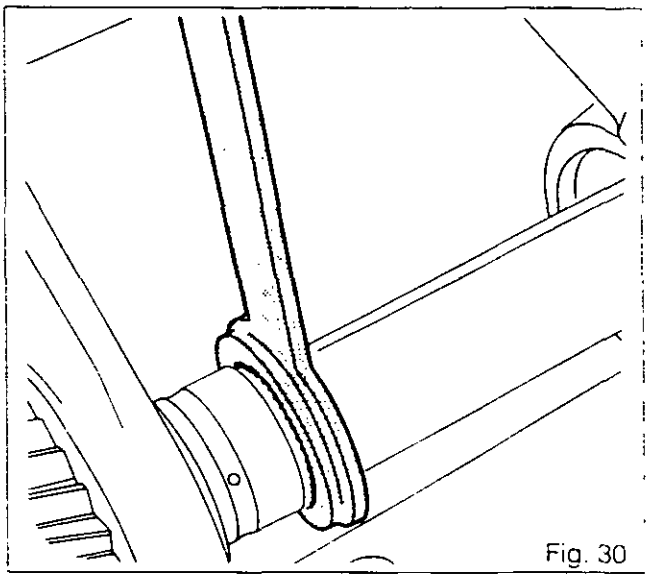
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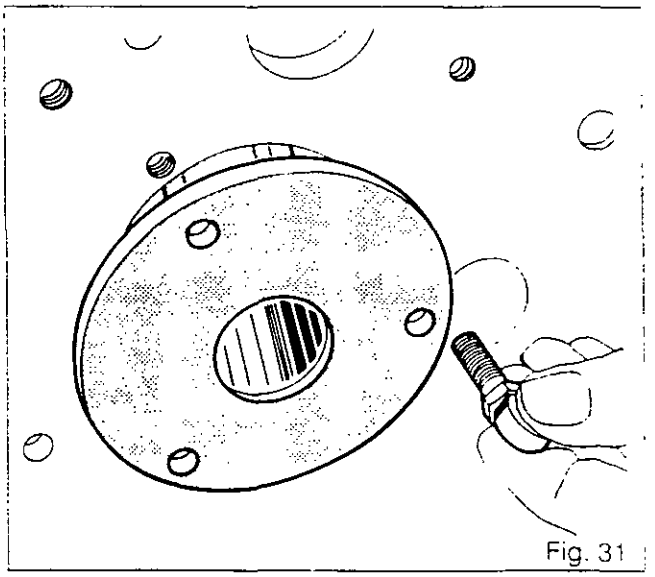
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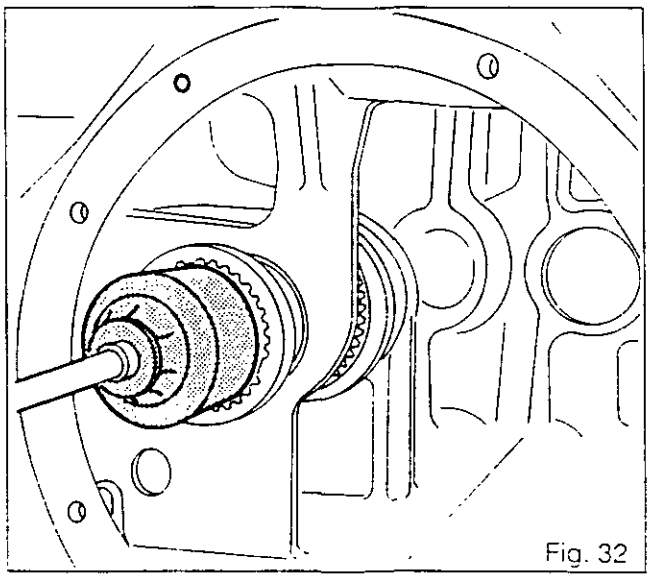
91. Fit the locking tool MF 458 and the locally made retaining sleeve (Fig.30 and 31).
92. Fit the washer **(6)**
93. Using a press, fit the bearing cone **(1)** on the sleeve **(82)**.
94. Fit the sleeve on the shaft.
Note: To shim using formula P1, do not fit the A/B gear train (Fig.32).
95. Fit the bush /**81**\, the A/B synchromesh **(78)**, the bush **(74)** and the spur wasner /**73**\ on the shaft.
96. Fit nut **(68)** and tighten to a torque of 80-100 Nm using tool MF 456 (Fig.32).

Method of shimming

97. Carry out Procedures 98 to 108 to obtain a pre-load (Fig.33) of **P1= minus 0.14mm to minus 0.20mm** (0.0055in to 0.008in)
98. Remove tool MF 458 and the sleeve (Fig.30 and 31).


Fig. 30


Fig. 31


Fig. 32

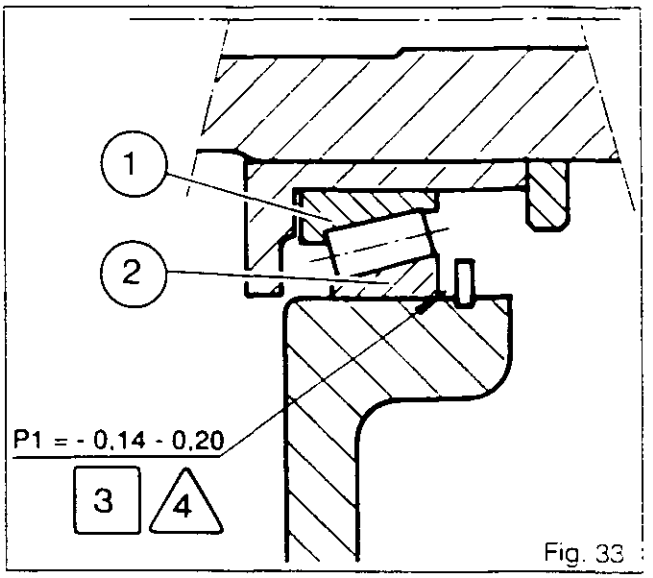


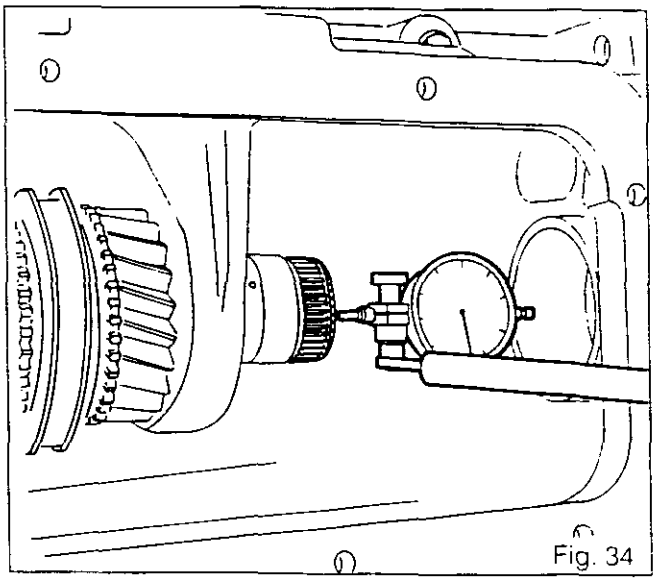
Fig. 33

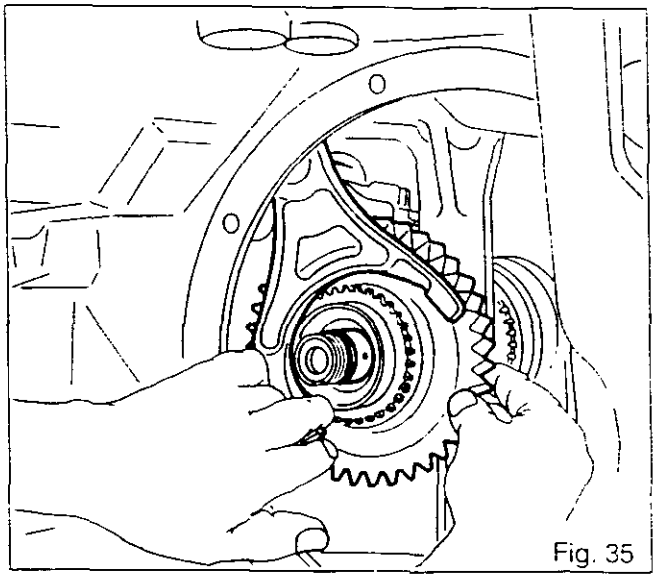
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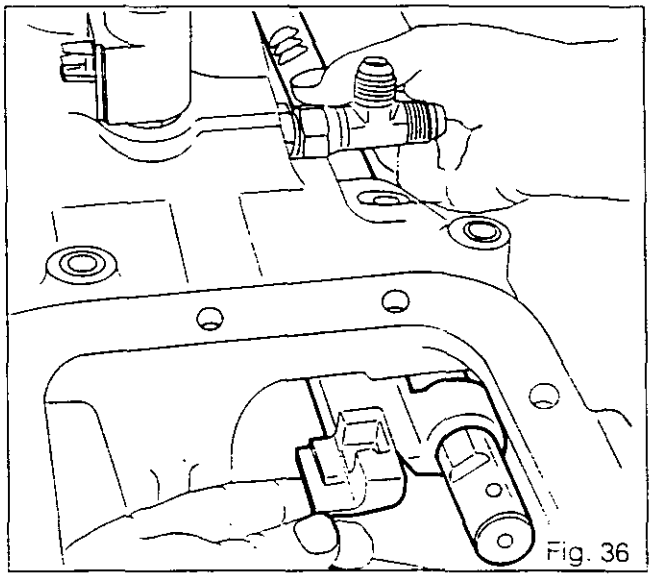
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Gearbox

99. Position a dial gauge pointer at the end of the shaft (Fig.34) .
100. From the front of the housing,while pulling on the shaft, turn it first to the right then to the left so that the cones bed properly into the cups.
101. Zero the dial gauge.
102. Repeat operation 100 by pushing on the shaft.
103. On the basis of the dial gauge reading; select the shim thickness required to obtain P1.
104. Fit tool MF 458 and the locally made-up sleeve (Fig.30 and 31).
105. Reverse procedures 95 and 96.
106. Remove the sleeve **(82)** and its cone **(1)**.
107. Withdraw the cup **(2)**.
108. Position the adjusting shims **[3]** which were selected in operation 103.
Note: Position the shim /4\ on the circlip (5) side (Fig.28) .
109. Fit the cup.
110. Fit the sleeve.
111. Slide the A gear **(67)** on to the shaft with the bush **/81** (stepped side facing the synchromesh) and the double needle roller bearing **(79)** inserting the A/B fork into the housing (Fig.35).
Note: Use the shifter rail to retain the fork (Fig.36).
112. Locate the synchromesh cup **(80)** and A/B synchromesh **(78)**.
113. Position the pads **(1)** and **(2)** for the fork **(3)**. coat the screws **(4)** and **(5)** with Loctite 241 and tighten them by hand (Fig.37 and 38).
Note: Check that the pads move freely in the synchromesh sliding coupling.


Fig. 34


Fig. 35


Fig. 36

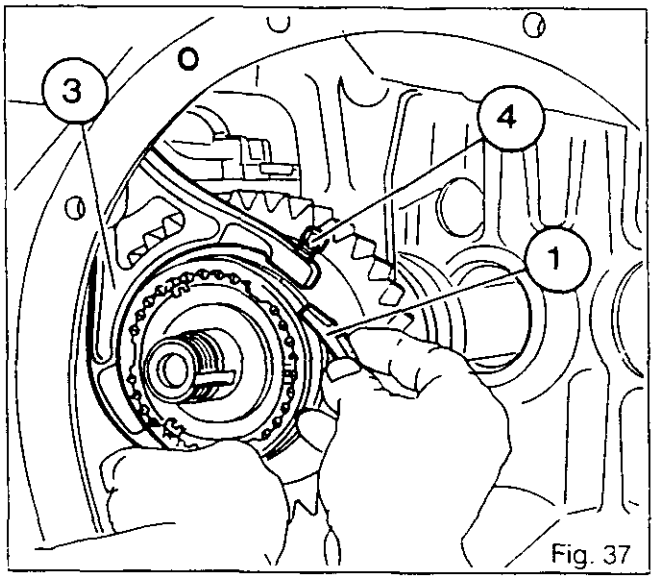


Fig. 37

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114. Slide the B gear **(76)** on to the shaft with the cup **(77)**, the bush **(74)** and the needle roller bearing **(75)**.
Note: Rotate gear A (67) and B (76) from right to left to ensure that the synchromesh cups are correctly positioned (80) (77).
115. Fit the spur wasner **/73**.
Note: The oil grooves should face the B gear.
116. Using a solvent degrease the shaft thread.
117. Lightly coat the nut **(68)** with Loctite 241 then tighten to a torque of 80-100 Nm.
118. Lock the nut by flattening the collar with a suitable drift punch (Fig.39).
119. Insert the spring **(72)** and the oil feed pipe **(71)** into the shaft.
120. Remove tool MF 458 and the retaining sleeve (Fig. 30 and 31).
121. Fit the gear **(18)** and the synchromesh lock plate **(20)**, the brake **(21)** and 3rd and 4th gear synchromesh **(23)**.
122. Fit the circlip **(26)**.
Note: Check that the synchromesh faces the correct way.
123. Manually check:
a) gear end play
b) shaft and gear train rotation
124. Check that 1st and 2nd gear and A/B gear synchromesh function correctly.

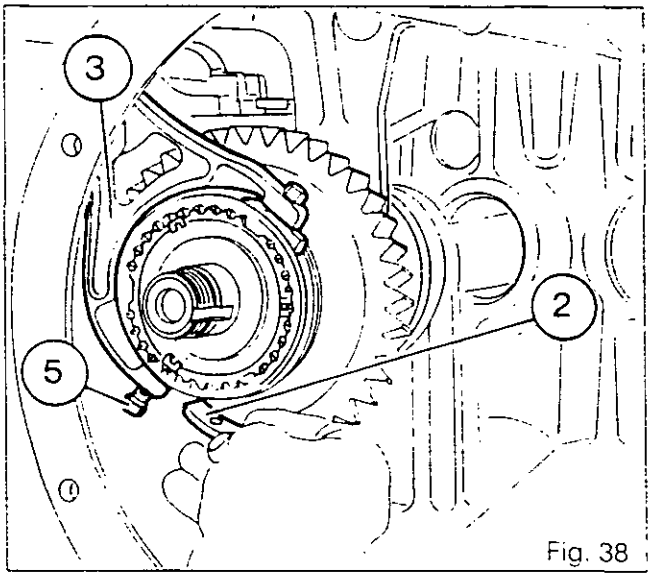


Fig. 38

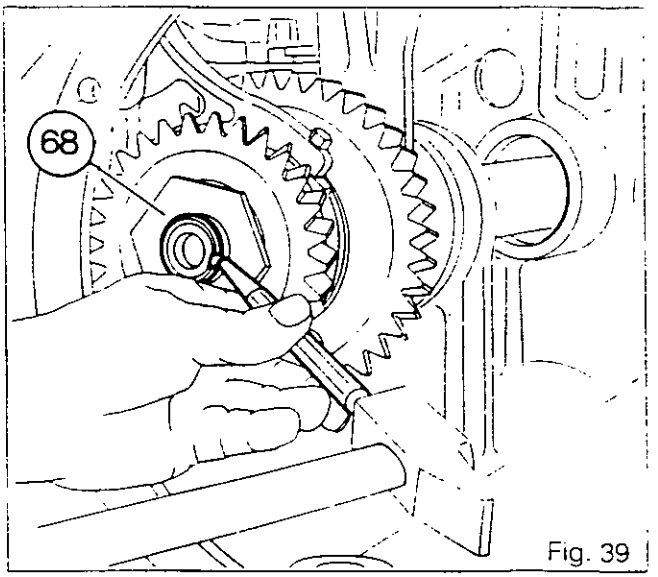
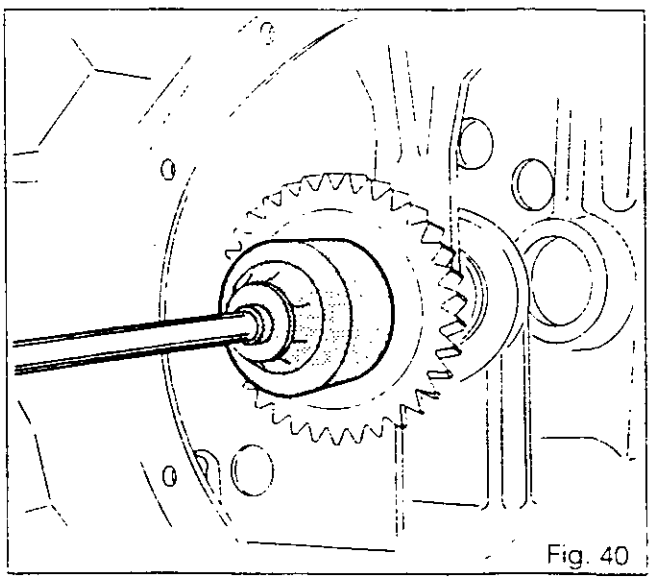


Fig. 39

L. Mainshaft - 4 x 2 gearbox - Reassembly

125. Carry out procedures 75 to 78 and 80 to 87.
126. Assemble the following in the order shown in the housing: 1st speed gear **(7)** and its bush **(8)**, the cone **(9)**, 1st gear synchromesh cup **(10)**, 1st and 2nd gear synchro **(11)**, 2nd gear synchro cup **(12)**, cone **(13)** and 2nd gear **(14)**.
127. Carry out procedures 90 to 92.
128. Press the bearing cone **(1)** on to the gear **(67)**.
129. Fit the gear**(67)** on to the shaft **(69)**.
130. Fit the nut **(68)** using special tool 3376805 M1. Tighten to a torque of 80-100 Nm (Fig.40).


Fig. 40

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131. Carry out procedures 97 to 103.
132. Fit tool MF 458 and the retaining sleeve (Fig.30 and 31).
133. Remove the lock from the nut.
134. Remove the gear.
135. Carry out procedures 107 to 109.
136. Refit the gear.
137. Carry out procedures 116 to 123.
138. Check that 1st and 2nd gear synchromesh functions correctly.

M. Output shaft - Reassembly

139. Fit the circlip **(49)** and the bearing cup **(37)**.
Note: The High/Low range synchromesh has been replaced by a coupler from serial no. V252037.
For tractors prior to this number see Workshop Service Manual 1646640 M1.
140. Refit the needle roller bearing **(24)**, washer **(22)** and circlip **(19)** on to the shaft **(44)**. Insert the shaft into the housing without the gears.
141. Slide the bearing cones **(39)** and **(40)** on to the shaft.

J3 shimming

142. The aim of this procedure is to prepare J3 shimming (Fig.41). Hold the cones **(39)** and **(40)** against the step in the shaft **(44)** using hand pressure.
Take up the clearance Y between the rear of cone **(40)** and the groove for the circlip **(45)** with shim adjuster **[42]** and spacer **/43**. Select a new circlip of a size that fits snugly into the groove (Fig.42).
143. Shim to obtain (Fig.43):
J3 = minus 0.05 to plus 0.05
The aim of this procedure is to take up the play between the cones **(39)** and **(40)** and the cups **(37)** and **(48)** while keeping the above-mentioned shimming tolerance.
144. Fit the circlip **(45)**.
Note: Position the spacer on the circlip side.
145. Fit the cup **(48)** and the lock plate **(46)**.
146. Tighten the bolts **(41)** to a torque of 27-32 Nm.

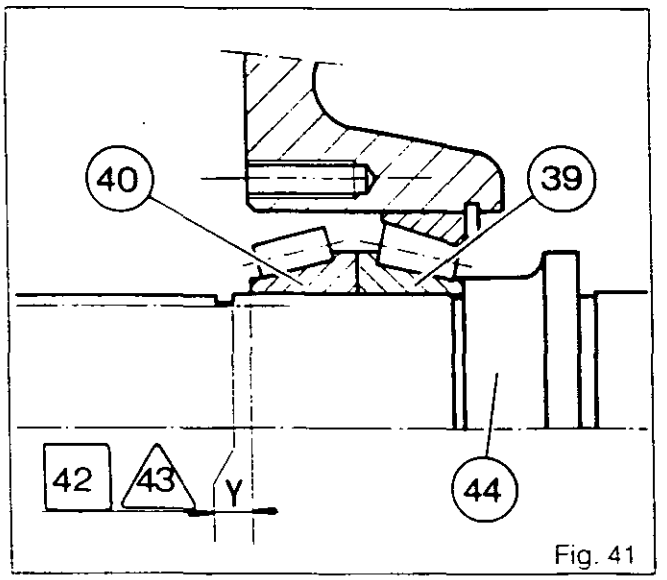


Fig. 41

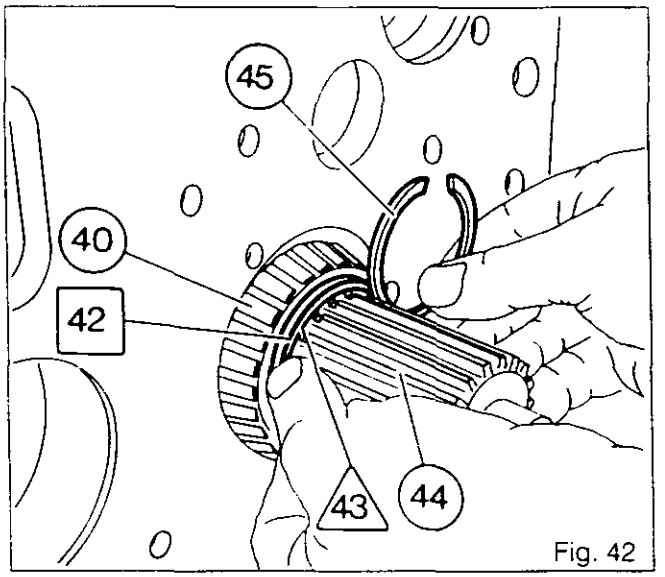


Fig. 42

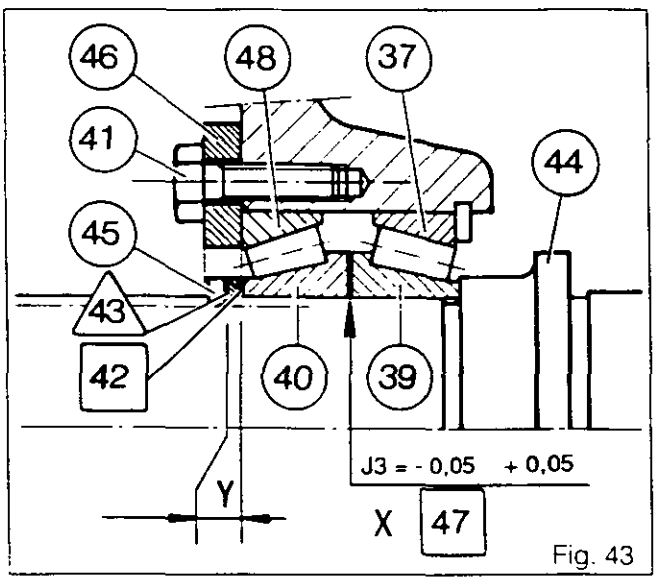


Fig. 43

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147. Position the dial gauge pointer at the end of the shaft **(44)** (Fig.44).
Note: For gearboxes fitted with the creeper range, use the gearbox plate (Fig.45) instead of the lock plate. Tighten the bolts to a torque of 34-52 Nm.
148. Push on the shaft and turn it to right and left so that the cones bed correctly into the cups.
149. Zero the dial gauge.
150. Carry out procedure 148 but pull on the shaft.
151. If end play exceeds 0.05 mm select the number of shims X **[47]** to obtain:
J3 = minus 0.05 to plus 0.05
Important: The shim(s) X [47] selected for J3 should be fitted between the cones for the following shimming procedures.

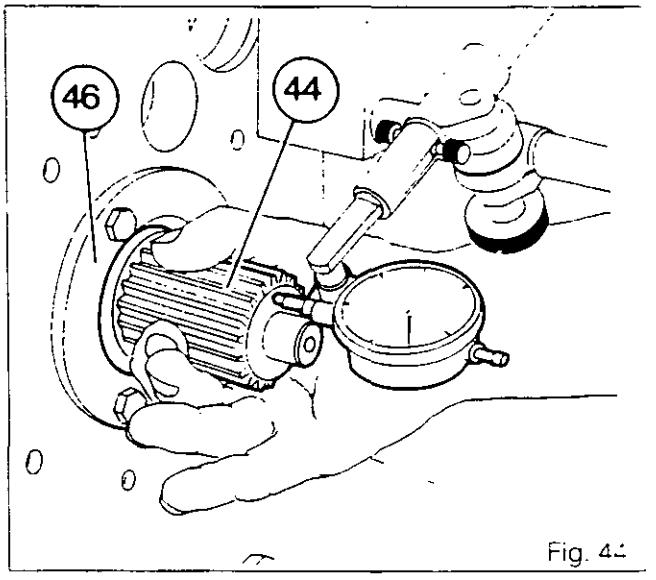


Fig. 44

J4 shimming

152. Remove the circlip **(45)**.
153. Remove the shim /**43**\ and the shim adjusters **[42]**.
154. Measure the thickness Y of all the shims **[42]** and /**43**\ (this measurement will be useful for J5 shimming).
155. Remove the bolts **(41)** and the lock plate **(46)**.
156. Remove the cup **(48)**, the cones **(40)** and **(39)** and the shaft **(44)**.
157. Assemble in the housing : the Low range gear **(36)**, the coupler **(31)**, the hub **(33)**, the thrust washer **(32)**, the 4 x 4 gearbox 4th gear/4 x 2 gearbox 3rd gear **(29)** with its combined needle roller bearings **(30)** and **(28)**, the thrust washer **(27)** and the synchromesh cup **(25)**.
Note: If the bush (35) is worn, replace the gear assembly (because the bush is bored out after it has been fitted).
If the combined bearings (30) and (28) are worn, replace the gear assembly (it is factory fitted).
158. Engage the input shaft **(44)** retaining the gear train assembly (Fig.46) .
159. Gently pull the shaft rearwards to expose the circlip **(34)** groove.

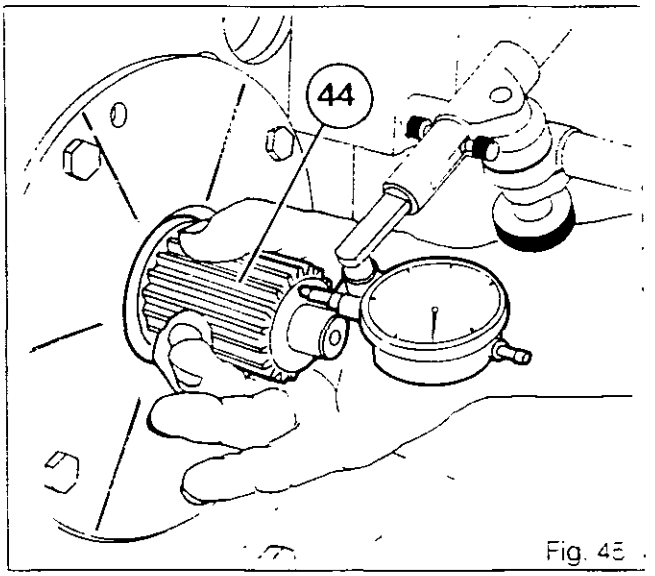


Fig. 45

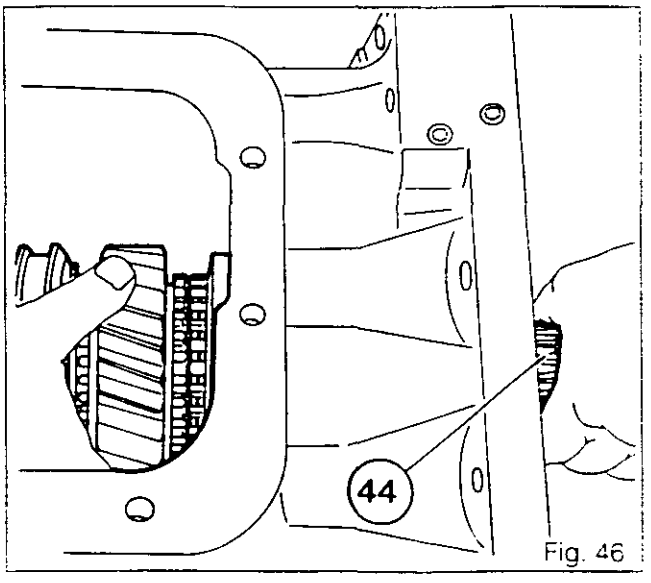


Fig. 46

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160. Fit the circlip **(34)** using tool MF 459 (Fig.47).
Note: Check that the circlip is correctly fitted.
161. Slide the following on to the shaft: the cone **(39)**, the shim(s) X **[47]** selected in operation 151, the cone **(40)** and the cup **(48)**.
162. Fit the lock plate **(46)**. Tighten the bolts **(41)** to a torque of 27-32 Nm.
163. Fit shims to obtain (Fig.48) :
J4 = plus 0.20 to plus 0.40
This shimming procedure produces end play on the gear **(29)** (4th Low 4 x 4 gearbox) (3rd Low 4 x 2 gearbox).
164. Carry out procedures 147 to 150.
165. On the basis of the reading obtained on the dial gauge select the thickness of shims Z **[38]** to obtain J4.
166. Remove the bolts **(41)** and the lock plate **(46)**.
167. Remove the cup **(48)**.
168. Withdraw the cones **(40)** and **(39)** and the shim(s) X **[47]**.
169. Slide the following on to the shaft: the shims Z **[38]**, the cone **(39)**, the shim(s) X **[47]** and the cone **(40)**.

J5 shimming

170. (Fig.49) Shim to obtain:
J5 = Zero play
The aim of this shimming procedure is to lock the cones **(40)** and **(39)** on to the shaft **(44)**.
171. From the thickness of shims Y **[42] /43**, selected in operation 154, deduct the thickness of shims Z **[38]** and X **[47]** to obtain:
J5 = Y - (Z+X).
172. Carry out procedures 145 and 146.
173. Slide the number of shims selected in operation 171 on to the shaft.
174. Fit the circlip **(45)**.
Note: Position the shim /43\ on the circlip side.
The circlip must be a snug fit in its groove. Check that it is correctly positioned.
Note: Refit the creeper gearbox (optional fit). See Section N.
175. Check the shaft and gear train rotation manually.
176. Check that the 3rd and 4th speed synchromesh and the High/Low range coupler operate normally.

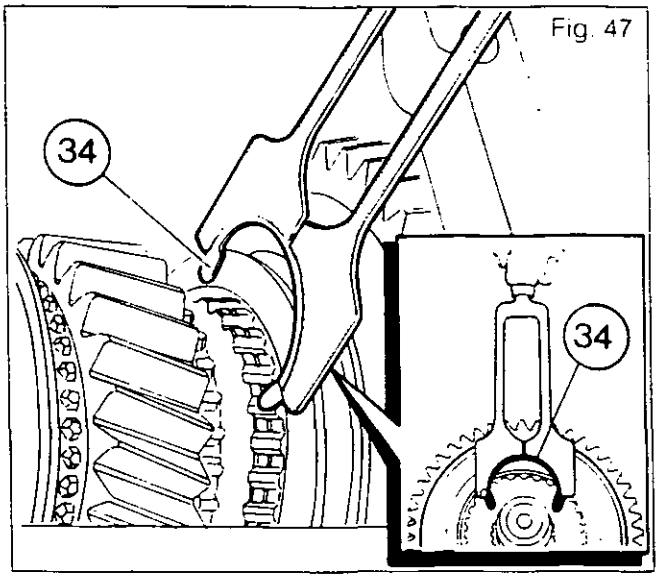


Fig. 47

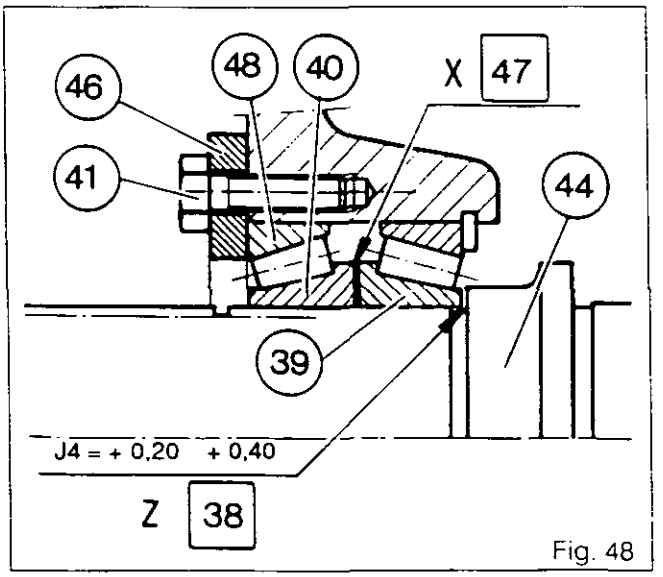


Fig. 48

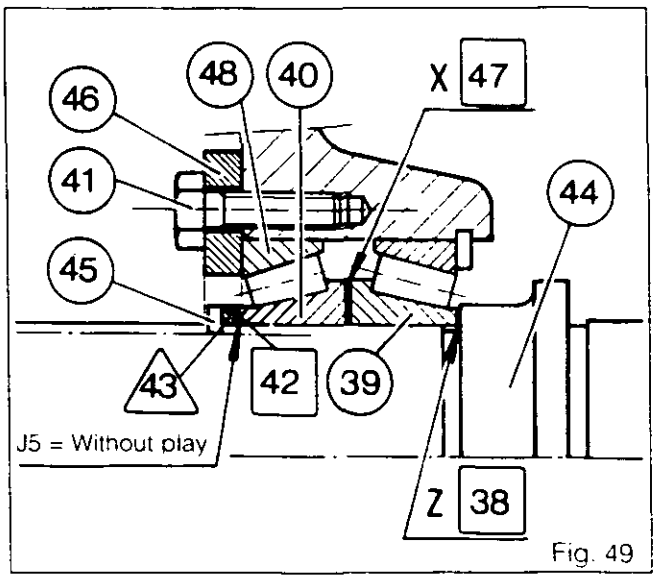


Fig. 49

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N. Creeper Gearbox - Refitment (Fig.50)

177. Position the lock plate **(1)** and the ring gear **(2)** on the housing.
178. Attach the friction washers **(3)** and **(4)** to the planetary carrier **(5)** using «Amber Technical» grease.
179. Slide the pinion carrier on to the output shaft.
180. Position the cover plate **(6)**.
181. Fit the bolts **(7)** and tighten to a torque of 34-52 Nm.

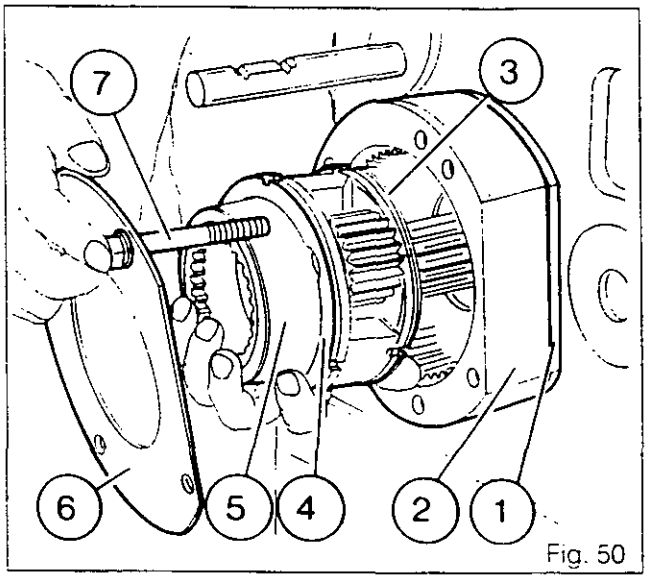


Fig. 50

P. Layshaft - Reassembly

A new designed shaft was introduced from serial no. P345012 (version b). Tractors prior to this are built using version a.

182. Fit the needle roller bearing **(62)** against the shoulder on the shaft **(54)** using a press (Fig.51).
Note: Check that the needle roller bearings turn freely in the cage.
183. **a)** Carry out procedures 25 to 29 in reverse order.
Note: Ensure that the circlips fit easily into their grooves.
The gap J1 is calculated according to machining tolerances (Fig.52).
b) Carry out procedures 28 and 29 in reverse.
Slide the spacer **(57)** on to the shaft.
Fit the 2nd gear **(59)**, the 1st gear **(60)** and the circlip **(61)**.
Using a set of shims, measure the space between the 1st gear **(60)** and the 2nd gear **(59)**. On the basis of the measurement, select a thickness of shims to obtain (Fig.52):
J1 = 0 to plus 0.25
Remove the circlip **(61)** and the gear **(60)**.
Slide the shims already selected on to the shaft.
Fit the gear and the circlip.
Note: Ensure that the circlip is correctly fitted.

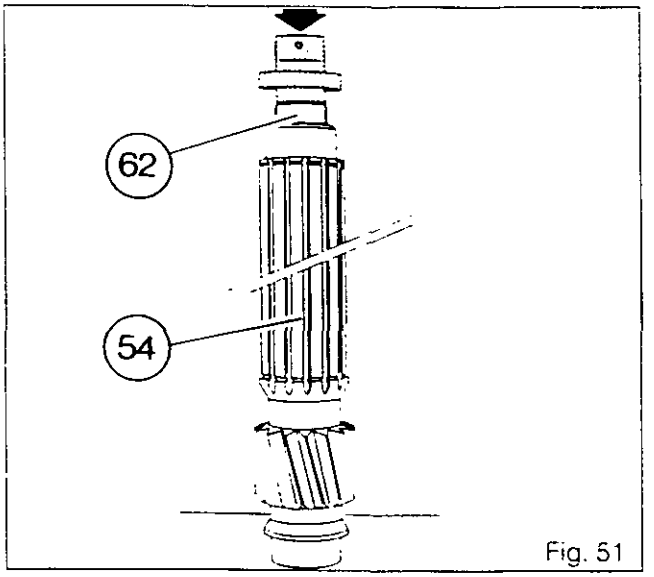


Fig. 51

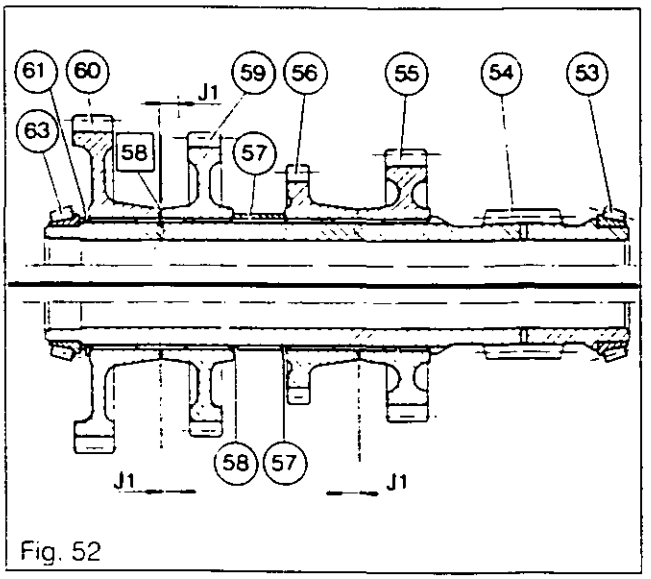


Fig. 52

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184. Using a press, fit the bearing cones **(63)** and **(53)** holding the assembly in a suitable jig (Fig.53).
185. Carry out procedures 23 and 20 in reverse.

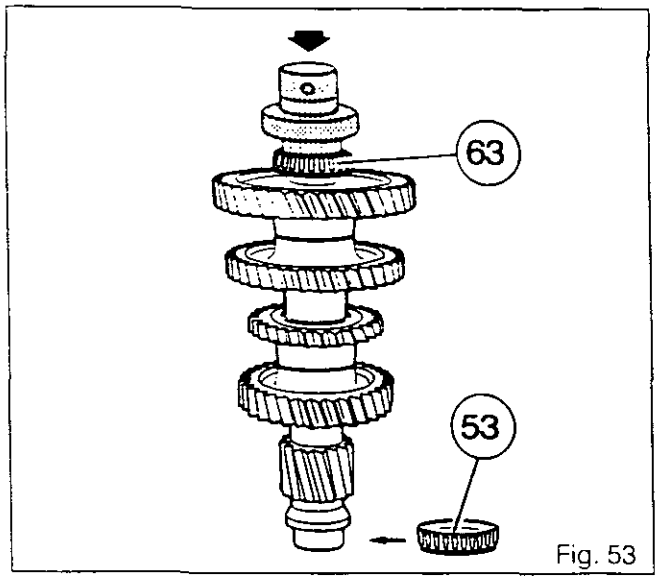


Fig. 53

Q. Input shaft housing - Refitment

186. Carry out procedures 15 and 17.
187. Clean the mating face.
188. **Check that the cup (1) and the «O» ring (2) are fitted (Fig.54).**
189. (Fig.55) Fit the «O» rings **(3)** and the locating dowel **(4)** in the housing.
190. (Fig.56) Offer up the input shaft housing assembly **(66)** into the housing by tilting it to the left then tilting it to the right to engage the reverser gear train into the A/B gear train.
191. At the same time, check through the selector cover that the reverse shuttle selector **(5)** (Fig.54) is not in contact with the housing partition and that the layshaft cone **(63)** engages in the cup **(64)** (Fig.56)
192. Position the housing assembly over the locating dowel.
193. Fit the bolts and tighten to a torque of 45-60 Nm. Remove the retaining tool.
194. Carry out procedure 16 in reverse.
195. (Fig.57) Shim to obtain:
J2 = plus 0.04 to plus 0.12
196. (Fig.59) Fit the locally made-up tool (see Section U) into the layshaft.
197. Lightly compress the spring by tightening the nut on the tool so that the cones seat correctly in the cups.
198. Rotate the shaft several times.
199. Measure the space **X** using a depth gauge between face A of the cup **(52)** and face B of the housing (Fig.58).
200. Measure the thickness **Y** of the washer **(50)**.
201. Calculate the difference between **X** and **Y**.
202. Determine the thickness of shims required to obtain a play of plus 0.04 to plus 0.12.
203. Remove the compression tool.
204. Position the shims **[51]** selected in procedure 202.
205. Press the washer into the housing.

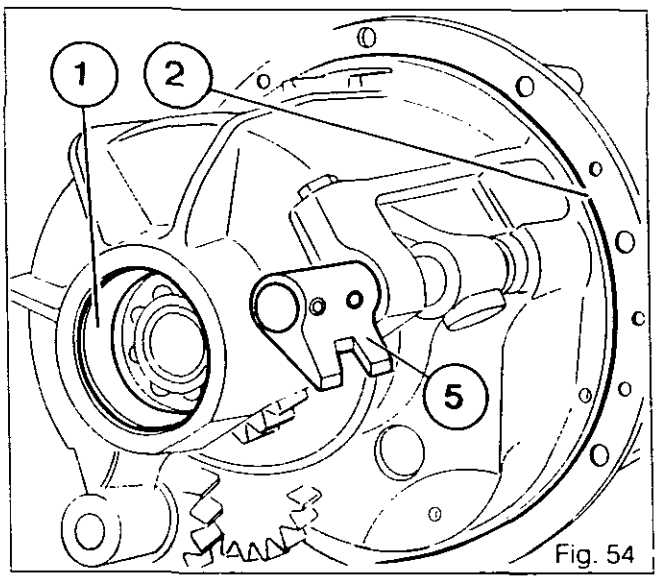


Fig. 54

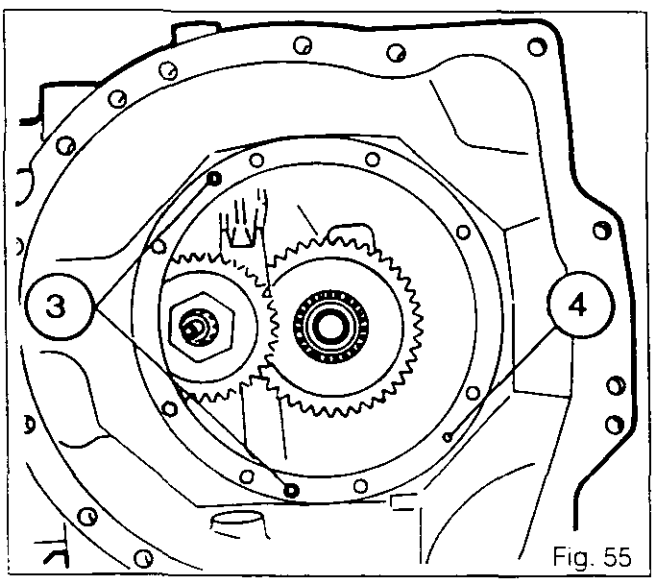


Fig. 55

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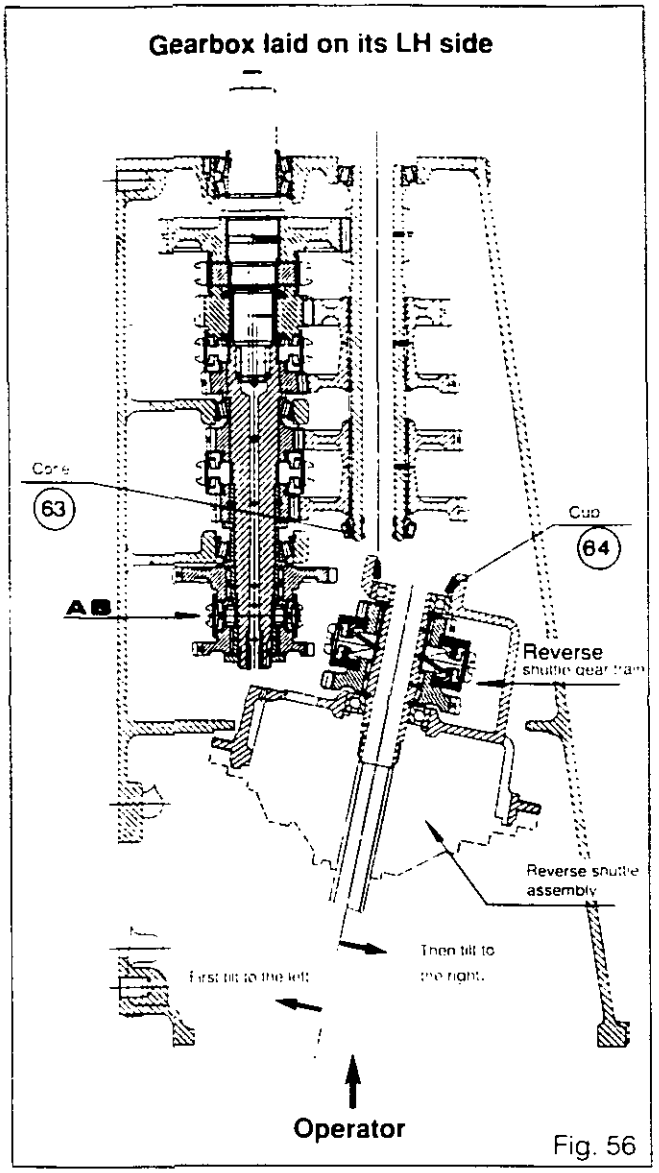


Fig. 56

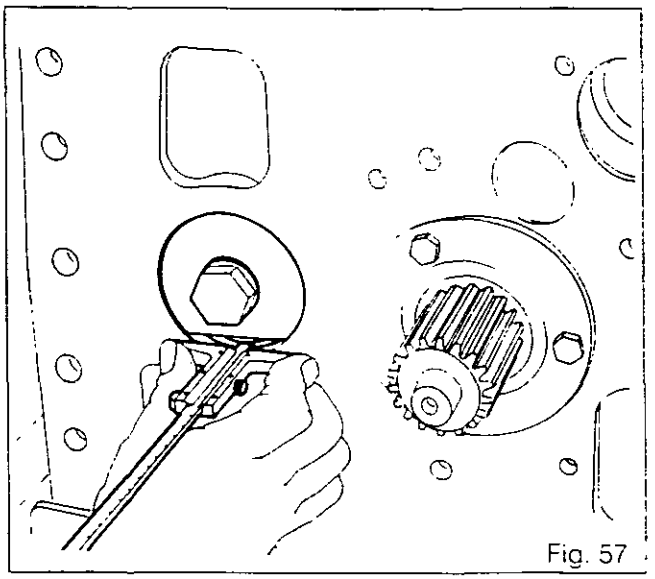


Fig. 57

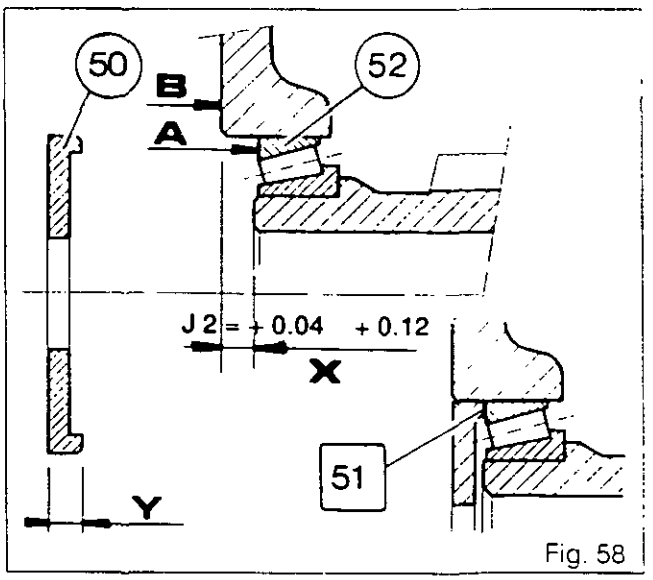


Fig. 58

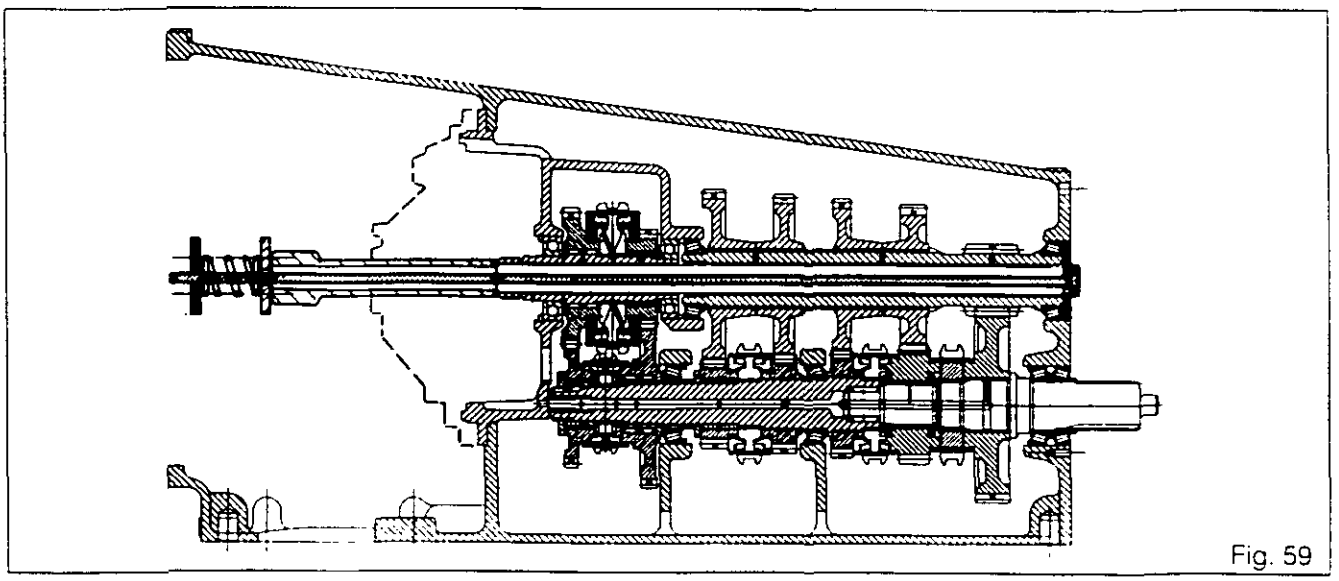


Fig. 59

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Gearbox

R. Shifter rail and forks - Reassembly (Fig.60)

206. Check that the hydraulic ports of the High/Low cylinder **(10)** are unobstructed.
207. Fit the cylinder **(10)** together with the «O» ring **(11)** in the housing.
208. Position the High/Low fork **(20)** in the coupler.
209. Fit the seals **(12)** and **(14)** on the piston **(13)** then insert it into the cylinder bore.
Note: The setscrew holes should face the tapped holes in the fork. Immobilise the fork with a setscrew (19).
210. Clean and assemble the mechanical lock **(22)**, the tapered bearing **(23)**, the cone **(24)** and castellated nut **(21)**.
211. Fit the 3rd and 4th speed gear forks **(6)**, 1st and 2nd gears **(5)** and the lock assembly **(25)**.
212. Insert the selector rail **(7)** through the rear of the housing and slide it into the piston, the lock assembly and the forks.
Note: For the 4 x 4 gearbox, do not forget the A/B fork (4).
213. Fit the bearing **(15)** and tighten the bolts **(16)** to a torque of 27-32 Nm.
214. Clean the setscrew **(8)** with solvent, coat with Loctite 542 and tighten to a torque of 28-43 Nm.

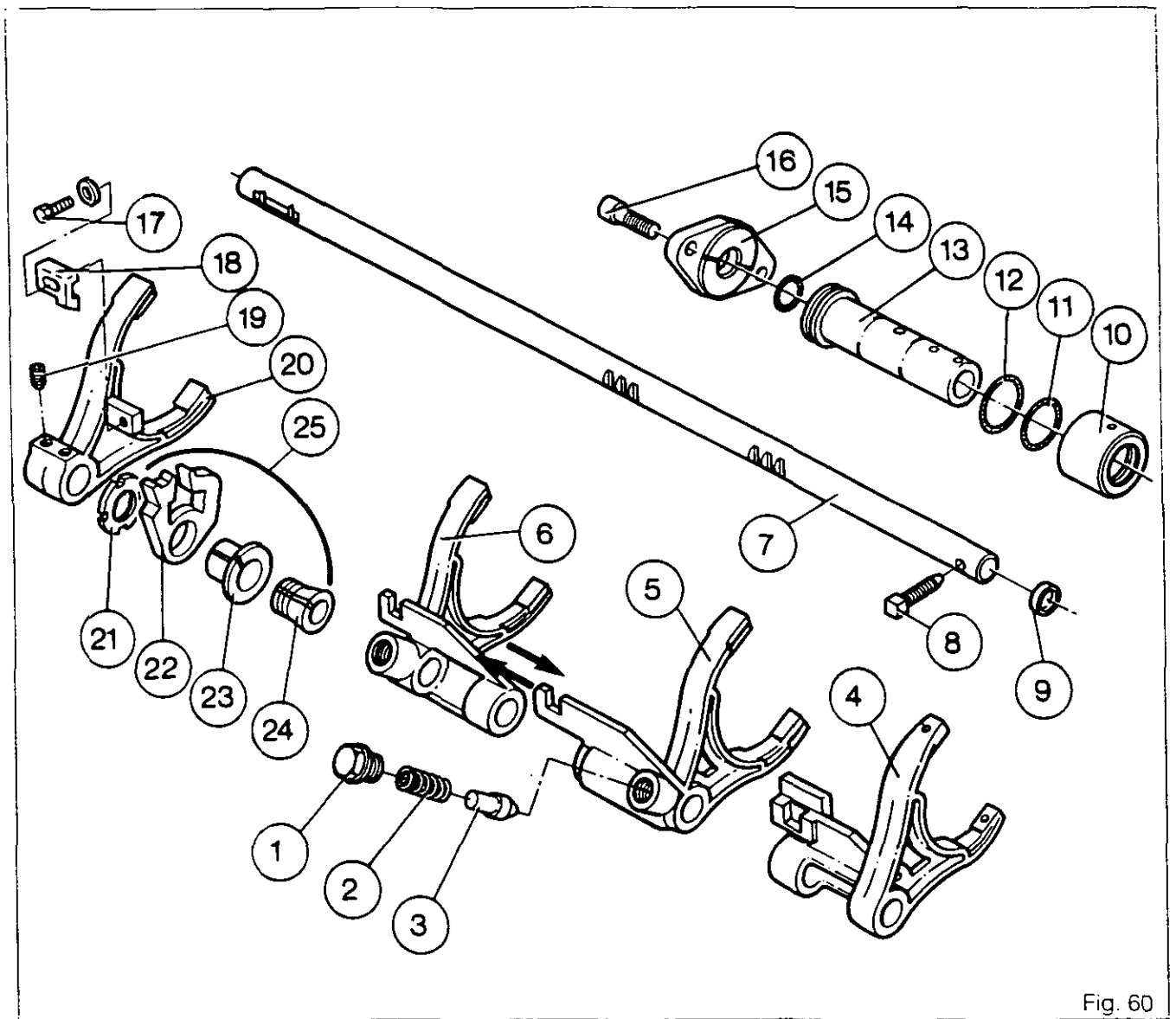


Fig. 60

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215. Clean the insert **(9)**, coat with Loctite 542 and press it in level with the housing.

216. Fit the locking plungers **(3)**, the springs **(2)** and tighten the plugs **(1)** to a torque of 50-70 Nm.
Note: Gearbox fitted with creeper gears (Fig.61).
Fit the sleeve (5), the fork (4) and the pin (1). Position the fork and the locking plunger (3) on the flat of the shifter rail (6) (between the two locking notches). Tighten the locking peg to compress the ball.
Slacken the screw a quarter turn.
Clean the nut (2) with solvent and coat with Loctite 241.
Tighten to a torque of 15-20 Nm.
Check that the fork is correctly locked.

217. **Setting the High/Low range fork.**
Principle: Positioning of the selector fork **(20)** on the rail is made possible by the different centre to centre distances of the tapped holes **Y** and of the notches **Z** on the piston **(13)**.
The fork's position is altered by turning either the front screw or the rear screw as necessary (Fig.62).

218. Position the control piston **(13)** and the coupler **(31)** in the High range.

219. Keep the coupler in contact with the high range gear **(29)** (Fig.63) (3rd gear on the 4 x 2 gearbox - 4th gear on the 4 x 4 box).

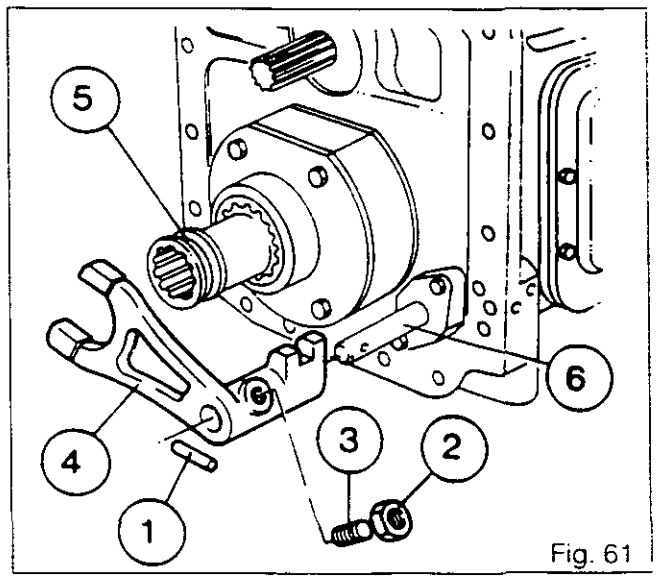


Fig. 61

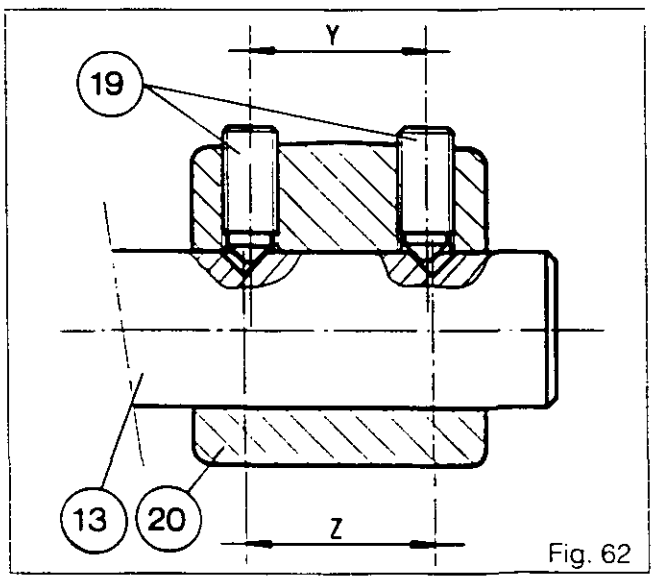


Fig. 62

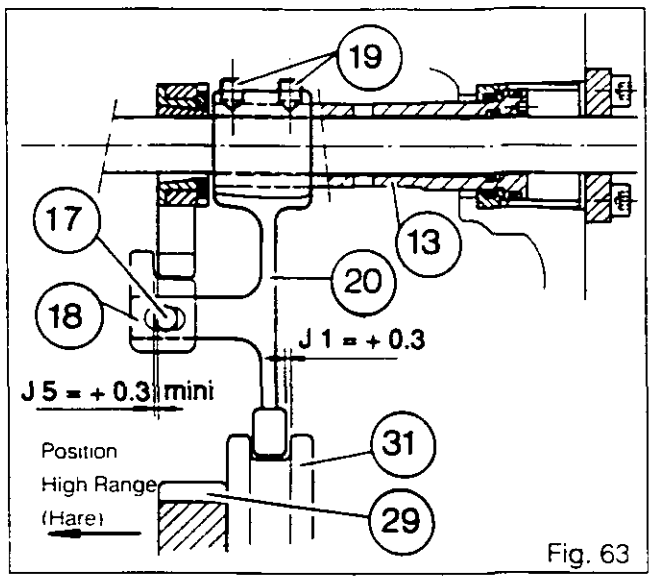


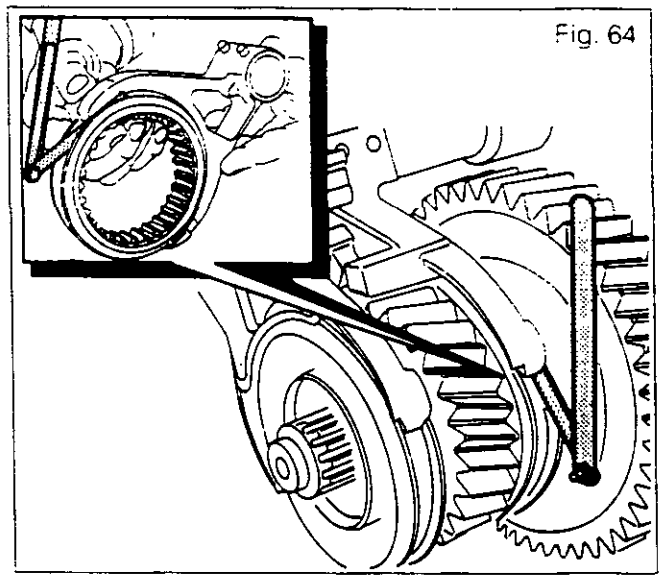
Fig. 63

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Gearbox

220. Adjust the position of the fork **(20)** by turning the two adjusting screws **(19)** after cleaning them with a solvent and lightly coating them with Loctite 221 to obtain a play of **J1 = 0.3 mm** between the rear face of the plate and the coupler (Figs. 63 & 64).
Note: Use the locally made-up tool to carry out the adjustment (see Section U).
221. Position the control piston **(13)** and the coupler **(31)** in Low range.
222. Check that there is a play of **J2 = 0.3 minimum** (value obtained by J1 adjustment) between the plate and the coupler with the latter in contact with the Low range gear **(36)** (Fig.65).
Tighten the screws to a torque of 35 Nm without changing the adjustment.
Note: In Low range position, if the face X of the fork (20) plate is in contact with the coupler (Fig.65) increase the play J1.
223. Move the fork into the Low range position.
224. Slightly slacken the castellated nut **(21)**.
Lightly coat the thread of the cone **(24)** with Loctite 270.
225. Move the forks into the neutral position.
226. Divide the J3 and J4 play (minimum 0.3 mm) equally so that the mechanical lock **(22)** moves freely (Figs.66 & 67).


Fig. 64

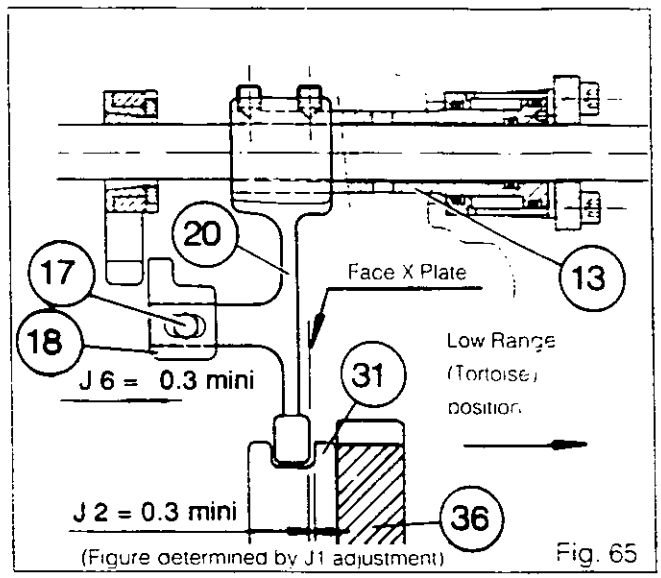


Fig. 65

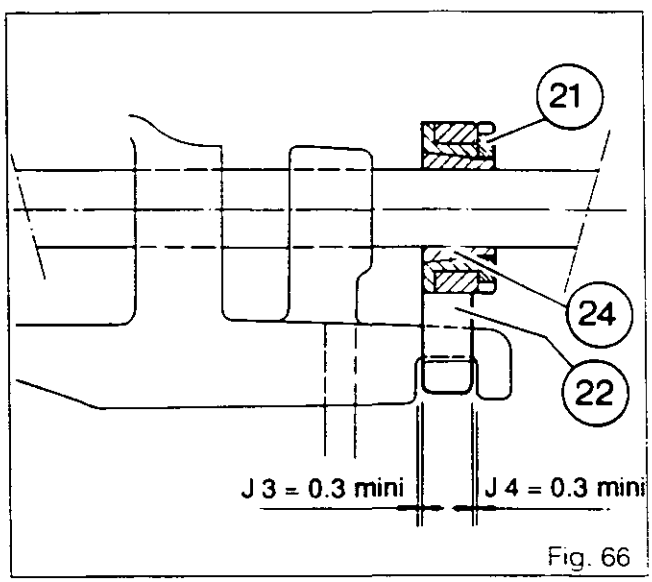
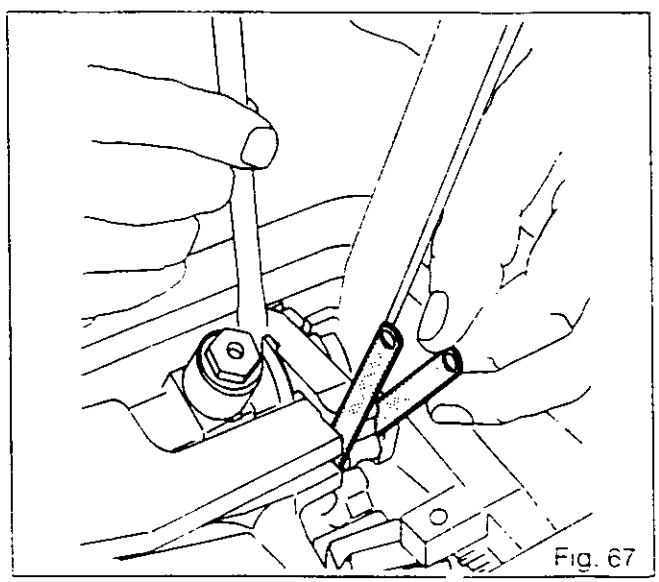


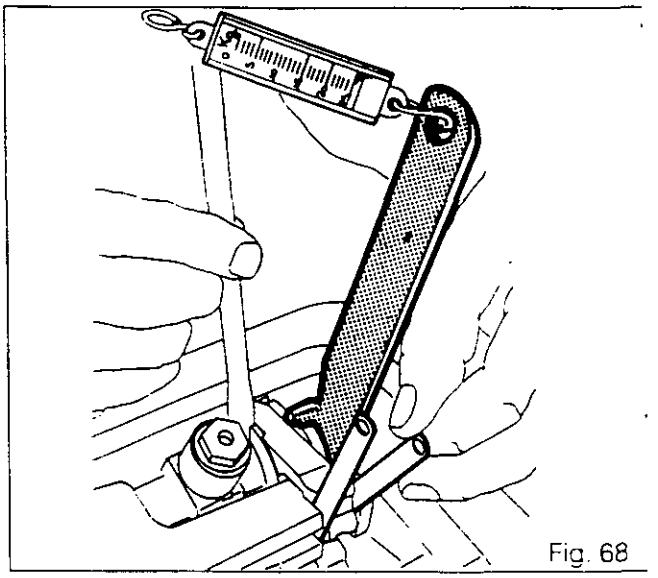
Fig. 66


Fig. 67

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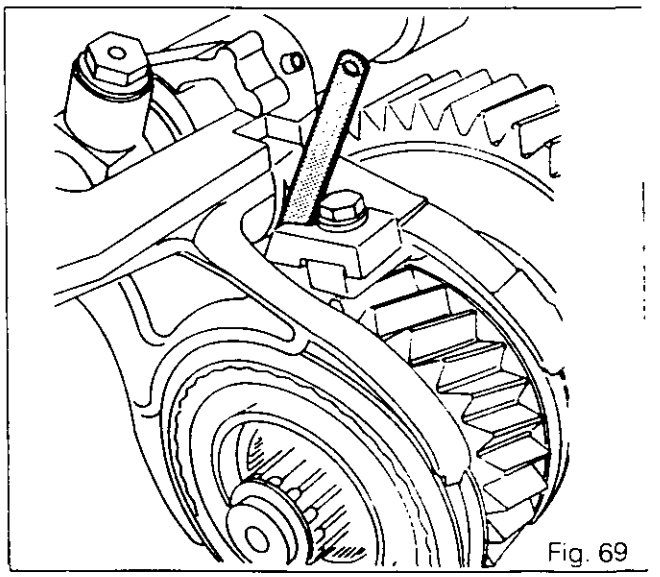
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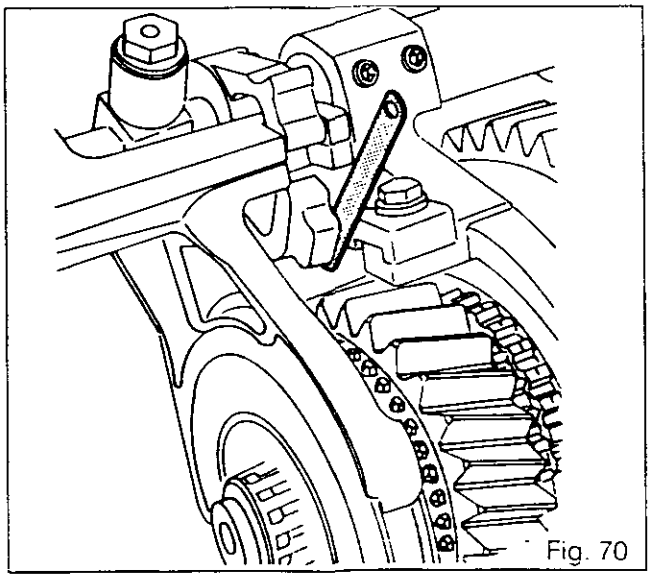
227. Tighten the castellated nut **(21)** to a torque of 50 Nm using spanner 3615334 M01 and a spring balance (Fig.68).
228. Coat the inner face of the slider **(18)** with Loctite 648 and the bolt **(17)** with Loctite 241. Fit the washer and the bolt.
229. Equalize the J5 and J6 clearances (minimum 0.3 mm) between the slider and the lock in the High and Low range positions (Figs.63, 65, 69 and 70).
230. Tighten the bolt to a torque of 27-32 Nm.
231. Check the operation of the High/Low range and of the lock.
232. Check the operation of the gears and of the A/B range.


Fig. 68

Reverse shuttle selector - Adjustment (Fig.71)

233. Move the selector **(1)** into neutral.
Fit and tighten service tool 3582434 M01 with two centring bolts fitted with spacers.
234. Coat the setscrews **(2)** with Loctite 221.
235. Position face X of the reverse shuttle selector in contact with the service tool using the screws **(2)**.
Note: See procedure 217 for the principle of adjustment.
236. Tighten the screws to a torque of 35 Nm.
237. Remove the tool.


Fig. 69


Fig. 70

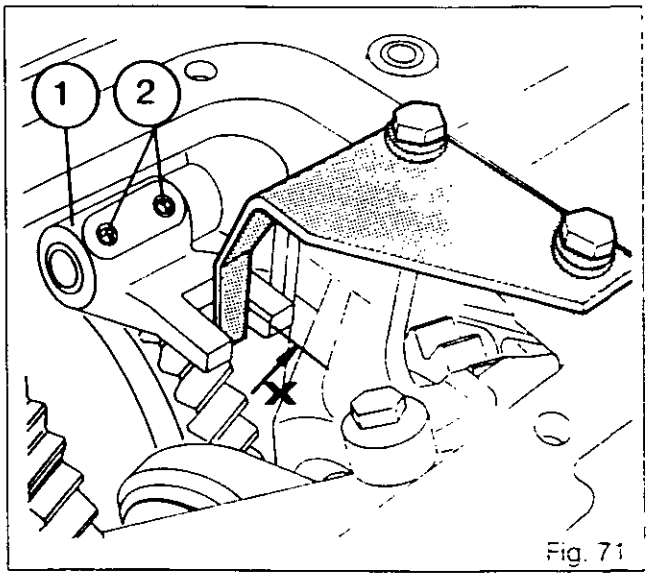


Fig. 71

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S. Selector cover - Refitment

4 x 2 Gearbox

238. Clean the mating face of the cover **(56)**.
239. Move the reverse shuttle selector into neutral.
240. Engage 1st gear.
241. Coat the mating face of the gearbox housing with a gasket sealant (Loctite 510 Master Joint or equivalent).
Note: Remember to position the bolt (1) on the housing (Fig.72).
242. Turn the two cover levers to the left, keeping them parallel.
243. Lay the cover on the gearbox ensuring that the levers are correctly positioned in the selectors (Fig.73).
244. Carry out procedure 5 in reverse.
Note: Tightening torque 50-70 Nm.
245. Check:
- the movement of all the gears and the position of the High/Low (Hare/Tortoise) range,
- the operation of the reverse shuttle.

4 x 4 Gearbox

246. Clean the mating face of the cover **(57)**.

On the gearbox:

247. Check that the reverse shuttle selector is in neutral and the A/B fork in position B (forwards).
248. Engage 1st gear.

On the cover:

249. Remove the pressure valve **(58)** and the plunger **/59** (Fig. 74).
250. Lock the control shaft **(53)** in position B with lugs **(66)** and **(54)** lined up (Fig. 76) using tool 3615053 M01 (Fig.74) (tighten but not fully).

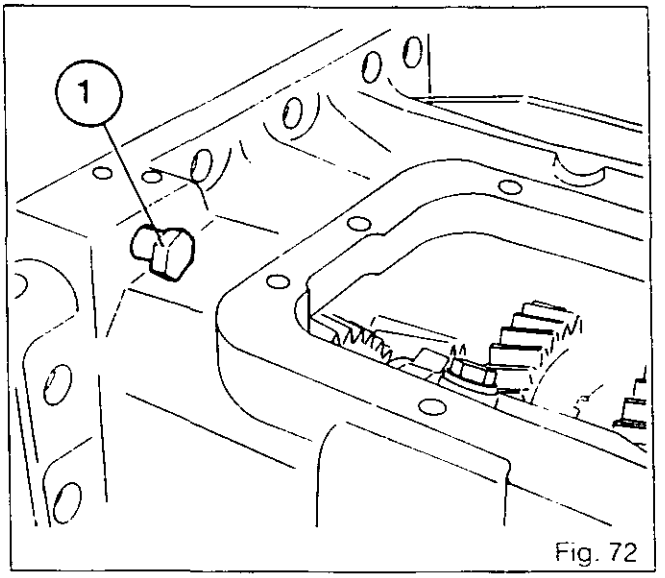


Fig. 72

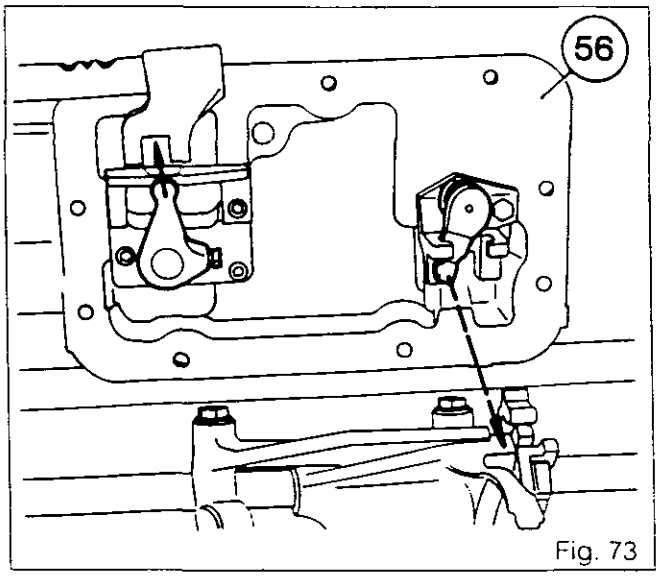


Fig. 73

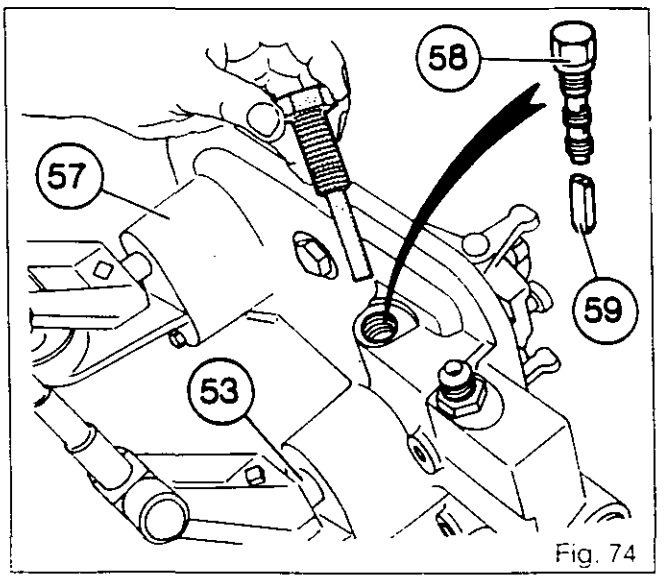


Fig. 74

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251. Move the lug /**61**\ of the A/B fork into position B (forwards) (Fig.75).
252. Move the gear lever to the left (into 1st) **(36)** (Fig. 76).
253. Carry out procedure 241.
254. Assemble the cover on the gearbox by engaging the lugs **(54)** and **(66)** in the reverse shuttle selector and the lug /**61**\ into the A/B fork, then engage the lug **(36)** into the 1st and 2nd gear fork and the mechanical lock (Fig.76).
255. Position the cover.
256. Fit the bolts and tighten to a torque of 50-70 Nm. Remove tool 3615053 M01.
Note: For a gearbox fitted with creeper gears, fit the cable bracket (1) (Fig.77)
To correctly centre the cover, first tighten bolt /3\ (Fig.77). Carry out a manual check, using the levers, that the lugs have been correctly fitted into the selectors.
257. Install the plunger /**59**\ and the pressure valve **(58)** and tighten to a torque of 18-20 Nm.
258. Check:
- the free movement of all gears
- the High/Low range positions
259. Adjust the A/B range. See Section 5 K03.

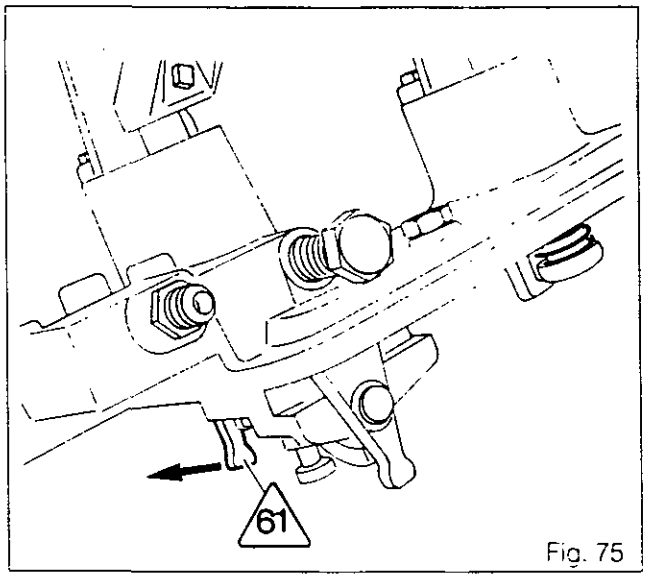


Fig. 75

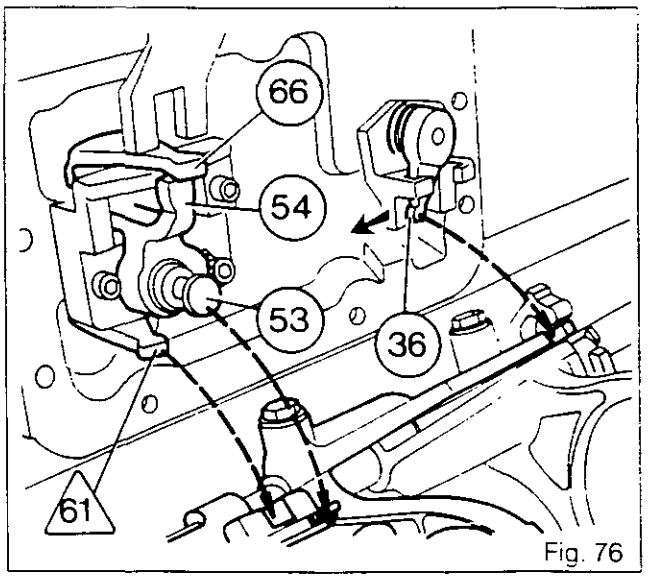


Fig. 76

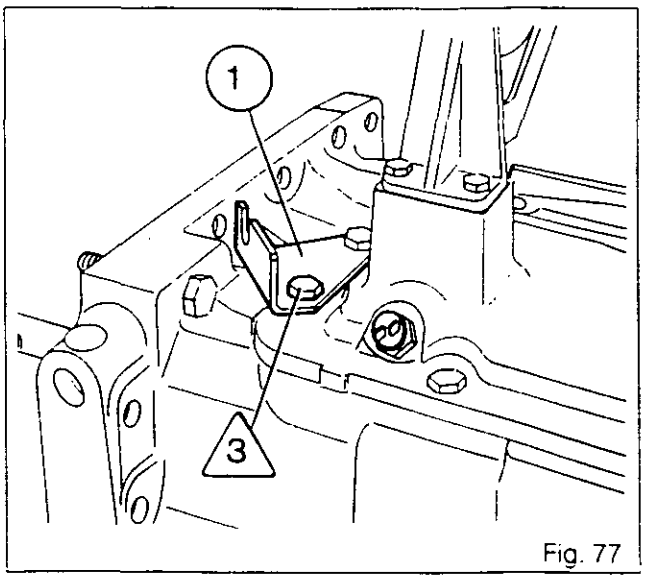


Fig. 77

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T. Gearbox - Preparation and Refitment

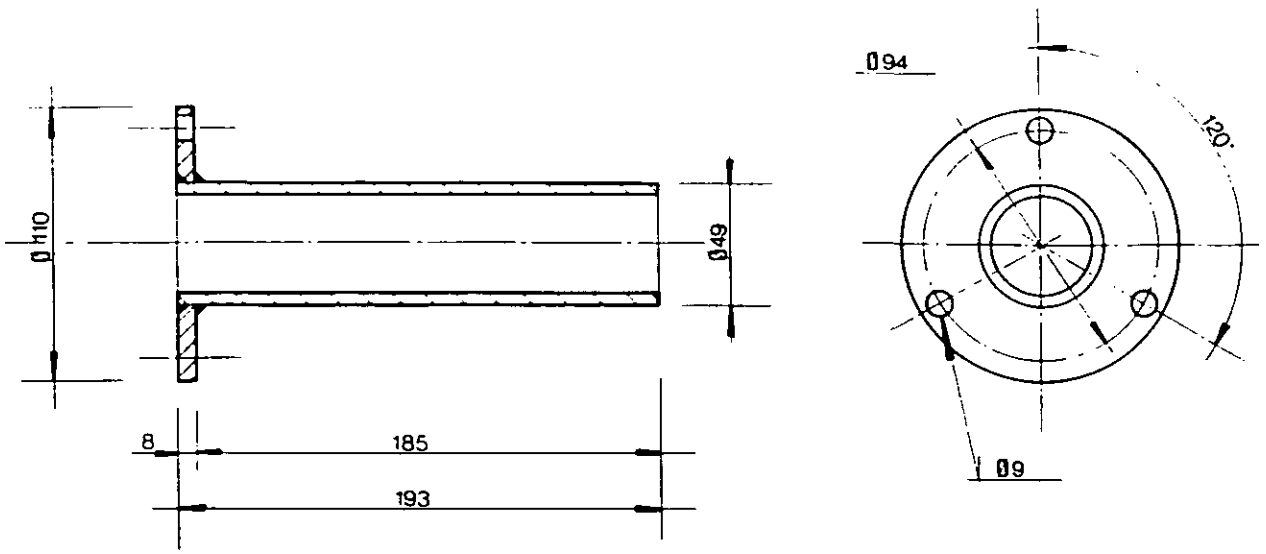
260. Reverse procedures 3 and 4, section A.

261. **3000 Tractor**
Refit the gearbox to the engine (Section 3 A01)
3100 Tractor
Refit the gearbox to the engine (Section 3 A02)

262. Refit the gearbox to the rear axle housing (See Section 3 B02).

U. Service Tools

1. Tools to be made up locally

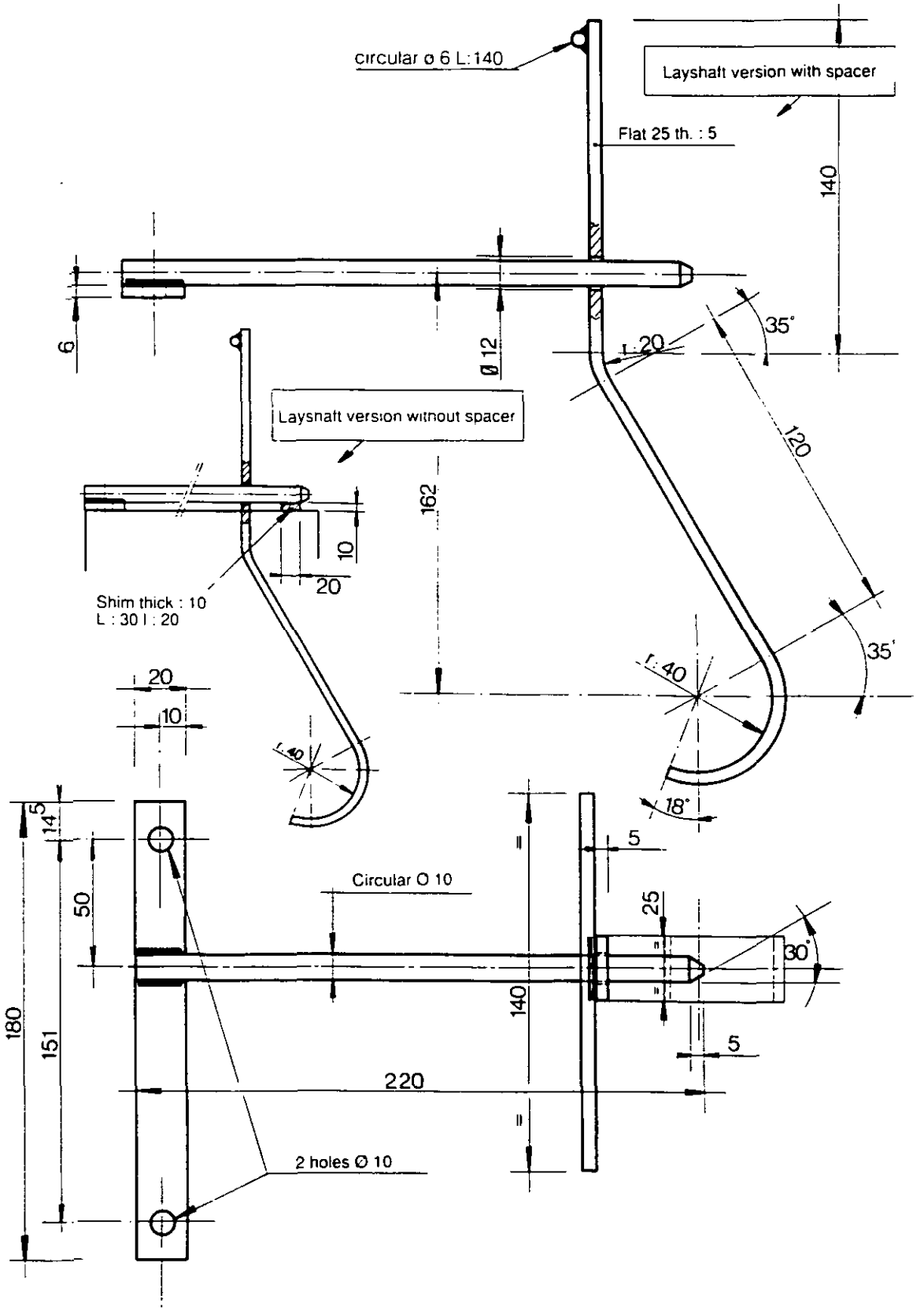


Mainshaft retaining tool

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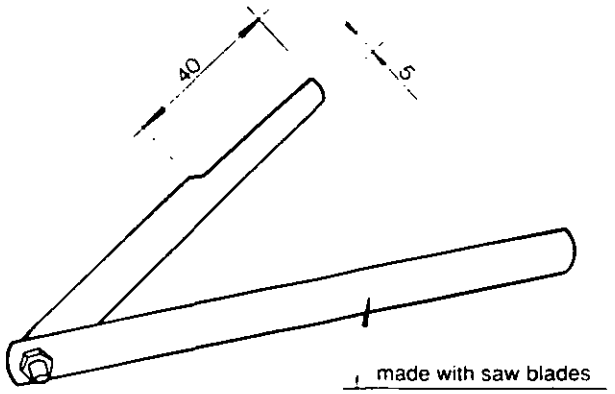
Gearbox



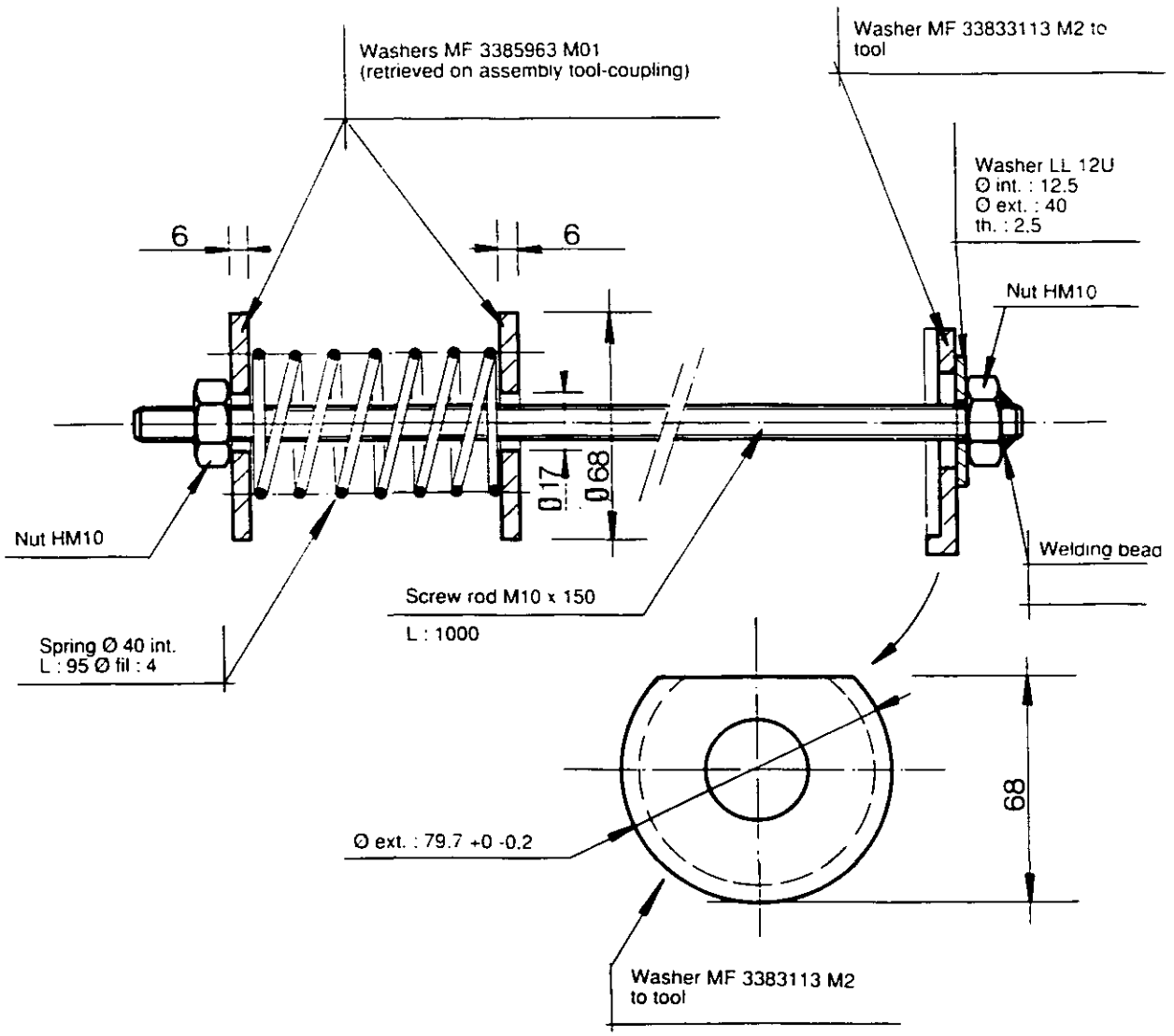
Layshaft retaining tool

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Gearbox



Feeler gauge



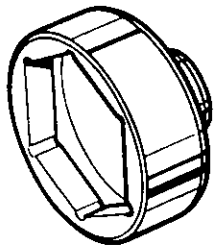
Layshaft retaining tool

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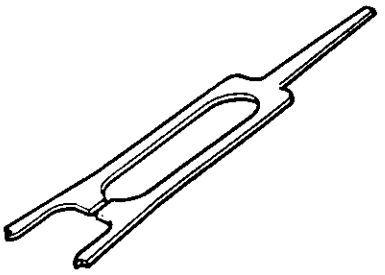
2. Tools available on the M.F. network

Mainshaft nut socket
(Gearbox 4 x 4)



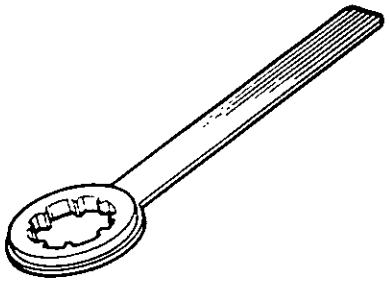
MF 456

Snap ring remover



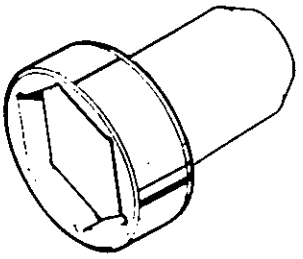
MF 460

Mainshaft retaining tool



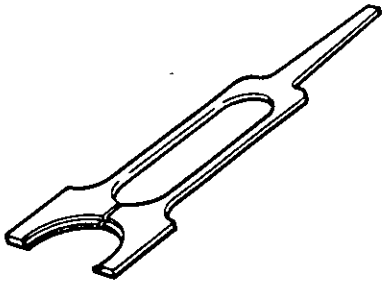
MF 458

Mainshaft nut socket
(gearbox 4 x 2)



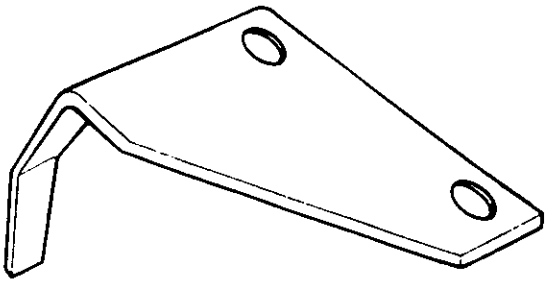
3376805 M1

Snap ring replacer



MF 459

Reverse shuttle setting gauge



3582434 M1

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4 x 4 Gearbox - Key to illustration

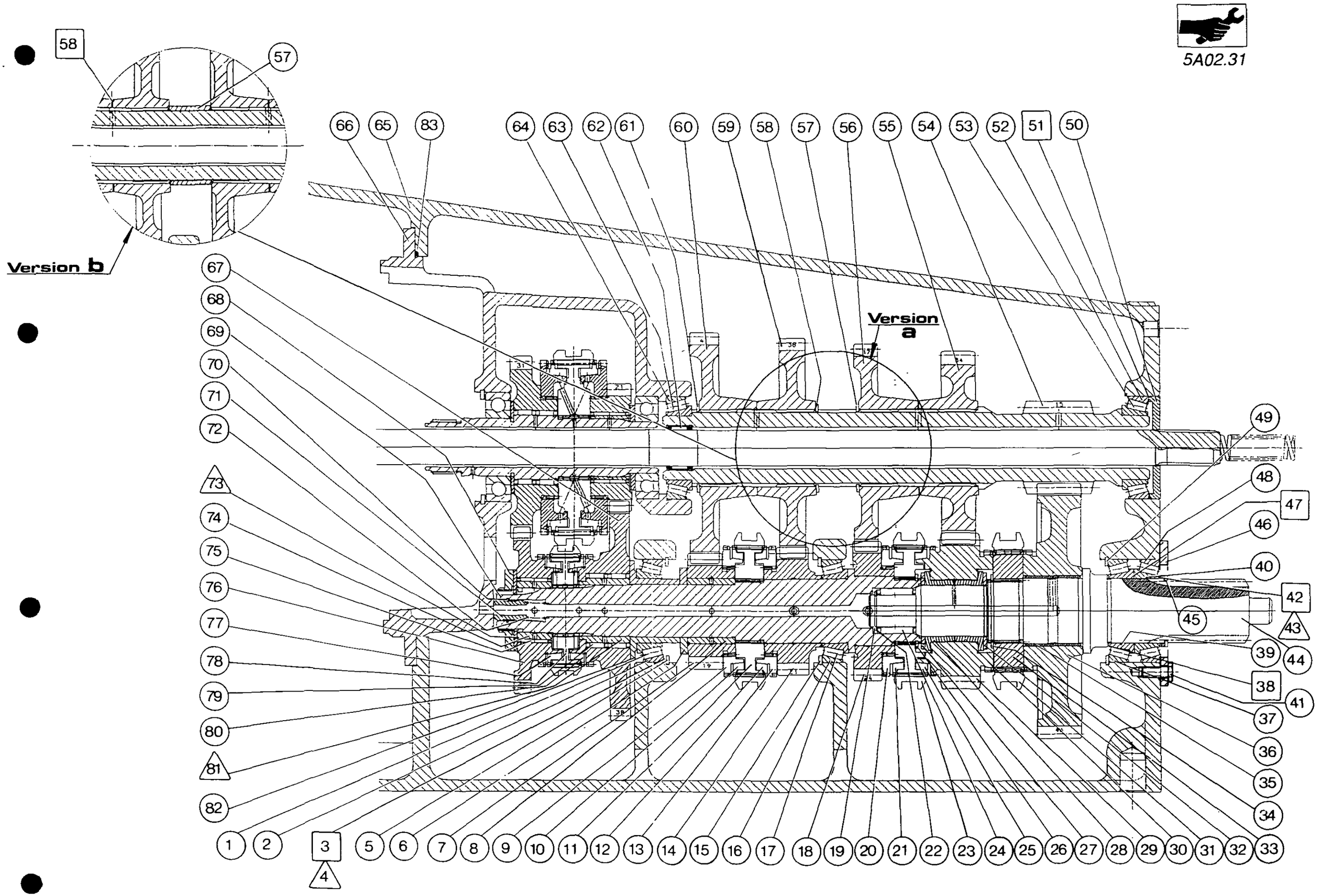
(1) Bearing cone
(2) Bearing cup
[3] Shims
/4 Spacer
(5) Circlip
(6) Washer
(7) 1st drive gear
(8) Bush
(9) 1st gear synchro cone
(10) 1st gear synchro cup
(11) 1st and 2nd gear synchro
(12) 2nd gear synchro cup
(13) 2nd gear synchro cone
(14) 2nd drive gear
(15) Circlip
(16) Bearing cup
(17) Bearing cone
(18) 3rd drive gear
(19) Circlip
(20) 3rd gear synchro cone
(21) 3rd gear synchro cup
(22) Washer
(23) 3rd and 4th gear synchro
(24) Needle roller bearing
(25) 4th gear synchro cup
(26) Circlip
(27) Thrust washer
(28) Combined bearing
(29) 4th gear drive pinion (High range)
(30) Combined bearing
(31) Coupler
(32) Thrust washer
(33) Coupler hub
(34) Circlip
(35) Bush
(36) Gear (Low range)
(37) Bearing cup
[38] Shims
(39) Bearing cone
(40) Bearing cone
(41) Bolt
[42] Shims
/43 Spacer
(44) Output shaft
(45) Circlip
(46) Lock plate
[47] Shims
(48) Bearing cup
(49) Circlip
(50) Washer
[51] Shims
(52) Bearing cup
(53) Bearing cone
(54) Layshaft
(55) 4th driven gear
(56) 3rd driven gear

	Version a	Version b
(57)	Circlip	Spacer
(58)	Circlip	-
[58]	-	Shim

(59) 2nd driven gear
(60) 1st driven gear
(61) Circlip
(62) Needle roller bearing
(63) Bearing cone
(64) Bearing cup
(65) Gearbox housing
(66) Input shaft housing assembly
(67) A range gear
(68) Nut
(69) Mainshaft
(70) Circlip
(71) Oil feed pipe
(72) Spring
/73 Spur washer
(74) Bush
(75) Needle roller bearing
(76) B range gear
(77) B range synchro cup
(78) A/B synchro
(79) Needle roller bearing
(80) A range synchro cup
/81 Bush
(82) Sleeve

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4 x 2 Gearbox - Key to illustration

(1) Bearing cone
(2) Bearing cup
[3] Shims
/4 Spacer
(5) Circlip
(6) Washer
(7) 1st drive gear
(8) Bush
(9) 1st gear synchro cone
(10) 1st gear synchro cup
(11) 1st and 2nd gear synchro
(12) 2nd gear synchro cup
(13) 2nd gear synchro cone
(14) 2nd drive gear
(15) Circlip
(16) Bearing cup
(17) Bearing cone
(18) 4th drive gear
(19) Circlip
(20) 4th gear synchro cone
(21) 4th gear synchro cup
(22) Washer
(23) 3rd and 4th gear synchro
(24) Needle roller bearing
(25) 3rd gear synchro cup
(26) Circlip
(27) Thrust washer
(28) Combined bearing
(29) 3rd gear drive pinion (High range)
(30) Combined bearing
(31) Coupler
(32) Thrust washer
(33) Coupler hub
(34) Circlip
(35) Bush
(36) Gear (Low range)
(37) Bearing cup
[38] Shims
(39) Bearing cone
(40) Bearing cone
(41) Bolt
[42] Shims
/43 Spacer
(44) Output shaft
(45) Circlip
(46) Lock plate
[47] Shims
(48) Bearing cup
(49) Circlip
(50) Washer
[51] Shims
(52) Bearing cup
(53) Bearing cone
(54) Layshaft
(55) 3rd driven gear
(56) 4th driven gear

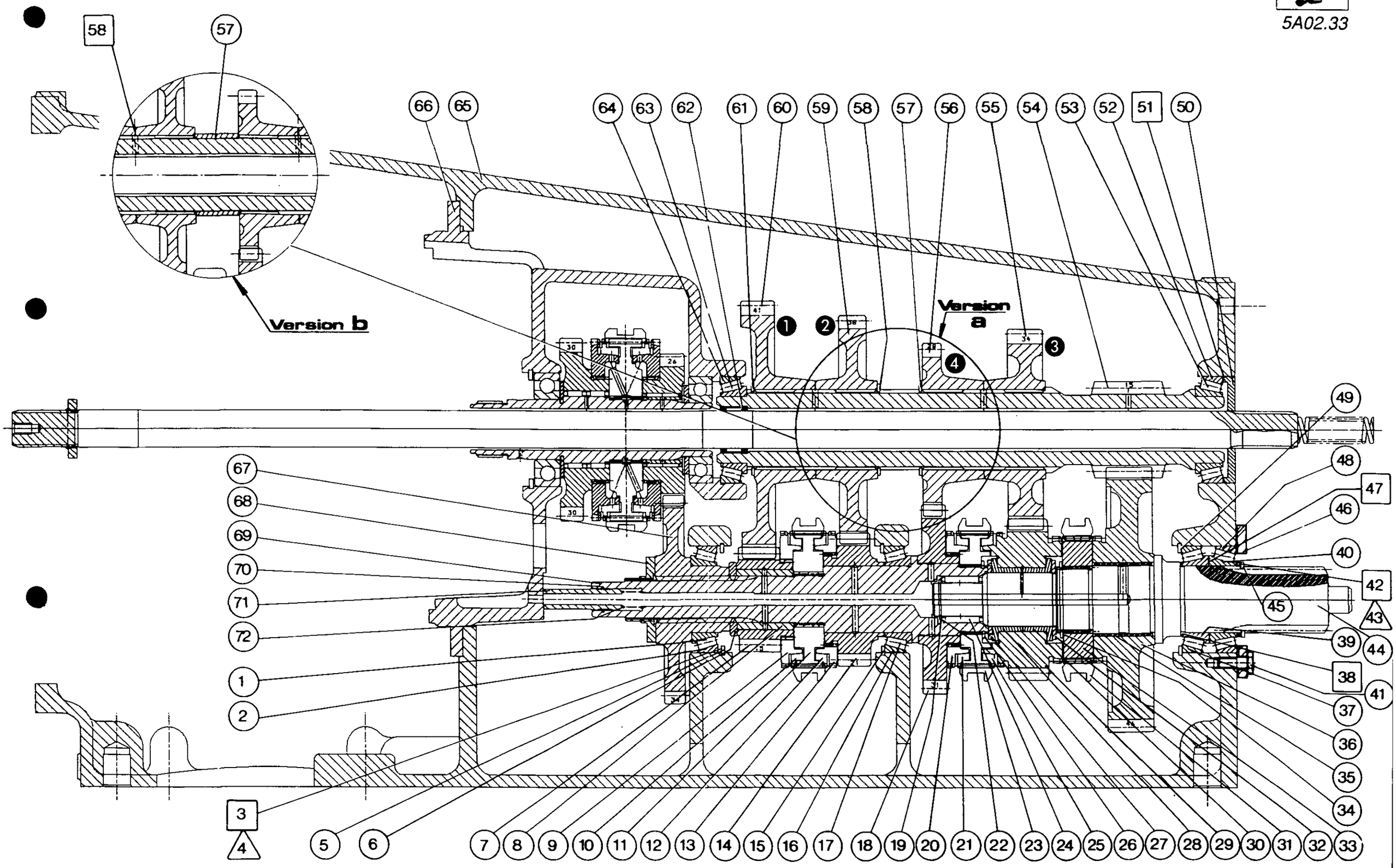
	Version a	**Version b**
(57)	Circlip	Spacer
(58)	Circlip	-
[58]	-	Shim

(59) 2nd driven gear
(60) 1st driven gear
(61) Circlip
(62) Needle roller bearing
(63) Bearing cone
(64) Bearing cup
(65) Gearbox housing
(66) Input shaft housing assembly
(67) Input gear
(68) Nut
(69) Mainshaft
(70) Circlip
(71) Oil feed pipe
(72) Spring

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5 B01 Push-type Clutch (3000)

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Gearbox - Clutch

General

Description

This is a diaphragm push-type clutch. The master cylinder is supplied by the low pressure hydraulic system. Drive to the gearbox is through the disc **(6)** which engages with the splined gearbox input shaft.

Construction

The slave cylinder **(11)** and guide **(17)** are fitted on the front face of the input shaft housing. The release bearing carrier **(9)** moves between the guide **(17)** and the cylinder **(11)**. "Composite" seals **/14** and **/14A** seal the release bearing carrier and the slave cylinder. Seals **/15**, **/15A** and **/16** seal the guide and the release bearing carrier. The clutch release bearing **(19)** is a force fit on the bearing carrier. The self-centring release bearing is sealed. The ball bearing races are sealed and the lubrication is maintained by the grease during rotation.

Operation

Clutch disengagement

Depressing the clutch pedal moves the control rod which in turn operates the piston of a master cylinder. The quantity of oil displaced by this piston passes through the hole drilled in the side of the slave cylinder **(11)** and moves the release bearing carrier **(9)** and release bearing **(19)** assembly forwards. The diaphragm in the clutch cover **(7)** is compressed, releasing pressure on the clutch plate and the disc **(6)** is released.

Clutch engagement

Releasing the clutch pedal causes a drop in pressure in the slave cylinder. The diaphragm pushes the release bearing carrier rearwards and the pressure plate forwards. The disc **(6)** is held between the pressure plate and the engine flywheel and transmits drive to the gearbox input shaft.

Specifications

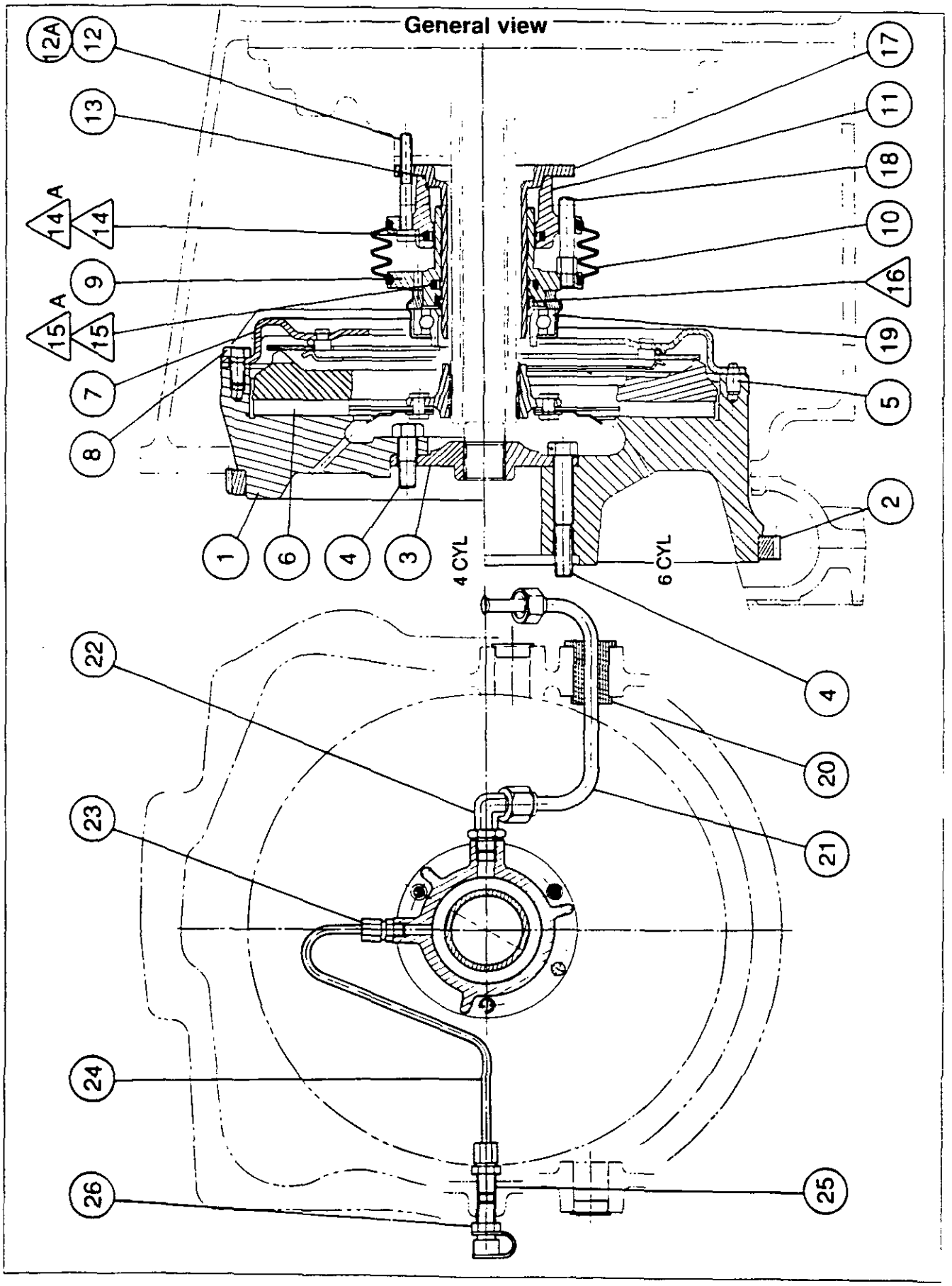
Clutch control	:	Push-type
Plate load	:	1300 kg
Number of vanes	:	6
Type of vane	:	Non-progressive
Disc diameter	:	330 mm
Friction linings	:	Cerametallic

Key to illustrations on pages 3 and 4

(1) Engine flywheel
(2) Flywheel ring gear
(3) PTO shaft drive hub
(4) Engine flywheel attaching bolts
(5) Clutch cover plate dowel pins
(6) Clutch friction disc
(7) Clutch cover plate
(8) Bolts attaching cover plate to flywheel
(9) Clutch release bearing carrier
(10) Rubber boot
(11) Cylinder
(12) Cylinder attaching bolt
(12A) Cylinder attaching bolt
(13) "O" ring
/14 Cylinder oil seal
/14A Cylinder "O" ring
/15 Clutch release bearing carrier seal
/15A Clutch release bearing "O" ring
/16 Scraper ring
(17) Guide
(18) Dowel
(19) Clutch release bearing
(20) Supply pipe grommet
(21) Supply pipe
(22) Cylinder supply 90° union
(23) Cylinder bleed straight union
(24) Bleed pipe
(25) Bleed pipe union
(26) Bleed point

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Gearbox - Clutch



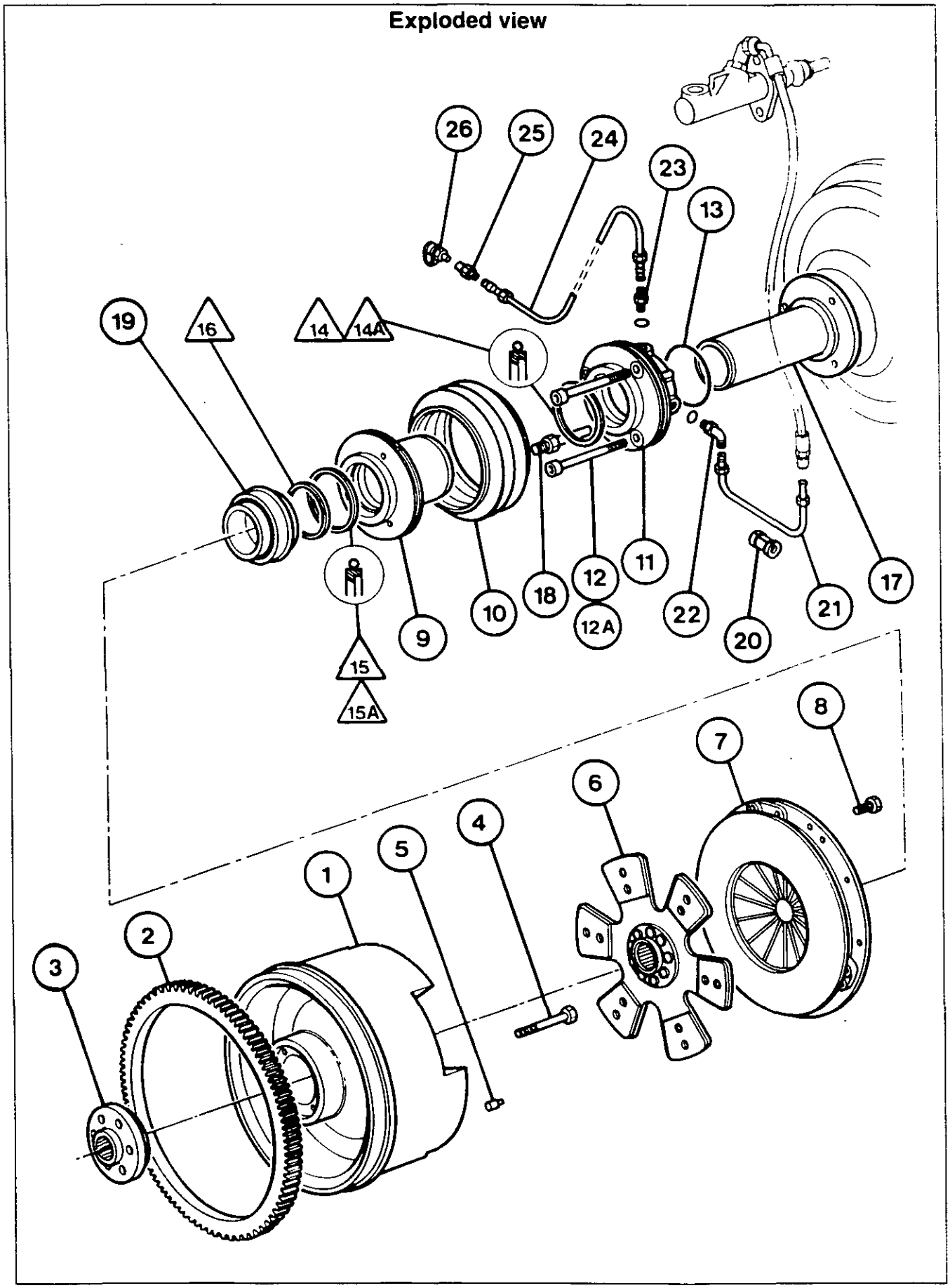
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Gearbox - Clutch

Exploded view



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A. Clutch cover plate

Disassembly

1. Split the tractor between the engine and the gearbox. See Section 3 A01.
2. Locate tool MF 457 (4 cyl Fig.1) - (6 cyl. Fig.2) to retain the cover plate/disc assembly.
3. Gradually slacken the bolts **(8)** attaching the cover plate **(7)** to the engine flywheel **(1)**.
4. Remove the cover plate and the disc **(6)**.
5. Remove the three dowel pins **(5)** on the flywheel.

Reassembly

6. Clean the flywheel with a solvent.
7. Check the flywheel friction surface.
   Note : if the flywheel friction surface is scored it can be skimmed. (See Section B procedure 6).
8. **Lightly** coat the PTO shaft hub splines in the flywheel with Molybdenum disulphide grease.
9. Fit the three dowel pins **(5)**.
10. Using tool MF 457, centre the clutch disc **(6)** on the flywheel. The longest section of the hub must face the diaphragm.
11. Refit the clutch cover plate.
12. Progressively tighten the bolts **(8)** to a torque of:
    50-70 Nm (4 cyl.)
    30-35 Nm (6 cyl.)
13. Withdraw tool MF 457.
14. Refit the gearbox to the engine (section 3 A01).

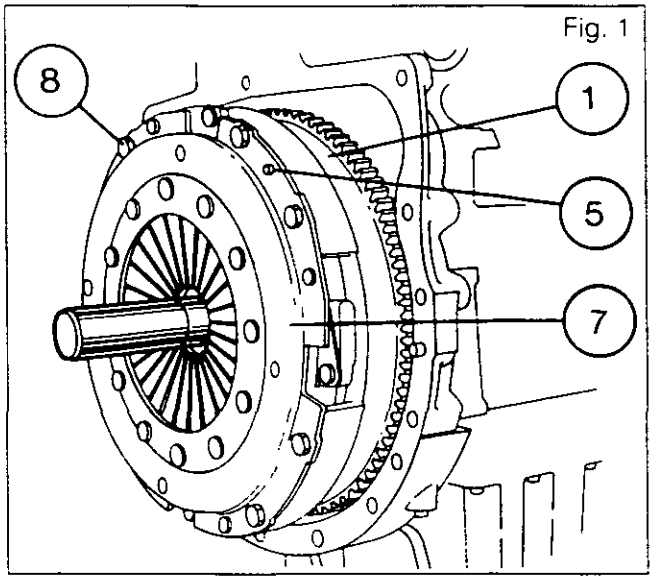


Fig. 1

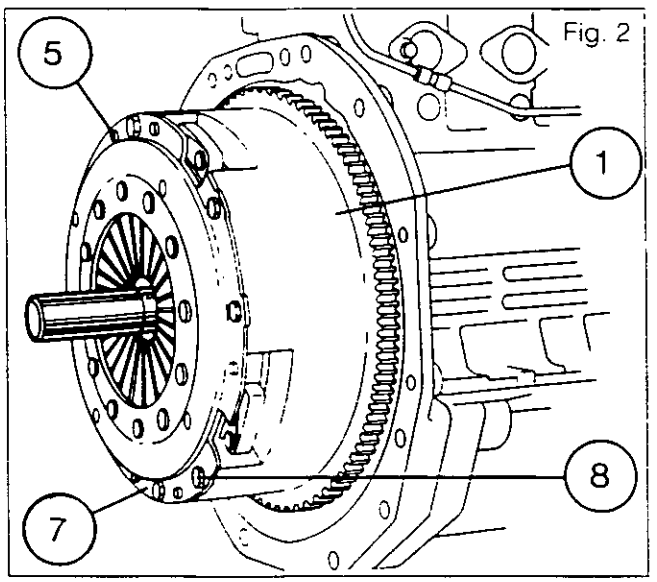


Fig. 2

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B. Engine flywheel

Disassembly

1. Split the tractor between the engine and gearbox (Section 3 A01).
2. Remove the engine clutch (see Section 3 A01). Carry out procedures 2 to 5 in Section A.
3. Immobilize the flywheel **(1)**.
4. Remove the six bolts **(4)** attaching the flywheel to the crankshaft.
5. Remove the flywheel and the PTO shaft hub **(3)**.

Reassembly

6. If the friction surface of the flywheel is scored, it can be skimmed.
   Grind surface **A** as necessary to obtain dimension **X** = 26 mm mini. Surface finish 2.5 microns maximum.
   Measure dimension **Y**, reduce surface **B** to obtain a measurement of 34.1 mm to 34.2 mm (4 cyl. Fig.3) (6 cyl. Fig.4).
   Shorten the three dowel pins **(5)** accordingly.
   Note:
   1) Check that the cover plate attaching bolt holes drilled in the flywheel are the correct depth; if not, drill to the correct depth. After skimming the flywheel clean it with a solvent.
   2) The release bearing PN3384863 M92 (45,5 mm long) is only used as repair part (Fig. 4A). If the flywheel has been skimmed on a tractor equipped with the old bearing (41 mm long) it is mandatory to replace it by the 45,5 mm long bearing.
   Do not fit a 3100 clutch disc if the flywheel has been skimmed.
7. Fit two dowel pins into the flywheel attaching holes.
8. Refit the flywheel and the hub **(3)**.
9. Coat the bolts **(4)** with Loctite 241.
10. Refit the six bolts **(4)** and tighten to a torque of 110-140 Nm (4 and 6 cyl.)
    Release the engine flywheel.
11. Carry out procedures 6 to 13 (Section A).
12. Refit the gearbox to the tractor (Section 3A01)

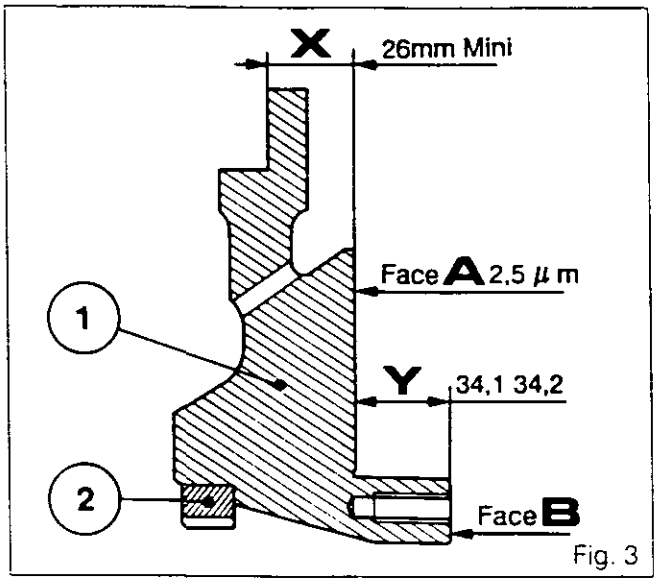


Fig. 3

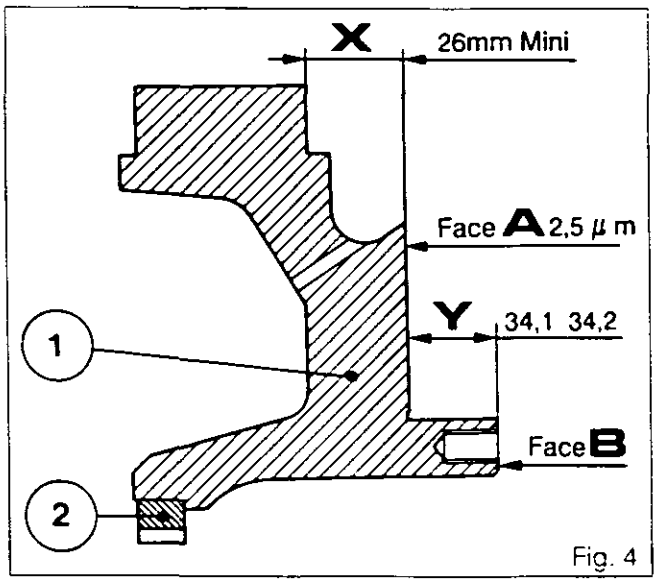


Fig. 4

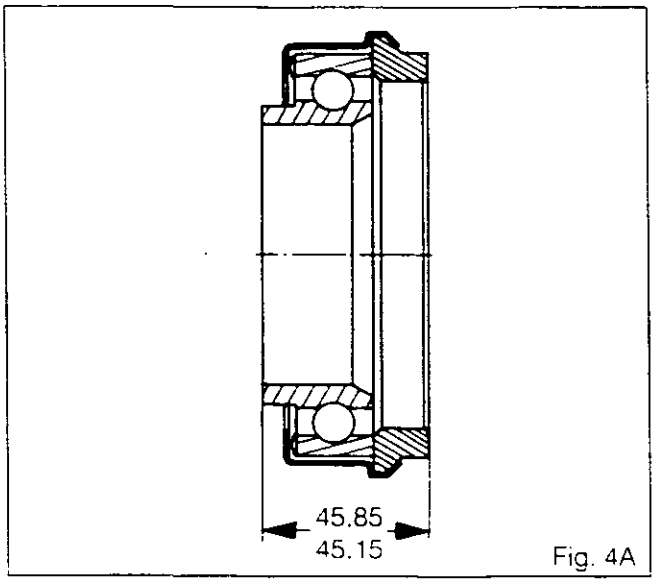


Fig. 4A

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C. Flywheel ring gear replacement

Disassembly

1. Remove the engine flywheel (Section B, procedures 1 to 5).
2. Carry out procedures 2 and 3 (Section 5C01.C).

Reassembly

3. Carry out procedures 4 and 5 (Section 5 C01.C).
4. Refit the engine flywheel (Section B, procedures 7 to 12).

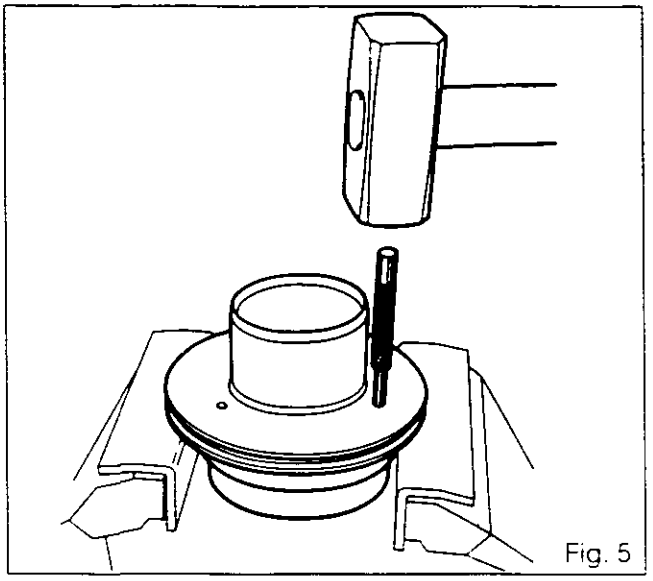


Fig. 5

D. Clutch release bearing

Note: As disassembly of the clutch release bearing entails its removal from the slave cylinder, seal replacement is recommended to avoid the risk of leakage during service. See Section F.

Disassembly

1. Using a suitable drift punch, remove the release bearing through the three holes in the slave cylinder (Fig.5).

Reassembly

2. Using a suitable assembly to support the outer collar, press the release bearing up against the release bearing carrier shoulder (Fig.6).
   Note: Coat the contact surface of the release bearing and carrier with Loctite 270 (Fig.7). Do not put Loctite into the bearing.

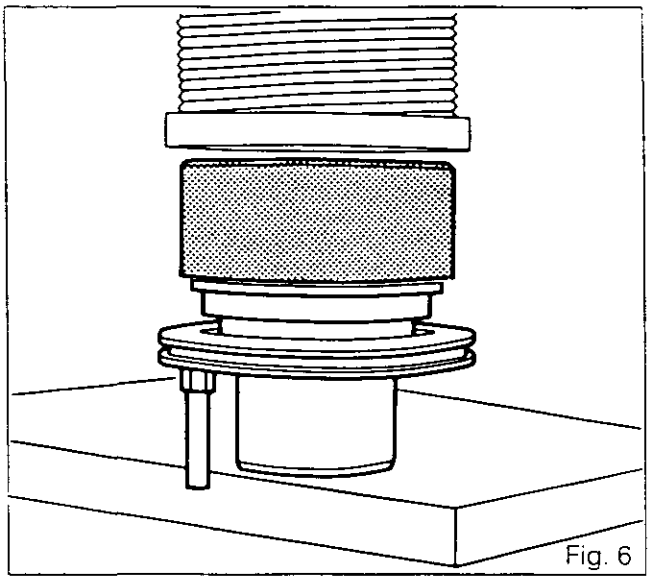


Fig. 6

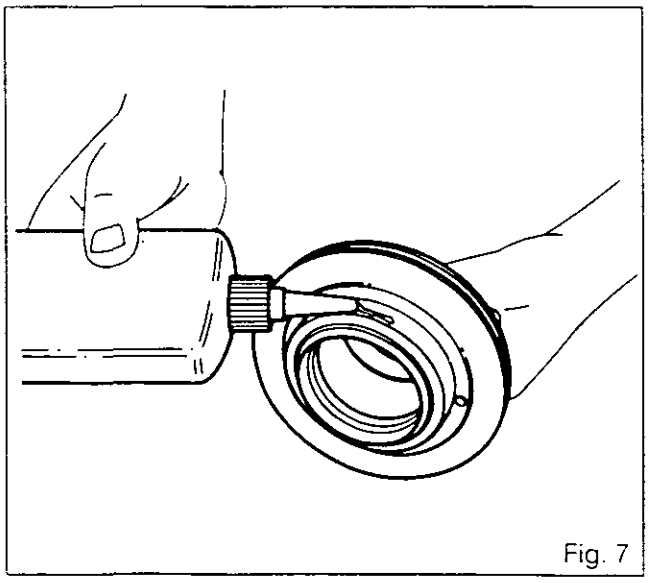


Fig. 7

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E. Hydraulic slave cylinder assembly

Removal

1. Split the tractor between the engine and the gearbox (Section 3 A01).
2. Disconnect the bleed pipe and supply pipe from the slave cylinder assembly.
   Note: To remove the hydraulic slave cylinder assembly complete, do not separate the bearing carrier fully from the cylinder to gain access to the attaching bolts.

Method (Fig.8)

3. Pull the release bearing carrier 40 mm away from the cylinder and remove the boot **(10)**.
4. Using short Allen keys, unscrew the two bolts **(12)** and bolts **(12A)**.

Refitment

5. Coat the bolts with Loctite 241. Fit and tighten the bolts to a torque of:
   8 diam. : 25-35 Nm
   10 diam. : 40-70 Nm
6. Refit the boot **(10)**. Refit the bleed pipe **(24)** and supply pipe **(21)**.
7. Refit the gearbox to the tractor (Section 3 A01).
8. Remove air from the clutch hydraulic control system (see Section G).
   Note: To avoid damage to the release bearing carrier (9) use plastic protective jaws and grip the collar lightly.

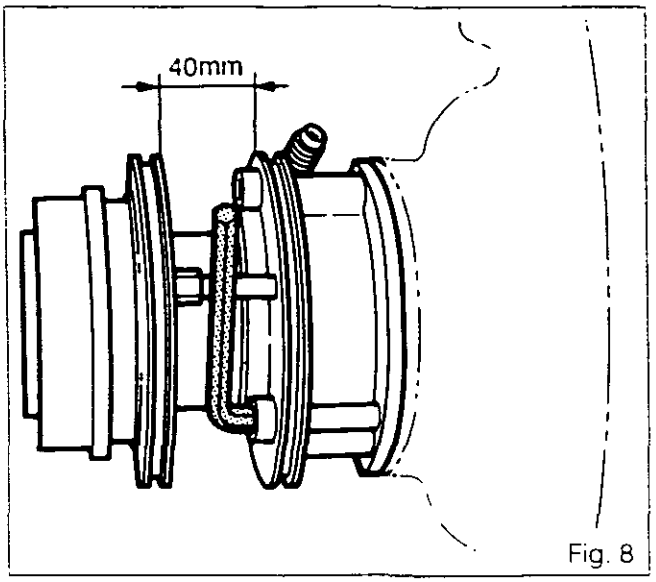


Fig. 8

4. Withdraw the clutch release bearing carrier **(9)** from the slave cylinder **(11)**.
5. Remove the two bolts **(12)** and the bolt **(12A)**.
6. Remove the slave cylinder-guide assembly.
7. Separate the slave cylinder and the guide **(17)**.
8. Remove the "O" ring **(13)**
9. Remove:
   - the elbow union **(22)**,
   - the straight union **(23)**,
10. Remove the rod **(18)**
11. Remove the clutch release bearing (Section D, procedure 1)

Disassembly

12. Remove:
   - **on the release bearing carrier (9)**: the scraper ring **/16**, the seal **/15** and the "O" ring **/15A** (Fig.9).
   - **on the slave cylinder (11)**: the seal **/14** and the "O" ring **/14A** (Fig.10).

   Note: To remove the seals and "O" rings, use a suitably protected screwdriver (Fig.9). The bores and grooves of the parts must be free from scoring and damage.

F. Slave cylinder seal replacement

1. Split the tractor between the engine and the gearbox (Section 3 A01).
2. Disconnect the bleed pipe **(24)** and the supply pipe **(21)**.
3. Remove the rubber boot **(10)**.

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Reassembly of "O" ring /14A\ and bush /14\ in cylinder (Fig.11).

13. *Clean the cylinder* **(11)**.
14. Position the cylinder with the groove facing upwards.
15. Lubricate and fit the "O" ring **/14A** in the groove. Do not twist it.
16. Form the seal **/14** into a heart-shape.
    Important: The lip of the seal must face outwards.
17. Fit the seal **/14** into the groove and push it gradually towards the "O" ring **/14A**.
18. Lubricate the seal and the cylinder bore.
    Note: To ensure seal seated properly, use bearing carrier as a mandril.

Method

Lubricate the release bearing carrier **(9)**
Insert the release bearing carrier **(9)** in the front of the cylinder **(11)** using the tool (Fig.12) (See Section J)
Turn the release bearing carrier approximately one turn in the cylinder to bed in seal.
Remove the release bearing carrier: the seal **/14** is now fitted.

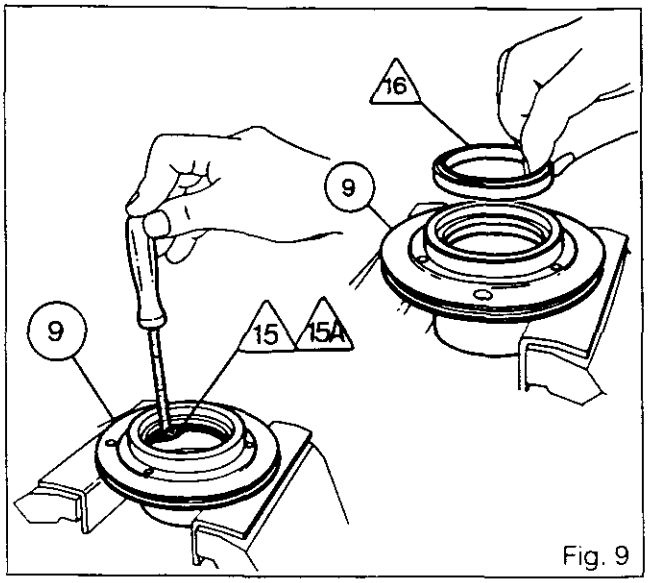


Fig. 9

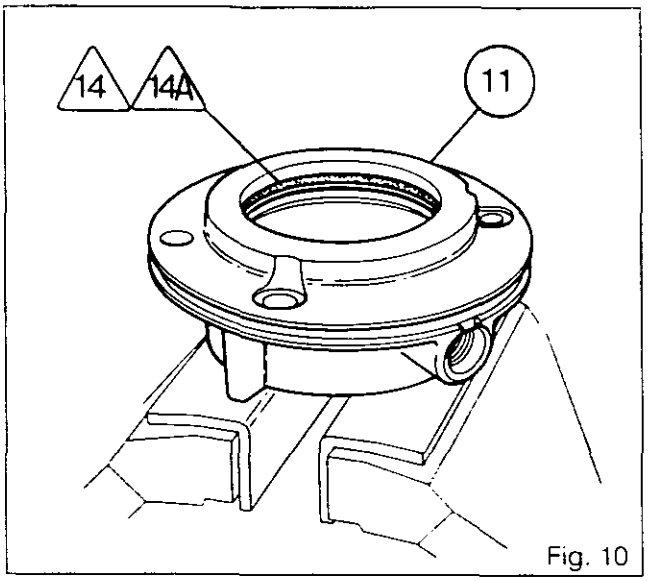


Fig. 10

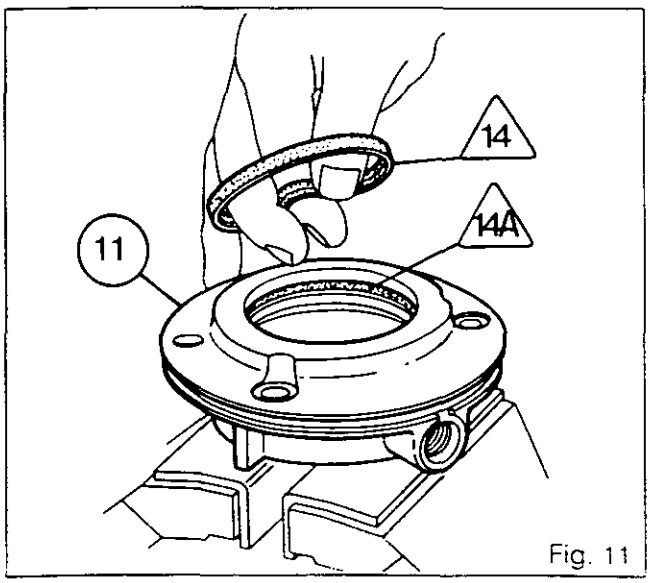


Fig. 11

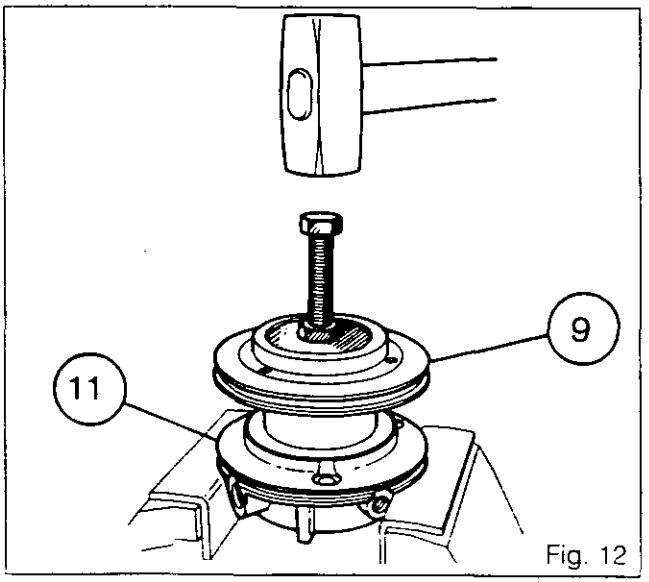


Fig. 12

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Reassembly of "O" ring /15A\ and seal /15\ on release bearing carrier (9).

19. Clean the release bearing carrier.
20. Position the release bearing carrier with the groove facing upwards.
21. Lubricate and fit the "O" ring **/15A** in the groove. Do not twist it (Fig.13).
22. Form the seal **/15** into a heart-shape (Fig.14). ***Important: The lip of the seal /15\ must face outwards.***
23. Fit the seal **/15** into the groove and push it gradually towards the "O" ring **/15A**. ***Note : To ensure seal seated properly, use guide as a mandril.***

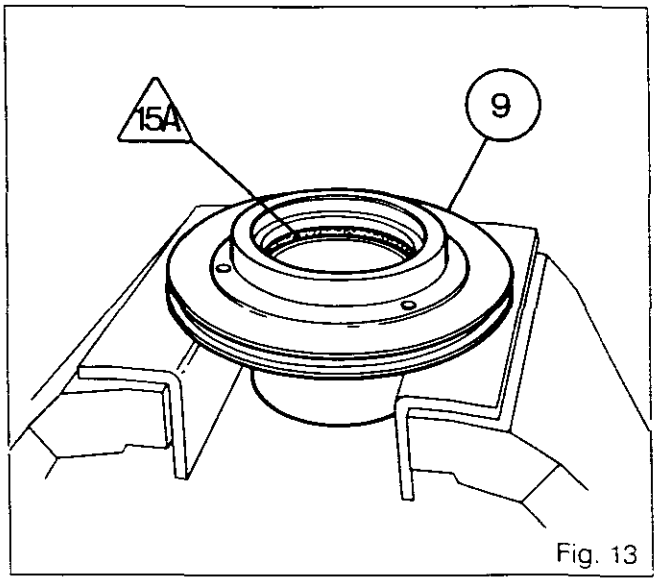


Fig. 13

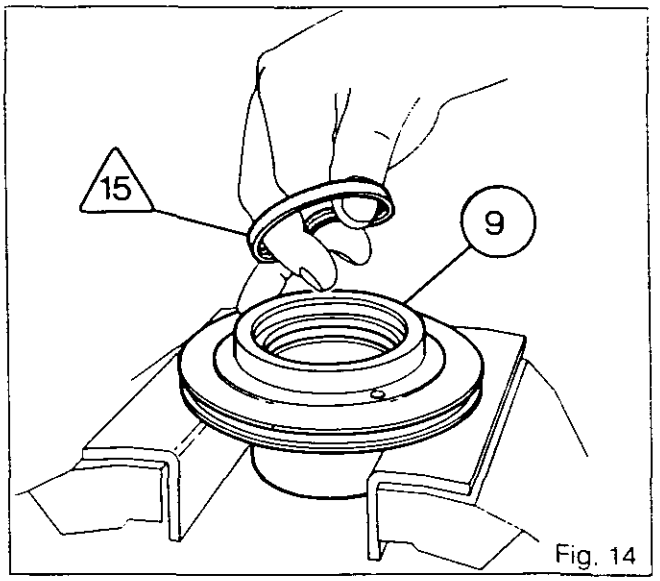


Fig. 14

Method

Lubricate the seal **/15** and the guide **(17)**.
Insert the guide **(17)** into the front of the release bearing carrier **(9)** using the tool shown Fig. 15. (See Section J).
Turn the guide approximately one turn.
Remove the guide. The seal **/15** is now fitted.

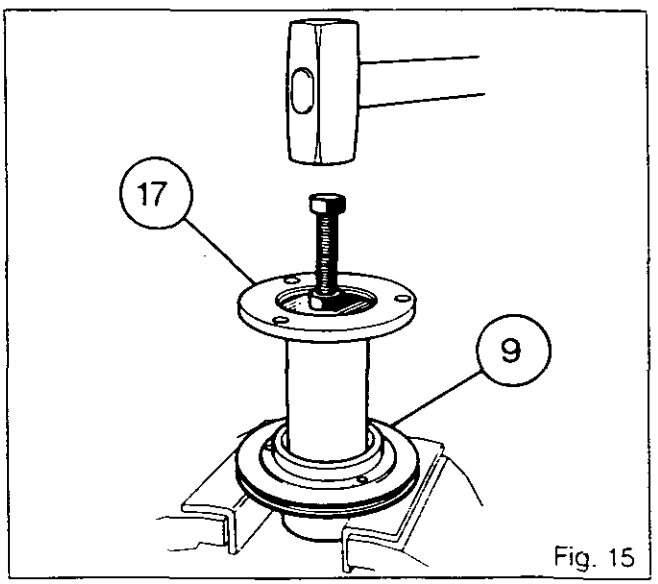


Fig. 15

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24. Using a suitable arrangment to support the bearing carrier, press in the scraper ring /**16**\ (Figs.16 and 17).
25. Fit the release bearing. See procedure 2 (Section D).
26. Lubricate the seal /**15**\, the seal /**16**\ and the release bearing carrier bore.
27. Fit the rod **(18)** after coating it with Loctite 241. Tighten to a torque of 25-35 Nm.
28. Lubricate the guide **(17)**, the seal **(14)** and the release bearing carrier **(9)**.
29. Position the "O" ring **(13)** on the guide.
30. Assemble the cylinder **(11)** with the guide **(17)**.
31. Refit the bolts **(12)** and **(12A)**.
32. Press the release bearing carrier **(9)** into the cylinder **(11)** so as to leave a gap of 40 mm to allow access for the Allen keys to tighten bolts **(12)** and **(12A)** (Fig.8).
33. Screw on the unions **(22)** and **(23)**.
34. Locate the slave cylinder assembly on the Speedshift cover.
35. Coat the bolts **(12)** and **(12A)** with Loctite 241. Using the short Allen keys, tighten to a torque of:
    8 diam. : 25-35 Nm
    10 diam. : 40-70 Nm
36. Fit the boot **(10)**. Refit the bleed pipe **(24)** and supply pipe **(21)**.
37. Refit the gearbox to the tractor. See Section 3 A01.
38. Remove air from the clutch hydraulic control system.

G. Removing air from the clutch hydraulic system

1. Carry out procedures 1 to 5, Section 5 C01.G.

H. Checking piston travel in the slave cylinder

1. Carry out procedures 1 to 3, Section 5 C01.H.

I. Clutch pedal adjustment

Before assembly coat the pins **(3)** and **(4)** with molybdenum disulphide grease.
Coat the threads of the rod **(1)** (Fig.18) with Loctite 542.
Adjust the rod to obtain a pedal travel of 170 mm between the disengaged position (pedal up against the stop **(2)**) and the engaged position.

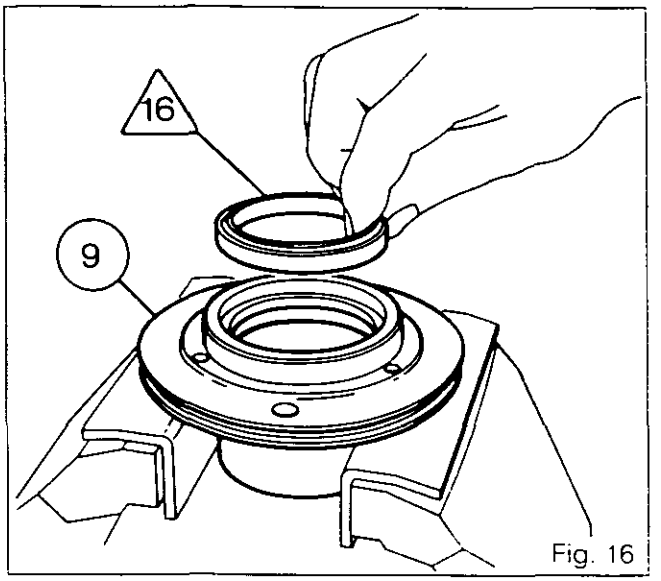


Fig. 16

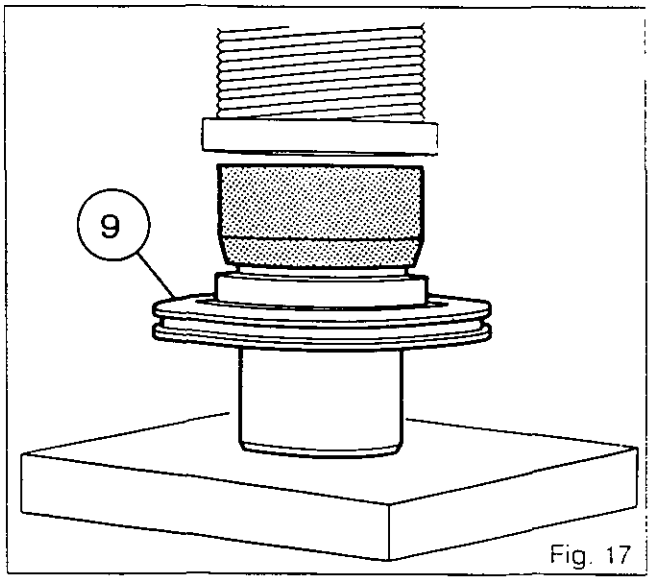


Fig. 17

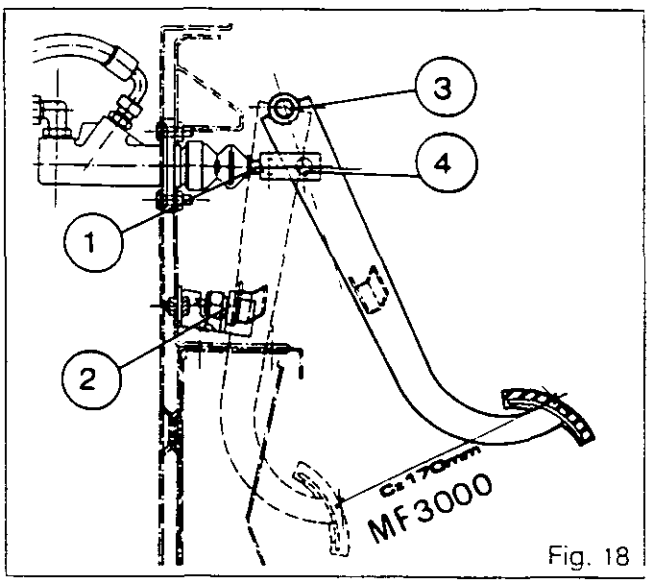


Fig. 18

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5 C01 Pull-type Clutch (3100)

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Gearbox - Clutch

General

Description

This is a diaphragm pull-type clutch. The master cylinder is supplied by the low pressure hydraulic system. Drive to the gearbox is through the disc **(6)** which engages with the splined gearbox input shaft during rotation.

Construction

The slave cylinder **(19)** is fitted on the front face of the input shaft housing. The piston/cylinder assembly is sealed by composite seals /**14**\ and /**16**\ and the slave cylinder guide by rings /**13**\ and /**17**\.

The boot holder **(11)** is screwed on to the end of the piston **(15)** and retains the clutch release bearing carrier **(9)** and clutch release bearing **(23)**. The spring clip **(10)** retains the clutch release bearing carrier **(9)** on the boot holder **(11)**.

The clutch cover plate **(7)** is connected to the release bearing by a circlip fitted on the cover plate and which locates in the groove of the release bearing **(23)**.

Warning: Any operation which requires splitting the tractor between the engine and the gearbox requires removal of the spring clip (10) (see Section 3 A02)

Operation

Clutch disengagement

Depressing the clutch pedal moves the control rod which in turn operates the piston of a master cylinder. The quantity of oil displaced by this piston passes through the lower hole in the slave cylinder **(19)** and moves the piston **(15)** and release bearing **(23)** assembly rearwards. The diaphragm is then compressed and the disc **(6)** is released.

Clutch engagement

Releasing the clutch pedal causes oil to escape from the slave cylinder pressure chamber and the release bearing to return.

The diaphragm is compressed and the disc **(6)** is held against the engine flywheel by the friction plate in the clutch cover **(7)**.

Specifications

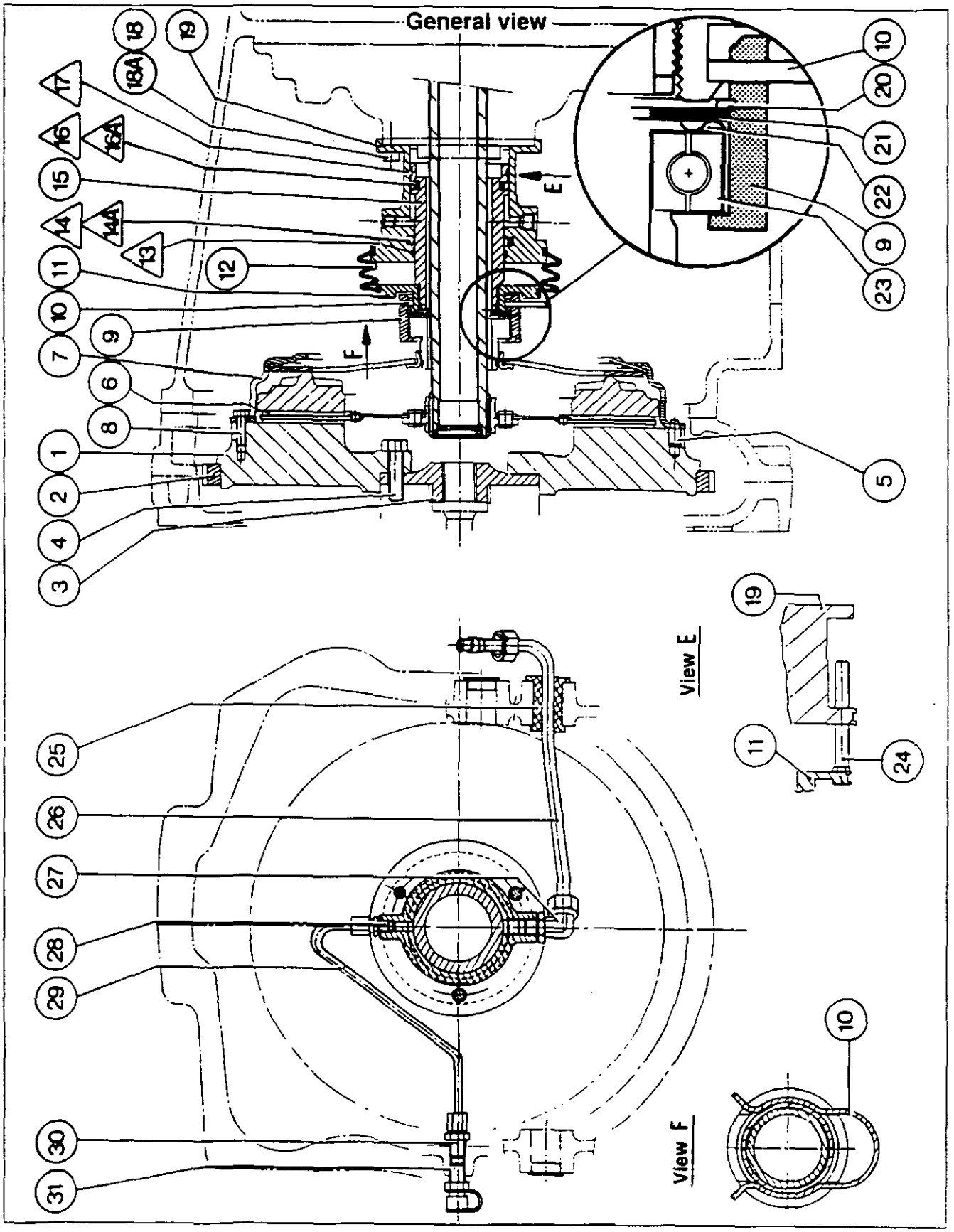
Clutch control type	Pull
Plate load	1300 kg
Number of vanes	7
Type of vane	Progressive
Type of pressure plate	Ventilated
Disc diameter	330 mm
Friction linings	Cerametallic

Key to illustrations

(1)	Engine flywheel
(2)	Flywheel ring gear
(3)	PTO shaft drive hub
(4)	Engine flywheel attaching bolts
(5)	Clutch cover plate dowel pins
(6)	Clutch friction disc
(7)	Clutch cover plate
(8)	Bolts attaching cover plate to flywheel
(9)	Clutch release bearing carrier
(10)	Spring clip
(11)	Rubber boot carrier
(12)	Rubber boot
/**13**\	Clutch slave cylinder guide ring
/**14**\	Clutch slave cylinder seal
/**14A**\	Slave cylinder "O" ring
(15)	Slave cylinder piston
/**16**\	Slave cylinder piston seal
/**16A**\	Slave cylinder piston "O" ring
/**17**\	Slave cylinder piston guide ring
(18)	bolts attaching slave cylinder to gearbox
(18A)	Speedshift housing
(19)	Slave cylinder
(20)	Retaining ring (clutch release bearing)
(21)	Flat washer (clutch release bearing)
(22)	Spring washer (clutch release bearing)
(23)	Clutch release bearing
(24)	Guide pin
(25)	Supply pipe grommet
(26)	Supply pipe
(27)	Cylinder supply elbow connector
(28)	Slave cylinder straight bleed connector
(29)	Bleed pipe
(30)	Bleed pipe union
(31)	Bleed take-off point

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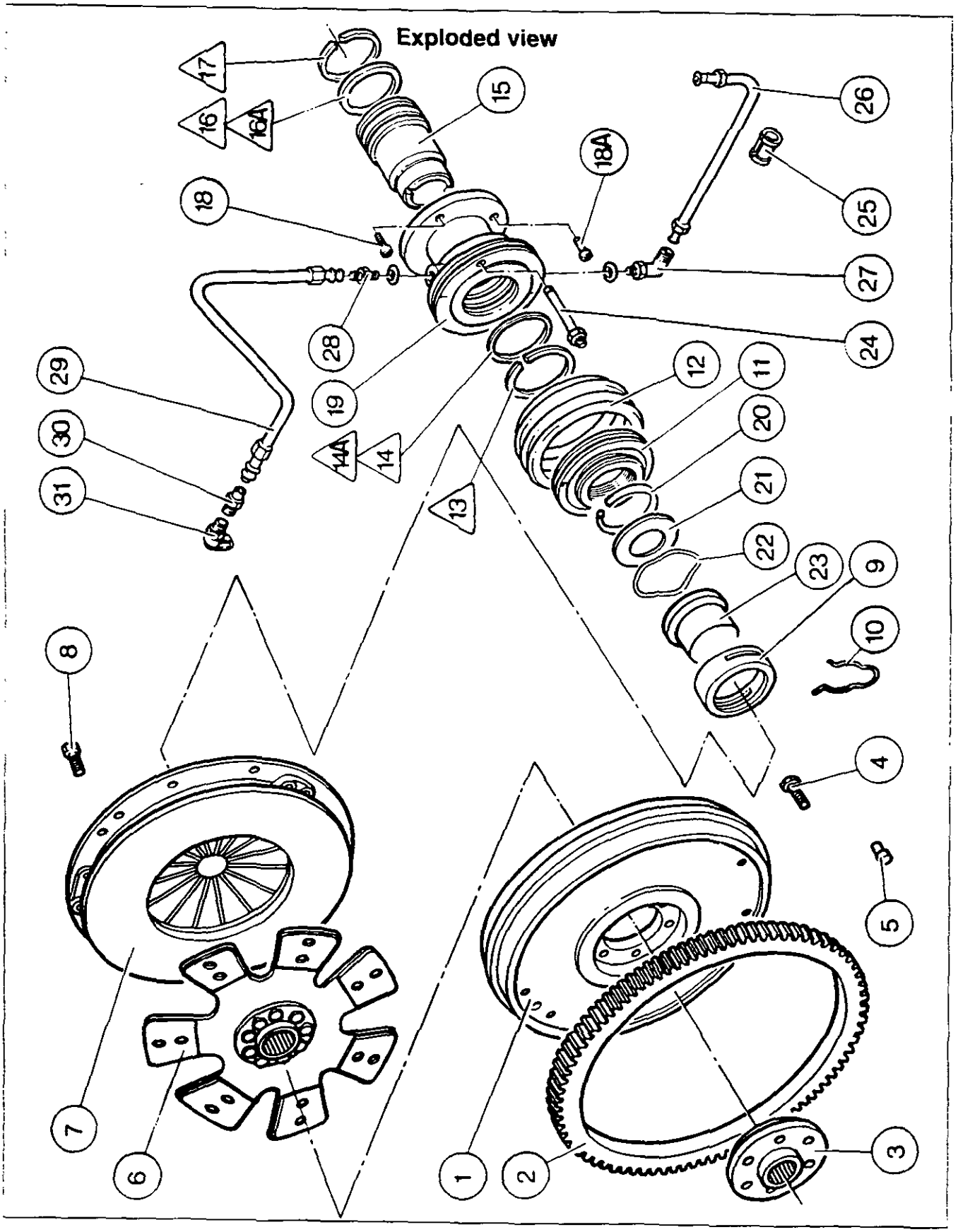
Gearbox - Clutch



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Gearbox - Clutch



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A. Clutch cover plate

Disassembly

1. Split the tractor between the engine and the gearbox. See Section 3 A02.
2. Separate the release bearing carrier from the cover plate **(7)**.
3. Position tool MF 457 to retain the cover plate/disc assembly (Fig.1).
4. Progessively slacken the bolts **(8)** attaching the cover plate **(7)** to the engine flywheel **(1)**.
5. Remove the cover plate **(7)** and the disc **(6)**.
6. Remove the three dowel pins **(5)** on the flywheel **(1)**.

Reassembly

7. Clean the flywheel **(1)** with a solvent.
8. Check the flywheel friction surface.
   Note: If the flywheel friction surface is scored it can be skimmed. (See 5 C01.B procedure 6).
9. Lightly coat the PTO shaft hub splines **(3)** with a molybdenum disulphide grease.
   Fit the three dowel pins **(5)** on the flywheel **(1)**.
10. Using tool MF 457, centre the clutch disc **(6)** on the flywheel. (The longest section of the hub must face the diaphragm). (Fig.1).
11. Refit the clutch cover plate.
12. Progressively tighten the bolts **(8)** to a torque of 25-35 Nm.
13. Withdraw tool MF 457.
14. Refit the gearbox to the engine (see 3 A02).

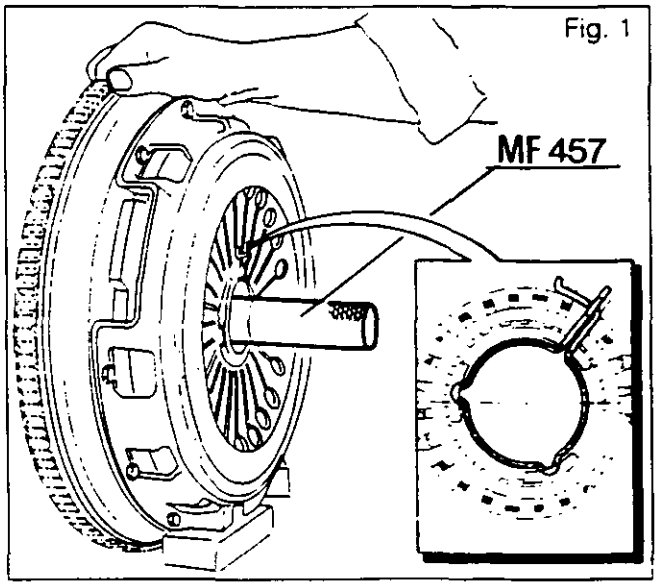


Fig. 1

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B. Engine flywheel

Disassembly (Fig.2)

1. Split the tractor between the engine and gearbox. Section 3A02.
2. Remove the engine clutch, see Section 5 C01A.
3. Immobilize the engine flywheel **(1)**.
4. Remove the six bolts **(4)**.
5. Remove the engine flywheel **(1)** and the hub **(3)**.

Reassembly

6. If the friction surface of the flywheel **(1)** is scored, it can be skimmed ; a maximum of 1.5 mm can be removed. Surface finish 2.5 micrometers maximum. Shorten the dowel pins **(5)** accordingly.
   NOTE: After skimming clean the flywheel with a solvent.
7. Fit two dowel pins into the flywheel attaching holes.
8. Refit the hub **(3)** and the flywheel **(1)**.
9. Clean the bolts **(4)** and coat them with Loctite 241.
10. Refit bolts **(4)** and immobilize the flywheel. Tighten to a torque of 110-140 Nm.
11. Carry out procedures 1 and 2 in reverse.

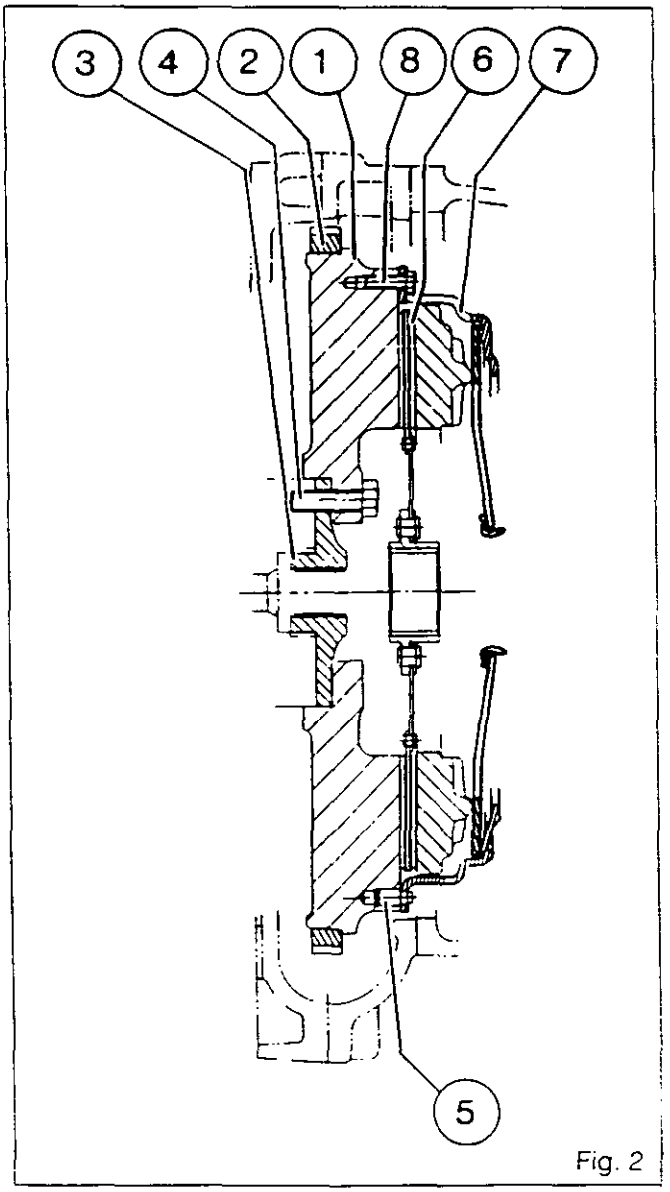


Fig. 2

C. Flywheel ring gear replacement

Disassembly

1. Remove the flywheel, see 5 C01.B.
2. Drill a 5 mm diameter hole in the ring gear halfway between the inner diameter of the ring **(2)** and the bottom of any tooth to a depth of 16 mm (Fig. 3).
3. Place a cold chisel in the space above the hole and split the ring gear.
   Important: Wear protective equipment when removing the ring gear to avoid flying metal particles.

Reassembly

4. Heat a new ring gear to 245°C in an oven. Do not use a blow torch or any other naked flame.
5. Fit the ring gear **(2)** on to the flywheel **(1)** with the chamfered lead on the teeth pointing towards the front (engine side) of the flywheel. Push the ring gear quickly into position. Allow the ring to cool slowly
6. Refit the flywheel.

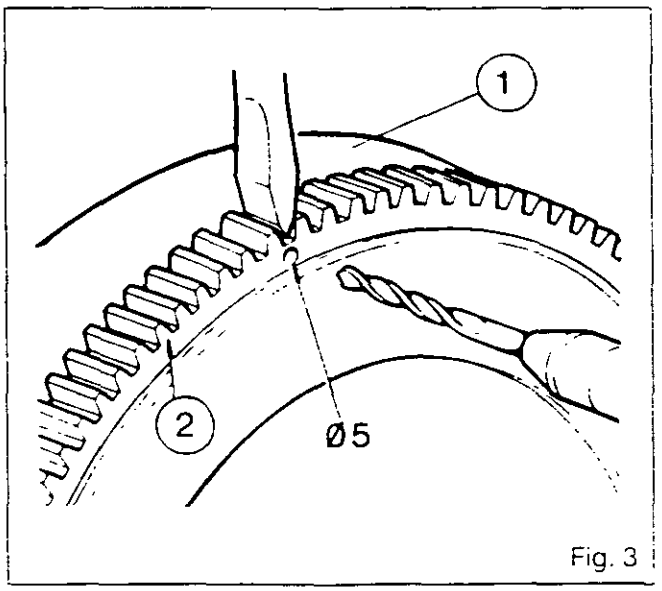


Fig. 3

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D. Clutch release bearing

Disassembly

1. Split the tractor between the engine and the gearbox. Operation 3 A02.
2. Release the carrier from the clutch cover plate.
3. Grip the tool (Fig. 4) made up locally (see Section J) in a vice. Locate the release bearing carrier on the tool.
4. Screw up the nut on the tool to compress the spring washer **(22)**.
5. Press the circlip **(20)** near the centre with a small screwdriver.
6. (Fig.5) Press on the carrier **(9)** and remove the circlip **(20)**.
7. Remove the washer **(21)**, the spring washer **(22)** and the release bearing **(23)** from the carrier.

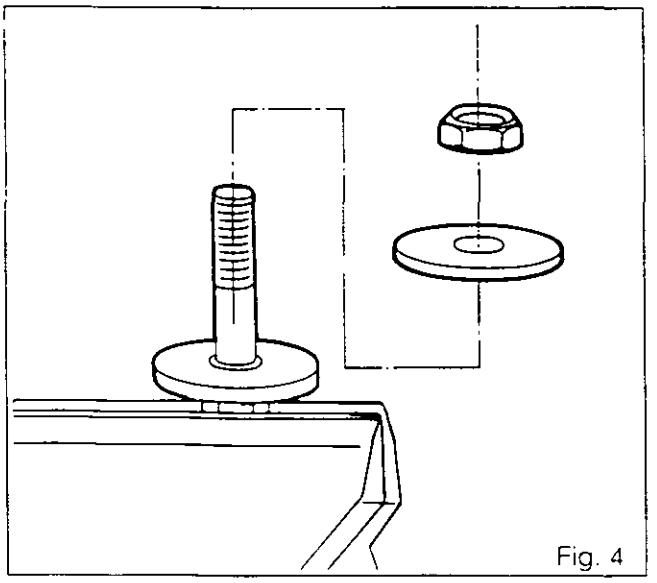


Fig. 4

Reassembly

8. Carry out procedures 3, 7 and 4.
9. Locate the circlip **(20)** in the groove of the carrier **(9)** and **ensure that it is correctly located.**
10. Check the radial clearance of the release bearing **(23)** in the housing of the carrier **(9)**.(Fig.6)
11. Refit the gearbox to the tractor. Section 3 A02.

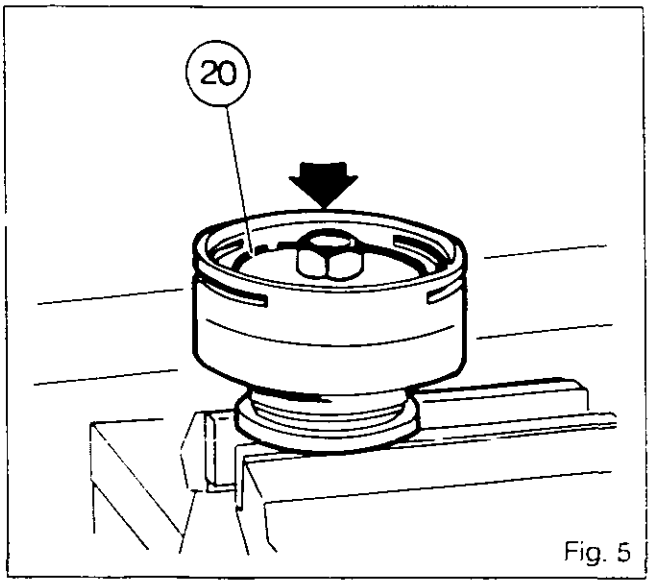


Fig. 5

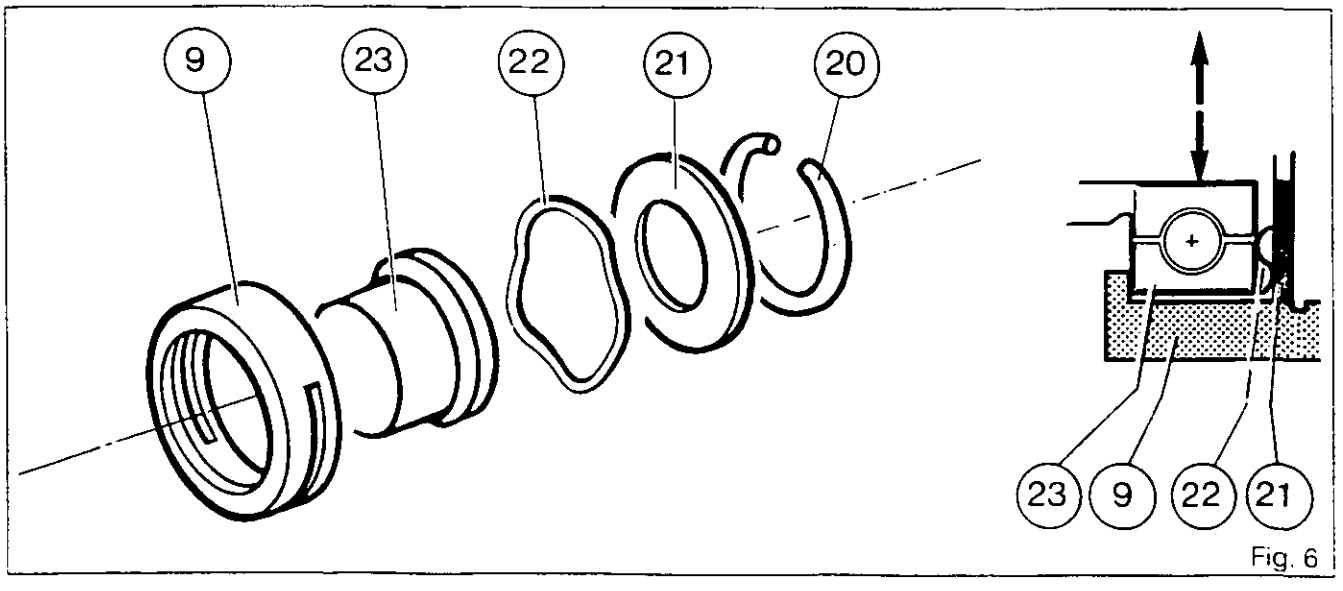


Fig. 6

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E. Hydraulic slave cylinder assembly

Removal

1. Split the tractor between the engine and the gearbox. Section 3 A02.
2. Disconnect
   - the supply pipe **(26)** (plug the pipe),
   - the bleed pipe **(29)**
3. Remove the two bolts **(18)** and the bolt **(18A)**.
4. Remove the slave cylinder assembly.

Refitment

5. Clean the threads of the slave cylinder attaching holes.
6. Position the slave cylinder assembly on the gearbox cover.
7. Clean the two bolts **(18)** and the bolt **(18A)** and coat them with Loctite 241.
8. Refit bolts **(18)** and **(18A)** and tighten to the torque:
   - 8 diam. : 25-35 Nm
   - 10 diam. : 50-70 Nm
9. Reconnect pipes **(26)** and **(29)**.
10. Clean the clutch housing with a solvent.
11. Refit the gearbox to the tractor. Section 3 A02.
12. Remove air from the clutch hydraulic control system (see Section 5 C01.G).

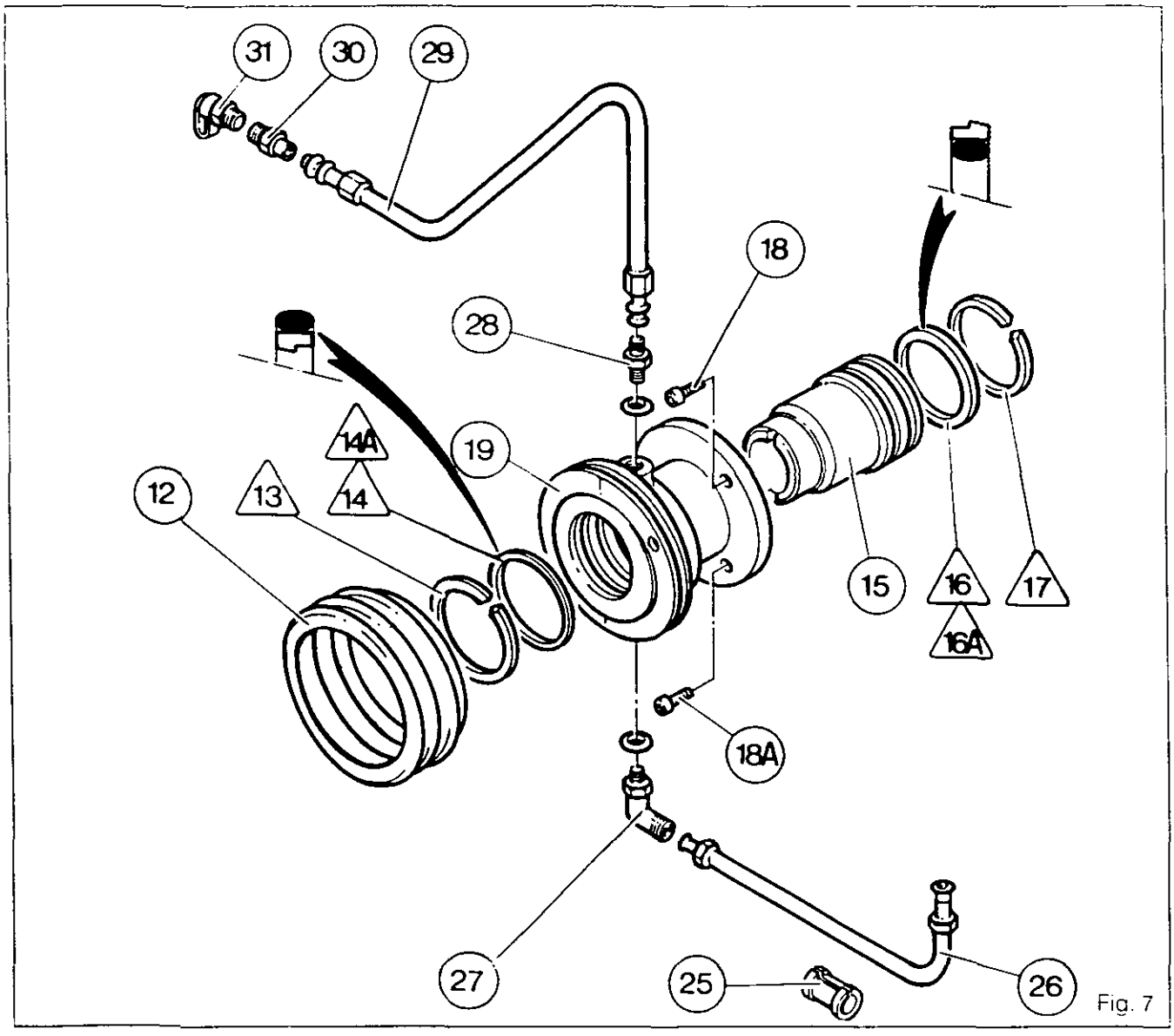


Fig. 7

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F . Slave cylinder seal replacement

1. Split the tractor between the engine and the gearbox. Section 3 A02.
2. Remove the clutch hydraulic slave cylinder. Section 5 C01.E.
3. Remove the rubber boot **(12)**.
4. Remove :
   - the elbow union **(27)**,
   - the straight union **(28)**,
   - the guide pin **(24)** on the boot carrier **(11)**,
   - the boot carrier **(11)** using the locally made-up tools shown in Figs.8 and 9 (see section J)
5. Remove the guide pin **(24)**.
6. Withdraw the piston **(15)** from the cylinder **(19)**.

Disassembly

7. Remove the piston seals **/16** - **/16A** and the ring **/17**.
   Remove the cylinder seals **/14** and **/14A** and ring **/13**.
   Note : 1) To remove the seals, use a suitably protected screwdriver (Fig.10).
   2) The bores and grooves of the parts must be free from scoring and damage.

Reassembly

Reassembly of "O" ring /14A\ and bush /14\ in cylinder :

8. Clean the cylinder **(19)**.
9. Position the cylinder with the grooves facing upwards.
10. Lubricate and fit the "O" ring **/14A** in the deepest groove. Do not twist it. (Fig. 11)
11. Compress the seal **/14** into a heart-shape (Fig.11)
    Important: The lip of the seal /14\ must face outwards.
12. Fit the seal **/14** into the groove and push it gradually towards the "O" ring **/14A**.
13. Lubricate the seal **/14** and the bore of the cylinder **(19)**.
14. ***Important: To ensure seal seated properly, use piston /15\ as a mandril.***

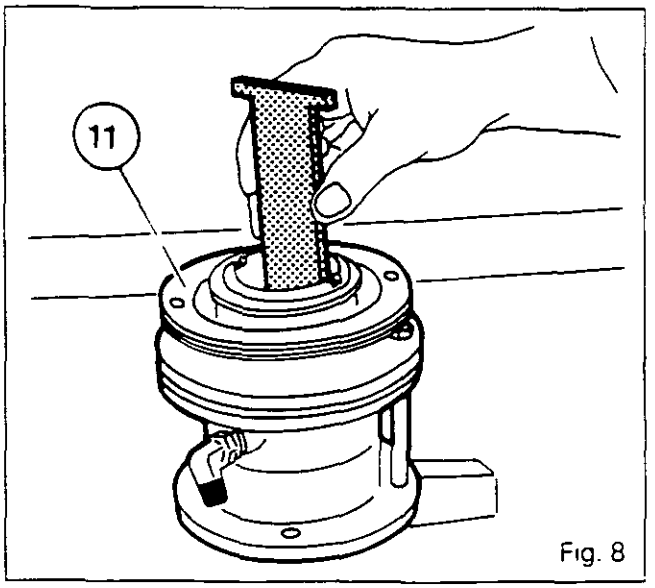


Fig. 8

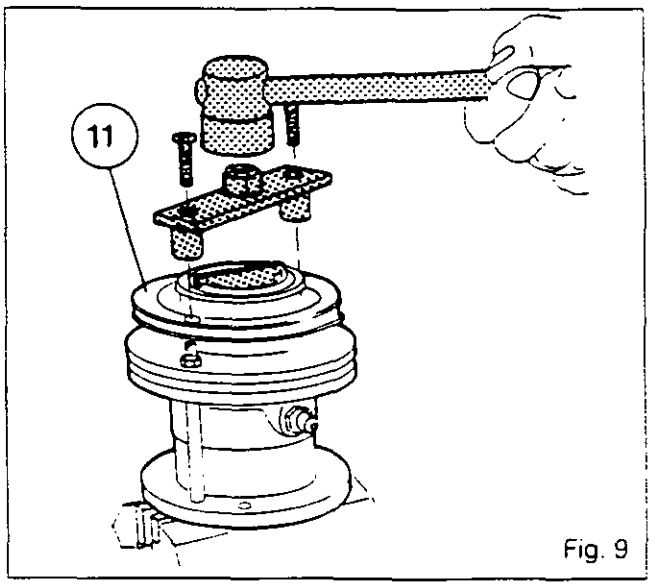


Fig. 9

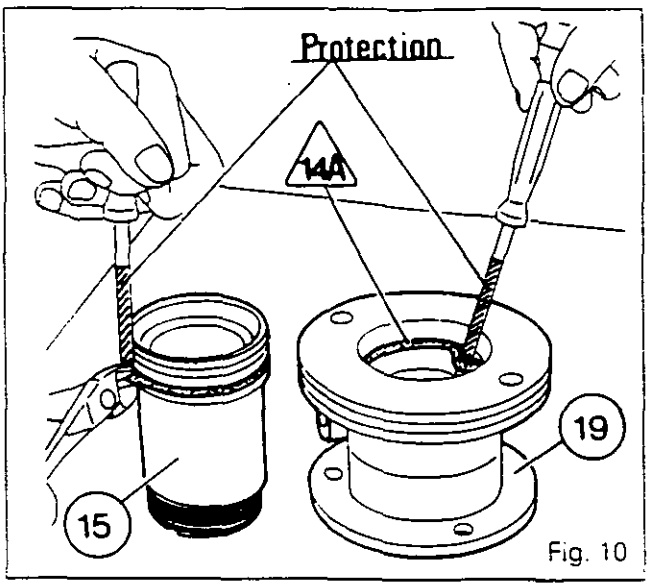


Fig. 10

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To fit seal /14\

Protect the threaded part of the piston **(15)** (Fig.11).
Locate the piston in the cylinder (the threaded portion of the piston **(15)** facing the front of the cylinder **(19)**).
Centre the piston and introduce it into the cylinder using the fitting tool Fig.12 (See Section J).
Turn the piston approximately one turn in the cylinder.
Remove the piston **(15)**. The seal **/14** is now fitted.

Reassembly of "O" ring and seal on piston

15. Clean the piston **(15)**.
16. Fit the seal **/16** on the small diameter of the piston. ***Important: The lip of the seal /16\ must face outwards.***
17. Place the piston (with the groove facing you) on a pipe gripped in a vice. Immobilise the piston (Fig.13).
18. Lubricate and fit the oil seal **/16A** in the deepest groove. Do not twist it.
19. Work the seal **/16** gradually into the groove using two lengths of tape (Fig.13).
20. ***Important: To ensure seal seated properly use cylinder (19) as a mandril.***
21. Fit the guide ring **/13** into the cylinder. Ensure that it is correctly seated in the groove. (Clearance 2 - 5 mm).

To fit seal /16\

Fit the seal using the torsion bar and tool 3376804 M1 (Fig.14).
Lubricate the seal and the piston **(15)**.
Insert the piston **(15)** into the cylinder **(19)** using the tool shown in Fig.15. Turn the piston approximately one turn.
Remove the piston **(15)**. The seal **/16** is now fitted.

22. Make the guide ring **/13** round. Lightly grease the two ends (Use grease made by Under Technical Socilt) WITCO 76320 Saint Pierre des Elfes).
Note: To reduce friction on the guide ring /13\, its contact surface with the piston has been milled from serial no. R023005. The milled surface MUST face the piston.

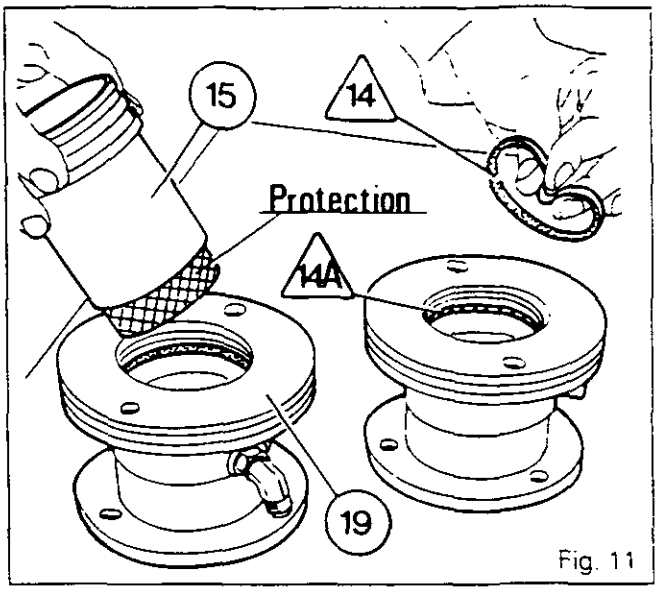


Fig. 11

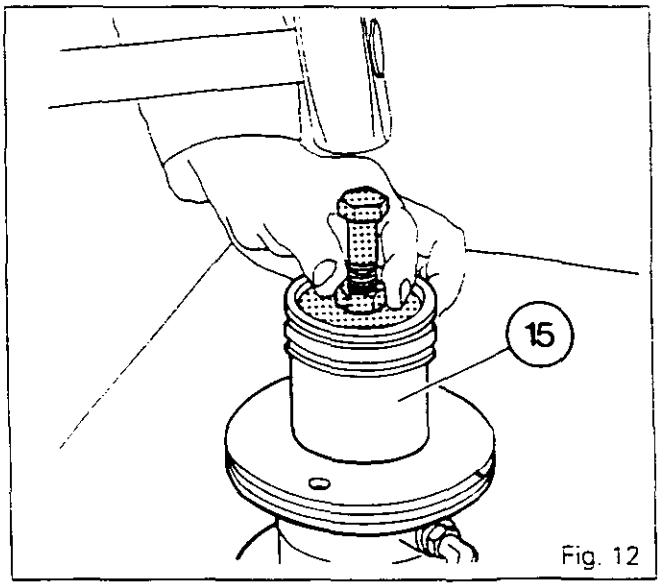


Fig. 12

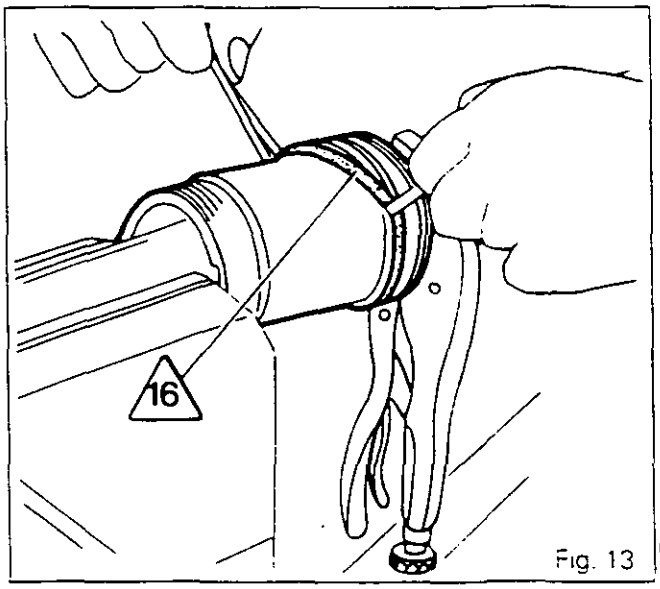


Fig. 13

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23. Lubricate the cylinder bore, the piston, the seals **/14**, **/16** and guide ring **/13\.**
24. Place the assembly in a vice.
25. Push the piston approximately 10 mm into the cylinder using the tool (Fig.16)
26. Make the long guide ring **/17** round. Lightly grease the two ends (Use grease «Amber technical» made by WITCO. co 76320 Saint Pierre des Elfes France) or equivalent miscible grease.
    Note: To reduce friction on the guide ring /17\, its contact surface with the piston has been milled from serial no. R023005. The milled surface MUST face the piston.
27. Fit the guide ring into the piston groove manually. (Clearance 2 to 5 mm).
28. Complete the assembly of the piston into the cylinder using the tool (Fig.17).
29. Clean and refit the guide pin **(24)**.
30. Clean the thread of the boot carrier **(11)** and of the piston **(15)**. Apply Loctite 542 to the boot carrier and tighten it on the piston using the tools (Figs.8 and 9)
31. Line up one of the threaded holes in the boot carrier with the rod **(24)**.
32. Coat the rod **(24)** with Loctite 241 and tighten to a torque of 25-35 Nm.
33. Tighten the unions **(27)** and **(28)**.
34. Carry out procedures 2 and 3 in reverse.
35. Refit the gearbox to the tractor, operation 3 AO2.
36. Remove air from the clutch hydraulic system. See Section G.

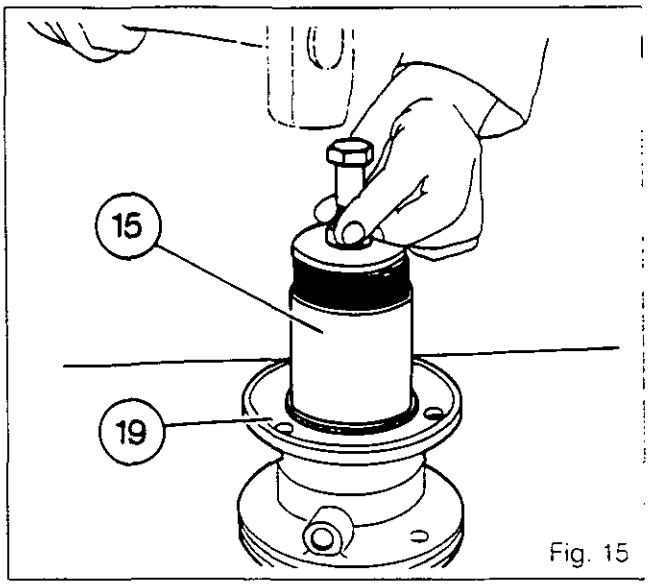
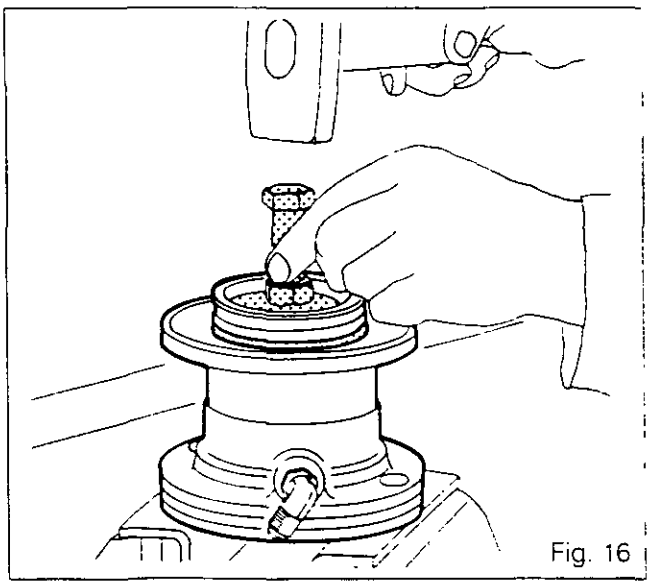
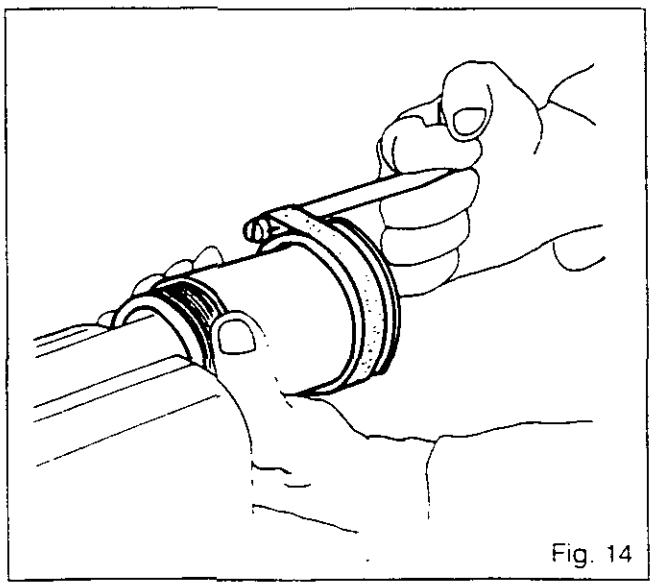
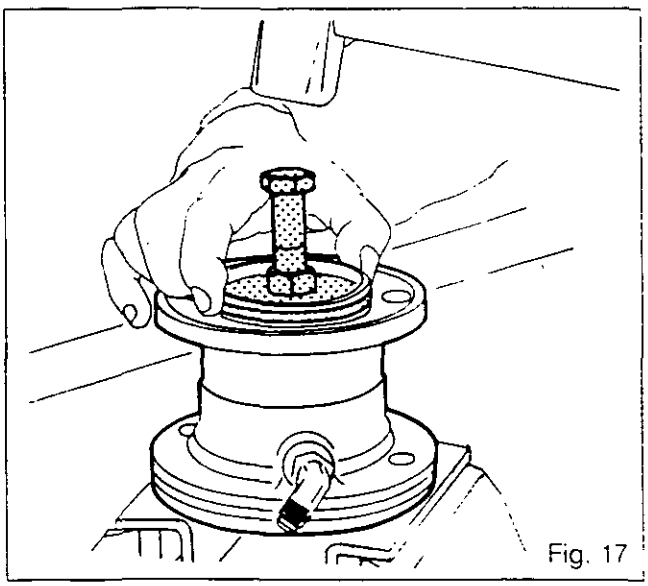


Fig. 15


Fig. 16


Fig. 14


Fig. 17

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G. Removing air from the clutch hydraulic system

1. Run the engine at approximately 1200 r.p.m and restrict the return hose **(1)** Fig. 18 with suitably protected pliers or clamp.
2. Connect the union 3582045 M1 **(1)** together with its hose (Fig.19) to the bleed point (RH side of gearbox).
3. Immerse the end of the hose into a receptacle partly filled with transmission oil.
4. Operate the clutch pedal. Repeat the action several times until oil free of air bubbles comes out of the hose.
5. Remove the union 3582045 M1 and release the return hose.

NOTE: On this type of clutch, pedal travel is taken up automatically.

However, if the clutch does not operate correctly, repeat the air removal procedure. If the problem persists, refer to Section H.

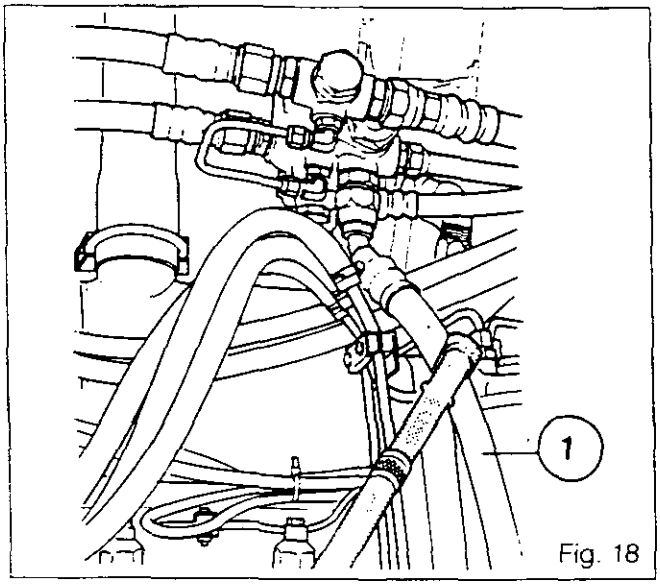


Fig. 18

H. Checking piston travel in the slave cylinder

1. Disconnect the two hoses supplying the front differential lock (4WD) and plug the connections.
2. Remove the guard and the 4WD transmission shaft.
3. Remove the inspection plate.
   Switch off the engine. Using a pair of dividers, measure the distance between the slave cylinder **(19)** and the boot carrier **(11)**
   Fully depress the clutch pedal. Measure the distance again.
   The difference between the two measurements (travel) must be 8-10 mm.

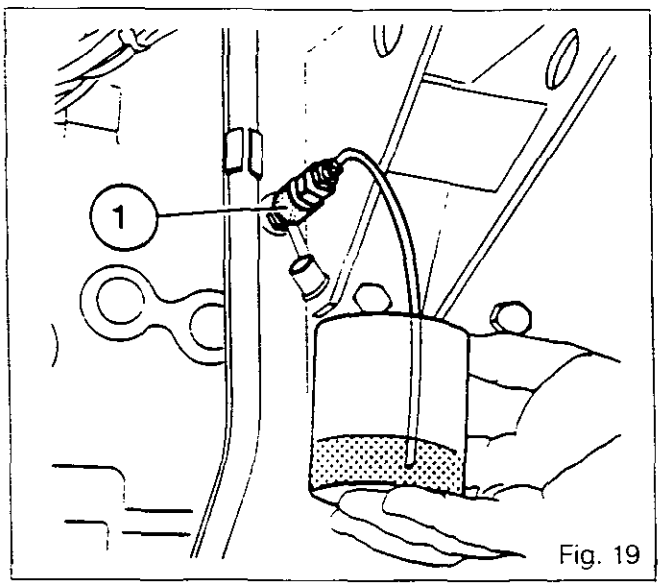


Fig. 19

I. Clutch pedal adjustment

Before assembly coat the pins **(3)** and **(4)** with molybdenum disulphide grease.
Coat the threads of the rod **(1)** (Fig.20) with Loctite 542.
Adjust the rod to obtain a pedal travel of 200 mm between the disengaged position (pedal against the stop **(2)**) and the engaged position.

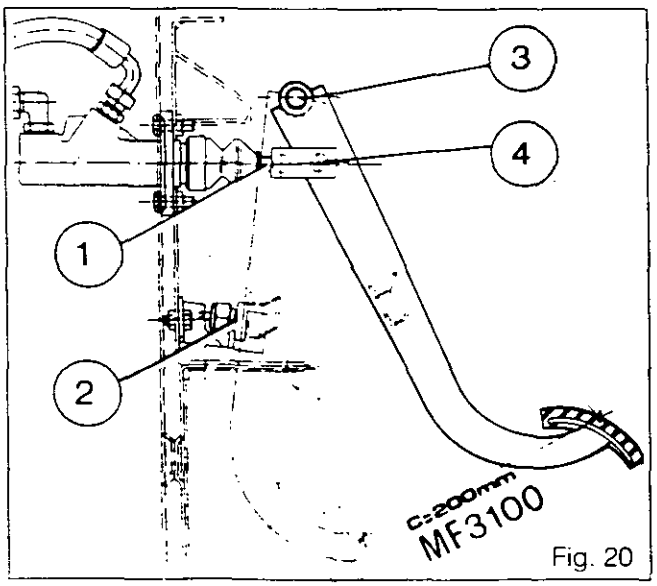


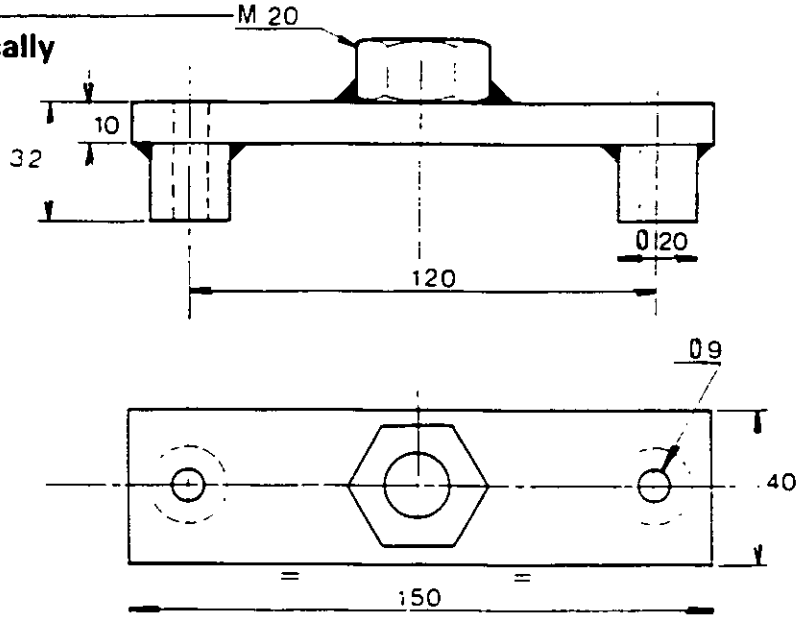
Fig. 20

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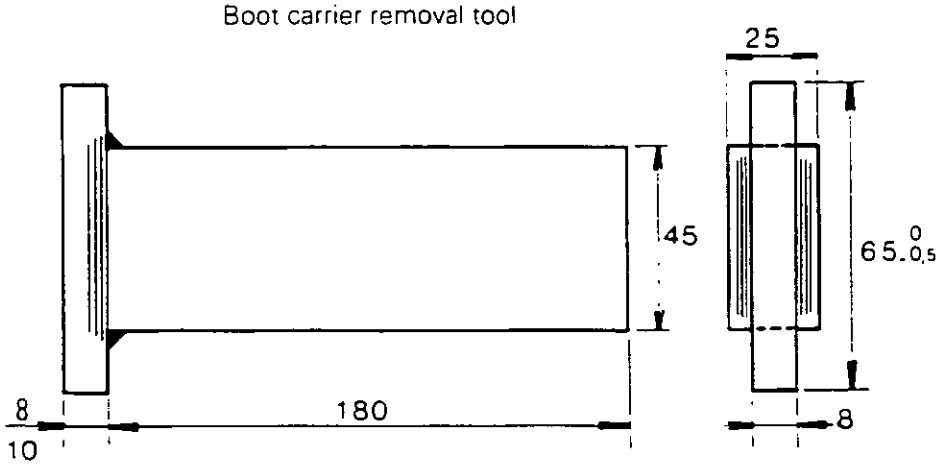
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J. Service Tools

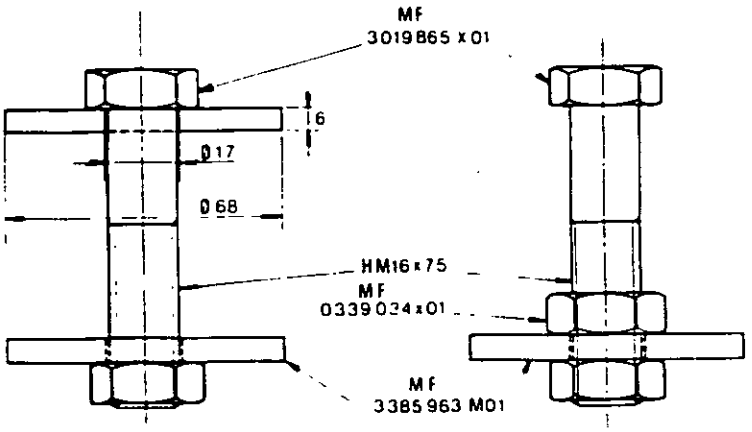
1. Tools to be made up locally



Boot carrier removal tool



Piston retaining tool



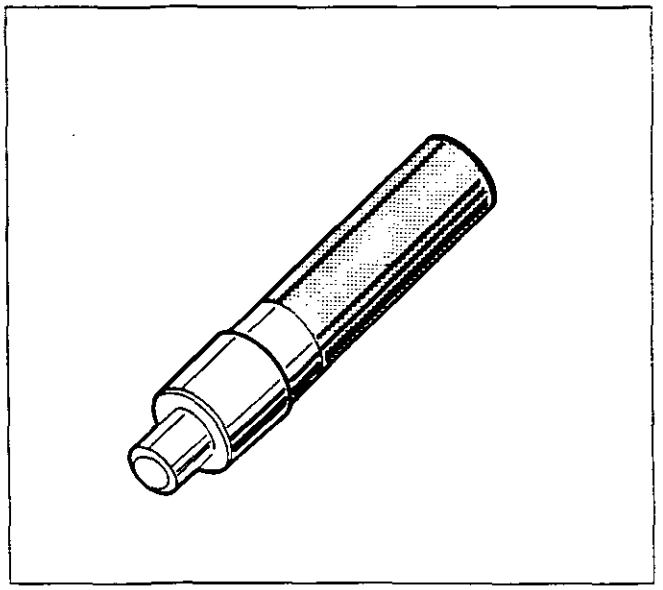
Piston fitting and spring washer compression tool

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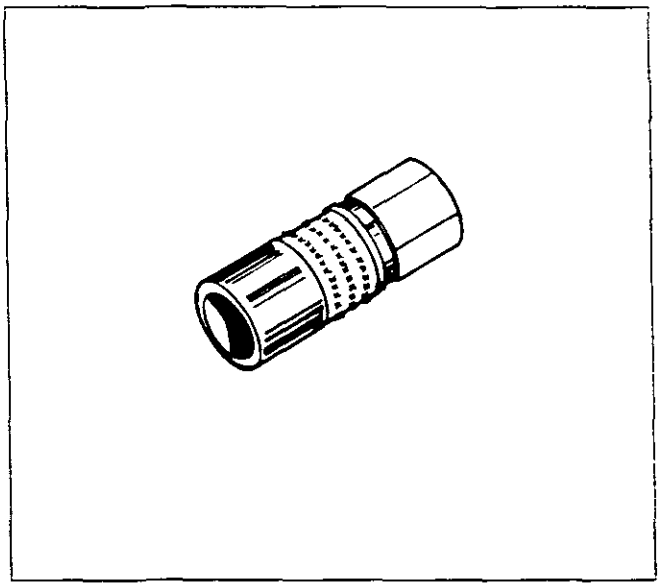
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2. Tools supplied by M-F.

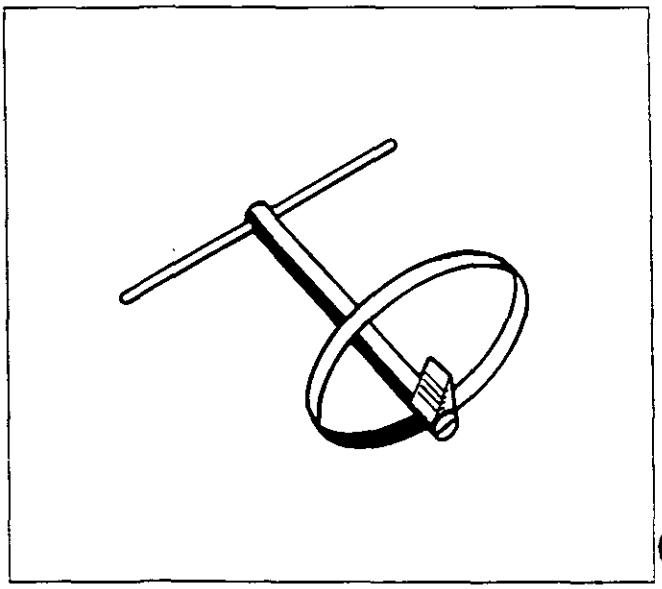
MF 457
Clutch centraliser



3582045 M1
Hydraulic connector (coupler)



3376804 M1
Oil seal calibrating tool



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5 D01 Selector rail and forks

CONTENTS

. General ____ 2

A. Creeper gear fork ____ 2

B. Hare/Tortoise range fork - Mechanical lock assembly - 1st/2nd - 3rd/4th forks - Selector rail ____ 6

C. A/B range fork ____ 7

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Gearbox - Selector rail and forks

General

The selector rail **(7)** which supports the various forks and the latch assembly is located on the RH side of the gearbox on the selector cover side. It crosses the gearbox housing and the Hare/Tortoise range control piston **(13)**. It is held in place by a setscrew **(8)**. A plug **(9)** seals the front end of the rail and a cover **(15)** seals the rear end. The forks for the A/B range **(4)**, 1st/2nd gears **(5)**, 3rd/4th gears **(6)** and the creeper gears **(28)** cannot be adjusted (except locking pressure for the creeper gears). The Hare/Tortoise range fork **(20)** is adjustable.
Note: The 4 x 2 gearboxes (8-speed) have no A/B fork (4).

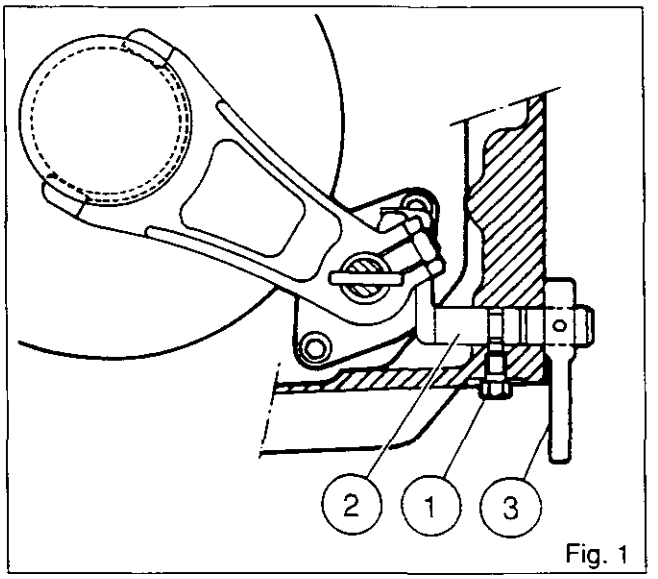


Fig. 1

A. Creeper gear fork

Disassembly

1. Carry out procedures 1 to 7 (Section 5 K01).
2. Carry out procedures 2 to 14 (Section 8 I01)
3. Disconnect the creeper gear control cable.
4. Remove the bolt **(1)**, withdraw the rod **(2)** to disengage the lever from the fork (Fig.1).
5. Unscrew nut **(26)** and the locking screw **(27)** on the fork **(28)** (Fig.2).
6. Remove the setscrew **(8)** (Fig. 5)
7. Turn the selector rail **(7)** and drive out the roll pin **(29)** (Figs.2 and 3).
   Note: Take care not to let the roll pin fall into the gearbox housing.
8. Drive out the double pin **(1)** from the coupling sleeve **(2)** (Fig. 4). If the pin is inaccessible, carry out procedures 9 to 12.

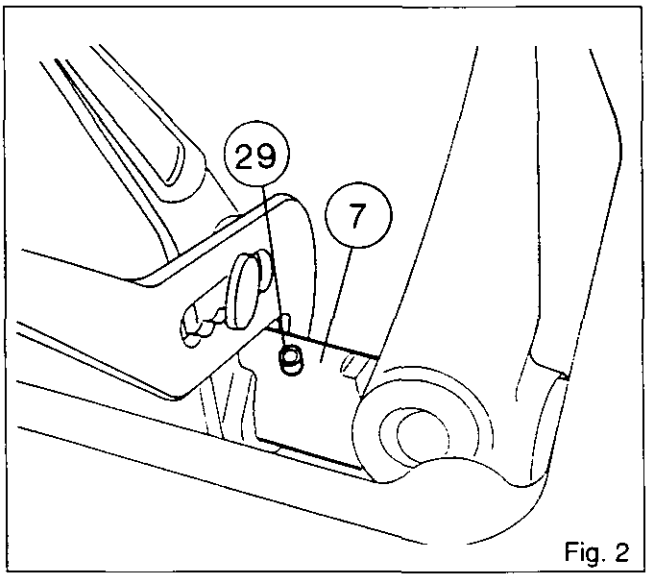


Fig. 2

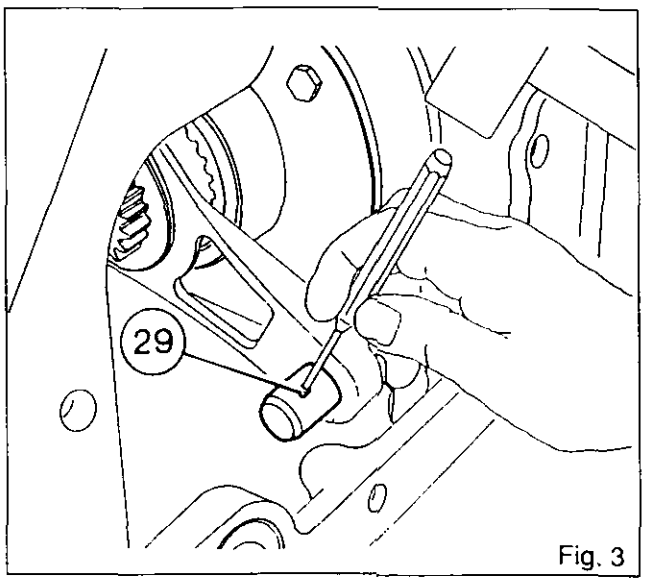


Fig. 3

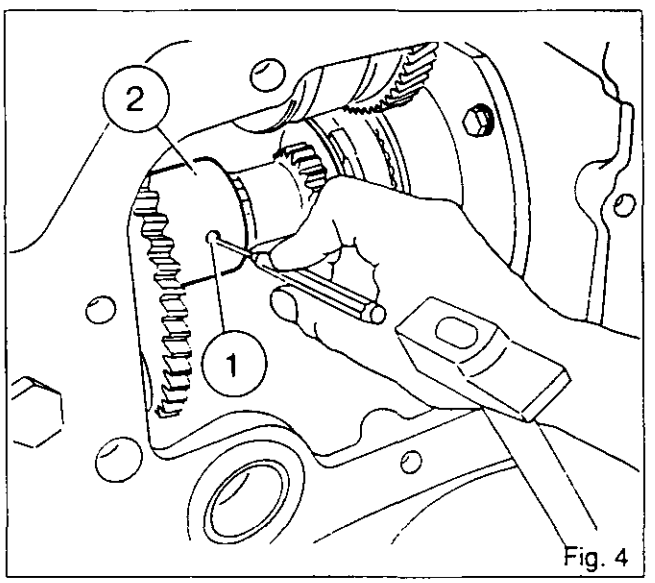


Fig. 4

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Gearbox - Selector rail and forks

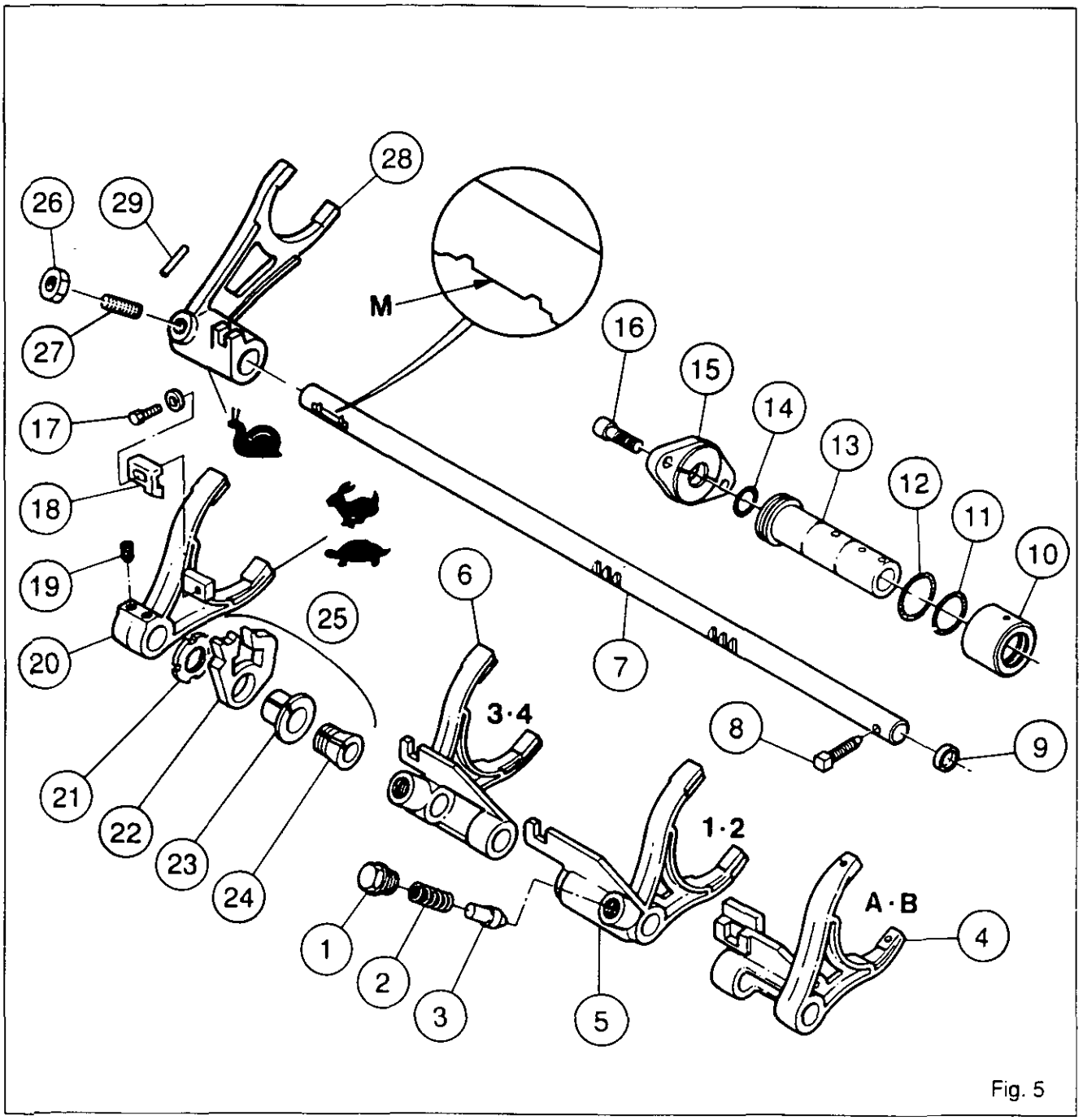


Fig. 5

Key to Figure 5

(1) Plug
(2) Spring
(3) Locking plunger
(4) A/B range fork
(5) 1st/2nd gear fork
(6) 3rd/4th gear fork
(7) Selector rail
(8) Setscrew
(9) Plug
(10) Cylinder
(11) 'O' ring
(12) 'O' ring
(13) Hare/Tortoise range piston
(14) 'O' ring
(15) Cover
(16) Bolt
(17) Bolt
(18) Slider
(19) Adjusting screw
(20) Hare/Tortoise range fork
(21) Castellated nut
(22) Latch
(23) Tapered bearing
(24) Cone
(25) Latch assembly
(26) Nut
(27) Locking screw
(28) Creeper gear fork
(29) Roll pin

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Gearbox - Selector rail and forks

On 4WD tractors.

9. Disconnect the front hose from the differential lock control (front axle side).
10. Remove the guard **(1)** (Fig. 6).
11. Unscrew the centre bearing **(2)** from the 4WD shaft **(3)** (Fig. 6).
12. Remove the split pin **(4)** from the rear sleeve **(5)**, disengage the 4WD clutch shaft by sliding off the sleeve (Fig. 6). Turn the halfshaft to bring the coupling sleeve **(2)** into position (Fig. 4).
13. Fit the setscrew **(8)** temporarily to hold the selector rail in order to remove the fork **(28)** (Fig. 5)
14. Slide the sleeve **(1)** and the coupler **(2)** towards each other on the connecting shaft **(3)** (Fig. 7).
15. Move the sleeve assembly, connecting shaft and coupler to the outer LH edge, then withdraw it from the fork **(28)** (Fig. 7).
    Note: Mark the direction in which the sleeve is assembled (1) (Fig. 7).
16. Remove the fork **(28)** from the selector rail **(7)** (Fig. 8).
17. Remove the rod **(3)** (Fig. 1).
18. To remove the creeper gear control shaft **(1)**, turn it so that it goes under the selector rail **(7)** (Fig. 9). Discard the 'O' ring **(3)**.

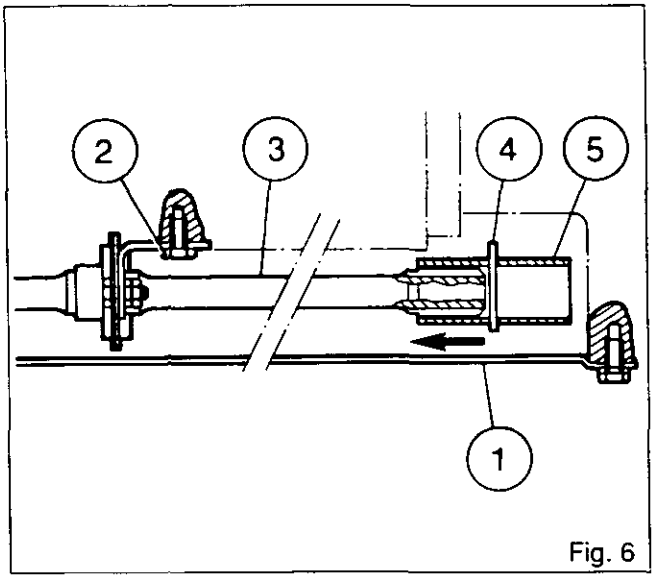


Fig. 6

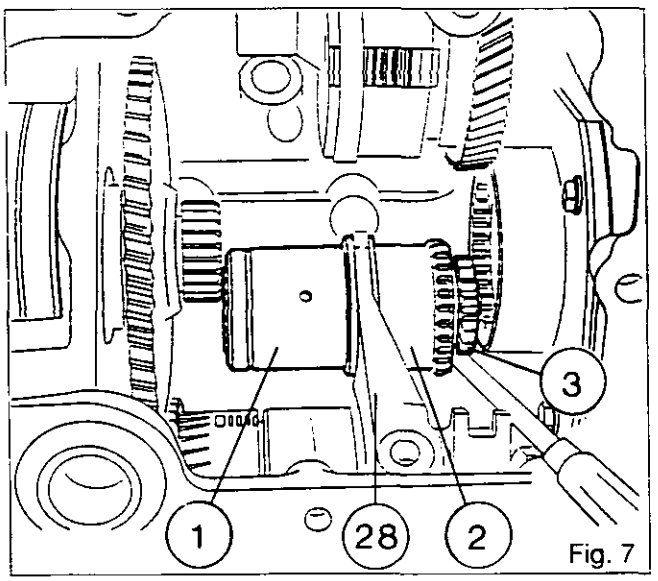


Fig. 7

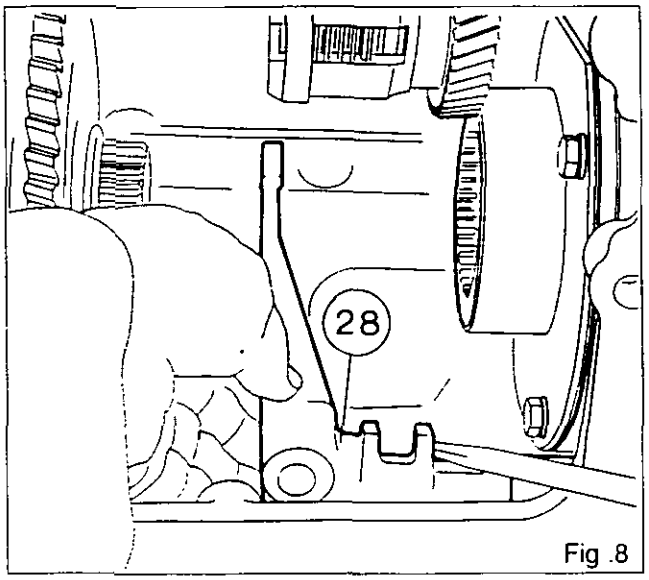


Fig .8

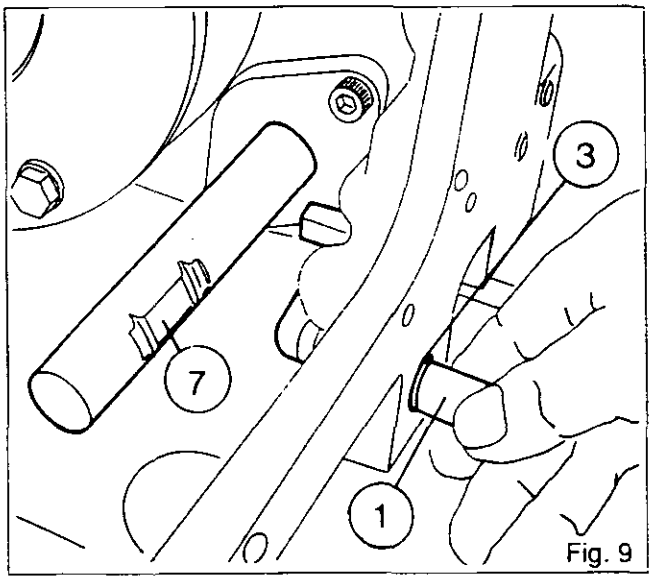


Fig. 9

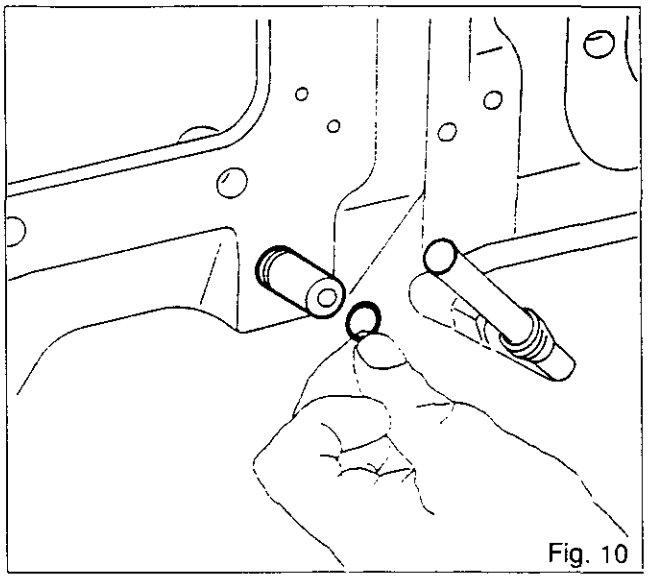
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Gearbox - Selector rail and forks

Reassembly

19. Check the parts and replace any which are faulty.
20. Refit the control rod. Pull the rod as far as possible to the right. Lubricate and fit a new 'O' ring (Fig. 10).
21. Refit the rod **(3)** (Fig. 11).
    Coat the bolts with Loctite 241 and tighten them.
22. Refit the fork on the selector rail.
    Note: Ensure that the lever (1) of the creeper gear control rod faces the front of the tractor (Fig. 11).
23. Engage the sleeve assembly, connecting shaft and coupler at the LH outer edge, then fit it in the fork.
    Note: The machining groove on the sleeve (1) should face the rear of the tractor (Fig. 12).
24. Slide the sleeve and the coupler on to the connecting shaft.
25. Press a new double pin **(1)** into the sleeve **(2)** (Fig. 4).
26. Remove the setscrew **(8)** (Fig. 5).
27. Press in a new pin **(29)** and turn the selector rail **(7)** (Figs. 2 and 3)
28. Clean the setscrew **(8)**, coat it with Loctite 542 and tighten to a torque of 28 - 43 Nm.
29. Locate the fork **(28)** and the locking screw **(27)** on flat M of the selector rail **(7)** (between the two detent notches) (Fig. 5).
    Tighten the screw to compress the ball. Slacken the screw a quarter turn. Clean the nut **(26)** and coat it with Loctite 241, then tighten to a torque of 15 - 20 Nm (Fig. 5).
    Check that the fork is correctly tightened.
30. Turn and push the rod **(2)** to engage the lever in the fork. Fit the bolt **(1)** after coating with Loctite 241 (Fig. 1).
    Note: Check the operation of the rod.
31. Reconnect and adjust the creeper gear control cable.
    Note : See Section 5 J01 for adjustment procedure.
32. Carry out procedures 15 to 17 (Section 8 I01).
33. Check that the transfer pipe 'O' rings are in good condition and insert the pipe into the LH cover (see Fig. 2 - Section 8 I01).
34. Carry out procedures 20 and 18 (Section 8 I01).
35. Refit the RH cover and the bolts. Tighten to a torque of 72-96 Nm.
36. Carry out procedures 7 - 11 in reverse (Section 8 I01).
37. Fit the wiring harnesses and secure with a clip.


Fig. 10

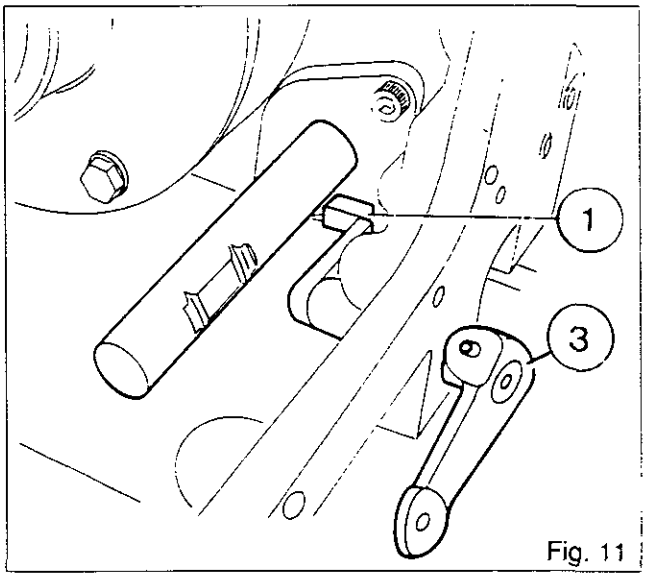


Fig. 11

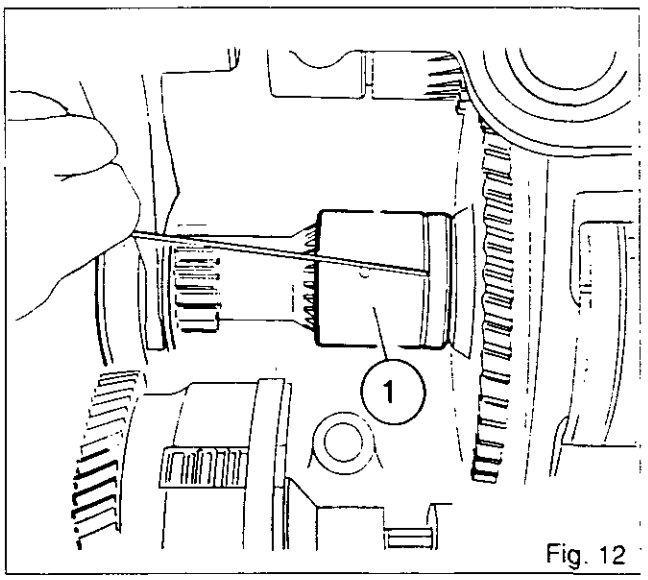


Fig. 12

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38. Refit the trailer braking valve (if fitted). Check that the 'O' rings are in good condition.
    Tighten to a torque of 25-35 Nm.
39. Carry out procedure 6 in reverse (Section 8 I01).
40. Refit the trailer braking valve pipe (if fitted) and the filter.
41. Carry out procedures 9 - 12 in reverse (Section 5 D01).
42. Refit the wheel. Remove the stand and the trolley jack.
43. Tighten the wheel nuts to a torque of 400 - 450 Nm.
44. Carry out procedures 1 to 4 in reverse (Section 5 K01).
45. Start the engine and carry out procedures 32 and 33 (Section 8 I01).
46. Road test the tractor and check the creeper gear control.

B. Hare/Tortoise range fork - Mechanical lock assembly - 1st/2nd and 3rd/4th forks - Selector rail

Disassembly with or without creeper gears

Note: For gearboxes fitted with creeper gears, carry out the additional procedures marked *.

47. Carry out procedures 1 to 12, Section 5 K01.
48*. Disconnect the creeper gear control cable.
49. Carry out procedures 5 and 6, Section 5 A02.B.
50. Carry out procedures 2 to 14, Section 8 I01.
51. Remove the plugs **(1)**, the springs **(2)** and the detent plungers **(3)** (Fig. 5).
52*. Carry out procedures 4 to 7.
53*. Refit the setscrew **(8)** temporarily.
54. Carry out procedures 8 to 11, Section 5 A02.C.
55. Tap the rear end of the selector rail **(7)** with a copper tipped mallet to drive out the plug **(9)** (Fig. 5).
    Note: This procedure gives access to the selector rail from the front.
56*. Remove the creeper gear fork **(28)** (Fig. 5) by moving the selector rail forwards.
57. Position the Hare/Tortoise range fork **(20)** (Fig. 5) in the Low position.
58. Remove the adjusting screws **(19)** (Fig. 5).
59. Remove the bolts **(16)** and the cover **(15)** (Fig. 5).
60. Remove the Hare/Tortoise piston **(13)** (Fig. 5) and discard the seals.
61. Remove the cylinder **(10)** (Fig. 5) and discard the seal.
62. Turn the pump suction pipe **(1)** upwards.
    Note: Do not slacken the bolt (2) on the pipe clip (Fig. 13).
63. Move the selector rail rearwards to free the A/B (4 x 4 gearbox), 1st, 2nd, 3rd, 4th and Hare/Tortoise forks.
64. Withdraw the 1st, 2nd, 3rd and 4th forks and the lock assembly.
65. Withdraw the Hare/Tortoise fork.
66. Remove the slider **(18)** (Fig. 7).
67. Withdraw the selector rail through the selector cover access panel after passing it through the High/Low range cylinder bore (Fig. 15).
68. Remove the lock assembly.

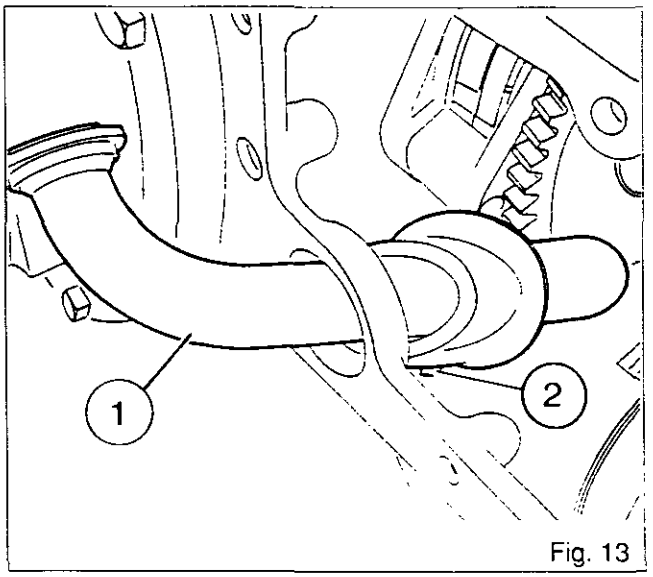


Fig. 13

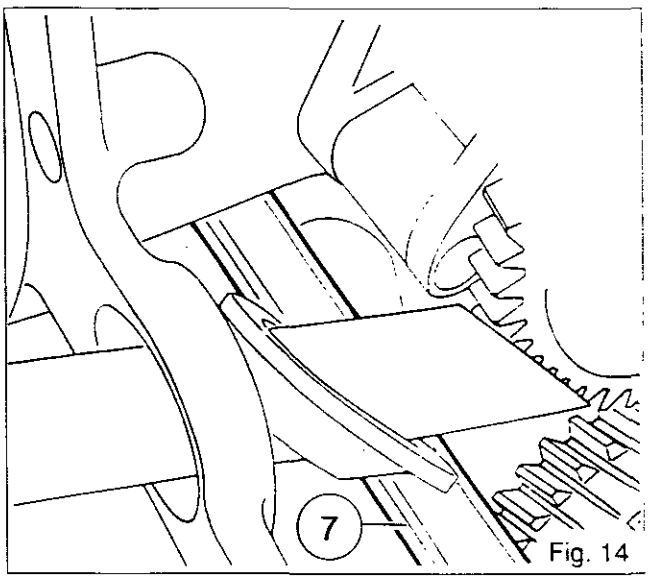


Fig. 14

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Reassembly

69. Check the parts and replace any that are worn.
70. Clean the cone threads and the nut tapping.
71. Refit the latch assembly.
72. Carry out procedure 67 in reverse (Fig. 15).
73. Refit the forks and the latch assembly.
74. Check that the ports of the Hare/Tortoise range hydraulic cylinder **(10)** are not blocked.
    Fit the cylinder complete with the 'O' ring **(11)**.
75. Slide the selector rail forwards into the Hare/Tortoise range fork, the latch assembly, 1st/2nd, 3rd/4th and the A/B range forks (4 x 4 gearbox).
    Note: For gearboxes fitted with creeper gears, move the selector rail far enough forward to refit the fork (28) (Fig. 16).
76. Carry out procedure 209, Section 5 A02.R.
77. Fit the cover **(15)** with the bolts **(16)** and tighten to a torque of 27 - 32 Nm.
78. * Fit the creeper gear fork lugs into the coupler.
    Note: The fork control lever (1) should face forwards (Fig. 11).
79. * Slide the selector rail rearwards into the creeper gear fork.
80. * Press in a new pin (Fig. 3) to facilitate fitting, turn the selector rail (Fig. 2).
81. Clean the setscrew, coat it with Loctite 542 and tighten to a torque of 38 - 43 Nm.
82. Coat the plug **(9)** with Loctite 542 and press it in level with the housing.
83. * Fit the locking screw **(27)** on the fork **(28)** and nut **(26)** on the bolt (Fig. 5).
84. * Carry out procedure 29.
85. Turn and push the rod **(2)** until it engages with the lever in the fork. Fit the bolt **(1)** after coating it with Loctite 241 (Fig. 1).
86. Fit the detent plungers, springs and locking nuts. Tighten the nuts to a torque of 50-70 Nm.
87. Carry out procedures 217 to 232, Section 5 A02.R
88. Carry out procedures 15 to 27, Section 8 I01.
89. Carry out procedures:
    246 to 256, Section 5 A02.S (4 x 4)
    238 to 244, Section 5 A02.S (4 x 2)
90. Fit the plunger and the hydraulic spool valve (4 x 4).
91. * Reconnect and adjust the creeper gear control cable. See Section 5 J01.
92. Carry out procedures 8 to 12 in reverse (Section 5 K01).
93. Refit the wheel. Remove the stand and the trolley jack.

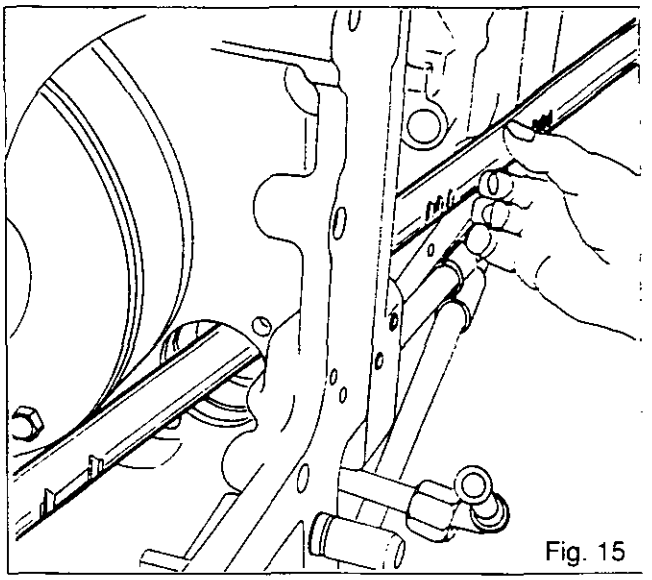


Fig. 15

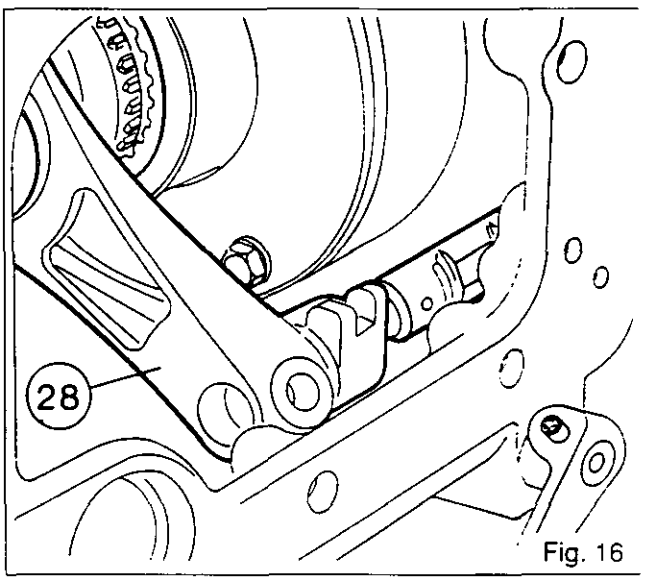


Fig. 16

94. Tighten the wheel nuts to a torque of 400 - 450 Nm.
95. Top up the oil in the gearbox, remove the chocks and release the parking brake.

Road test the following controls:
. Creeper gears (if fitted)
. Hare/Tortoise range
. 1st, 2nd; 3rd, 4th gears

96. Check all cover gasket faces and hydraulic unions for leaks.

C. A/B range fork

Note: Since the A/B fork disassembly and reassembly procedures are identical to the A/B range procedures, refer to Section 5 F01.

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5 E01 Input unit

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- **General** ____ 2

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Gearbox - Input unit

General

The input gearbox is in the form of an interchangeable module fitted at the input end of the gearbox. It is made up of two quite separate parts: the speedshift (if fitted) and the reversing mechanism.

The speedshift : This is an independant device which allows the input speed to the main gearbox to be doubled. It is situated at the front of the input gearbox and consists of a hydraulic clutch coupled to epicyclic reduction gearing. For operation see Section 5 E02.

Reverse shuttle : This is housed in the enclosure at the rear of the input gearbox and consists a set of two gears operated via a synchromesh mechanism. Paired idler gears allow the direction of rotation to be reversed. For operation see Section 5 E03.

A. Removal

N.B.:
1) To enable the layshaft bearings to be shimmed correctly, the gearbox must be removed from the tractor.
2) If the input gearbox is to be replaced as a complete assembly, the layshaft will need to be shimmed again.

3000-3100 tractors

1. Split the tractor between the gearbox and the rear axle (Section 3 BO2).

3000 tractors.

2. Separate the gearbox from the engine. Carry out procedures 11 and 12, Section 3 AO1 (after suspending the gearbox in slings). Remove the PTO shaft. Remove the input gearbox: carry out procedures 7 to 12, Section 5 EO3.

Remove the clutch slave cylinder assembly.

N.B.: To avoid damaging the seals, it is best not to remove the release bearing mounting from the slave cylinder.

3. Withdraw the release bearing from the slave cylinder for a distance of approx. 40 mm (Fig.8 - 5 BO1), take off the rubber boot.
4. Undo the three bolts holding the slave cylinder assembly in position.

3100 tractors

5. Separate the gearbox from the engine. Section 5 A02A, procedure 2.
6. Carry out procedures 6 to 12 (Section 5 E03).

Removing the clutch slave cylinder assembly

7. Carry out procedures 3 and 4, Section 5 C01E.

B. Refitment

3000 tractors

Refit the clutch slave cylinder assembly.

8. Clean the 3 bolts and apply Loctite 421 to them. Fits the bolts and tighten them to torques of :
   8 mm ⌀ : 25-35 Nm
   10 mm ⌀ : 50-70 Nm
9. Refit the rubber boot and push the thrust washer mounting back in.
   Refit the input gearbox; carry out procedures 72 to 83, Section 5 E03.
   Refit the gearbox to the engine.

   The following procedures are to be carried out from Section 3 A01:13 and 14 (except a)
   15, 16, 17 and 18 (after the gearbox has been suspended in slings).

3100 tractors

Refit the clutch slave cylinder assembly.

10. Carry out procedures 7 and 8, Section 5 C01E.
11. Carry out procedures 72 to 83, Section 5 E03.
    Fit the gearbox to the engine.
    The following procedures are to be carried out from Section 3 A02:15 to 18 (except a)
    19 to 22.

3000 - 3100 tractors

12. Re-unite the tractor at the joint between the gearbox and rear axle (Section 3 BO2).
13. Perform road test on speedshift, reversing mechanism and gears.
14. Check that there are no leaks at the selector cover joint and the gearbox to rear axle joint.

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5 E02 Speedshift

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- Operation ____ 2
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J. Refitting the front cover ____ 13

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Gearbox - Speedshift

General

The speedshift unit is mounted at the front of the gearbox input. It is a hydraulically operated gearchange device which provides two different input ratios to the main gearbox. It does this by means of:

- a multidisc hydraulic clutch,
- an epicylic gear train consisting of a planetary carrier with three twin planetary gears, an input sun gear and an output sun gear,
- a system for braking the planetary carrier hydraulically.

The design of the speedshift allows the ratios to be changed on the move, even under full load, without declutching.

Different versions

The following versions can be obtained as a function of the number of teeth on sun gears /6\ and /7\ and the order in which they are fitted:

- 30 km/h or 40 km/h version (Fig.1)
- version with super creeper gears (Fig.2).

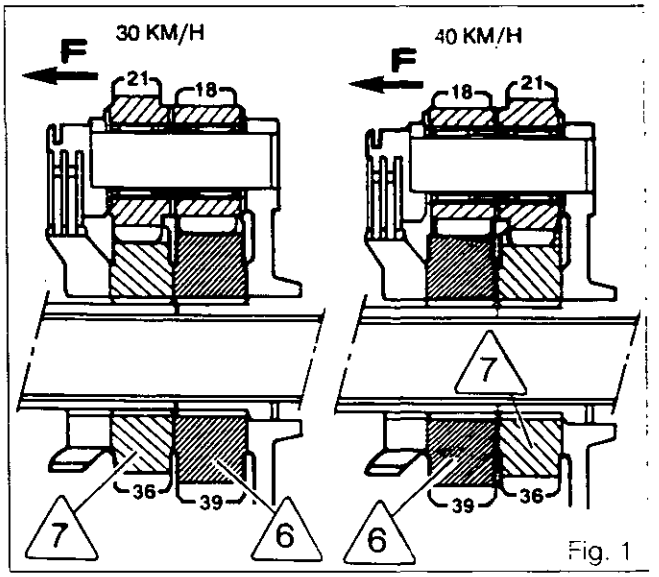
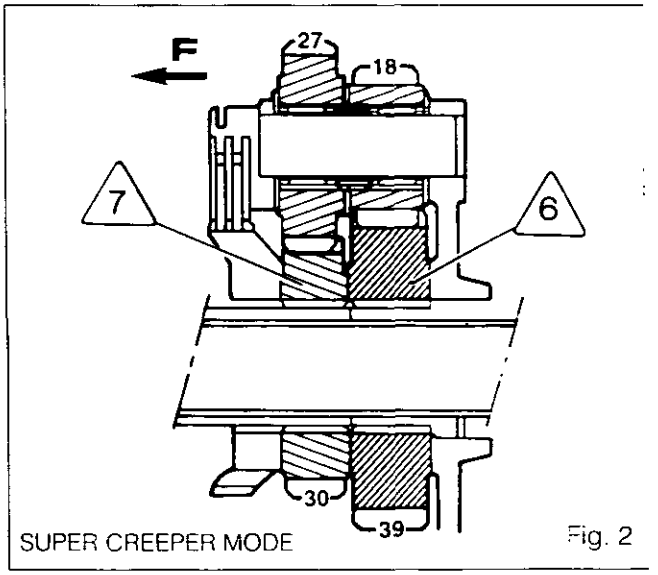


Fig. 1



SUPER CREEPER MODE

Fig. 2

Operation

30 Kph and super creeper version : stepdown
40 Kph version : stepup (Fig. 3)

In this mode (Fig. 3), there is no supply to the hydraulic components and the speedshift operates as a purely mechanical transmission. Oil in chamber of pistons **(28)** and (48) returns to the housing via the gallery C and the solenoid.

The drive from the hollow primary shaft **(36)** is transmitted to the input sun gear /7\ by the splines which secure the gear to the shaft. Sun gear /7\ drives the compound planetary gears /12\ which are mounted to rotate freely on spindles /8\.

The planetary gears in turn drive the output sun gear /6\, which is splined to the hollow secondary shaft **(5)**, in one of the following ratios: 30 km/h 1.26 stepdown - 40 km/h 1.26 stepup - super creeper 7.8 stepdown. Since no hydraulic pressure is applied, the planetary carrier assembly **(50)** is locked against rotation by a Belleville spring disc **(18)** which applies pressure to pressure plate **(20)** and thus stops disc **(21)** from turning, the latter being locked to the planetary carrier assembly in rotation by splines.

List of parts

(1) O-ring
(2) O-ring
(3) Bolt
(4) Bush
(5) Secondary shaft
/6\ Output sun gear
/7\ Input sun gear
/8\ Planetary gear spindles
/9\ Planetary carrier cover
(10) Thrust washer
(11) Needle-roller bearing
/12\ Compound planetary gears
(13) Housing
(14) Spacer
(15) Hub
(16) Needle-roller bearing
(17) Thrust washer
(18) Belleville spring disc
(19) O-ring
(20) Pressure plate
(21) Disc
(22) O-ring
(23) O-ring
(24) Bolt
/25\ Hydraulic cover
(26) O-ring
(27) Front cover
(28) Clutch piston
(29) O-ring
/30\ Seal ring
/31\ Seal ring
(32) Needle-roller bearing
(33) Seal carrier
/34\ Seal
/35\ Wide seal
(36) Primary shaft
(37) Circlip
(38) Lug washer
(39) Washer
(40) Ball
(41) Pressure plate
(42) Disc
(43) Spring washer
(44) Pressure plate
(45) Disc
(46) Spring washer
(47) Pressure plate
(48) Piston
(49) Bolt
(50) Planetary carrier assembly
(51) O-ring
(52) Seal
(53) Needle-roller bearing

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Gearbox - Speedshift

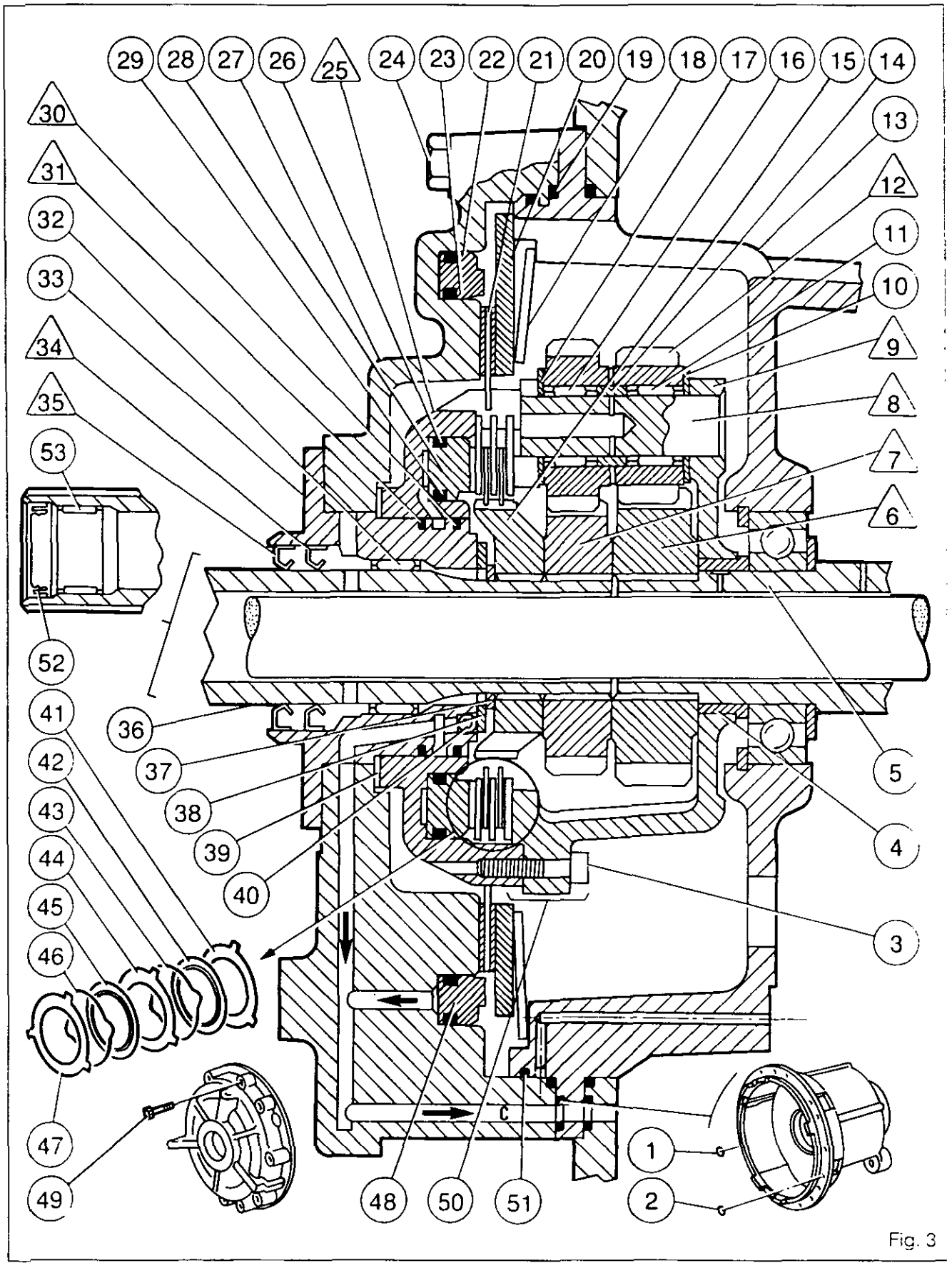


Fig. 3

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Gearbox - Speedshift

Hydraulic operation : direct transmission (Fig.4)
The range is changed by actuating the solenoid valve. which then feeds hydraulic oil to the chambers behind pistons **(48)** and **(28)** simultaneously. Braking piston **(48)** is then applied to pressure plate **(20)**, which compresses the Belleville spring disc **(18)**, thus releasing disc **(21)** and the planetary carrier assembly **(50)**. At the same time clutch piston **(28)** clamps together pressure plates **(41)**, **(44)**, **(47)** and the discs **(42)**, **(45)** which are driven by hub **(15)**. Since the pressure plates are secured to the planetary carrier by three lugs, drive is transmitted from the primary input shaft **(36)** to the hub **(15)** and from there to the clutch assembly which transmits it to the planetary carrier **(50)**. The primary shaft **(36)** and the planetary gear and sun gear assembly turn at the same speed as the secondary shaft **(5)** thus giving direct transmission in the ratio of 1/1.

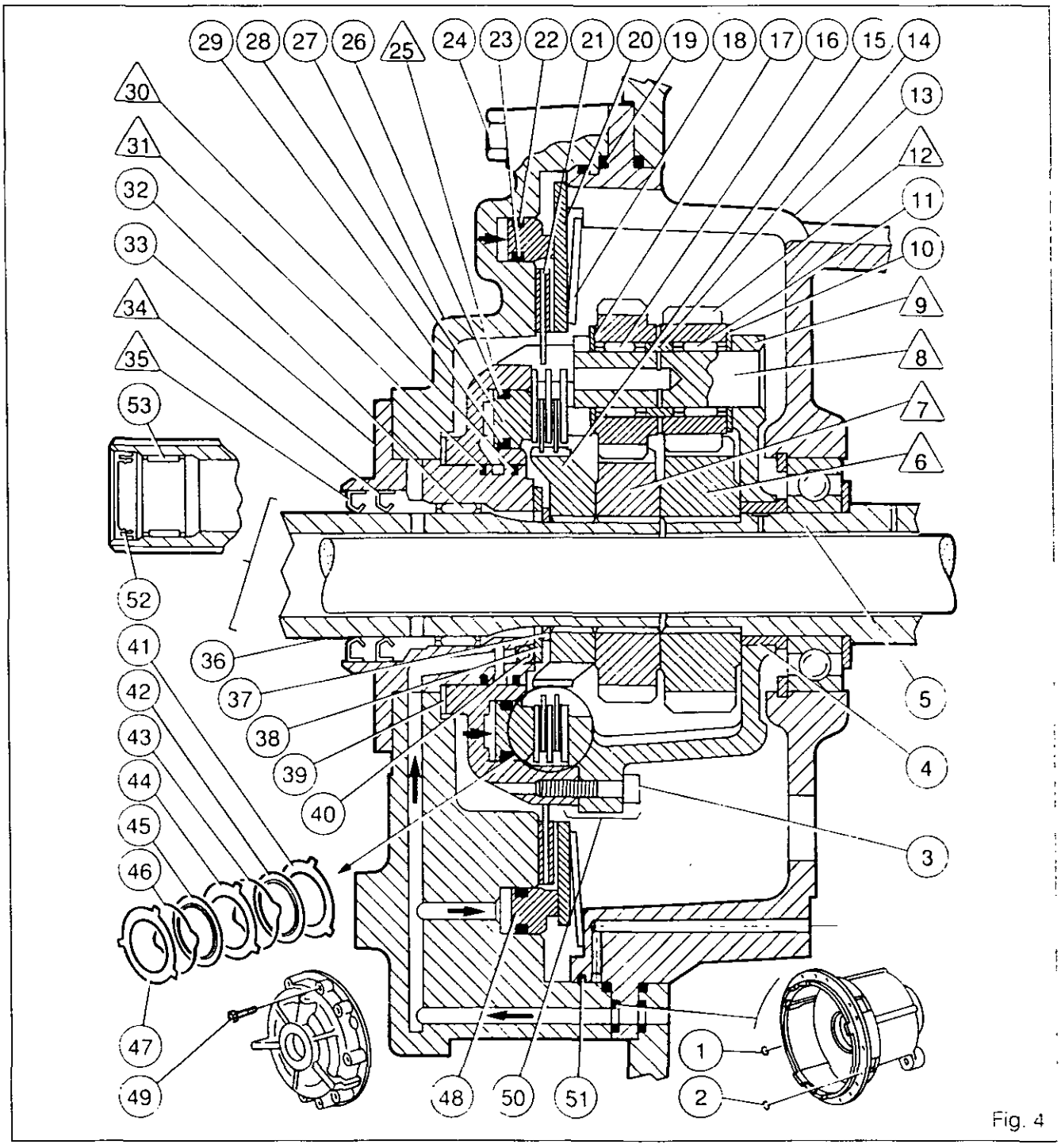


Fig. 4

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Gearbox - Speedshift

Exploded view

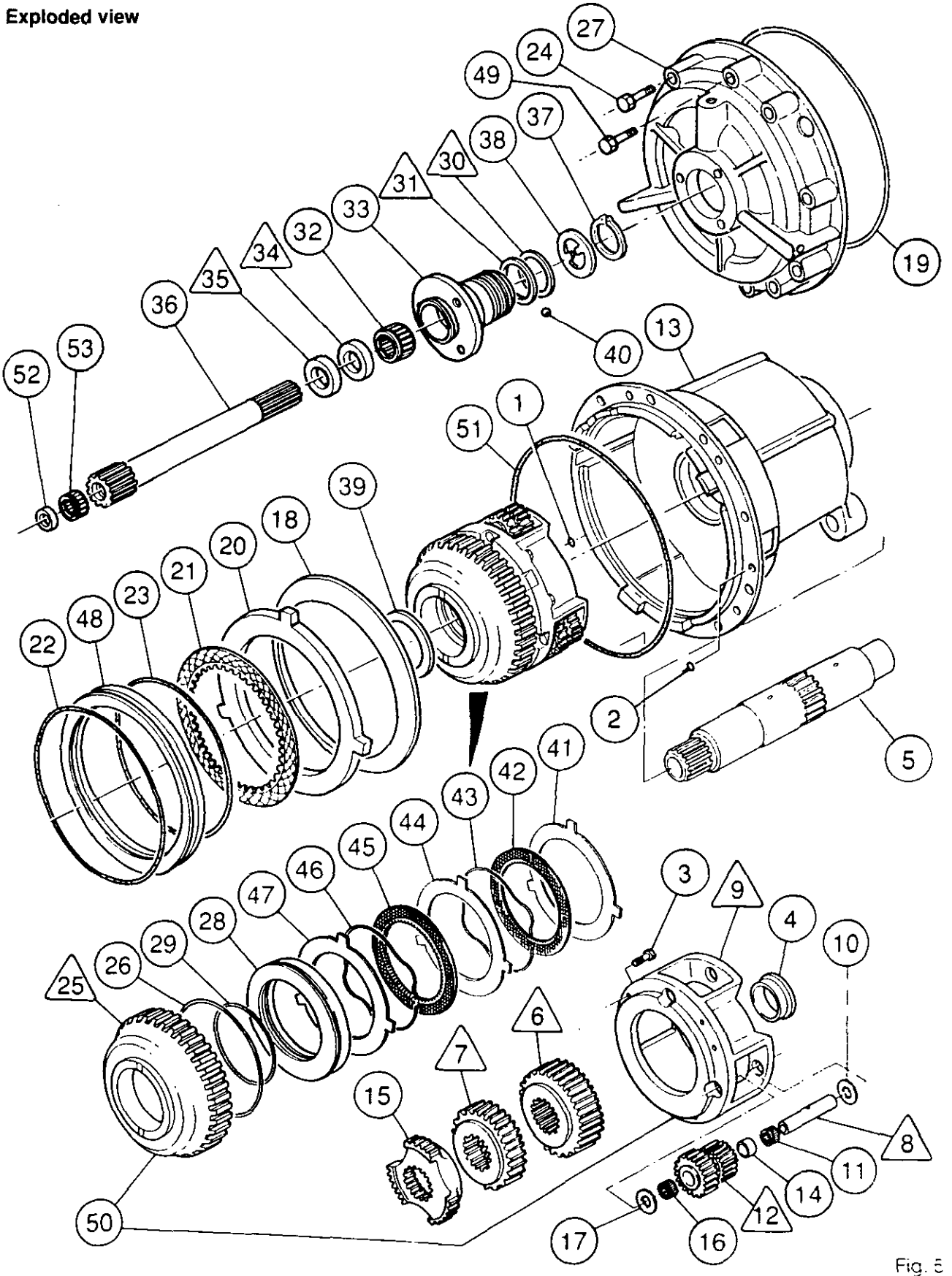


Fig. 5

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Gearbox - Speedshift

A. Removing the front cover

3000 tractors

1. Split the tractor between the engine and gearbox (Section 3 A01).

3100 tractors

2. Split the tractor between the engine and gearbox (Section 3 A02).

3000-3100 tractors

3. Remove the PTO shaft.
4. Withdraw seal **(52)**.
5. Remove the bleed and supply pipes to the clutch assembly.
6. Drain the gearbox only of oil.
7. Unscrew bolts **(24)** (Fig.6).
8. Screw two pilot pins into the gearbox housing in diametrically opposed positions (Fig.6).
9. Unscrew the three bolts **(49)** a little at a time, taking them in order (Fig.6).
10. Remove cover **(27)** together with shaft **(36)** (Fig.6). Discard O-rings **(1)** and **(2)**, **(19)** and **(51)**.
    N.B.: In anticipation of future rationalisation of the design of the speedshift, the former 6-lugged friction disc has been replaced by one with 40 internal splines. The hydraulic cover and the planetary carrier cover, and the bolts for securing them, have also been replaced by new covers and bolts adapted to the design with the splined disc.
    These new parts were introduced as from serial no.P179018.
    For tractors with lower serial numbers see Workshop Manual 1646640M1.
11. Take out disc **(21)**, pressure plate **(20)**, Belleville spring disc **(18)** and planetary carrier assembly **(50)**.

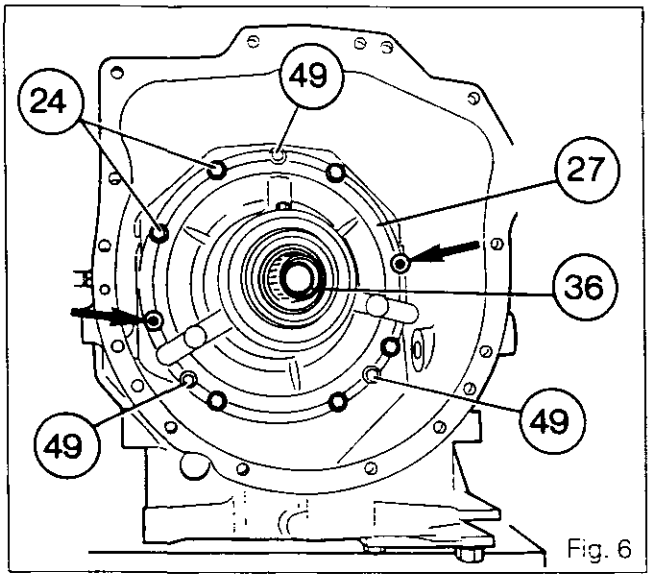


Fig. 6

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B. Disassembling the front cover

12. Extract circlip **(37)** and take out lug washer **(38)**.
13. Withdraw shaft **(36)** from the front of the cover.
14. Take out needle-roller bearing **(53)**.
15. Remove washer **(39)**.

3000 tractors

Take out the clutch slave cylinder assembly

N.B.: You are advised not to take the release bearing out of the slave cylinder to avoid damage to the seals.

16. Withdraw the release bearing from the slave cylinder for a distance of approx. 40 mm (Fig.8 - 5 B01), take off the bellows.
17. Unscrew the three bolts holding the cylinder in place.

3100 tractors

Take out the clutch slave cylinder assembly

18. Unscrew the bolts holding the slave cylinder assembly in place and take the assembly out. Withdraw piston **(48)** from the cover (Fig.7).

3000-3100 tractors

19. Remove seals **(22)** and **(23)** and discard them.

N.B.: In 3000-3100 series tractors, new speedshift rings made of PTFE rather than cast iron and with gaps increased to 2.1/2.4 mm were introduced as from serial no. N155012.
For tractors with serial numbers lower than this see Workshop Manual 1646640M1.

20. Remove seal rings /**30**\ and /**31**\ (discard these rings).
21. Remove lip seals /**34**\ and /**35**\ and discard them.
22. Take out needle-roller bearing **(32)** and discard it.
23. Drive ring carrier **(33)** out of cover **(27)** (Fig.8) (Work from the rear of the ring carrier using a plastic-faced mallet as a drift).

C. Separating planetary carrier and cover assembly.

24. Place the planetary carrier assembly **(50)** down on a bench (with the planetary carrier cover /**9**\ on top).
25. Unscrew bolts **(3)**.
26. Separate planetary carrier cover /**9**\ from hydraulic cover /**25**\ while holding sun gears /**6**\ and /**7**\ in position in planetary carrier cover (Fig.9).

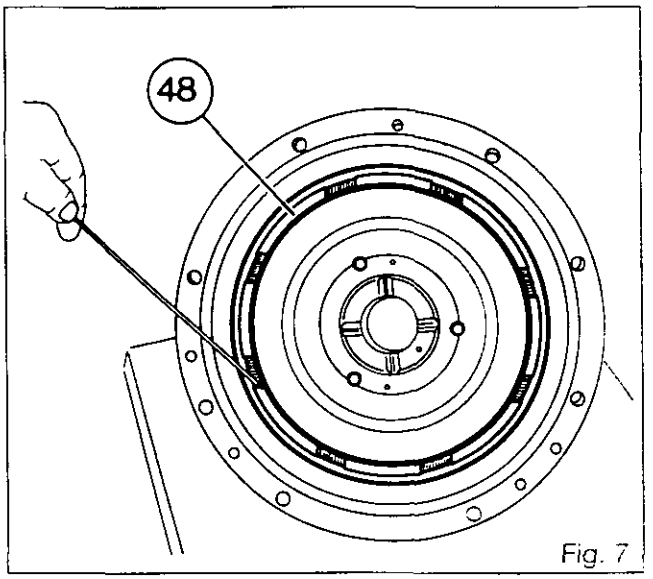


Fig. 7

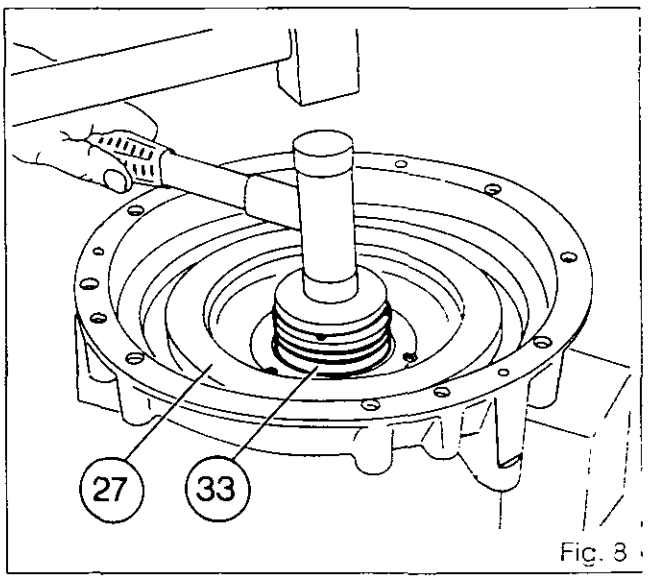


Fig. 8

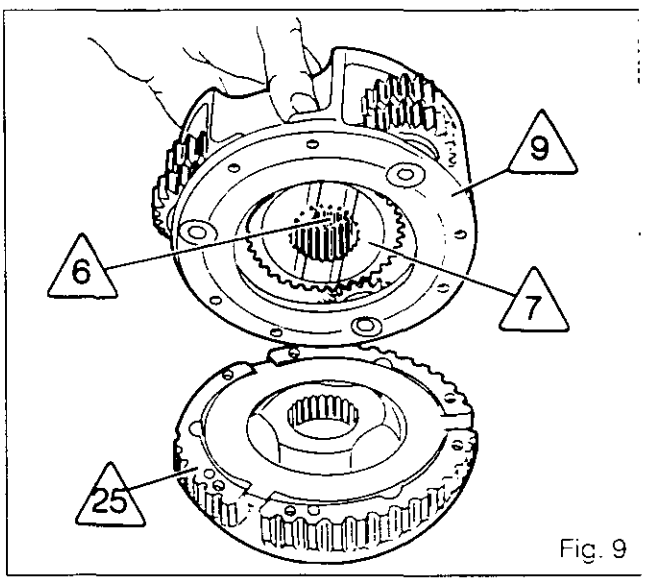


Fig. 9

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D. Disassembling planetary carrier assembly

27. Take out the 1st sun gear :
    - /7\ 36 tooth in 30 km/h version (Fig.1)
    - /6\ 30 tooth in 40 km/h version (Fig.1)
    - /7\ 30 tooth in super creeper version (Fig.2)

    N.B. : Mark the direction in which the lubricating grooves in the sun gear should face when the gear is refitted.
28. Drive out spindles /8\ with a drift and a mallet (Fig.10).
29. Take out the planetary gears /12\.
30. Take out needle-roller bearings **(11)** and **(16)**, spacers **(14)**, and washers **(10)** and **(17)**.
31. Take out the second sun gear :
    - /6\ 39 tooth in 30 km/h version (Fig.1)
    - /7\ 36 tooth in 40 km/h version (Fig.1)
    - /6\ 39 tooth in supper creeper version (Fig.2)

    N.B. : Bush (4) is a force fit in planetary carrier cover /9\.

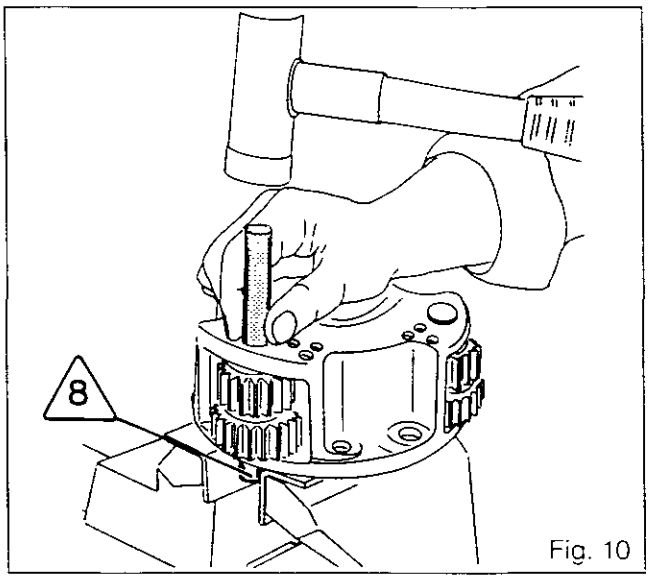


Fig. 10

E. Disassembling the hydraulic cover

32. Take out splined hub **(15)**.
33. Take out pressure plate **(41)**, disc **(42)**, spring washer **(43)**, pressure plate **(44)**, disc **(45)**, spring washer **(46)** and pressure plate **(47)**.
34. Withdraw piston **(28)** from cover /25\ (Fig.11).
35. Remove O-rings **(26)** and **(29)** and discard them.

    N.B. : In the supper creeper version, cover /25\ and piston (28) differ from those in the 30 and 40 km/h versions. The cross-sectional area of the piston is greater and this means that the diametric cutouts in the cover are larger.

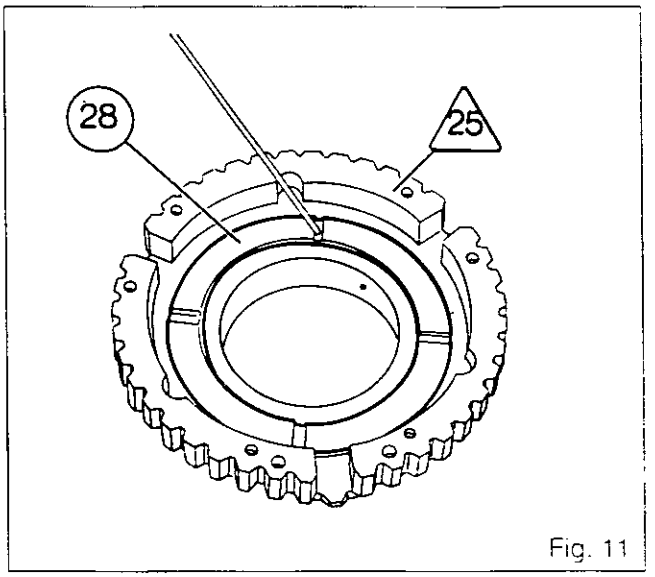


Fig. 11

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Reassembling the planetary carrier

Clean and check the parts and replace any which are faulty.

Lubricate the needle-roller bearings.

Check that the oilways in spindles /**8**\ are not blocked.

km/h version

Fit the 39 tooth sun gear /**6**\ into the planetary carrier cover (Fig.12).

km/h version

Fit the 36 tooth sun gear /**7**\ into the planetary carrier cover (Fig.12).

per creeper version

Fit the 39 tooth sun gear /**6**\ into the planetary carrier cover (Fig.12).

N.B. : In all versions, fit the gear so that the lubricating grooves in it are facing towards face F of the planetary carrier cover (Fig.12).

Fit a needle-roller bearing **(11)**, a spacer **(14)** and a needle-roller bearing **(16)** into a planetary gear /**12**\.

Fit an assembled planetary gear into the cover, with the following gears closer to face F in the respective cases (Fig.13) :

- 21 tooth: 30 km/h version
- 18 tooth: 40 km/h version
- 27 tooth: super creeper version.

N.B. : The planetary gear is marked with three punch marks made in a single face. Each punch mark indicates two teeth which line up.

In the case of the 40 km/h version, mark the unpunched face with three paint lines in the same positions as the punch marks made in the factory.

Fit washers **(10)** and **(17)**.

Line up the planetary gear and washers with a locating rod made up locally : diameter = 16 mm, length = 80 mm (Fig.13).

Insert spindle /**8**\ into the unobstructed bore in face F and drive it home with a mallet until it is slightly recessed below the face (Fig.14).

N.B. : The oilway opening onto the circumference of spindle /8\ must face outwards.

The oilway opening onto the endface of spindle /8\ must face towards face F of the planetary carrier cover (Fig.13).

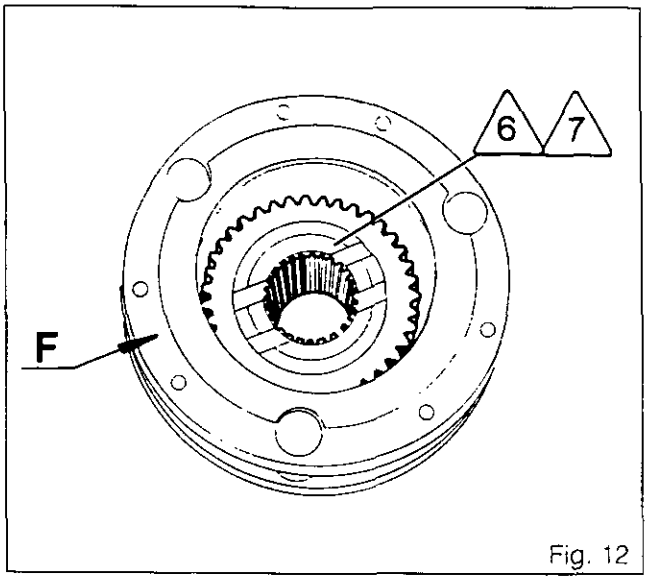


Fig. 12

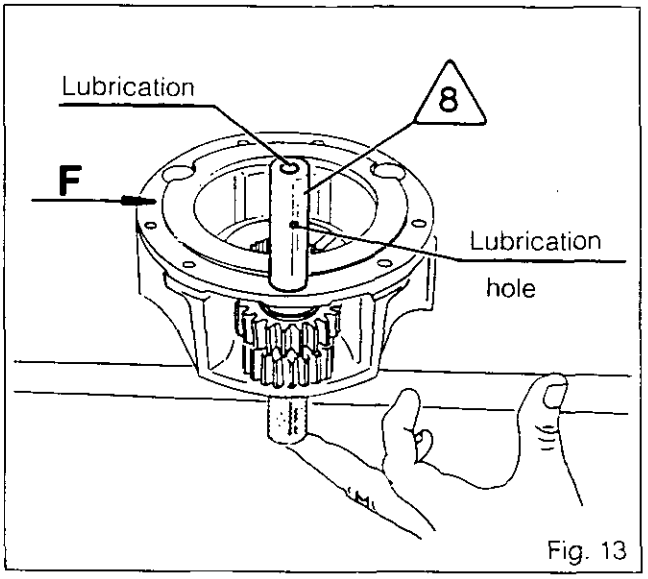


Fig. 13

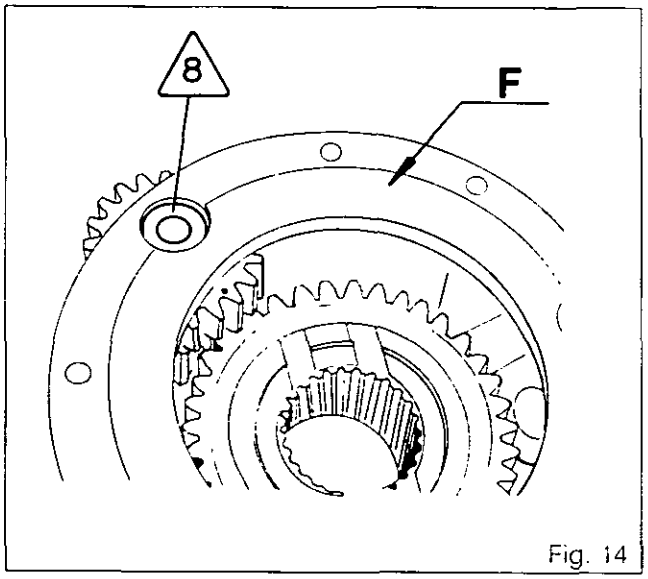


Fig. 14

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47. Repeat procedures 42 to 46 to fit the other two planetary gears.
N.B.: The marks (punch marks) on the three planetary gears must line up with the centre on line spaced 120° apart, as shown in Fig.15.
Once fitting of the spindles /8\ has been completed, re-check that the marks on the planetary gears line up as above.
If the marks do not line up properly, this will cause damage to the speedshift.
48. Fit the following sun gears in the respective versions :
- /7\ 36 tooth: 30 km/h version (Fig.1)
- /6\ 39 tooth: 40 km/h version (Fig.1)
- /7\ 30 tooth: super creeper version (Fig.2)
N.B. : In all versions, fit the gear so that the lubricating grooves in it are facing towards face F of the cover.

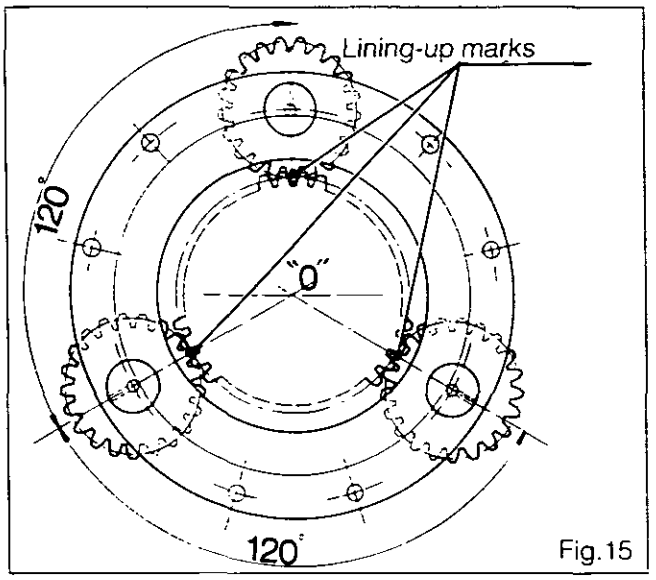


Fig.15

G. Reassembling the hydraulic cover

49. Clean and check the parts and replace any which are faulty.
50. Make sure that the three openings into the 17 bar passage in the hydraulic cover /**25**\ are not blocked (Fig. 16).
51. Lubricate O-rings **(26)** and **(29)** and fit them to piston **(28)**.
52. Lubricate the faces against which the piston seals bear in the hydraulic cover.
53. Place the piston in the cover with the grooves facing towards the operator.
54. Tap the piston **(28)** gradually home into the cover by working progressively round its face with a plastic-faced mallet (Fig.17).
N.B.: Once the piston is fitted, check that no pieces have been detached from the O-rings.
55. Refit the splined hub **(15)** making sure it is correctly orientated.
56. Refit pressure plate **(47)**, spring washer **(46)**, disc **(45)**, pressure plate **(44)**, spring washer **(43)**, disc **(42)** and pressure plate **(41)**.
N.B. : Place the gaps in spring washers (43) and (46) in diametrically opposed positions.

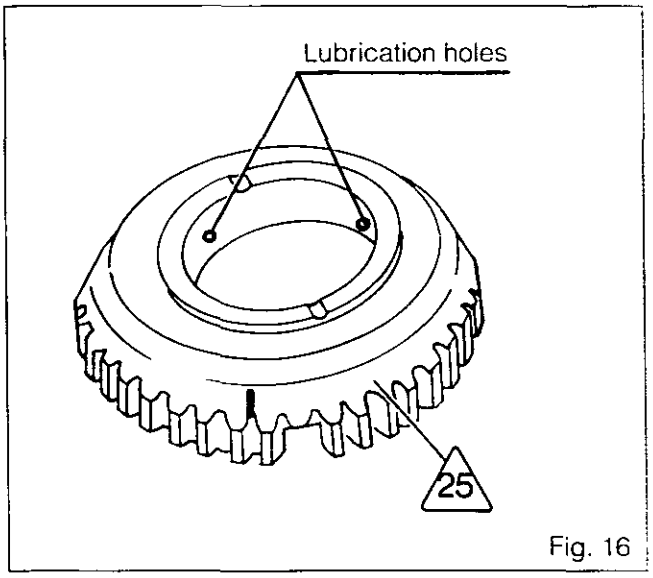


Fig. 16

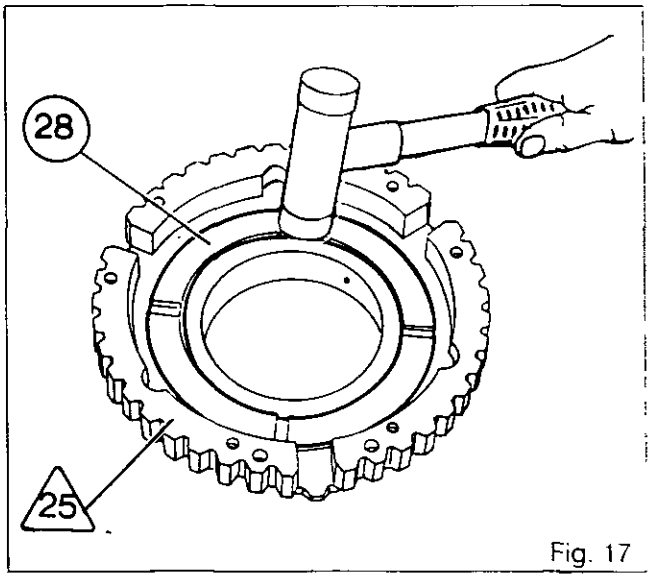


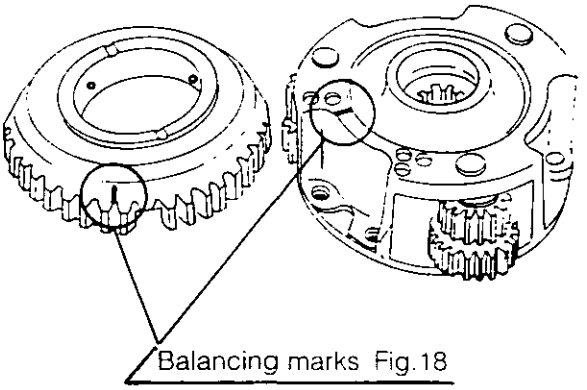
Fig. 17

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H. Reassembling the planetary carrier assembly

57. Screw two pilot pins into the hydraulic cover /**25**\ in diametrically opposed positions.
58. Fit the planetary carrier cover /**9**\ to the hydraulic cover /**25**\, while holding the sun gears /**6**\ and /**7**\ in position.
    N.B. : Position the two covers so that the balancing marks (milled grooves or paint lines) are as far away from each other as possible (Fig.18).
59. Refit bolts **(3)**. Bolts must be tightened to a torque of 10 - 14 Nm.
60. Tap spindles /**8**\ in with a pin punch so that they butt against the hydraulic cover /**25**\.
61. Check :
    - that discs **(42)** and **(45)** are not compressed
    - that planetary gears /**12**\ and sun gears /**6**\ and /**7**\ can turn freely.
62. Fit planetary carrier assembly **(50)** to shaft **(5)**.
63. Fit Belleville spring disc **(18)**.
64. Fit pressure plate **(20)** into housing **(13)**.
    N.B. : Apply three spots of grease («Amber Technical» or equivalent) to the lugs on the pressure plate.
65. Engage friction disc **(21)** onto the planetary carrier assembly.



Balancing marks Fig.18

Fig. 18

I. Reassembling the front cover

66. Clean the mating face and the rest of the cover. Make sure that the 17 bar passage and the lubricating passage are not blocked.
67. Fit seals **(22)** and **(23)** to piston **(48)**.
68. Lubricate the surfaces in the speedshift cover against which the piston seals bear.
69. Position the piston on the cover with its grooves facing towards the operator.
70. Tap piston **(48)** gradually home into the cover by working progressively round its face with a plastic-faced mallet (Fig.19).
    N.B. : Once the piston is fitted, check that no pieces have been detached from the O-rings.

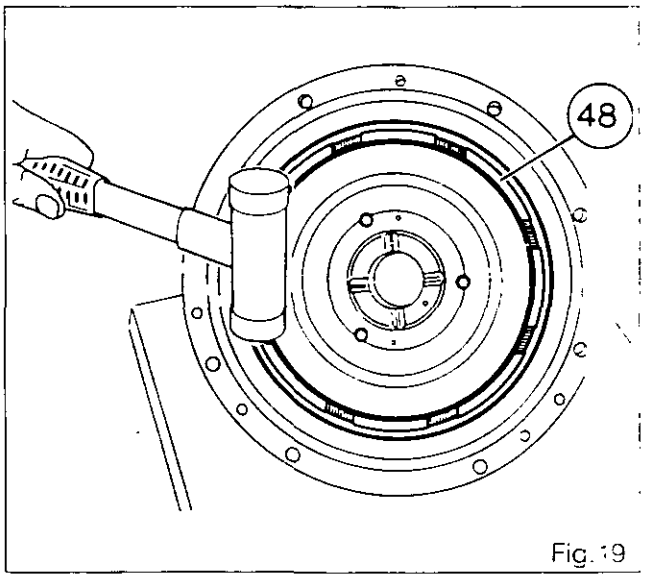


Fig. 19

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71. Clean the ring carrier and its mating face (check that the 17 bar passage and the lubricating passage are not blocked).
N.B. : Ball (40) is crimped into the ring carrier.
72. Position (Fig.20) :
- needle-roller bearing **(32)** at 29.3 ± 0.1 mm from face G
- seal /**34**\ at 43.8 mm from face H
- wide seal /**35**\ at 0.3 - 0.8 from face G.

N.B. : Use a press and a suitable press tool to position the bearing and seals perpendicular to the axis of the ring carrier.
Having fitted seals /34\ and /35\, check that the two pressure-relief passages are not blocked (Fig.21).
73. Apply a gasketing compound (Loctite Masterjoint 510 or equivalent) to the mating face of the cover to allow the ring carrier **(33)** to be fitted.
74. Screw two pilot pins **(1)** into the cover. Engage the ring carrier in the cover bore (Fig.22).
N.B. : Check that the openings of the 17 bar passage and the lubricating passage in the ring carrier match up with the passages in the cover.
75. Tap the ring carrier home in the cover (Fig.22).
76. Lubricate seals /**34**\ and /**35**\.

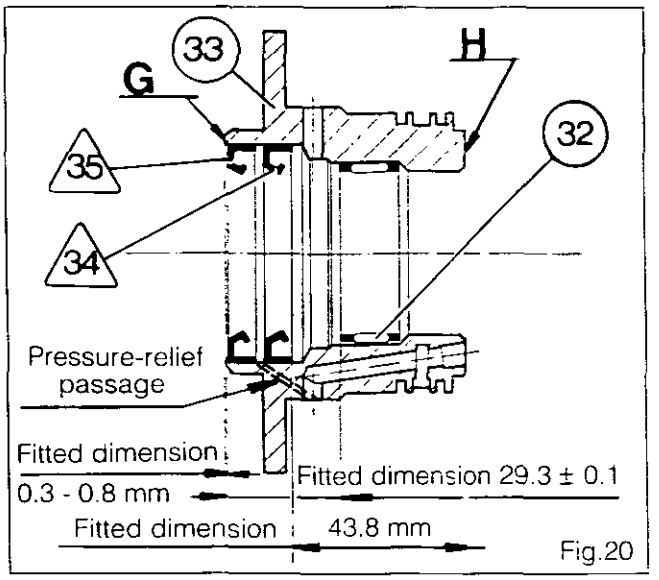
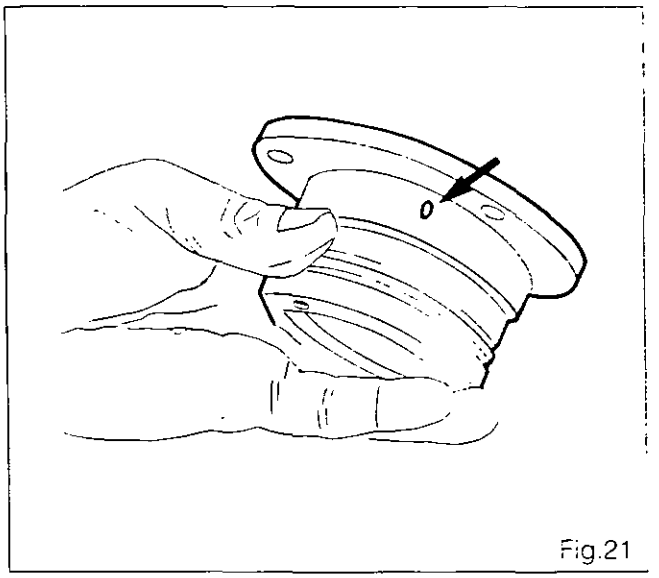


Fig.20


Fig.21

3000 tractors
Refit the clutch slave cylinder assembly
77. Apply Loctite 241 to the three bolts and tighten them to torques of :
8 mm : 25 - 35 Nm
10 mm : 50 - 70 Nm.
78. Refit the bellows and push in the release bearing.

3100 tractors
Refit the clutch slave cylinder assembly
79. Apply Loctite 241 to the bolts which hold the clutch slave cylinder assembly in place and tighten them to the following torques :
8 mm : 25 - 35 Nm
10 mm : 50 - 70 Nm.

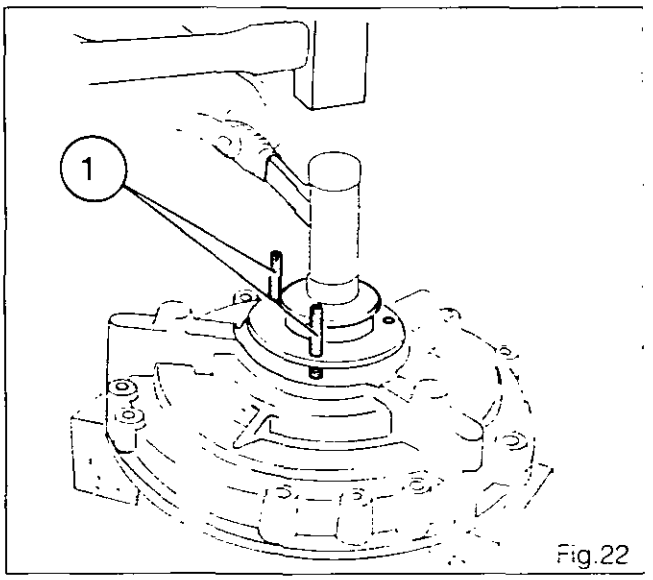


Fig.22

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3000-3100 tractors

80. Fit needle-roller bearing **(1)** (Fig.23) so that it is 15 - 16 mm from the front face of the shaft.
81. Lubricate shaft **(36)** and insert it in ring carrier **(33)** from the front.
    N.B. :
    1) Make sure that the lubricating passages in the shaft are not blocked.
    2) Cover the splines in the shaft temporarily to avoid damage to seals /34\ and /35\.
82. Refit washer **(38)** and circlip **(37)**.
83. Refit rings **/30** and **/31** and make sure that they turn freely in the grooves.
84. Having made this check, remove the rings, preform them by reducing them to approximately 1/3 of their original diameter, and coat them with miscible grease (Amber Technical or equivalent) to ensure that they will be held in position effectively when the front cover is being refitted.
85. Fit the rings into their respective grooves, making sure that :
    - they do not project from the circumference of the ring carrier,
    - their ends are correctly overlapped (Fig.24).

    N.B. : Even the slightest damage to the rings may give rise to leaks followed by pressure dropping in operation.
86. Grease washer **(39)** and fit it into cover **(27)**.
87. Fit new O-rings **(1)** and **(2)**, **(19)** and **(51)**.
88. Check that the locating pin is present in the reversing mechanism housing and that the two pilot pins are fitted.

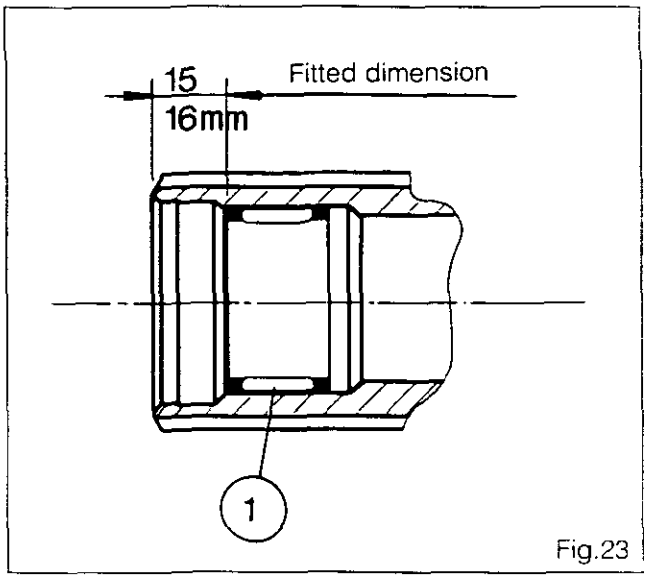
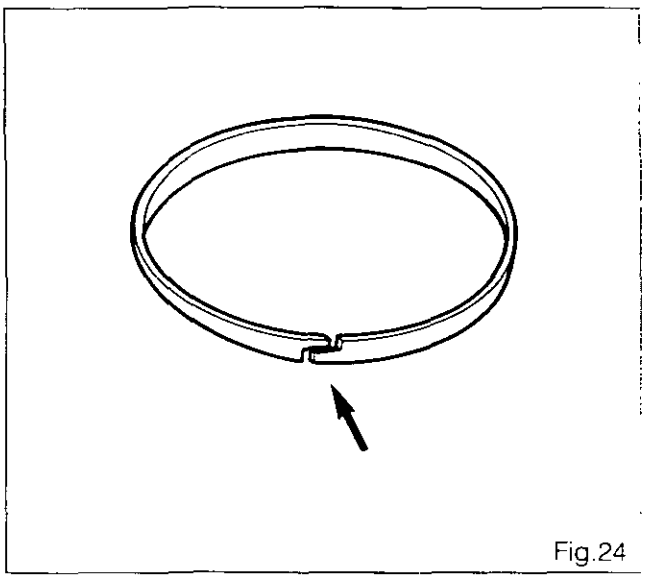


Fig.23


Fig.24

J. Refitting the front cover

89. Fit front cover **(27)** together with shaft **(36)**.
    N.B. :
    1) Use the PTO shaft to make mating-up easier (only when fitting on tractor).
    2) Check that the 17 bar and lubricating passages in the cover match up with the openings in the housing.
90. Refit bolts **(24)** and tighten them to a torque of 45 - 60 Nm.
91. Fit bolts **(49)** and tighten them to a torque of 25 - 35 Nm.
92. Reconnect the supply and bleed pipes to the clutch slave cylinder assembly.

3000 tractors

93. Re-unite the tractor between engine and gearbox (Section 3 A01).

3100 tractors

94. Re-unite the tractor between engine and gearbox (Section 3 A02).

3000-3100 tractors

95. Top up the oil in the housing.
96. Bleed the clutch circuit (Section 5 C01G).
97. Carry out a road test on the speedshift control.

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5 E03 Reverse shuttle

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Gearbox - Reverse shuttle

General

The function of the reversing mechanism is to transmit motion from the speedshift (if fitted) or the mainshaft to the secondary shaft mounted at the front of the main gearbox. In the A/B range version (4 x 4), it provides two forward speeds and two reverse speeds.

The reversing mechanism is housed in the enclosure at the back of the input gearbox behind the speedshift. It consists of :

- two helical gears **(5)** and **(23)**, carried on two roller bearings **(6)** and **(20)**. These gears are in constant mesh with the A range gear **(67)** and the B range gear **(76)** respectively (4 x 4 version), these latter gears being mounted on the secondary shaft which forms the input to the main gearbox. In the 4 x 2 version, there is only the rear gear **(5)** in constant mesh with input gear **(67)** to the main gearbox.
- a synchromesh assembly **(18)** including a body and outer member assembly **(2)**. The body of assembly **(2)** is splined to the hollow input shaft **(19)**.
- an assembly comprising a guide rail and synchroniser control fork.
- a hollow shaft **(19)** carried in roller bearings **(24)** or **/44** (depending on version) and **(9)**. The roller bearings are supported in two seatings in the reversing mechanism housing.
- an idler gear set **(15)** in constant mesh with gear **(23)** and the A range gear **(67)** (4 x 4 version) or the input gear (4 x 2 version) of the gearbox.

Operation

Forward

A range

If they are moved in the rearward direction, the couplers of synchromesh assemblies **(18)** and **(78)** respectively connect gear **(5)** to shaft **(19)** and gear **(67)** to shaft **(69)**. Gear **(5)** then applies drive to gear **(67)**, with which it is in constant mesh, to synchromesh assembly **(78)** and to secondary shaft **(69)**.

B range

If they are moved in the forward direction, the couplers of the synchromesh assemblies respectively connect gear **(23)** to shaft **(19)** and gear **(76)** to shaft **(69)**.Gear **(23)** then applies drive to gear **(76)**, with which it is in constant mesh, to synchromesh assembly **(78)** and to secondary shaft **(69)**.

Reverse

The reverse speeds are obtained by means of the reverse idle gear set **(15)**. When either of the reverse speeds is selected (in the same range as was previously selected in forward), only synchromesh assembly **(18)** moves. Drive is transmitted from hollow shaft **(19)** to secondary shaft **(69)** via the two sets of teeth on idler gear **(15)**.

A range

When moved forward, synchromesh assembly **(18)** connects gear **(23)** to shaft **(19)**. Drive is transmitted from gear **(23)**, via sets of teeth **(c)** and **(d)** on gear **(15)**, gear **(67)** and synchromesh assembly **(78)**, to secondary shaft **(69)**.

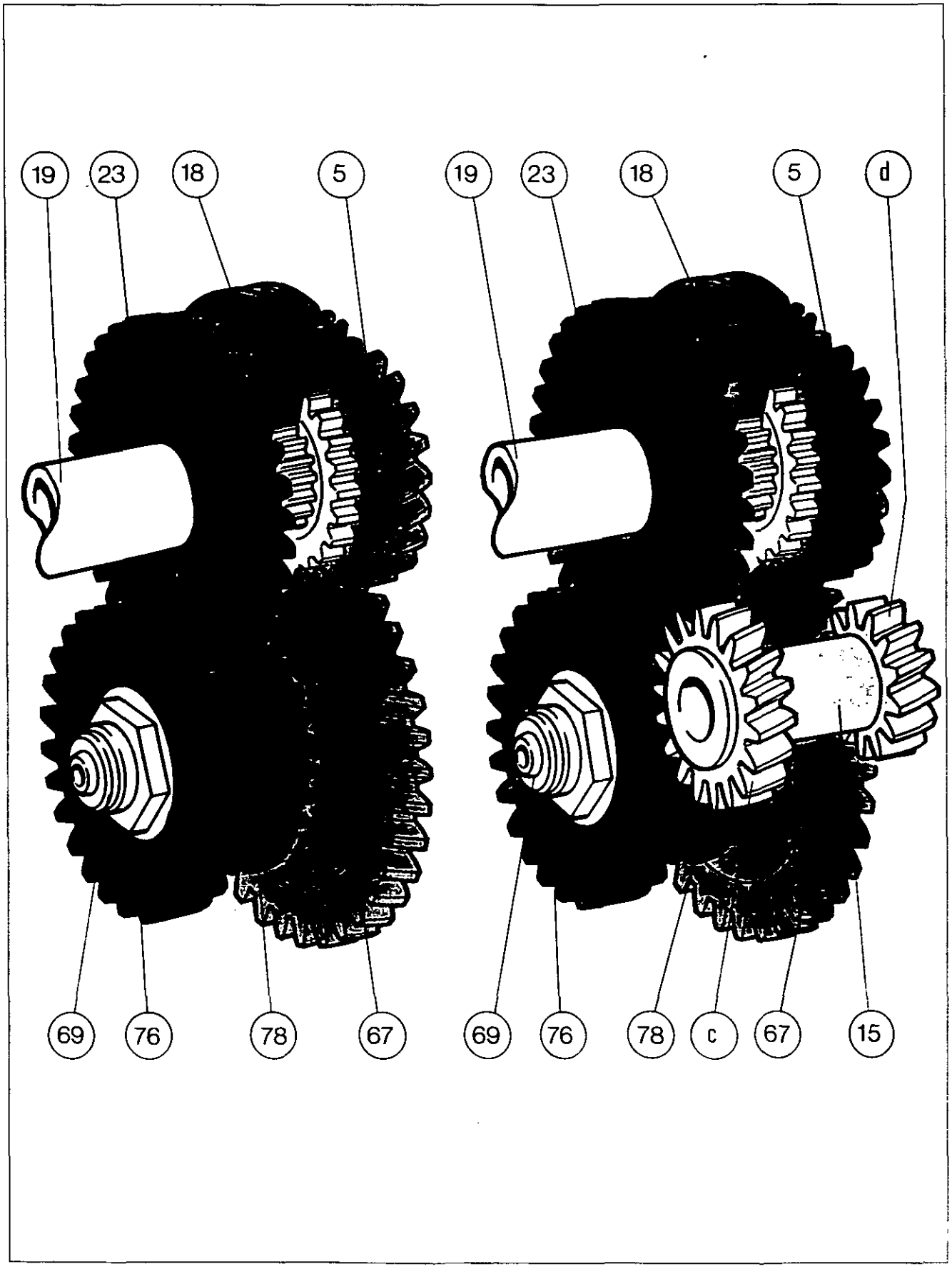
B range

When moved rearward, synchromesh assembly **(18)** connects gear **(5)** to shaft **(19)**.
Gear **(5)** transmits drive to turn gear **(67)**. Gear **(67)** is in mesh with set of teeth **(d)**, which rotate with set of teeth **(c)**. Teeth **(c)** drive gear **(23)** and this turns secondary shaft **(69)** via gear **(76)** and synchromesh assembly **(78)**.

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Gearbox - Reverse shuttle



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Gearbox - Reverse shuttle

A. Removal

Procedure where intermediate shaft has to be set up, e.g. when reverse mechanism housing **(26)** is being replaced.

To allow the intermediate shaft bearings to be set up *correctly, the gearbox has to be removed from the* tractor.

3000-3100 tractors

1. Split the tractor between the gearbox and the rear axle ; see Section 3 BO2.

3000 tractors

2. Separate the gearbox from the engine ; see Section 3 A01. Carry out procedures 11 and 12 after suspending the gearbox in slings (Fig.1).

3100 tractors

3. Separate the gearbox from the engine ; see Section 5 A02.A, procedure 2.

Procedure where intermediate shaft does not have to be set up.

N.B.: Take off the RH step. Gearbox only should be drained of oil.

3000 tractors

4. Split the tractor between the engine and gearbox, Section 3 A01.

3100 tractors

5. Split the tractor between the engine and gearbox, section 3A02.

3000-3100 tractors, with or without shimming.

6. Remove the PTO shaft and take out seal **(6)** (Fig.2).
7. Remove the bleed pipe **(1)** and supply pipe **(2)** and connector **(3)**. Plug the passage openings (Fig.2).
8. Carry out the following procedures from Section 5 K01
   - 9 to 14 (procedure with no shimming)
   - 13 and 14 (procedure with shimming).
9. Unscrew set-screws **(34)** and take off the selector dog **(33)**.
10. Unscrew the 8 bolt diam. 10 mm **(4)** (Fig.2).
    N.B.: Do not remove the three bolts (5) (Fig.2) (with speedshift).

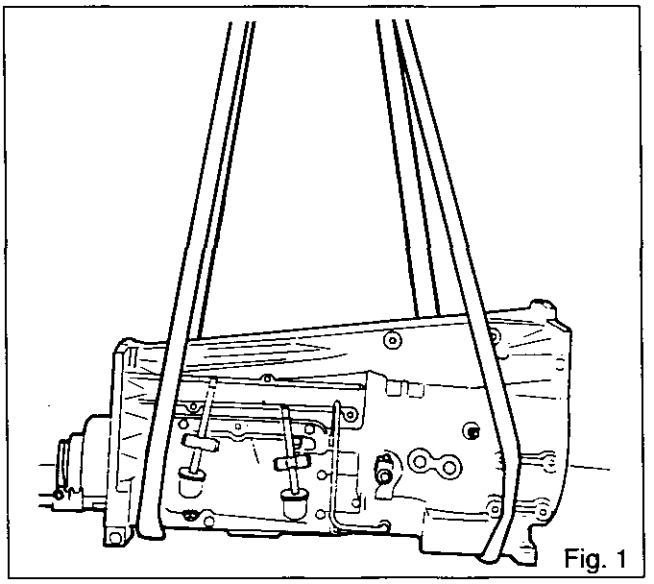


Fig. 1

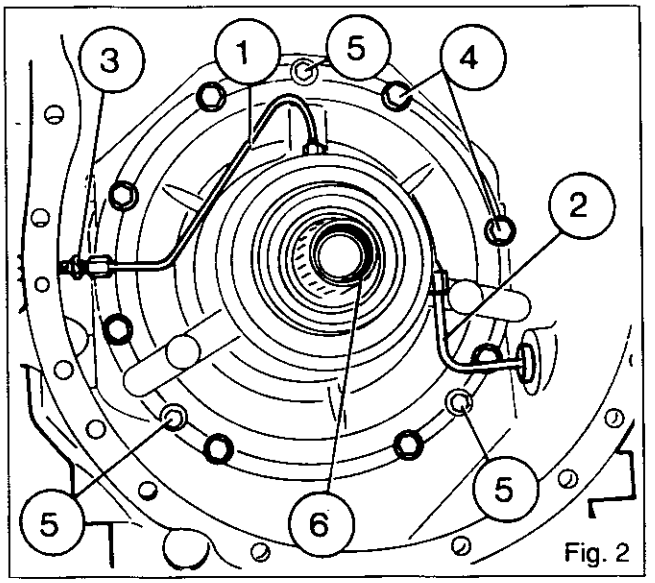


Fig. 2

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Gearbox - Reverse shuttle

11. Release and withdraw the reversing mechanism by tilting it forward and down (Fig.3).
N.B.: Save the locating pin (1) but discard the O-rings (2) and (3) (Fig.4).
12. Place the reversing mechanism on a bench.
13. Remove plug **(29)**, spring **(28)** and locking plunger **(27)**.
N.B. : Remember that this plunger is not interchangeable with the locking plungers used for 1st, 2nd, 3rd, 4th and 5th gears in the gearbox (different length).
14. Unscrew bolts **(32)**.
N.B.: To prevent jerky operation of the reversing mechanism, the locked position of the guide rail was modified as from serial no P188030. For tractors with serial number prior to the above, see Workshop Manual 1646640M1.
15. Remove guide rail **(31)** and fork **(30)**.
N.B.: To avoid the risk of wear to the bearings carrying the reverse idler gear in the reversing mechanism, the following modifications were introduced as from these serial numbers:
- P090012 : units with speedshift
- P251008 : units without speedshift
- The shape of the thrust washers was altered to prevent them from turning.
- The cast housing of the reversing mechanism was strengthened.
For tractors with serial numbers prior to the above, see Workshop Manual 1646640 M1.

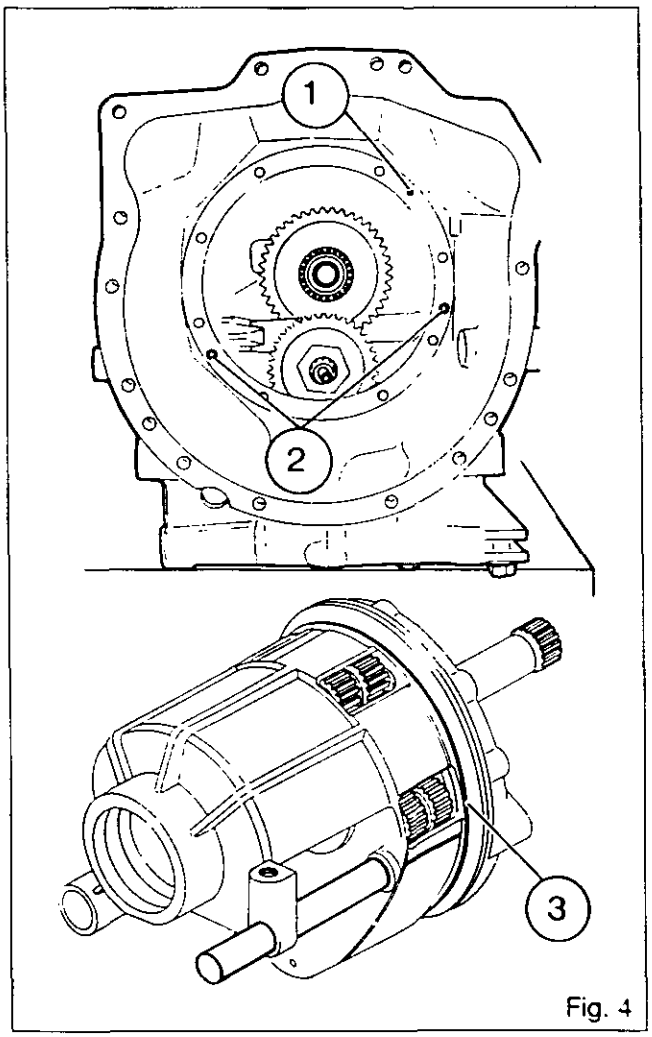
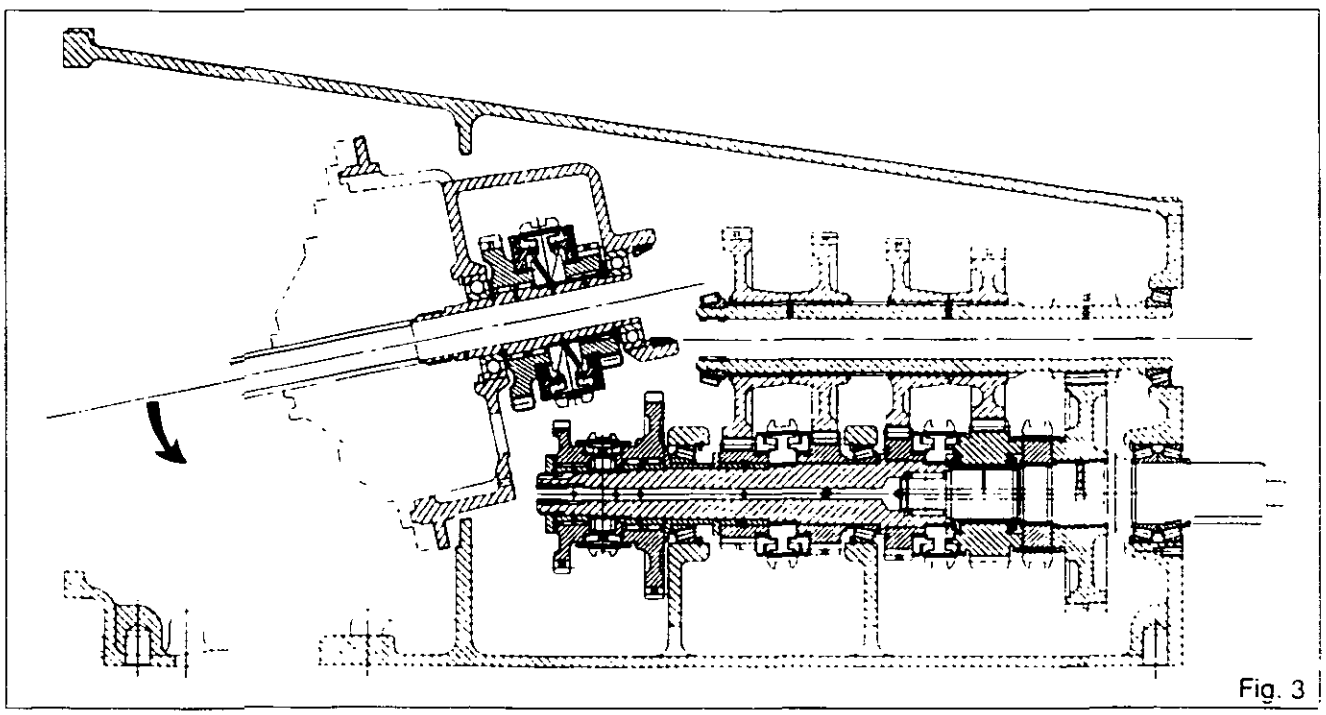


Fig. 4


Fig. 3

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Gearbox - Reverse shuttle

16. Unscrew set-screw **(10)**.
17. Withdraw the shaft **(13)** carrying the reverse idler gear **(15)**.
18. Take out the two washers **(12)** and **(17)**, the reverse idler gear, the two needle roller bearings **(14)** and **(16)**, and the spacer **(11)**.
19. Carry out procedures 9 to 11, Section 5 E02 (reversing mechanism with speedshift).
20. Extract circlip **(25)** (reversing mechanism with speedshift).
21. Remove spacer **(36)**, sealing ring **(37)** and pipe **(42)** (reversing mechanism without speedshift).
22. Remove the shims **[1]**.
23. Press out the secondary shaft **(19)** using a press and a suitable press tool (Fig.5 - reversing mechanism with speedshift) - (Fig.6 - reversing mechanism without speedshift).
    N.B. : There have been two alternative suppliers for the 114 mm diameter reversing synchromesh assembly : CGT and ZF.
    All 3000 series tractors produced from the beginning of production to serial no. V058034 and from serial no. P054040 onwards are fitted with a CGT assembly.
    All 3000 series tractors produced between serial nos. V058035 and P054039 are fitted with a ZF assembly.
24. Take out washer **/8**.
25. Remove the gear and synchromesh assembly **(18)** (Fig.7).
26. Take out bearing **(9)**.
27. From the gear and synchromesh assembly, separate: gear **(5)**, bush **(7)**, single-row needle-roller bearing **(6)**, end ring **(4)**, synchroniser brake **(3)**, synchroniser **(2)**, synchroniser brake **(21)**, end ring **(22)**, gear **(23)**, and double-row needle-roller bearing **(20)**.
28. From the secondary shaft, separate :
    - bearing **(24)** and washer **/35** (with speedshift).
    N.B.: Mark which way round the washer fits.
    - bearing **/44** (without speedshift).
    N.B.: Mark which way round the bearing fits.
29. Withdraw seal **/41** from spacer **(36)** and discard it (if necessary).

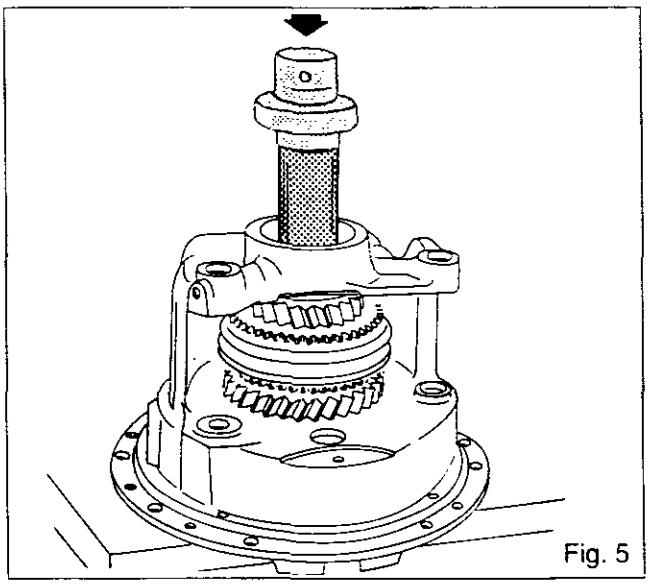


Fig. 5

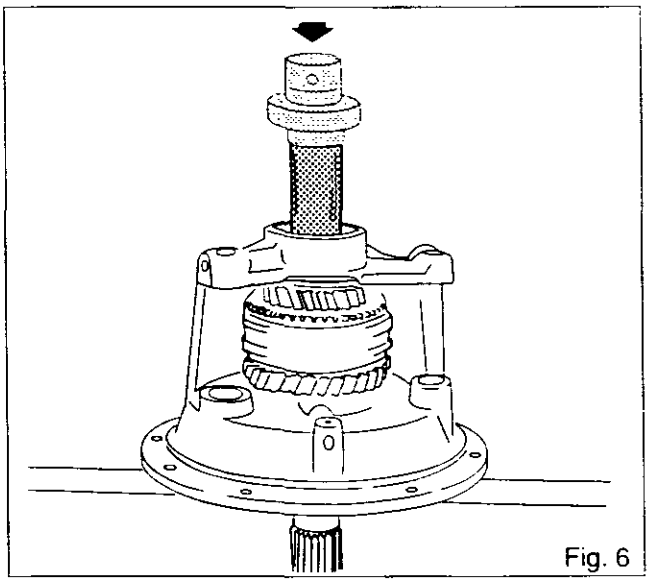


Fig. 6

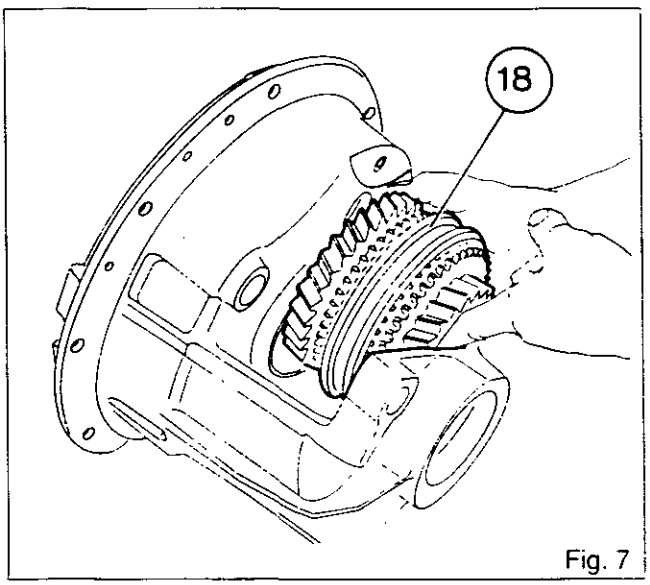


Fig. 7

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B. Refitting and adjusting the reverse gear selector fork

Refitment

30. Clean and check all parts and replace any which are faulty.
31. Check that oilways and their openings are not blocked in secondary shaft **(19)**, shaft **(13)** and housing **(26)**.
32. Oil shaft, bearings and seals.
33. Check the clearance between the synchroniser brakes **(3)** and **(21)** and the end rings **(4)** and **(22)**. ***N.B. : See Section 5 A01, p.9.***
34. Fit washer /**35**\ to shaft **(19)** (lubrication grooves facing towards shoulder E) (Fig.8).
35. Press bearing **(24)** on until tight against washer /**35**\ with a press and a suitable press tool (units with speedshift) (Fig.9).
36. Press bearing /**44**\ on until tight against shoulder E on shaft **(19)** with a press and a suitable press tool. ***N.B.: The sealed side of the bearing should face towards shoulder E (units without speedshift) (Fig.10).***
37. Carry out procedures 25 to 27 in reverse.

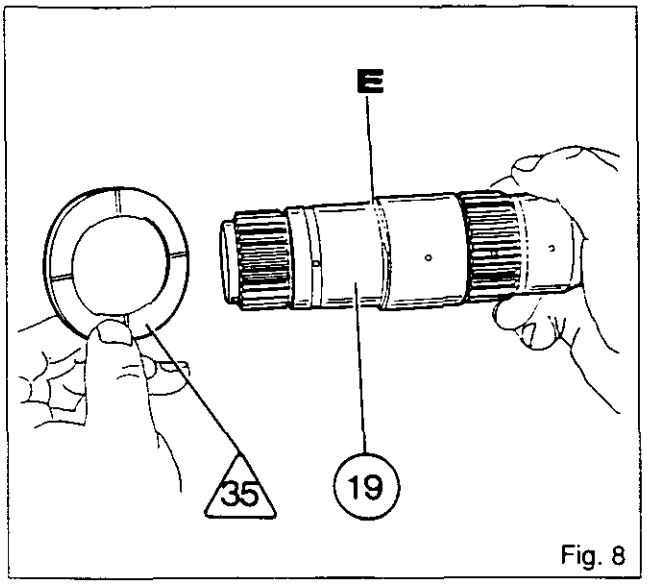


Fig. 8

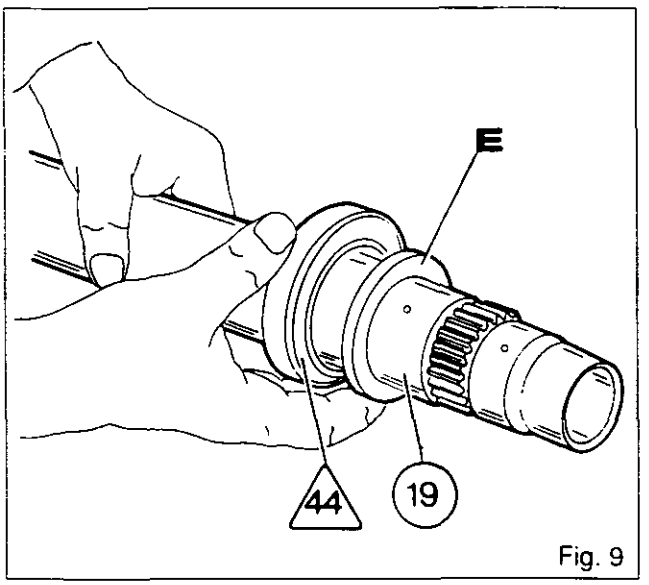


Fig. 9

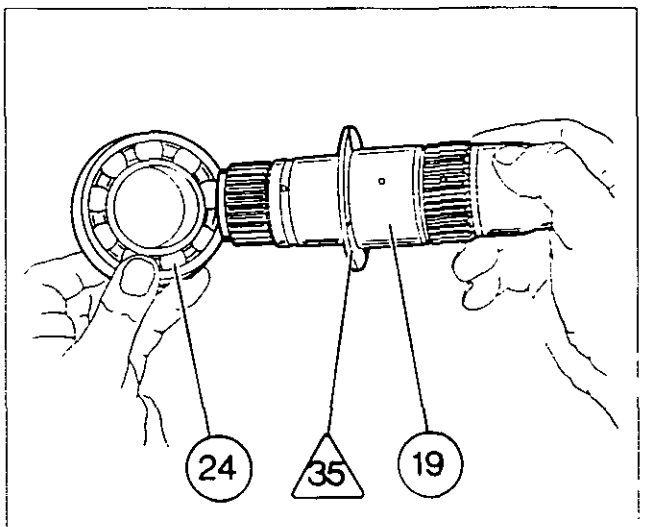


Fig. 10

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38. Fit and centralise washer /**8**\ with its lubrication grooves facing towards gear **(5)** (Fig.11).
39. Insert secondary shaft **(19)** into the gear and synchromesh assembly **(18)**.
40. Check that the splines on shaft **(19)** are engaged in the splines in the synchroniser body (2).
    Press the shaft in until it is fully home against the inner races of bearings **(24)** or /**44**\, and **(9)** with a press and a suitable press tool.
    - reversing unit with speedshift (Fig.12a)
    - reversing unit without speedshift (Fig.12b).
41. Refit circlip **(25)** (units with speedshift).
42. Fit spacer **(36)** (units without speedshift) (Fig.14).
    Tighten bolt **(38)** to a torque of 25-30 Nm.
    Tighten bolts **(40)** to a torque of 45-60 Nm.
43. Hold the unit in a suitable position in a vice.
44. Shim up the shaft bearings
    J1 = +0.05 to +0.2 mm
    - units with speedshift (Fig.13).
    - units without speedshift (Fig.14).

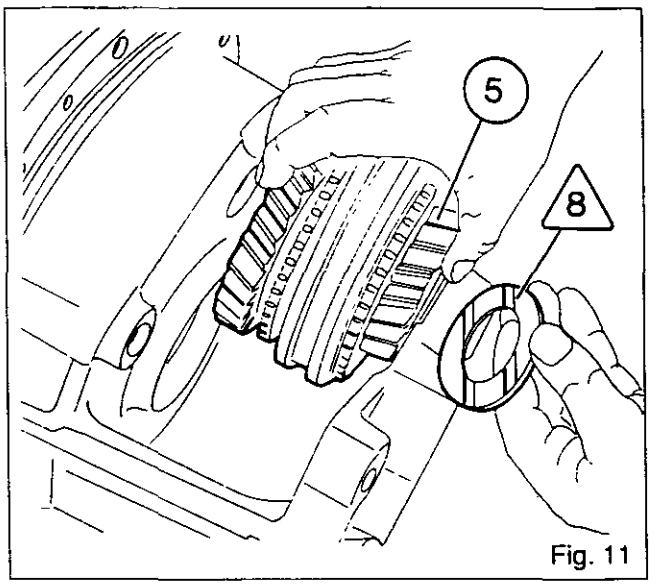


Fig. 11

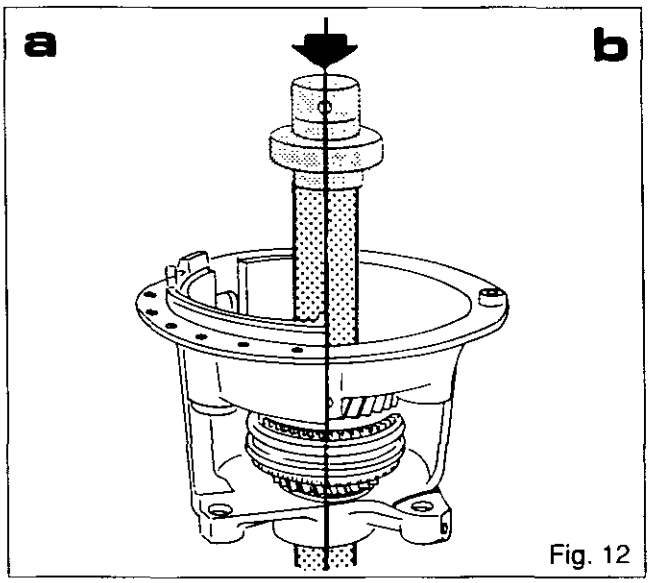


Fig. 12

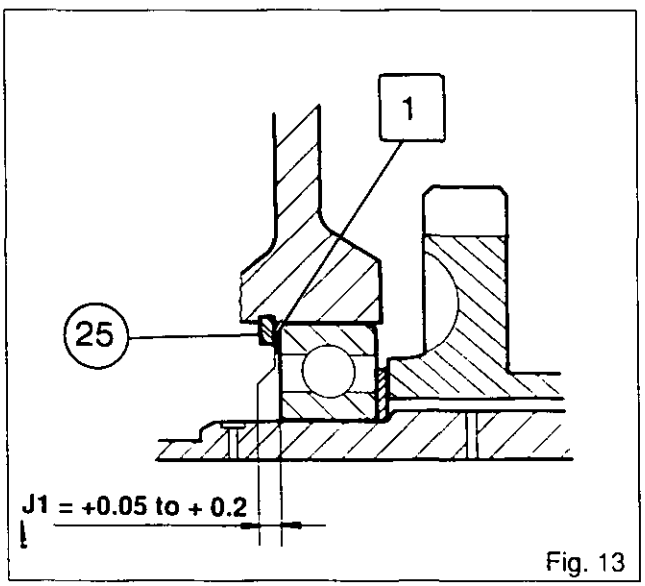


Fig. 13

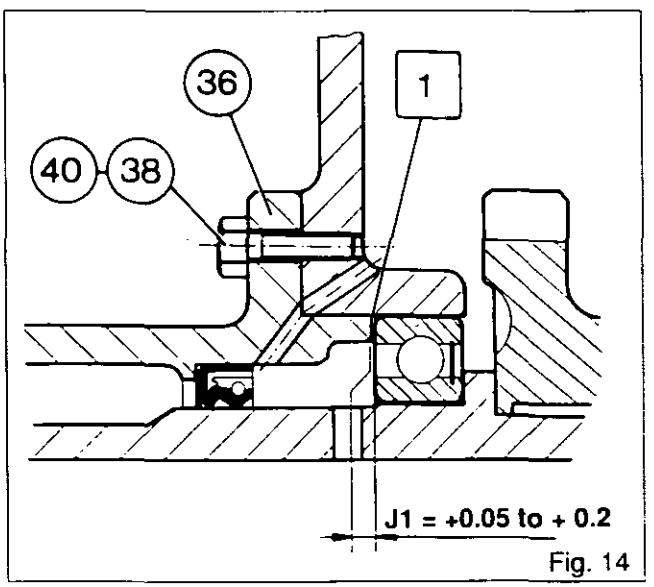


Fig. 14

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Gearbox - Reverse shuttle

45. Set up dial gauge with stylus against end of shaft (Fig.15).
46. Pull on shaft to position bearing **(24)** correctly against circlip **(25)**, or bearing **/44** correctly against spacer **(36)**, depending on version.
47. Set dial gauge to zero.
48. Push on the shaft to position bearing **(9)** correctly, hard against the shoulder in the housing.
49. As dictated by the reading taken from the dial gauge, select shims of the appropriate thickness to give **J1**.
50. Remove circlip **(25)** (units with speedshift).
51. Remove spacer **(36)** (units without speedshift).
52. Fit the shims **[1]** selected in operation 49.
53. Refit circlip **(25)** (units with speedshift).
54. Where required, fit a new seal **/41** in spacer **(36)** so that it is a distance of 27.5 mm from face F (units without speedshift) (Fig.16)
    N.B. : Use a suitable tool to set up the seal perpendicular to the axis of the spacer.
55. Cover the splines in shaft **(19)** temporarily so that seal **/41** will not be damaged (units without speedshift).
56. Lubricate seal **/41** and refit spacer **(36)**, with a new sealing ring **(37)**, and pipe **(42)** (units without speedshift).
    Remove the temporary covering and tighten bolts **(38)**, smeared with Loctite 542, to a torque of 25-30 Nm. Tighten bolts **(40)**, smeared with Loctite 542, to a torque of 45-60 Nm. Remove the temporary covering (units without speedshift).
57. Check the rotation of shaft **(19)** and the end float of gears **(5)** and **(23)** manually.
58. Carry out procedures 17 and 18 in the reverse order.
59. Apply Loctite 241 to set screw **(10)** and tighten screw to a torque of 28-43 Nm.
    N.B.: Check the end float and backlash of the reverse idler gear (15).
60. Carry out procedures 62 to 65 from Section 5 E02 (units with speedshift).
61. Carry out procedures 83 to 87 from Section 5 E02 (units with speedshift).
62. Carry out procedure 89 from Section 5 E02 (units with speedshift).
63. Fit the three 8 mm bolts holding the speedshift cover to the unit and tighten them to a torque of 25-35 Nm (units with speedshift).

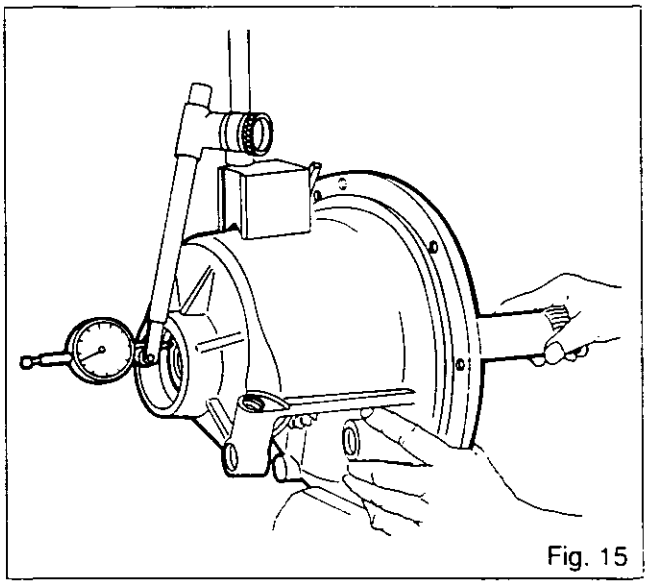


Fig. 15

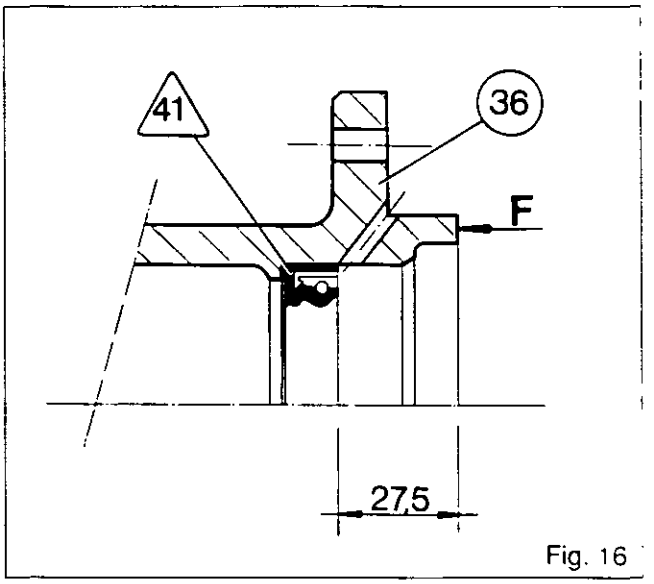


Fig. 16

64. Clean out the tapped holes in fork **(30)** and slide the fork onto the guide rail **(31)**.
65. Fit locking plunger **(27)**, spring **(28)** and plug **(29)** Fighten the plug to a troque of 50-70 Nm.
66. Coat screws **(32)** lightly with Loctite 221 and tighten them gently to allow the selector fork to be adjusted.

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Gearbox - Reverse shuttle

Adjusting the selector fork (procedures 67 to 71)

General principle

The fork **(30)** is positioned by means of the difference in the spacing Y of the tapped holes and the spacing Z of the spot-facings in the guide rail **(31)**.
The fork can be adjusted to move to different points by acting on either the front or rear screw **(32)** depending on what adjustment is required (Fig.17).

67. Position the fork so that it is locked in the forward position.
68. Hold the synchro outer member against the gear.
69. Check that the front pad on the fork is not touching the synchro outer member.
70. Repeat the procedure (with the fork locked in the rearward position), checking that the rear pad on the fork is not touching the synchro outer member. If it is, adjust the fork by acting on screws **(32)** (Fig.17).
71. Tighten the screws to a torque of 35 Nm without disturbing the adjustment.
72. On the reversing mechanism, check that cup **(1)** and O-ring **(2)** are in position (Fig.18).
73. Fit locating pin **(4)** and new O-rings **(3)** to the housing (Fig.19).
74. Offer up the reversing mechanism to the gearbox housing and tilt it downwards to engage its gearing in the A/B gearing (4 x 4 gearboxes).
75. At the same time, with the help of an assistant, lift the front of the intermediate shaft slightly through the opening in the selector cover to allow the cone to be engaged in the cup.
76. Locate the reversing mechanism on the locating pin.
77. Fit the bolts and tighten them to a torque of 45-60 Nm.
78. Refit pipes **(1)** and **(2)**, and connector **(3)** (Fig.2).

Version with shimmed intermediate shaft

79. Carry out procedures 21 and 22 from Section 5 A02.E.
    Carry out procedures 195 to 205 from Section 5 A02.Q.
80. Fit the reverse selector dog **(33)** (shimmed and unshimmed units)
81. Carry out procedures 233 to 237 from Section 5 A02.R (shimmed and unshimmed units).

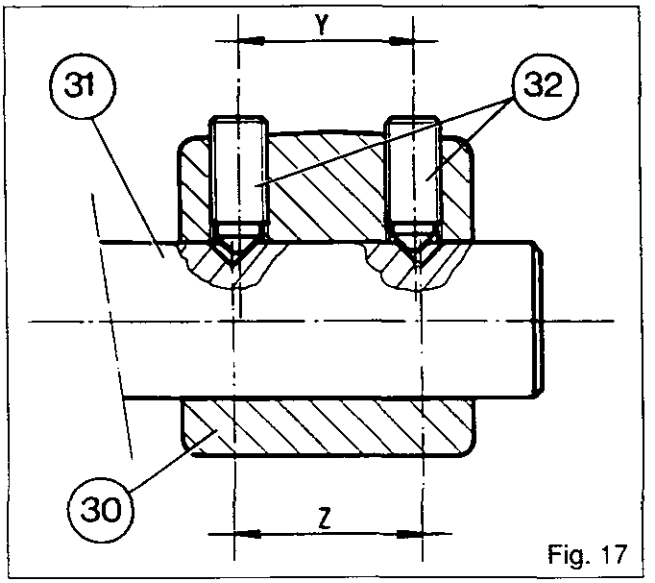


Fig. 17

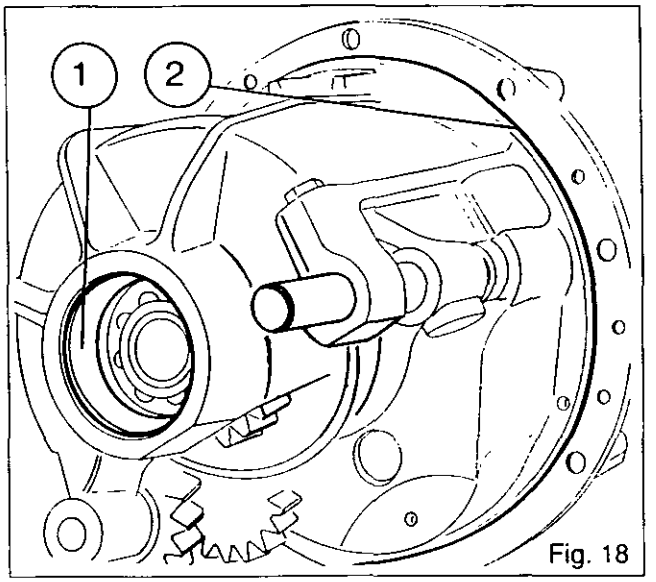


Fig. 18

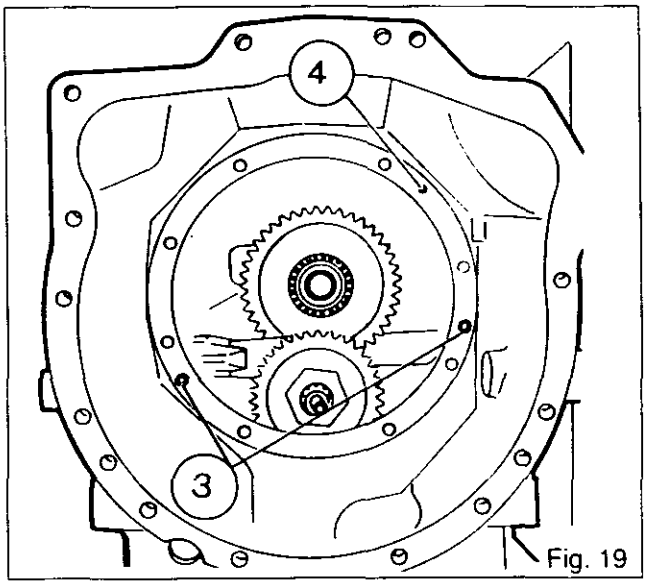


Fig. 19

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Refitting 4 x 2 selector cover

82. Carry out procedures 238 to 243, Section 5 A02.S (shimmed and unshimmed units)
From Section 5 K01, carry out in reverse order:
- procedure 13. Tighten the bolts to a torque of 50-70 Nm (shimmed and unshimmed units).
- procedures 11 and 12 (unshimmed units).
- procedure 10 (unshimmed units).

N.B.: Grease ball-joints (8) (14) and (21) (27) (Loctite anti-seize grease or equivalent).

Carry out procedure 50, Section 5 K01 (unshimmed units).
Carry out procedures 8 and 9, Section 5 K01 in reverse (unshimmed units).

Refitting 4 x 4 selector cover

83. Carry out procedures 246 to 255 from Section 5 A02.S (shimmed and unshimmed units)
Fit the earth cable lug to the cover (shimmed and unshimmed units).
Carry out procedures 256 and 257, Section 5 A02.S (shimmed and unshimmed units).
Carry out procedures 48 to 51, Section 5 K01 (unshimmed units).

Version with shimmed intermediate shaft
3000 tractors

84. Connect the gearbox to the engine. Carry out the following procedures from Section 3 A01:
- 13, 14 (except a and b)
- 15, 16
- 17, 18 (after suspending the gearbox in slings)

3100 tractors

85. Connect the gearbox to the engine. Carry out the following procedures from Section 3 A02:
- 15 to 17
- 18 (except a and b)
- 19 to 22.

3000-3100 tractors

86. Join the tractor at the joint between the gearbox and the rear axle, Section 3 B02.

Version with unshimmed intermediate shaft
3000 tractors

87. Connect the tractor at the joint between the engine and gearbox, Section 3 A01.

3100 tractors

88. Connect the tractor at the joint between the engine and gearbox, Section 3 A02.

3000-3100 tractors

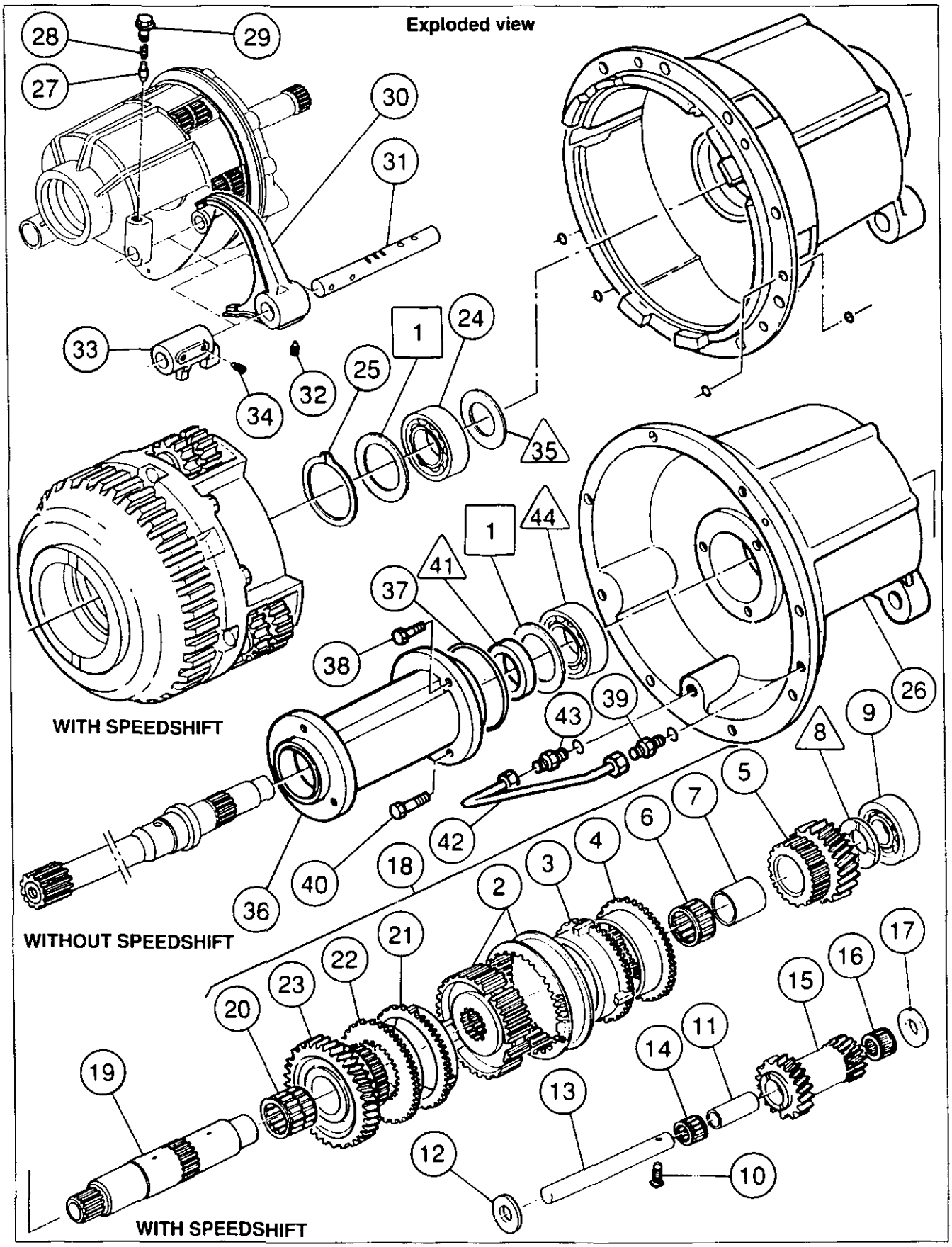
89. Top up the oil in the housing and bleed the clutch circuit, Section 5 C01.F.
90. Carry out a road test on all the controls.
91. Check the selector cover joint and the joint between the gearbox and rear axle for leaks.

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5E03.12

Gearbox - Reverse shuttle



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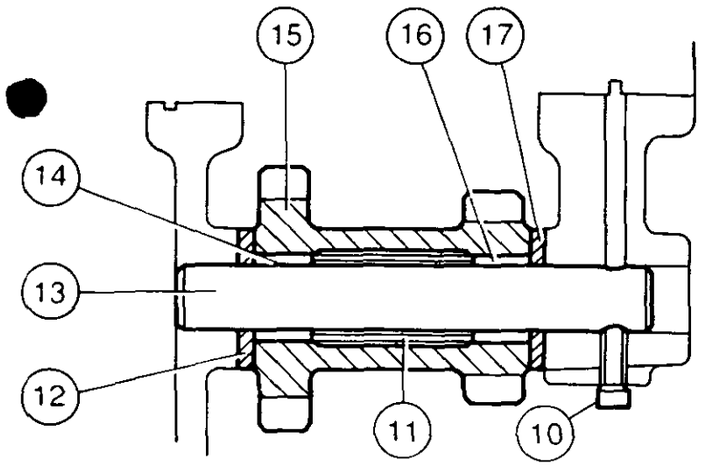
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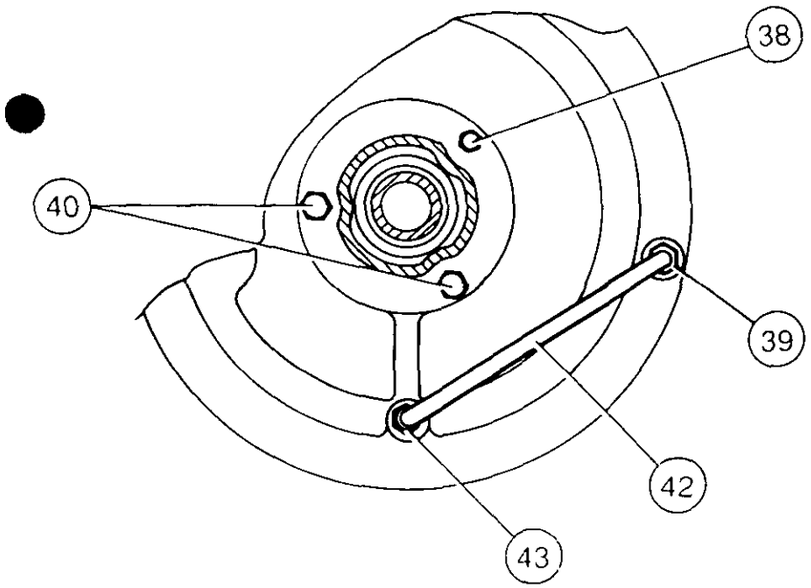
Gearbox - Reverse shuttle

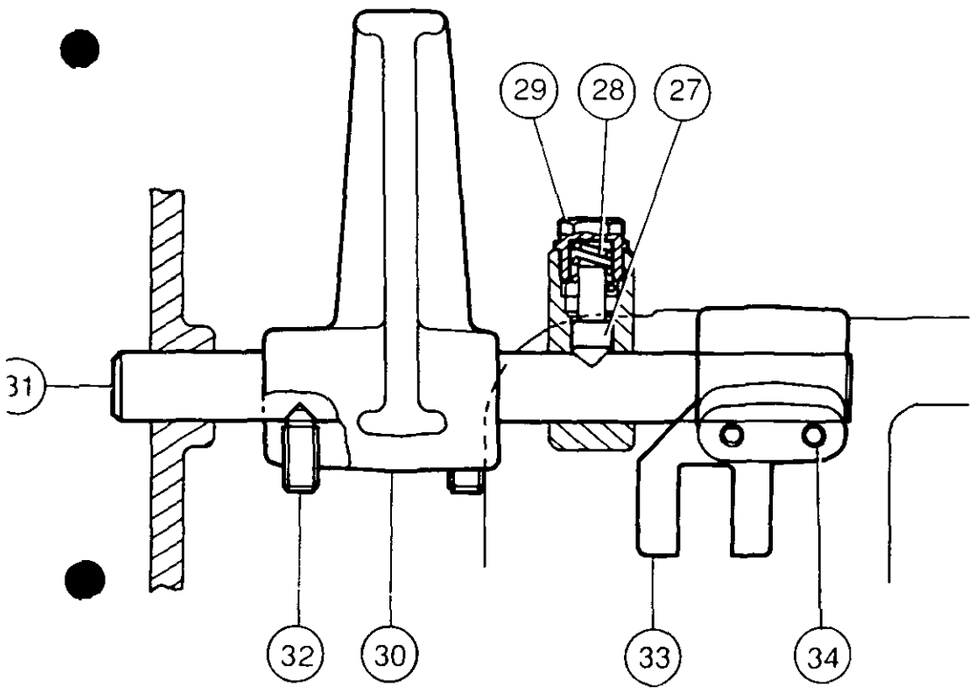
List of parts - Reverse shuttle		With speedshift	Without speedshift
[1]	Shims	•	•
(2)	Synchroniser	•	•
(3)	Synchroniser brake	•	•
(4)	Synchroniser end ring	•	•
(5)	Gear	•	•
(6)	Single-row needle-roller bearing	•	•
(7)	Bush	•	•
/8\	Thrust washer	•	•
(9)	Bearing	•	•
(10)	Set screw	•	•
(11)	Spacer	•	•
(12)	Thrust washer	•	•
(13)	Shaft	•	•
(14)	Needle-roller bearing	•	•
(15)	Reverse idler gear	•	•
(16)	Needle-roller bearing	•	•
(17)	Thrust washer	•	•
(18)	Synchromesh assembly	•	•
(19)	Secondary shaft	•	•
(20)	Double-row needle-roller bearing	•	•
(21)	Synchroniser brake	•	•
(22)	Synchroniser end ring	•	•
(23)	Gear	•	•
(24)	Bearing	•	-
(25)	Circlip	•	-
(26)	Housing	•	•
(27)	Locking plunger	•	•
(28)	Spring	•	•
(29)	Plug	•	•
(30)	Fork	•	•
(31)	Guide rail	•	•
(32)	Adjusting screw	•	•
(33)	Selector dog	•	•
(34)	Adjusting screw	•	•
/35\	Thrust washer	•	-
(36)	Spacer	-	•
(37)	O-ring	-	•
(38)	Bolt	-	•
(39)	Connector	-	•
(40)	Bolt	-	•
/41\	Seal	-	•
(42)	Pipe	-	•
(43)	Connector	-	•
/44\	Bearing	-	•

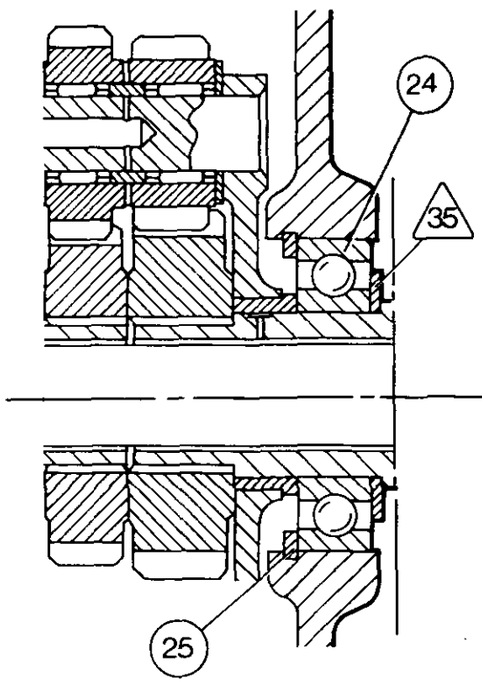
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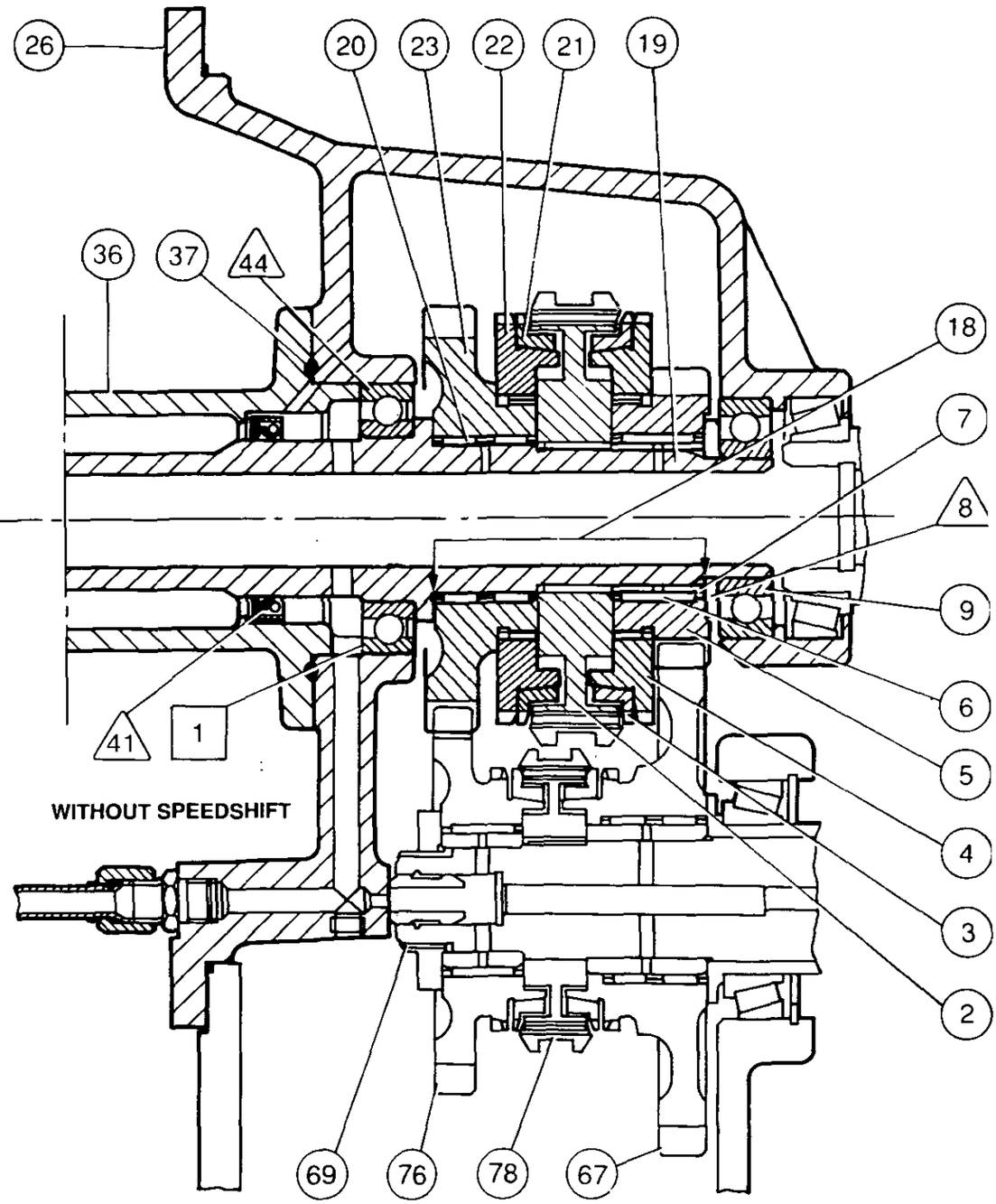








WITH SPEEDSHIFT



WITHOUT SPEEDSHIFT

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5 F01 A/B range gears and synchromesh mechanism

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. General ____ 2

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B. Reassembly ____ 4

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5F01.2

Gearbox - A/B range and synchromesh

General

Drive from the reverse shuttle gears is transmitted to the train of two gears fitted at the front end of the layshaft to give two additional forward and reverse speeds to the main gearbox.
For a general description of the A/B range operation, refer to Sections 5 E03 and 5 K01.
The A range **(67)** and B range **(76)** gears, separated by the synchromesh assembly, are located on the front end of the gearbox layshaft.
They are fitted respectively on the needle roller bearings **(79)**, **(75)** and the bushes /**81**\, **(74)** and retained by the sleeve **(82)**, the washer /**73**\ and the nut **(68)**.

A . Disassembly

Without creeper gears

3000 Tractors

1. Split the tractor between the engine and the gearbox. Section 3 A01.

3100 Tractors

2. Split the tractor between the engine and the gearbox. Section 3 A02.

3000-3100 Tractors

3. Drain the gearbox.
4. Carry out procedures 8 to 14, Section 5 K01.
5. Carry out procedures 7 and 10 to 12, Section 5 E03.
6. Carry out procedures 7 to 11, Section 5 A02.C
7. Remove the slider **(7)** (Fig. 2).
8. Extract the insert **(1)** (Fig. 1).
9. Withdraw the selector rail forwards.
10. Remove the latch assembly **(1)** (Fig. 2)
11. Remove and clean (Fig.2) :
    - the castellated nut **(2)**
    - the latch **(3)**
    - the tapered bearing **(4)**
    - the cone **(5)**

Tractors fitted with creeper gears

The RH hydraulic lift cover must be removed.

12. Set the RH rear wheel on wide track to gain access to the cover.

3000 Tractors

13. Split the tractor between the engine and the gearbox. Section 3 A01.

3100 Tractors

14. Split the tractor between the engine and the gearbox. Section 3 A02.

3000-3100 Tractors

15. Drain the gearbox.
16. Carry out procedures 8 to 14. Section 5 K01.
17. Carry out procedures 7 and 10 to 12, Section 5 E03.
18. Carry out procedures 2 to 14. Section 8 101.
19. Carry out procedures 4 to 6, Section 5 D01.A.
20. Carry out procedures 7 to 10. Section 5 A02.C.
21. Remove the slider **(7)** (Fig.2).
22. Carry out procedures 62 and 55 in Section 5 D01.B
23. Move the selector rail rearwards to release the A/B fork.

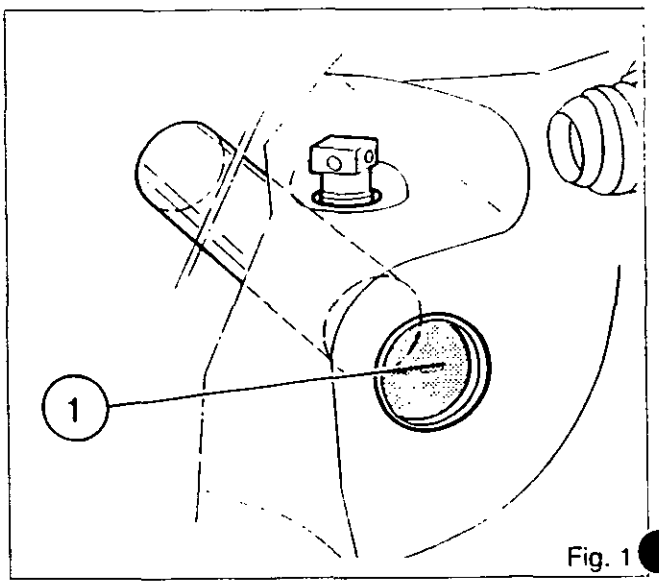


Fig. 1

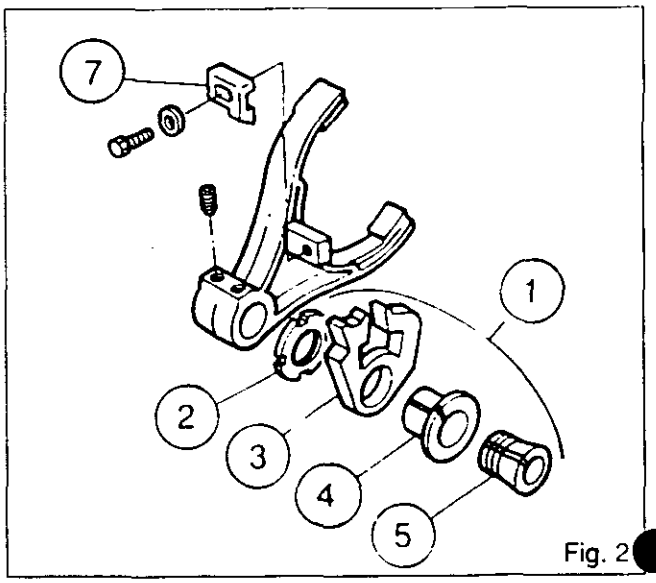


Fig. 2

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Gearbox - A/B range and synchromesh

Disassembly with or without creeper gears

24. Release the lock from the nut **(68)** and remove it using special tool M-F 456 by engaging the synchromesh mechanism and immobilising the B gear.

Note : To improve the performance of the synchromesh and A/B range cones, rings with sintered grooved cones are now fitted. The new synchromesh assembly was introduced on 40 kph tractors from serial number P089036 and on 30 kph tractors from serial number P297030.

25. Remove the spur washer /**73**\.
26. Remove the B gear **(76)** together with the needle roller bearing **(75)** and the bush **(74)** (Fig.3).
27. Remove the attaching bolts **(1)** from the shoes **(2)** on the A/B fork **(3)** (Fig.4)
28. Remove the brake **(77)**, the synchromesh ring **(78)** and the brake **(80)** (Fig.3) without unfastening the synchromesh hub slide.
29. Remove the fork.

Note: Move the A gear (67) to release the fork.

30. Remove the A gear together with the needle roller bearing **(79)** and the bush /**81**\

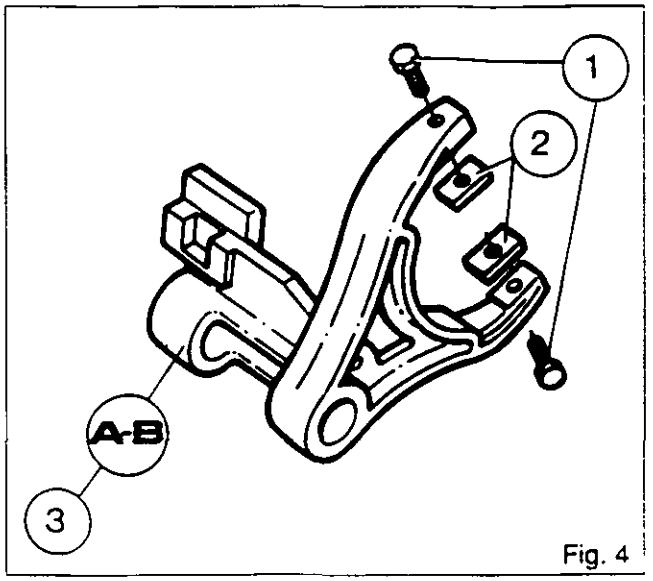


Fig. 4

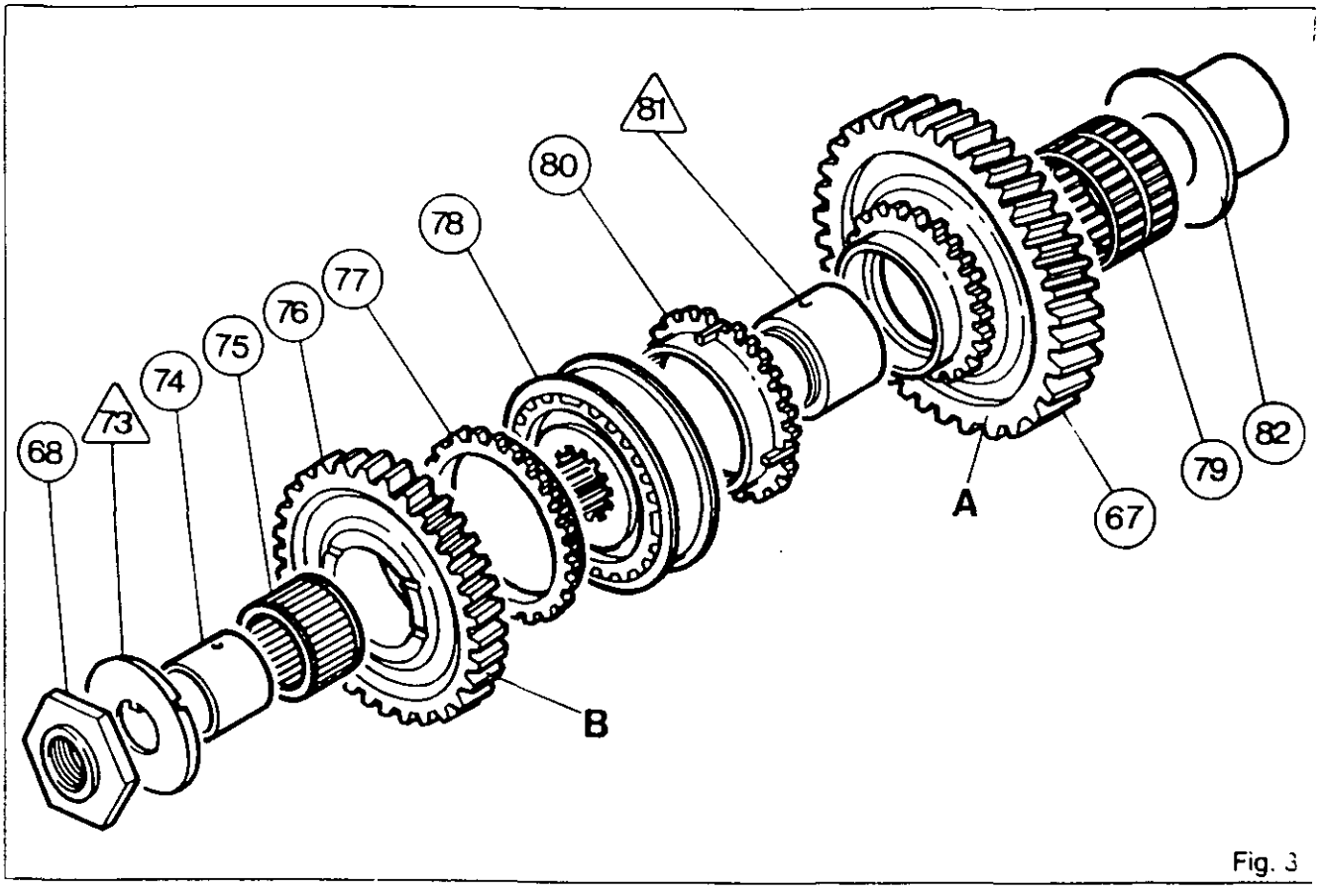


Fig. 3

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B. Reassembly

Tractors without creeper gears

31. Clean and check the parts. Replace any which are faulty.
32. Lubricate the bushes and bearings.
33. Refit the A gear together with the needle roller bearing **(79)** and the bush **/81** with its shoulder facing the synchromesh mechanism.
34. Move the A gear slightly forwards to refit the fork.
35. Carry out procedures 9 to 11 in reverse.
36. Refit the brake **(80)** and the synchromesh mechanism **(78)**.
37. Position the shoes **(2)**, fit the bolts after coating them with Loctite 241 and tighten them but not fully (Fig.4).
38. Check that the shoes move freely in the synchromesh slider.
39. Refit the gear **(76)**, the brake **(77)**, the bearing **(75)** and the bush **(74)** and check that the synchromesh brakes **(77)** and **(80)** are correctly positioned.
40. Refit the spur washer **/73**, the oil grooves must face the B gear.
41. Clean the thread of the shaft and of the nut **(68)**. Coat it with Loctite 241 and tighten to a torque of 80-100 Nm. Lock the nut by bending the collar into the shaft groove.
42. Check manually that the A/B synchromesh operates correctly.
43. Carry out procedures 214 to 216 in Section 5 A02.R.
44. Carry out procedures 223 to 232 in Section 5 A02.R.
45. Carry out procedures 72 to 78 in Section 5 E03.
46. Clean the selector cover joint and carry out procedures 45 to 51 in Section 5 K01.

Tractors with creeper gears

47. Clean and check the parts. Replace any which are faulty.
48. Lubricate the bushes and bearings.
49. Refit the A gear together with the needle roller bearing **(79)** and the bush **/81** with its shoulder facing the synchromesh mechanism.
50. Move the A gear slightly forwards to refit the fork.
51. Move the selector rail forwards to insert it into the A/B fork.
52. Fit the setscrew after coating it with Loctite 542 and tighten to a torque of 28-43 Nm.
53. Press in the insert coated with Loctite 542 flush with the housing.
54. Refit the brake **(80)** and the synchromesh mechanism **(78)**.
55. Position the shoes **(2)**, fit the bolts after coating them with Loctite 241 and tighten them but not fully (Fig.4).
    Note: Check that the shoes move freely in the synchromesh slider.
56. Refit the gear **(76)**, the brake **(77)**, the bearing **(75)** and the bush **(74)** and check that the synchromesh brakes **(77)** and **(80)** are correctly positioned.
57. Refit the spur washer **/73**, the oil grooves must face the B gear.
58. Clean the thread of the shaft and of the nut **(68)**. Coat it with Loctite 241 and tighten to a torque of 80-100 Nm. Lock the nut by bending the collar into the shaft groove.
59. Manually check that the A/B synchromesh operates correctly.
60. Carry out procedure 216 in Section 5 A02.R.
61. Carry out procedure 83, Section 5 D01.B.
62. Carry out procedure 29, Section 5 D01.A.
63. Carry out procedures 223 to 232 in Section 5 A02.R.
64. Clean the selector cover joint and carry out procedures 15 to 27, Section 8 I01.
65. Carry out procedures 72 to 78 in Section 5 E03.
66. Clean the selector cover joint and carry out procedures 45 to 51 in Section 5 K01.

Tractors with or without creeper gears
3000 Tractors

67. Refit the gearbox to the tractor, Section 3 A01.

3100 Tractors

68. Refit the gearbox to the tractor, Section 3 A02.

Tractors with creeper gears

69. Fit the creeper gear control.
70. Adjust the creeper gear control, Section 5 J01.
71. Position the wheel on normal track (creeper gears). Tighten the nuts to 400 - 450 Nm.

Tractors with or without creeper gears

72. Fill the gearbox with oil.
73. Remove air from the hydraulic clutch circuit, Section 5 C01G.
74. Road test the A/B range, the gears, the Hare/Tortoise range and the creeper gears (if fitted).
75. Check the following for leaks:
    - the selector cover gasket faces
    - the RH hydraulic lift cover gasket faces
    - the hydraulic unions

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5 G01 Mainshaft

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Gearbox - Mainshaft

General

The mainshaft **(69)** is fitted on the two taper roller bearings **(1) (2)** and **(16) (17)** which are supported by the two lower bearings of the main gearbox. The front end houses the A/B range gears and synchromesh assembly 4x4 (16 speed) version or the input gear 4x2 (8 speed) version.

Between the two lower bearings it supports the 1st **(7)** and 2nd **(14)** drive gears which run free and the 1st and 2nd synchromesh assembly **(11)** whose hub is splined on to it. At the rear end, it supports the 3rd (4x4) or 4th (4x2) **(18)** drive gear and the 3rd/4th synchromesh assembly **(23)**.

The rear end carries a needle roller bearing **(24)** which supports the front end of the output shaft **(44)**. The moving parts are lubricated by a central oilway and holes drilled radially. The taper roller bearings are preloaded by means of the shim **/4** and shim adjusters **[3]** located behind the bearing cup **(2)**.

A. Preliminary procedures

The gearbox must be removed in order to dismantle the mainshaft.

3000-3100 Tractors

1. Split the tractor between the gearbox and the rear axle. Section 3 B02.

3000 Tractors

2. Split the tractor between the gearbox and the engine. Section 3 A01.

Support the gearbox on a sling and carry out procedures 11 and 12. Remove the PTO shaft.

3100 Tractors

3. Split the tractor between the gearbox and the engine. Section 5 A02.A, procedure 2.

B. Disassembly and reassembly

4. Carry out the following operations in Section 5 A02:

4x2 gearbox	4x4 gearbox
5 to 63	5 to 48
125 to 245	64 to 124
-	139 to 237
-	246 to 259

Refit the gearbox to the engine.

3000 Tractors

5. Carry out procedures 13 to 18. Section 3 A01.

3100 Tractors

6. Carry out procedures 15 to 22. Section 3 A02.

3000-3100 Tractors

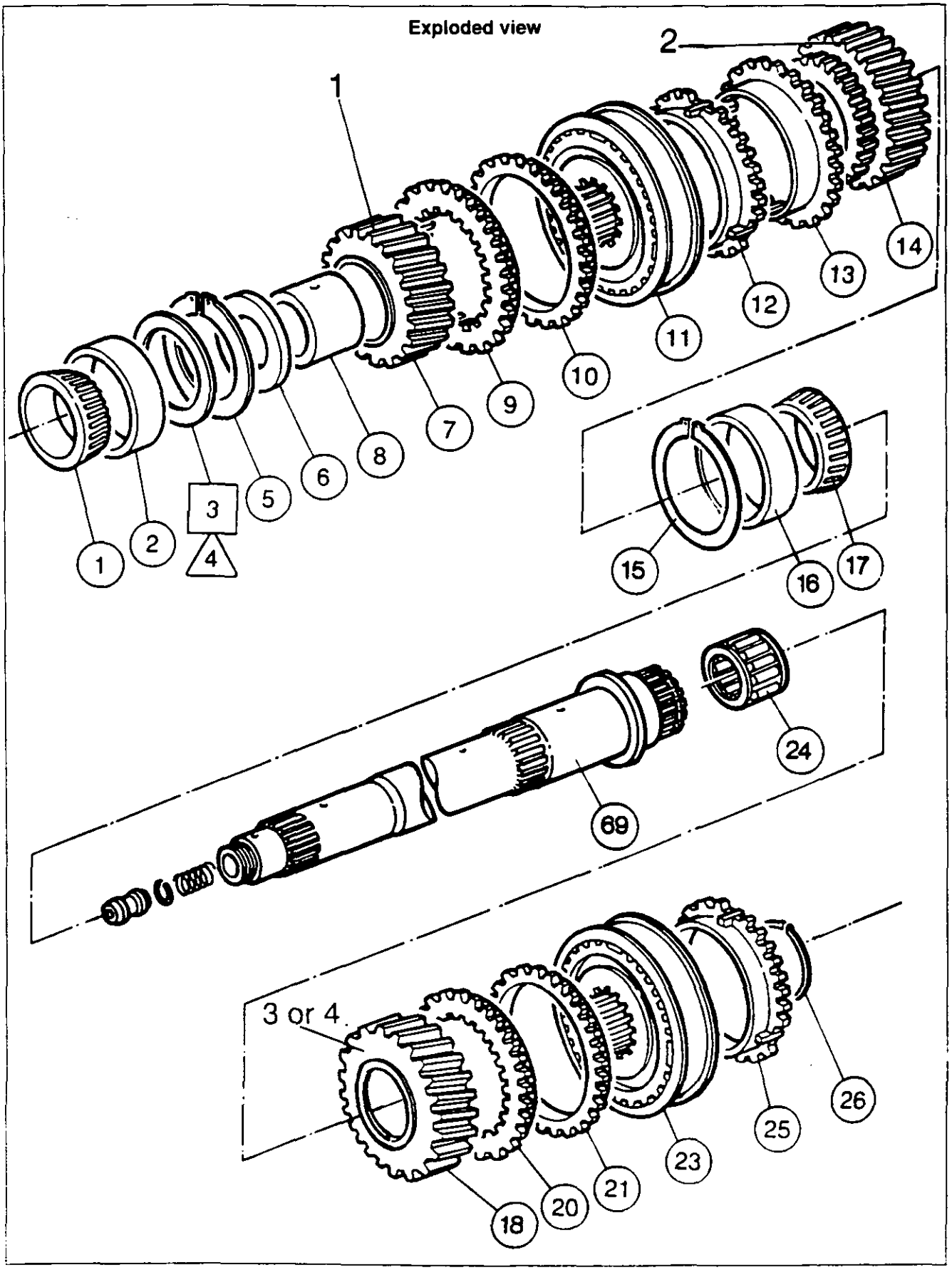
Refit the gearbox to the rear axle (see Section 3 B02).

7. Road test the control assembly
8. Check the selector cover and gear box gasket faces for leaks.

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Gearbox - Mainshaft



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5 H01 Layshaft

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C. **Reassembling layshaft** ____ 5

D. **Refitting input gearbox** ____ 6

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Gearbox - Layshaft

General

The layshaft and the gears it carries form the upper drive line in the gearbox. The shaft **(54)** carries the driven gears for 1st speed **(60)**, 2nd speed **(59)**, 3rd speed **(56)** and 4th speed **(55)**. In the 4 x 2 version (8 speeds), **(55)** is the 3rd speed gear and **(56)** the 4th speed gear. The set of teeth at the rear are in constant mesh with the Lo gear.

The front of the shaft is carried by a taper roller bearing **(63) (64)** in the rear of the input gearbox and at the rear it is carried in a bearing **(52) (53)** mounted in the bearing at the rear of the gearbox.

Gears **(56)** and **(59)** are held in position either by two circlips **(57)** and **(58)** in version A, or by a spacer **(57)** in version B. The running clearance the gears require is obtained by machined tolerances in version A and by inserting shims **[58]** in version B.

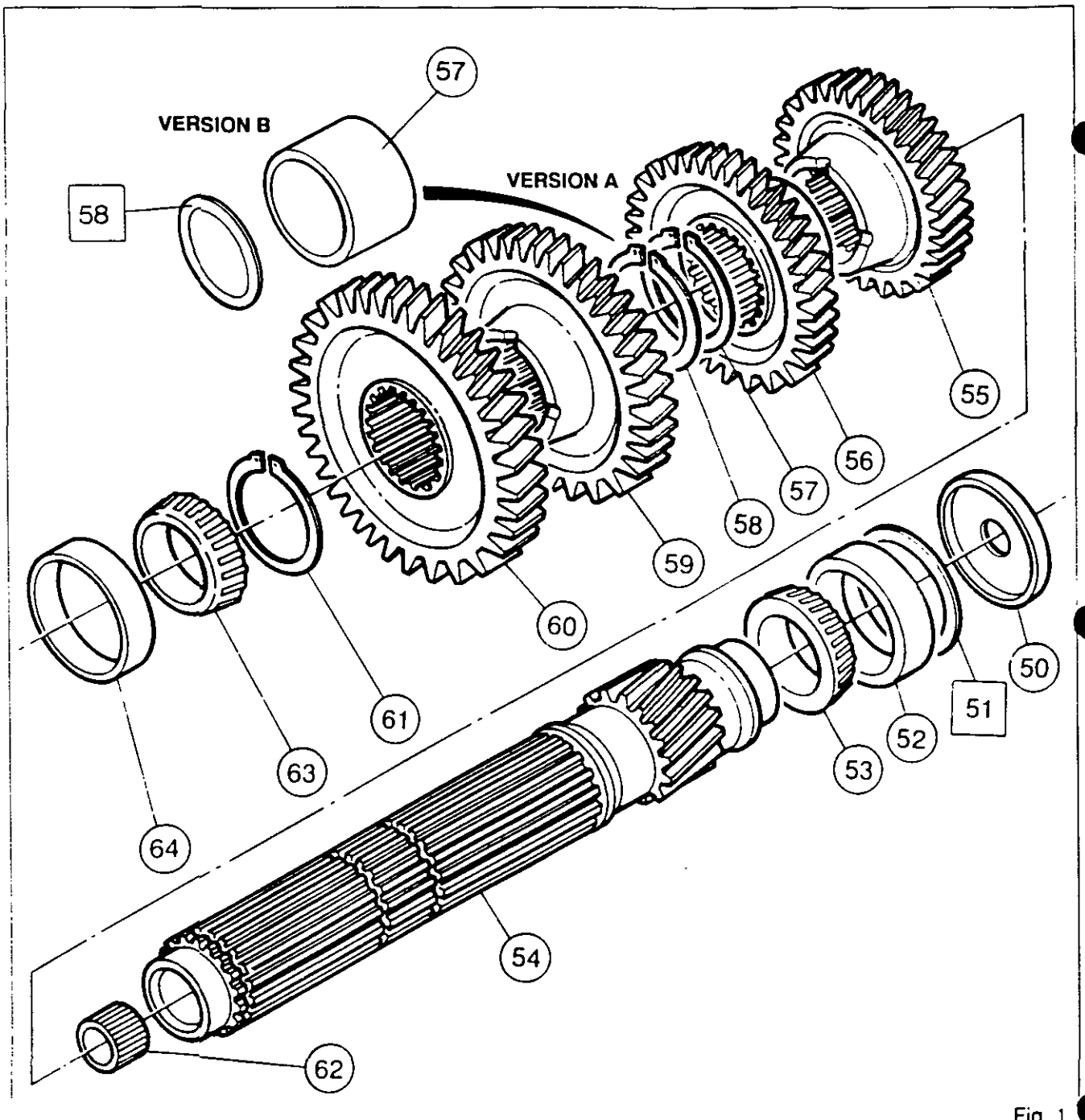


Fig. 1

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Gearbox - Layshaft

A. Preliminary procedures

To allow the bearings carrying the layshaft to be correctly shimmed, the gearbox must be removed.

3000-3100 tractors

1. Split the tractor between gearbox and rear axle. Section 3 B02.

3000 tractors

2. Separate the gearbox from the engine. Carry out procedures 11 and 12, Section 3 A01 (having suspended the gearbox in slings).
   Remove the PTO shaft.

3100 tractors

3. Separate the gearbox from the engine
   Carry out procedure 2, Section 5 A02.A.
4. Remove bleed pipe **(1)**, supply pipe **(2)** and connector **(3)** (plug the openings into the passages) (Fig.2).

3000-3100 tractors
Removing the selector cover

5. Carry out procedures 13 and 14, Section 5 K01.
6. Unscrew the 8 x 10 mm bolts **(4)** (Fig.2).
   N.B.: Do not unscrew the three bolts (5) (Fig.2)
7. Release and withdraw the input gearbox by tilting it forwards and down (Fig.3).
   N.B.: Keep locating pin (1) but discard O-rings (2) and (3) (Fig.4).
8. Position the input gearbox on a bench.

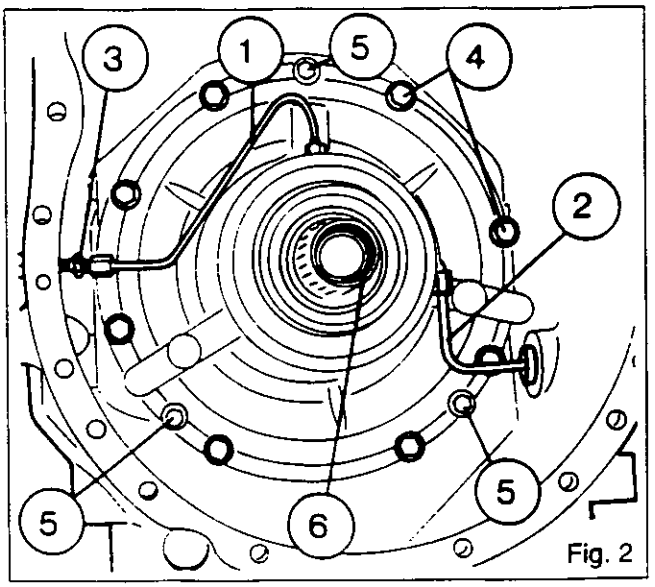


Fig. 2

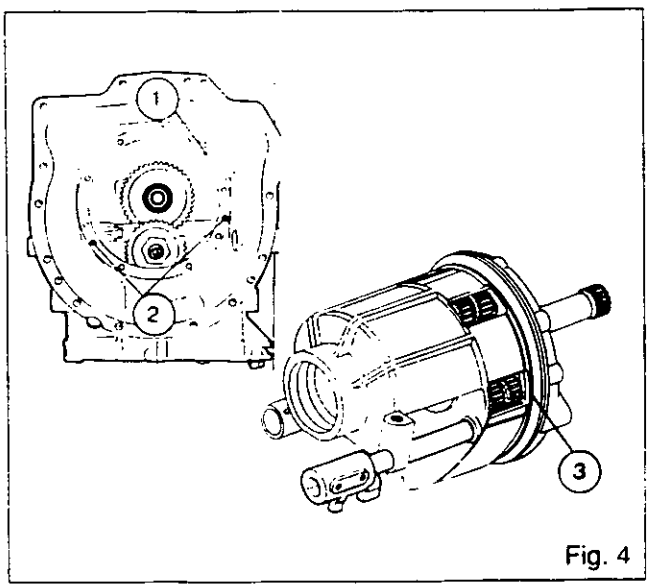
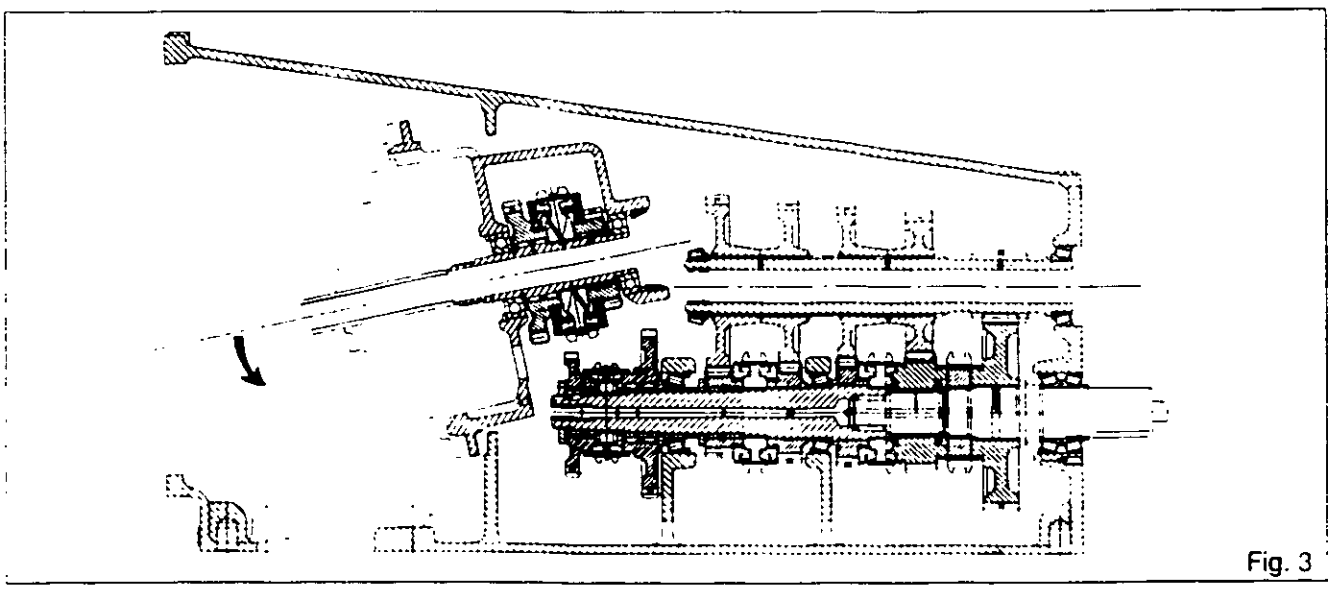


Fig. 4


Fig. 3

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B. Disassembling the layshaft

9. Withdraw the assembled shaft (Fig.5).
10. Remove washer **(50)**.
11. Remove shims **[51]**
12. Remove cup **(52)**.

Disassembling shaft (54) (Fig.6)
A new shaft arrangement was introduced as from serial number P345012 (version b).
Previous tractors were fitted with version a.

13. Extract bearing cones **(53)** and **(63)**.
N.B.: Keep the cups and cones together in pairs if they are going to be re-used.
14. Remove circlip **(61)**.
15. **a)** Take off the 1st speed gear **(60)** and the 2nd speed gear **(59)**.
b) Take off the 1st speed gear **(60)**, shims **[58]**, and the 2nd speed gear **(59)**.
16. **a)** Remove circlips **(58)** and **(57)**.
b) Remove spacer **(57)**.
17. Take off the following gears:
- 4th speed **(56)** (4 x 2 gearbox)
- 3rd speed **(55)** (4 x 2 gearbox)

18. Take off the following gears:
- 3rd speed **(56)** (4 x 4 gearbox)
- 4th speed **(55)** (4 x 4 gearbox)

19. Drive out needle-roller bearing **(62)** (Fig.7) and discard it.

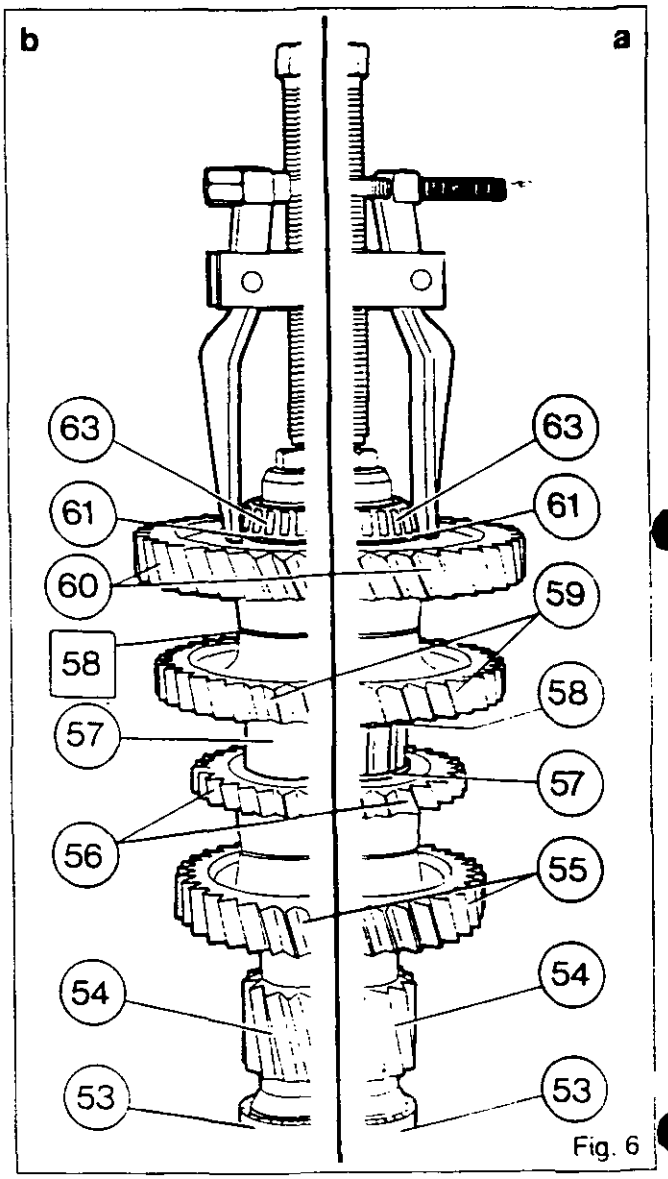
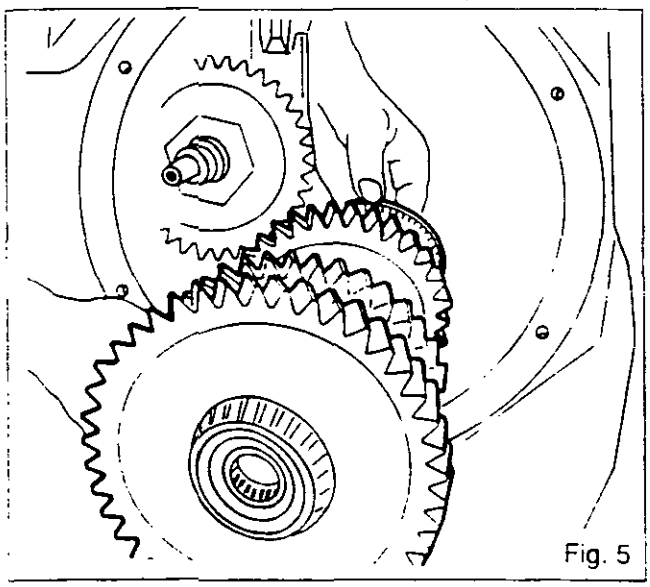


Fig. 6


Fig. 5

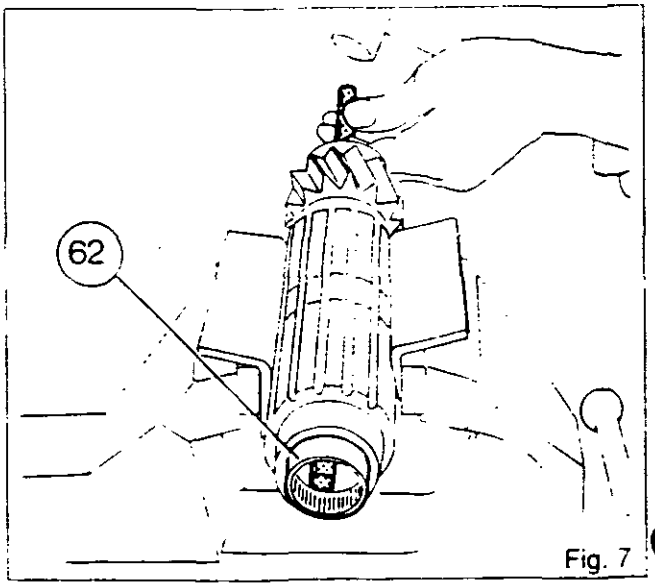


Fig. 7

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C. Reassembling layshaft

20. Clean and check the parts and replace any which are faulty.

A new shaft arrangement was introduced as from serial number P345012 (version b).
Previous tractors were fitted with version a.

21. In a press, press needle-roller bearing **(62)** in until it is bearing against the shoulder in shaft **(54)** (Fig.8).
N.B.: Check that the needle-rollers can turn normally in their cages.

22. **a)** Carry out procedures 14 to 18 in reverse.
N.B.: Make sure that the circlips seat cleanly in their grooves.
Clearance J1 is set by machined tolerances (Fig.9).
b) Carry out procedures 17 and 18 in reverse.
Slide spacer **(57)** onto the shaft.
Fit 2nd speed gear **(59)**, 1st speed gear **(60)** and circlip **(61)**.
With a set of feeler gauges, measure the gap between 1st speed gear **(60)** and 2nd speed gear **(59)**.
As a function of the gap measured, select shims of a thickness to give (Fig.9) :
J1 = 0 to +0.25 mm
Remove circlip (61) and gear **(60)**.
Slide the shims selected as above onto the shaft.
Refit the gear and circlip.
N.B.: Make sure that the circlip is correctly fitted.

23. Press on cones **(63)** and **(53)** with a suitable press tool (Fig. 10).

24. Refit cup **(52)** and replace the assembled shaft.

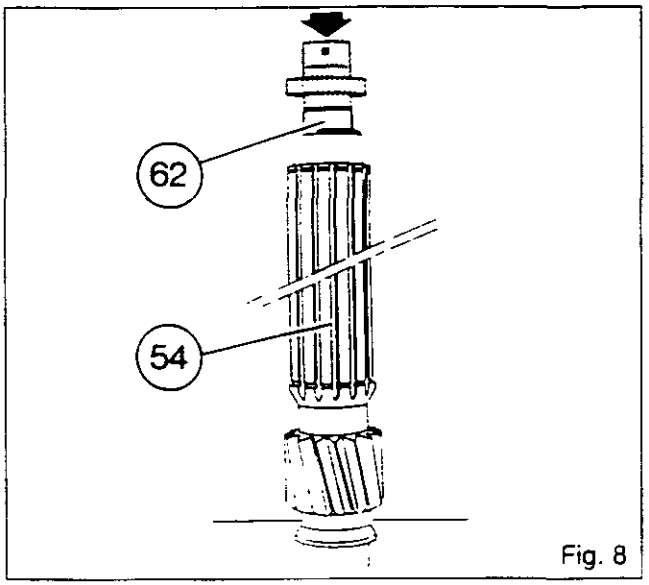


Fig. 8

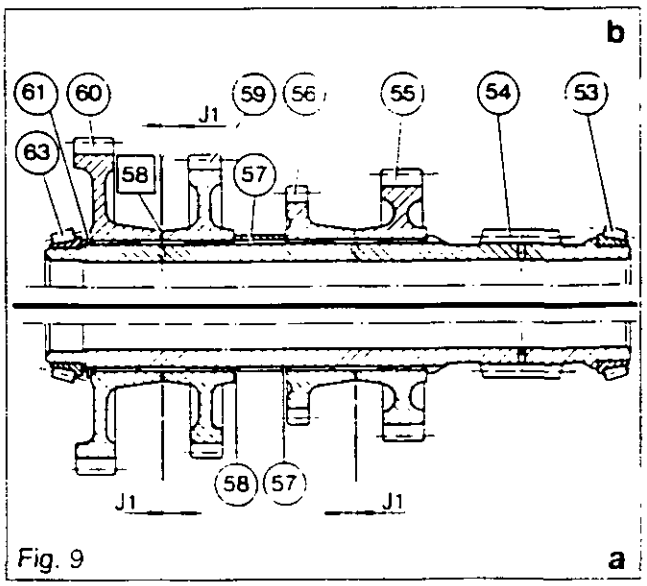


Fig. 9

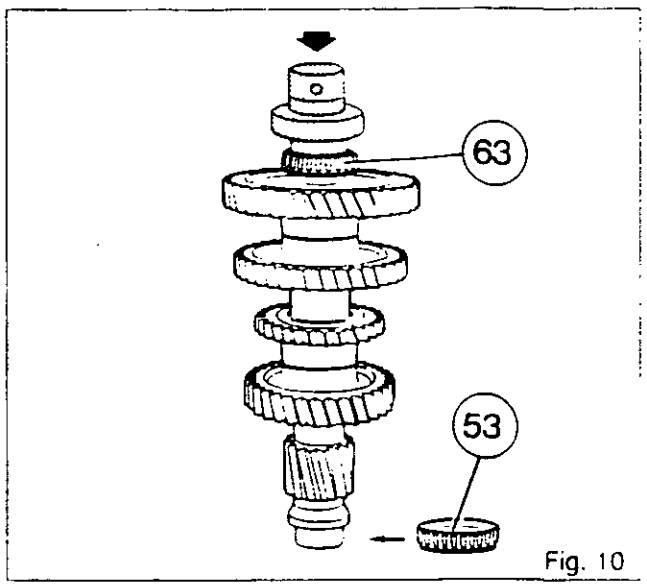


Fig. 10

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D. Refitting input gearbox

25. Fit new O-rings **(3)** and the locating pin **(4)** to the gearbox housing (Fig.11).
Check that cup **(1)** is present in the input gearbox housing and fit a new O-ring **(2)** to the housing (Fig.12).
26. Engage the input gearbox assembly in the gearbox housing by tilting it back and down to engage the gears of the reverse shuttle in the A/B gearing (4 x 4 gearbox).
27. At the same time, with the help of an assistant, raise the front of the layshaft slightly through the opening in the selector cover to engage the cup in the cone.
28. Locate the input gearbox on the locating pin.
29. Fit the bolts and tighten them to a torque of 45 - 60 Nm.
30. Refit pipes **(1)** and **(2)** and connector **(3)** (Fig.2).

Shimming the layshaft.
Carry out procedures 195 to 205 from Section 5 A02.Q.

Refitting 4 x 2 selector cover
31. Carry out procedures 238 to 243 from Section 5 AO2.S
Fit the earth cable lug to the cover.
Carry out procedure 13, Section 5 K01, in reverse.
Tighten bolts to a torque of 50 - 70 Nm.

Refitting 4 x 4 selector cover
32. Carry out procedures 246 to 255 from Section 5 A02.S.
Fit the earth cable lug to the cover.
Carry out procedures 256 and 257 from Section 5 A02.S.

Fit gearbox to engine.

3000 tractors
33. Carry out procedures 13 and 14 (except a), Section 3 A01.
34. Carry out procedures 15 and 16, Section 3 A01.
35. Carry out procedures 17 and 18 (after suspending the gearbox in slings), Section 3 A01.

3100 tractors
36. Carry out procedures 15 to 17, Section 3 A02.
37. Carry out procedures 18 (except a), Section 3 A02.
38. Carry out procedures 19 to 22, Section 3 A02.

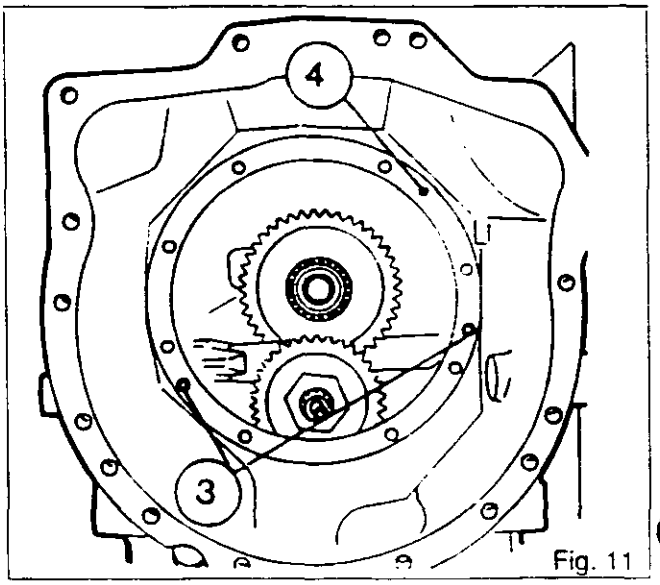


Fig. 11

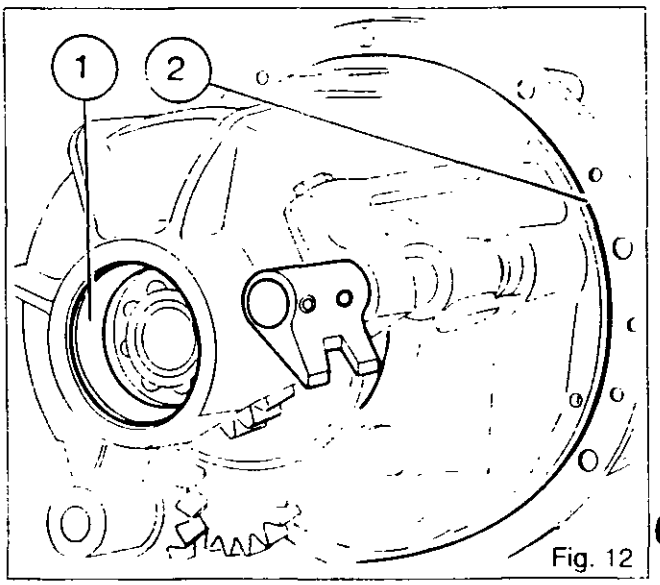


Fig. 12

3000-3100 tractors
Join the tractor between gearbox and rear axle, Section 3 B02.
39. Check .
- all circuits for leaks
- that electrical circuits are working
40. Carry out road test on controls.
41. Check that there are no leaks at the joints (selector cover joint and joint between gearbox and rear axle) or the connections.

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5 I01 Output shaft

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- General ____ 2

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D. Refitting and shimming output shaft ____ 5

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Gearbox - Output shaft

General

The output shaft transmits the drive provided by the various gear ratios to the rear axle transfer shaft. It is mounted at the rear of the gearbox on the lower transmission drive line.

At the front it is carried in a needle-roller bearing located in the bore in the mainshaft and at the rear in two taper bearings mounted with their tapers opposed.

The shaft **(44)** carries :

- a driving gear **(29)** which is mounted to rotate freely on combination bearings **(28)** and **(30)**.
- an assembly consisting of gear **(36)** and spacer **(35)**, which are mounted to turn freely.
- a coupler **(31)** and its hub **(33)** which are splined to rotate together.

To ensure that the complete assembly will operate correctly under the forces applied to the transmission, various settings have to be made with shims :

- **setting J3** : by means of shim or shims **[47]**, this setting allows the clearance to be taken up between cones **(39)** and **(40)** and their respective cups.

- **setting J4** : shims or shims **[38]** placed between the shoulder on shaft **(44)** and cone **(39)** allow end float for gear **(29)**.

- **setting J5** : shim or shims **[42]** placed between cone **(40)** and packing shim **/43** take up the axial clearance which cones **(39)** and **(40)** have on shaft **(44)**.

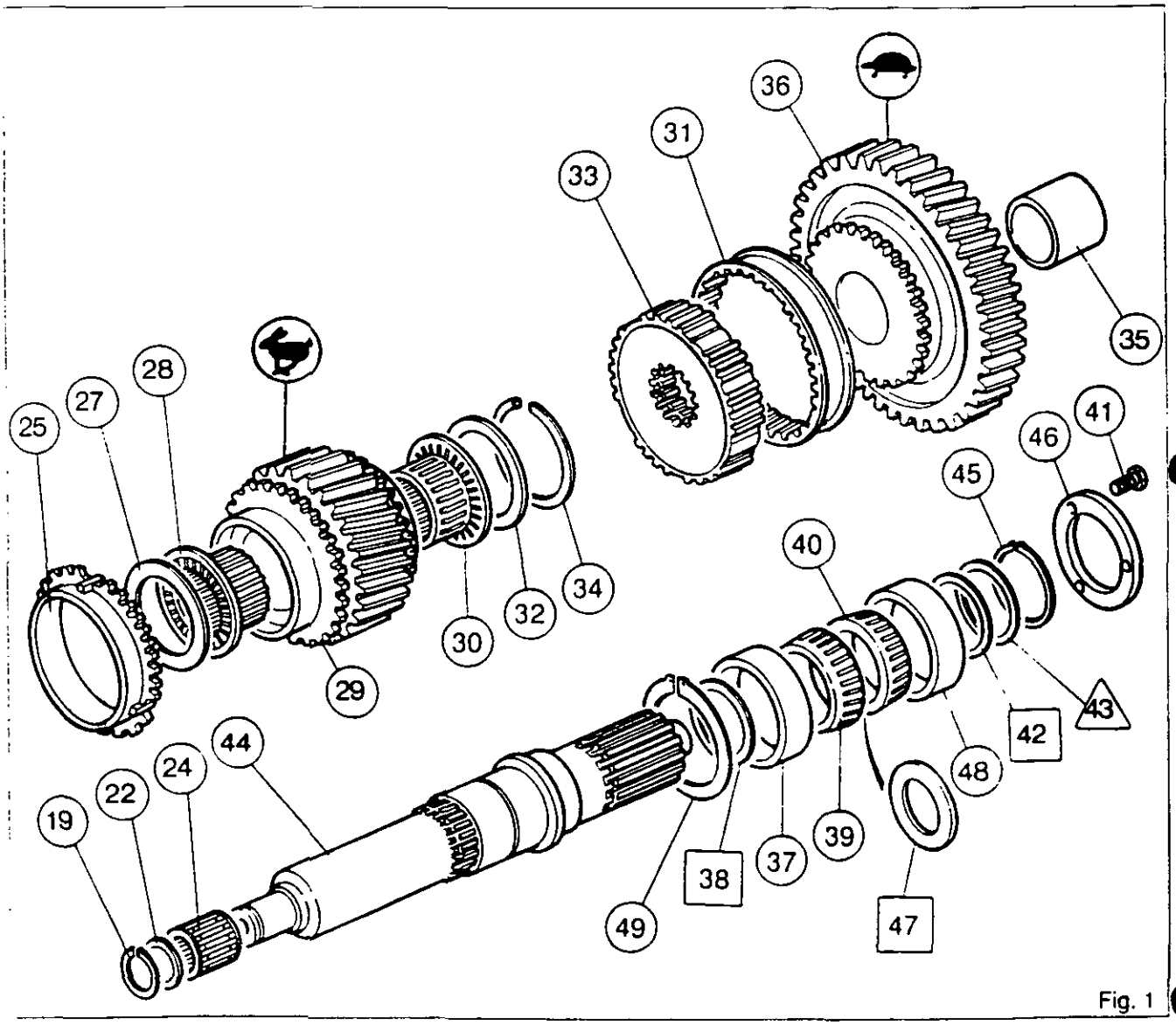


Fig. 1

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A. Removing selector cover (Fig.2)

1. Before doing anything to the selector cover, split the tractor between gearbox and rear axle. Section 3 B02.
2. Remove the A/B range supply pipe **(1)**. (4 x 4 gearbox). Remove bolts **(2)**
   N.B.: On gearboxes with creeper gears, remove the control cable support and mark the position of bolt /3\.
3. Remove cover **(4)** and bolt **(5)**.

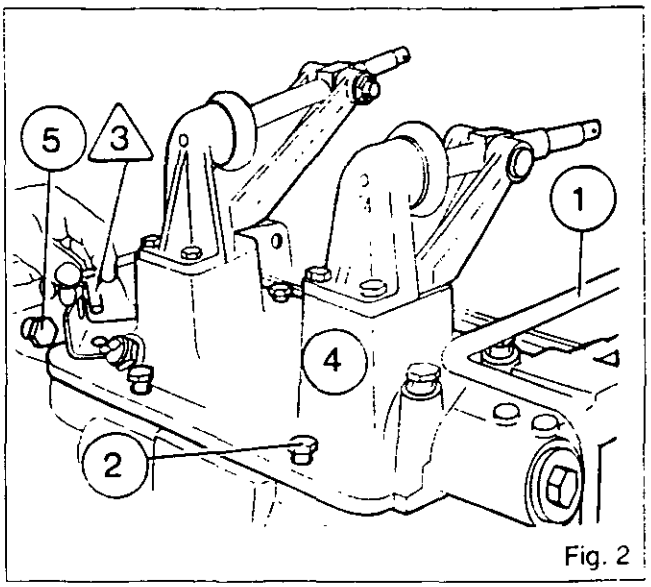


Fig. 2

B. Removing guide rail and selector forks

N.B. :
1) Gearbox fitted with creeper gears.
Remove pin (1), locknut (2), adjustable locking screw (3), and fork (4) together with sleeve (5) (Fig.3).
2) Mechanical locking for the Hi-Lo (Hare/Tortoise) range was introduced in production as from serial number P107048.
For tractors with numbers lower than this, see Workshop Manual 1646640M1.

4. Remove plugs **(1)**, springs **(2)** and locking plungers **(3)** from forks **(5)** and **(6)** (Fig.4).
5. Slacken off lock ring **(21)** with spanner 3615334 M01 (Fig.5).
6. Engage 4th gear (4 x 2 gearbox) or 3rd gear (4 x 4 gearbox).

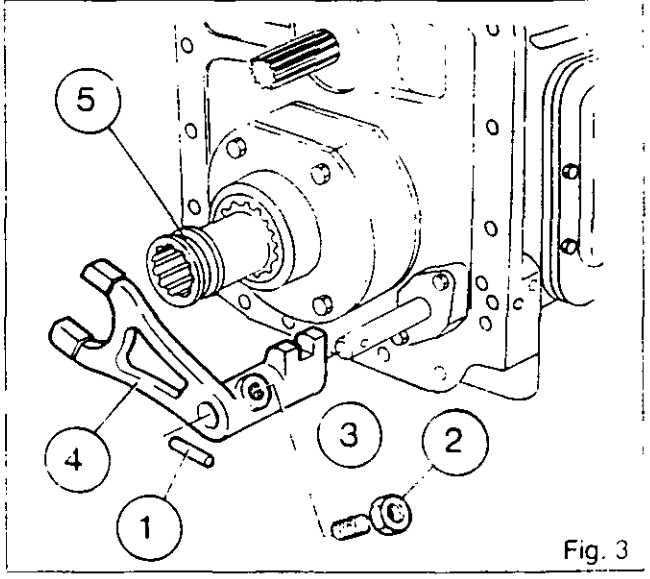


Fig. 3

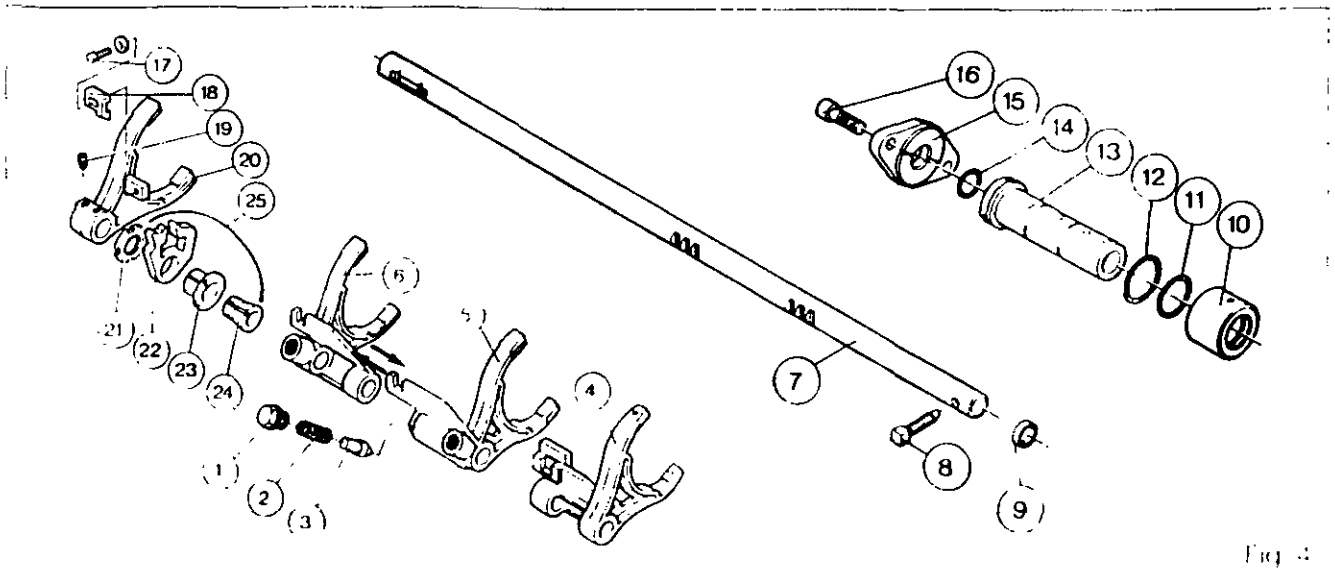


Fig. 4

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7. Free off cone **(24)** on guide rail **(7)** with a bronze drift (Fig.6).
8. Unscrew set screw **(8)**.
9. Remove : bearing **(15)**, guide rail **(7)** from the rear, forks **(5)** and **(6)**, and locking assembly **(25)**.
10. Remove : lock ring **(21)**, locking gate **(22)**, bearing **(23)**, and cone **(24)**.
    Remove : set screw **(19)**, piston **(13)**, Hi-Lo fork **(20)**, bolt and washer **(17)**, slider **(18)**, and cylinder **(10)**.
    N.B.: Discard O-rings (11), (12) and (14). Leave the A/B fork (4) in the housing.

C. Removing output shaft

N.B.: Remove the creeper gearbox if the tractor is fitted with one (see 5 AO2.F).

11. Unscrew the three bolts **(41)**.
12. Take off the retainer ring **(46)**.
13. Withdraw bearing cup **(48)**.
    N.B.: Keep cups and cones together in pairs if they are to be re-used.
14. Take off circlip **(45)**
15. Remove packing shim /**43**\ and adjusting shims **[42]**.
16. Remove bearing cone **(40)**.
    N.B.: Where shimming was needed between the cones, take off the shims [47].
17. Remove cone **(39)**.
18. Take off shims **[38]**.
    N.B.: In all versions, the Hi-Lo range synchroniser was replaced by a coupler as from serial number V252037. For tractors with earlier numbers, see Workshop Manual 1646640M1.
19. Slide the Hi-Lo coupler **(31)** (Fig. 7) onto the Lo gear **(36)**.
20. Pull shaft **(44)** towards the rear.
21. Remove spring ring **(34)** with tool MF460 and discard it (Figs.7 and 8).
22. Remove the shaft.
23. Through the opening in the selector cover take out: hub **(33)** and its coupler, gear **(29)**, synchroniser brake **(25)**, the two thrust washers **(32)**, **(27)** and the Lo gear **(36)**.
    N.B.: Keep the synchromesh brake (25) paired with gear (29) if they are to be re-used.
24. Remove cup **(37)**.

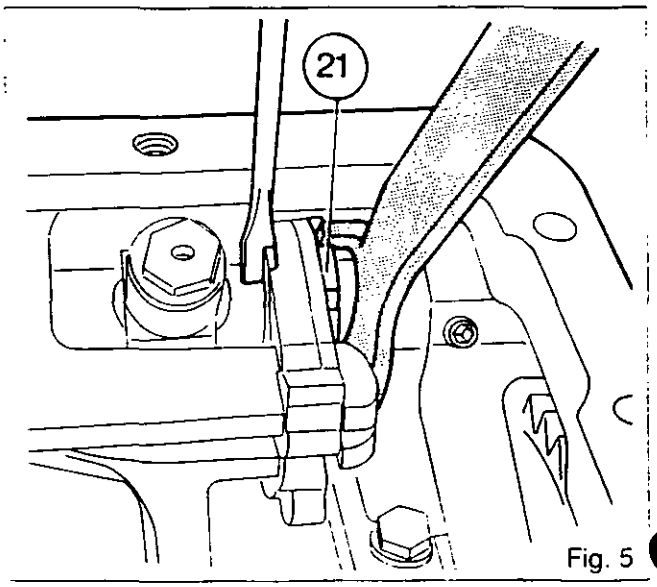


Fig. 5

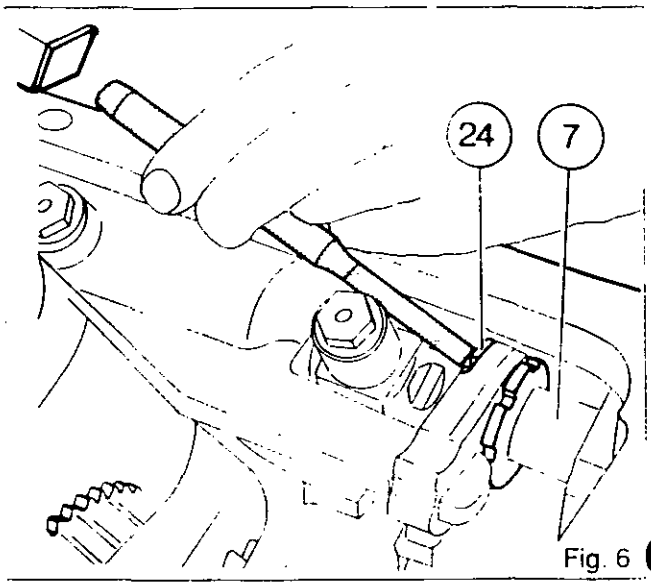


Fig. 6

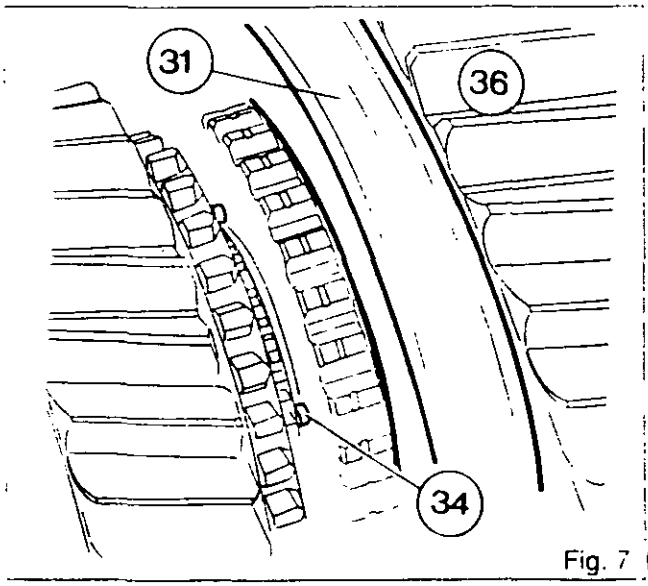


Fig. 7

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25. Remove circlip **(49)**.
26. Remove circlip **(19)**, washer **(22)** and needle-roller bearing **(24)**.

D. Refitting and shimming output shaft

27. Clean and check the parts and replace any which are faulty.
28. Fit circlip **(49)** and cup **(37)**.
    N.B.: The Hi-Lo range synchroniser was replaced by a coupler as from serial number V252037.
    For tractors with earlier numbers, see Workshop Manual 1646640M1.
29. On shaft **(44)** refit needle-roller bearing **(24)**, washer **(22)** and circlip **(19)**. Engage the shaft in the housing without gears.
30. Slide cones **(39)** and **(40)** onto the shaft.

Setting J3

31. The purpose of this procedure is to prepare for the making of setting J3 (Fig.9). Hold cones **(39)** and **(40)** hard against the shoulder on shaft **(44)** by applying manual pressure to them.
    Fill the gap between the rear face of cone **(40)** and the groove for circlip **(45)** with shims **[42]** and packing shim **/43**. Select a new circlip such that it will be a slightly tight fit in the groove (Fig.10).
32. Make the setting (Fig.11) with shims to give :
    J3 = -0.05 to +0.05 mm
    The setting consists in taking up the clearance between cone **(39)**, **(40)** and cups **(37)**, **(48)** while observing the tolerance given above.

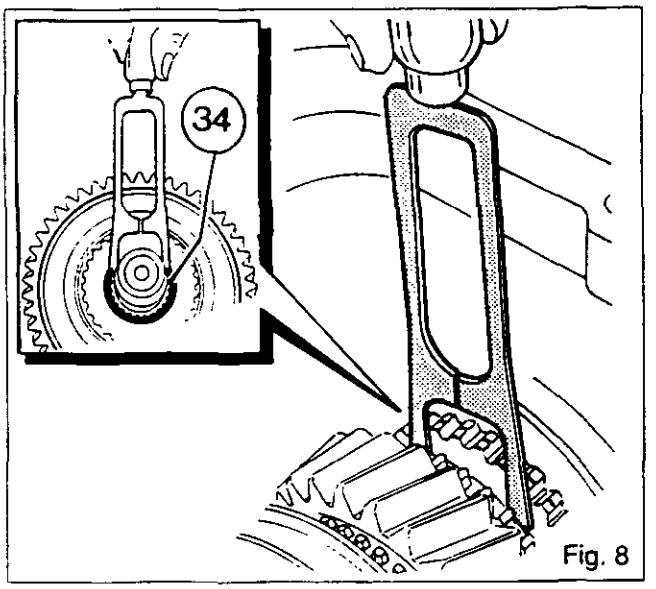


Fig. 8

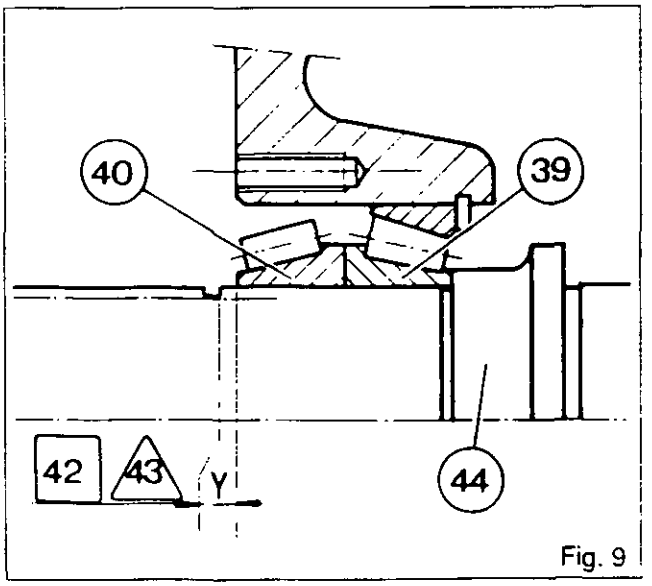


Fig. 9

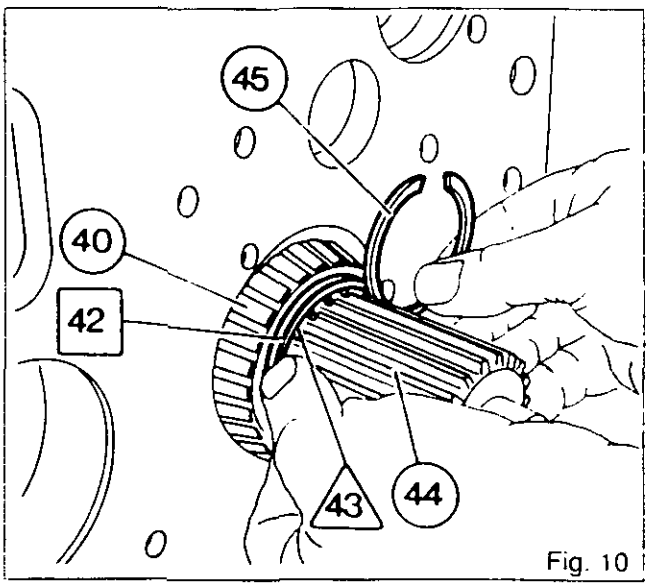


Fig. 10

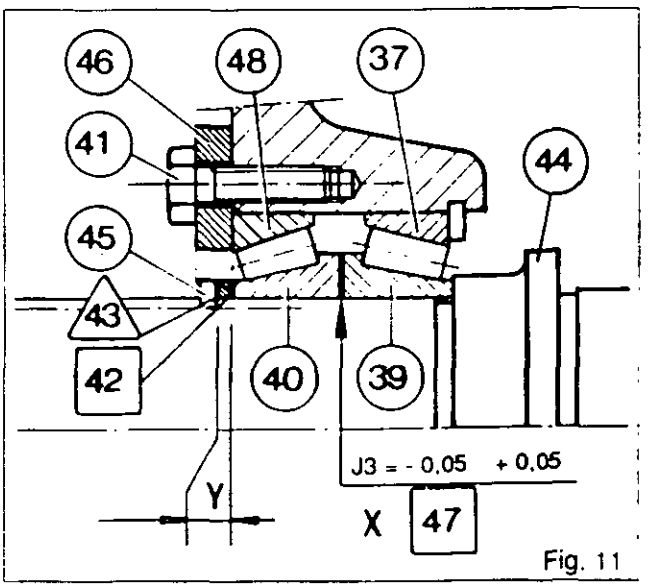


Fig. 11

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Gearbox - Output shaft

33. Fit circlip **(45)**
N.B.: Fit the packing shim on the same side as the circlip.
34. Fit cup **(48)** and retainer ring **(46)**.
35. Tighten bolts **(41)** to a torque of 27 - 32 Nm.
36. Set up a dial gauge against the end-face of shaft **(44)** (Fig.12).
N.B.: In the case of gearboxes fitted with creeper gears, use the gearbox ring (Fig.13) rather than the retainer ring. Tighten the bolts to a torque of 34 - 52 Nm.
37. Push on the shaft while turning it alternately clockwise and anticlockwise to seat the cones properly in the cups.
38. Zero the dial gauge.
39. Repeat procedure 37 pulling on the shaft.
40. If the end float measured is greater than 0.05 mm, select shim(s) X **[47]** to give:
J3 = -0,05 á + 0,05
Important: The shim or shims X [47] selected for J3 must be in place between the cones for the following settings.

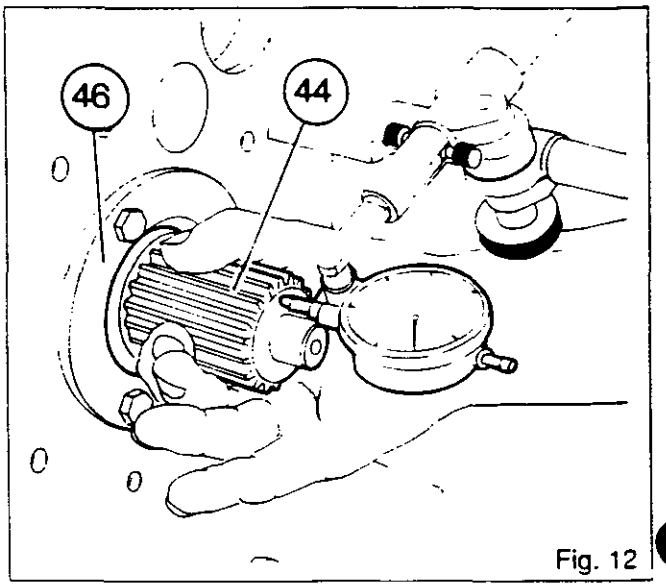


Fig. 12

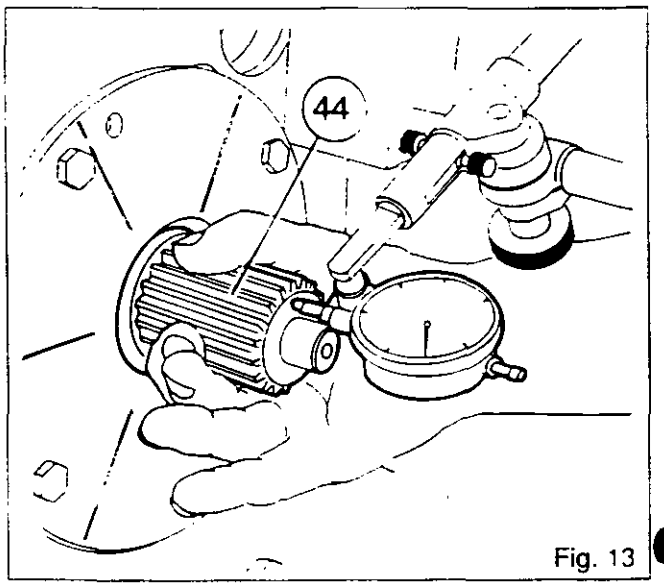


Fig. 13

Setting J4

41. Remove circlip **(45)**.
42. Take out packing shim **/43** and adjusting shims **[42]**.
43. Measure the total thickness Y of shims **[42]** and **/43** (this measurement will be helpful for setting J5).
44. Remove bolts **(41)** and retainer ring **(46)**.
45. Take out cup **(48)**, cones **(40)**, **(39)** and shaft **(44)**.
46. Fit together in the housing the following : Lo gear **(36)**, coupler **(31)**, hub **(33)**, thrust washer **(32)**, gear **(29)** (4th speed in 4 x 4 gearbox, 3rd in 4 x 2 gearbox), together with its combination needle-roller bearings **(30)** and **(28)**, thrust washer **(27)**, and synchro brake **(25)**.
N.B.: If bush (35) is showing signs of wear, replace the gear complete (the bush is reamed after fitting).
If the combination bearings (30) and (28) are worn, replace the gear complete (bearings are fitted in the factory).
47. Insert output shaft **(44)** while holding the gear assembly in position (Fig.14).
48. Pull the shaft back slightly to expose the groove for the spring ring **(34)**

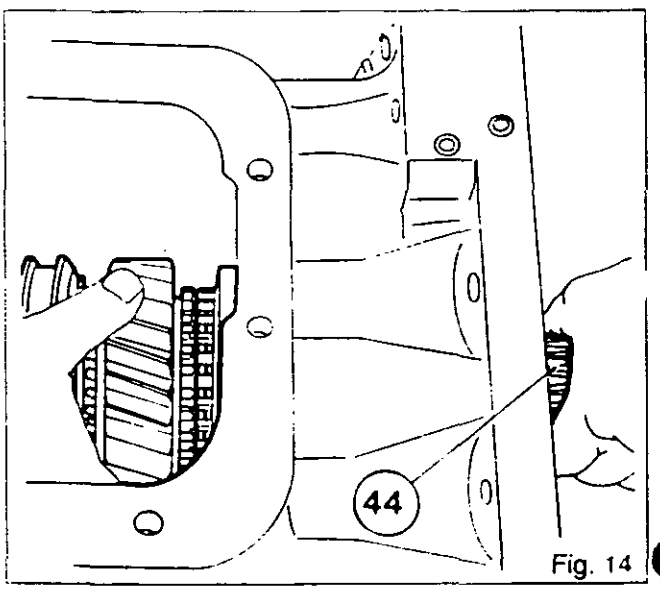


Fig. 14

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49. Fit spring ring **(34)** with tool MF 459 (Fig.15).
N.B.: Check that the spring ring is properly seated.
50. Slide the following onto the shaft: cone **(39)**, the shim or shims X **[47]** selected in procedure 40, cone **(40)** and cup **(48)**.
51. Fit retainer ring **(46)** and tighten bolts **(41)** to a torque of 27 - 32 Nm.
52. Make setting J4 (Fig.16) to give :
J4 = +0.2 to +0.4 mm
This setting consists in providing end float for gear **(29)** (Hi 4th speed in 4 x 4 gearbox . Hi 3rd gear in 4 x 2 gearbox).
53. Carry out procedures 36 to 39.
54. As dictated by the reading taken from the dial gauge, find the thickness required for shim(s) Z **[38]** to give J4.
55. Remove bolts **(41)** and retainer ring **(46)**.
56. Remove cup **(48)**.
57. Withdraw cones **(40)** and **(39)**, and shim(s) X **[47]**.
58. Slide the following onto the shaft: shim(s) Z **[38]**, cone **(39)**, shim(s) X **[47]** and cone **(40)**.

Setting J5.

59. Make setting J5 (Fig.17) to give :
J5 = No end float
This setting consists in taking up the end float which cones **(40)** and **(39)** have on shaft **(44)**.
60. From the thickness measured for shim(s) Y **[42]** /**43**\ in procedure 43 find the thickness required for shim(s) Z **[38]** and X **[47]** to give **J5 = Y - (Z+X)**
61. Carry out procedures 34 and 35.
62. Slide the shims of the thickness selected in procedure 60 onto the shaft.
63. Fit circlip **(45)**.
N.B.: Position packing shim /43\ on the same side as the circlip.
The circlip should be a slightly tight fit in its groove. Check that it is properly seated.
N.B.: Refit the creeper gearbox (if fitted). See Section 5 A02.N.
64. Check by hand that the shaft and its gears turn freely.
65. Check that the 3rd/4th speed synchroniser and the Hi-Lo coupler are operating normally.

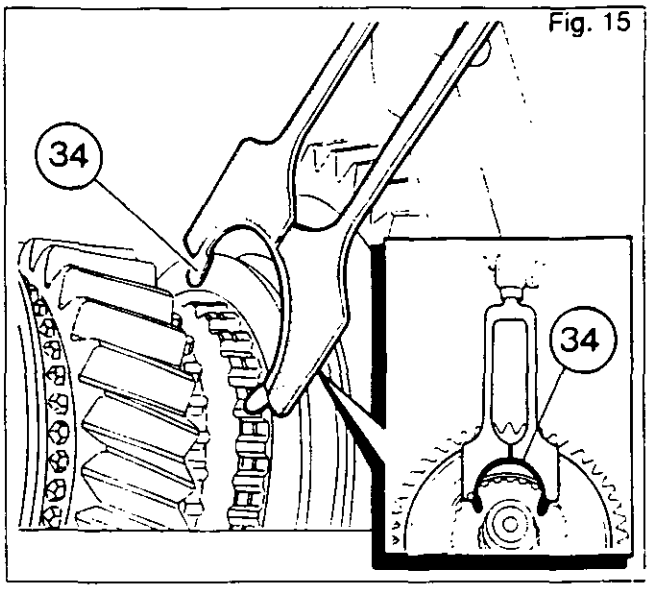


Fig. 15

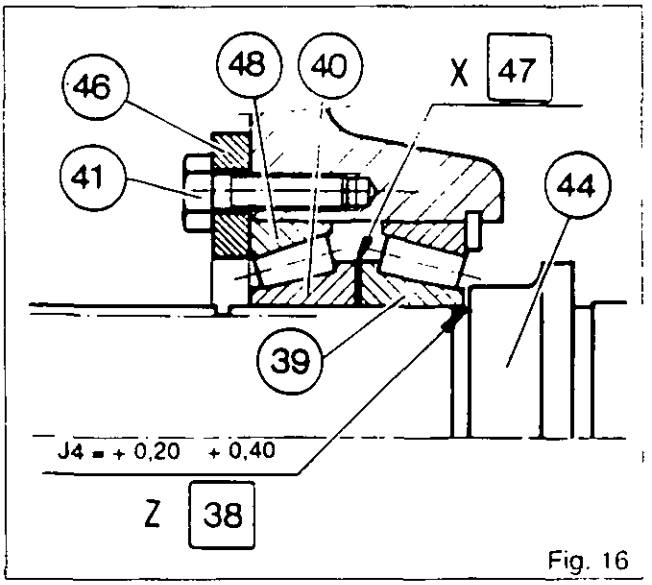


Fig. 16

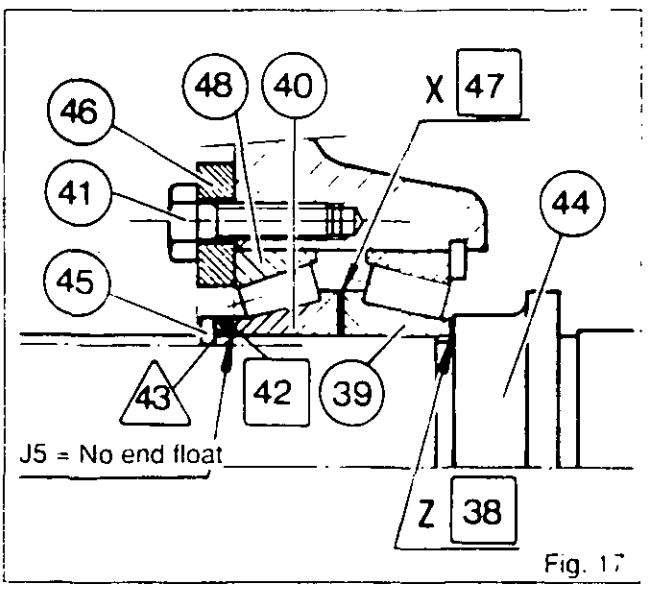


Fig. 17

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E. Refitting guide rail and selector forks (Fig.18)

66. Check that the hydraulic ports in the Hi-Lo cylinder **(10)** are not blocked.
67. Fit O-ring **(11)** to cylinder **(10)** and insert cylinder in gearbox housing.
68. Fit Hi-Lo fork **(20)** to the coupling ring.
69. Fit O-rings **(12)**, **(14)** to piston **(13)** and then slide the piston into the bore in the cylinder.
    N.B.: Line up the seatings for the adjusting screws with the tapped holes in the fork. Hold the piston in position with an adjusting screw (19).
70. Clean and put together mechanical locking gate **(22)**, taper bearing **(23)**, cone **(24)** and lock ring **(21)**.
71. Fit the 3rd/4th speed fork **(6)**, the 1st/2nd speed fork **(5)** and the locking gate assembly **(25)**.
72. Insert the guide rail **(7)** from the rear of the housing and slide it through the piston, locking gate assembly and forks.
    N.B.: In the case of 4 x 4 gearboxes, do not forget the A/B fork (4).
73. Fit bearing **(15)** and tighten bolts **(16)** to a torque of 27-32 Nm.
74. Clean set screw **(8)** with a solvent, apply Loctite 542 to it and tighten it to a torque of 28-43 Nm.

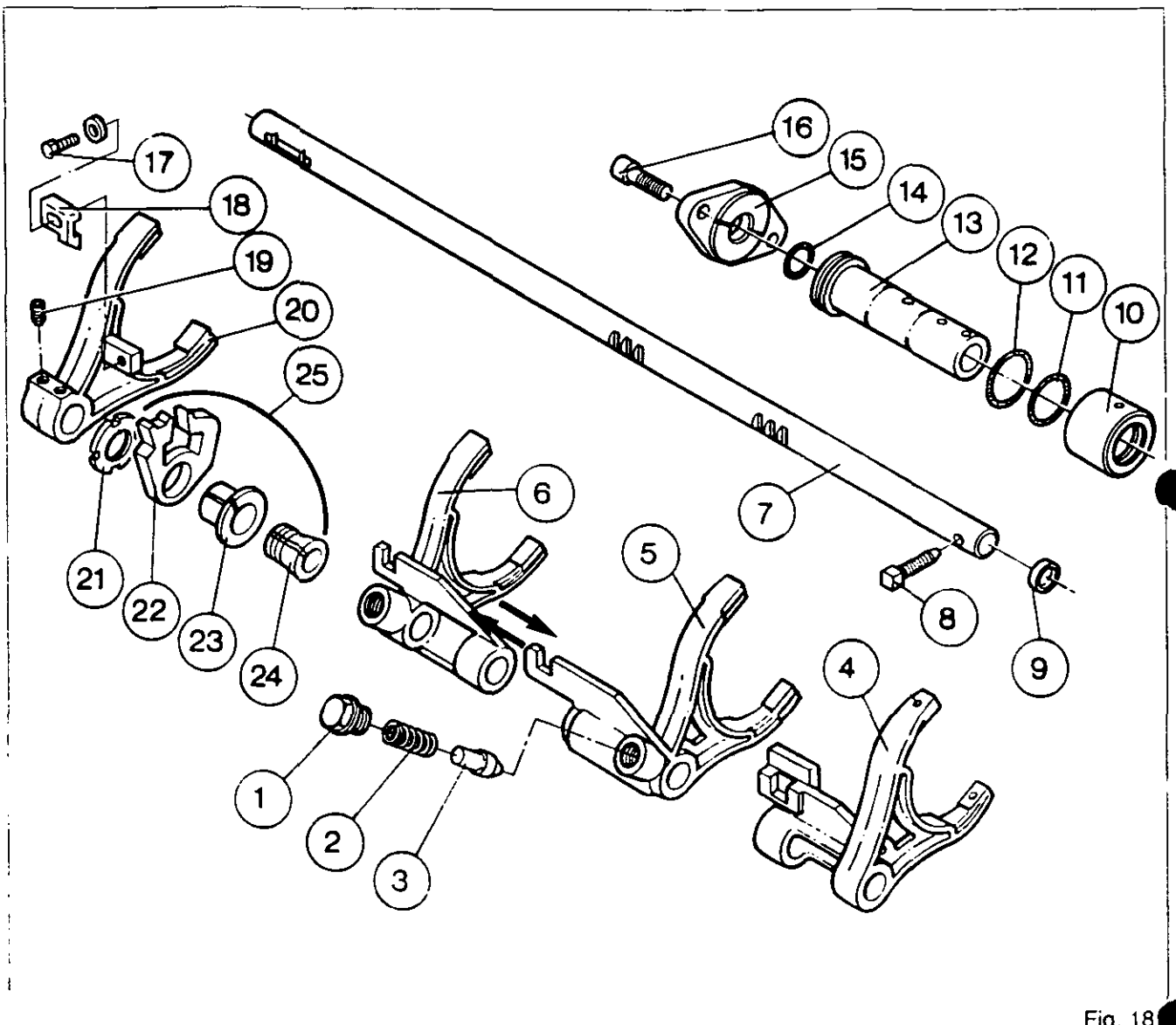


Fig. 18

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75. Fit locking plungers **(3)** and springs **(2)** and tighten plugs **(1)** to a torque of 50-70 Nm.
N.B.: Gearboxes fitted with creeper gears (Fig.19).
Fit sleeve (5), fork (4) and pin (1).
Position the fork so that locking screw (3) is over the flat on guide rail (6) (between the two locking recesses).
Tighten the screw fully in so that the ball is compressed.
Unscrew the screw one quarter turn.
Apply Loctite 241 to nut (2) after cleaning it with solvent.
Tighten the nut to a torque of 15-20 Nm.
Check that the fork locks correctly.

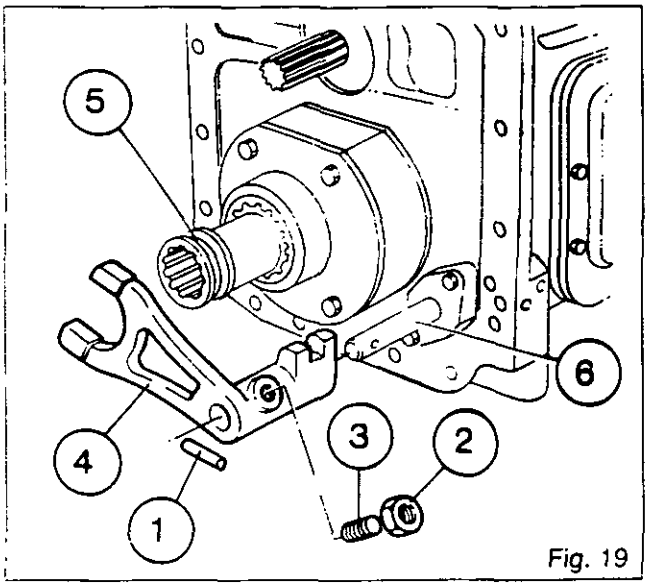


Fig. 19

76. Adjusting the Hi-Lo fork.
General principle :
The fork **(20)** is positioned by means of the difference in the spacing **Y** between the tapped holes and the spacing **Z** of the spot-facings in piston **(13)**.
The fork can be adjusted to move to different points by acting on either the front or rear screw depending on what adjustment is required (Fig.20).

77. Set control piston **(13)** and coupling ring **(31)** to the Hi range.

78. Hold the coupling ring pressed against the Hi range gear **(29)** (Fig.21) (3rd speed in 4 x 2 gearbox , 4th in 4 x 4 gearbox).

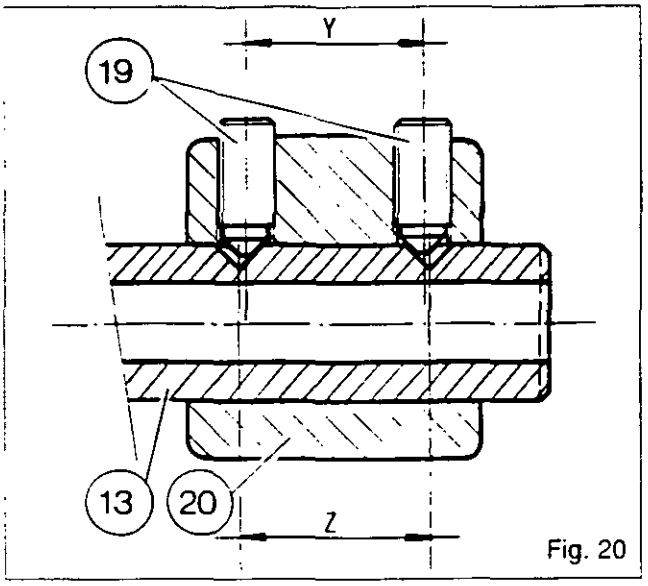


Fig. 20

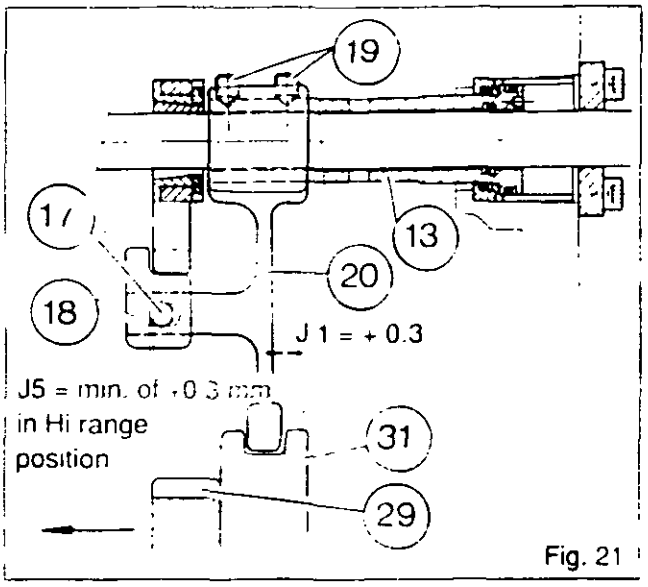
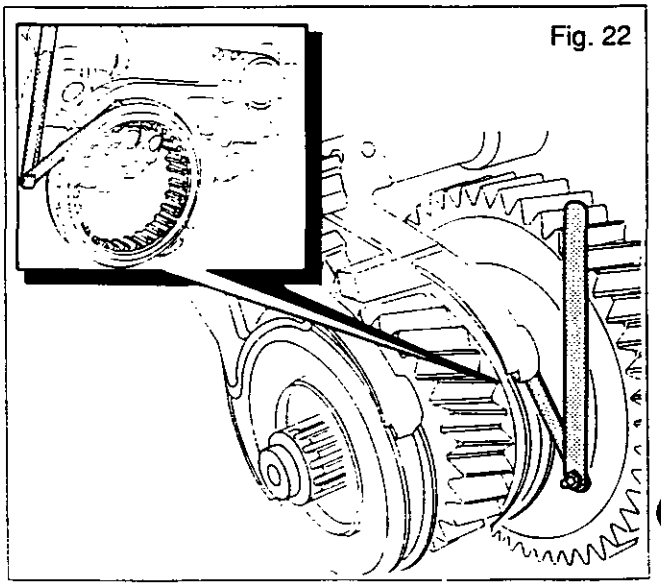


Fig. 21

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Gearbox - Output shaft

79. Having cleaned the two adjusting screws **(19)** with a solvent and coated them lightly with Loctite 221, use them to adjust the position of fork **(20)** to set a clearance of J1 = 0.3 mm between the rear face of the pad and the coupling ring (Figs.21 and 22).
N.B.: For making the adjustment use the locally fabricated tool mentioned in sub-section U of 5 A02.
80. Set control piston **(13)** and coupling ring **(31)** to the Lo (Tortoise) range.
81. Check that there is a clearance of **J2 = min. of 0.3 mm** (dimension determined by setting J1) between pad and coupling ring with the latter hard against Lo range gear **(36)** (Fig.23).
Tighten the screws to a torque of 35 Nm without disturbing the adjustment.
N.B.: In the Lo (Tortoise) position, if face X of the pad on fork (20) is in contact with the coupling ring (Fig.23), increase clearance J1.
82. Set the fork to the Lo position.
83. Unscrew lock ring **(21)** slightly.
Apply Loctite 270 sparingly to the thread on cone **(24)**.
84. Set the forks to the neutral position.
85. Set clearances J3 and J4 to be of equal size (min. = 0.3 mm) so that the mechanical locking gate **(22)** can operate freely (Figs.24 and 25)


Fig. 22

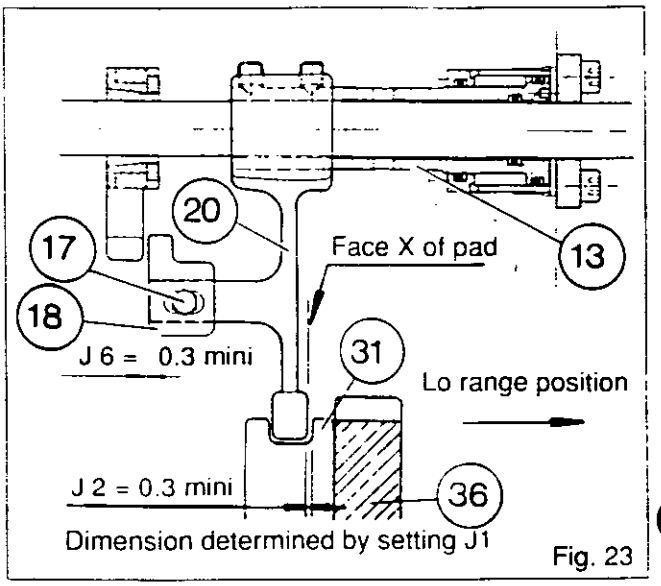


Fig. 23

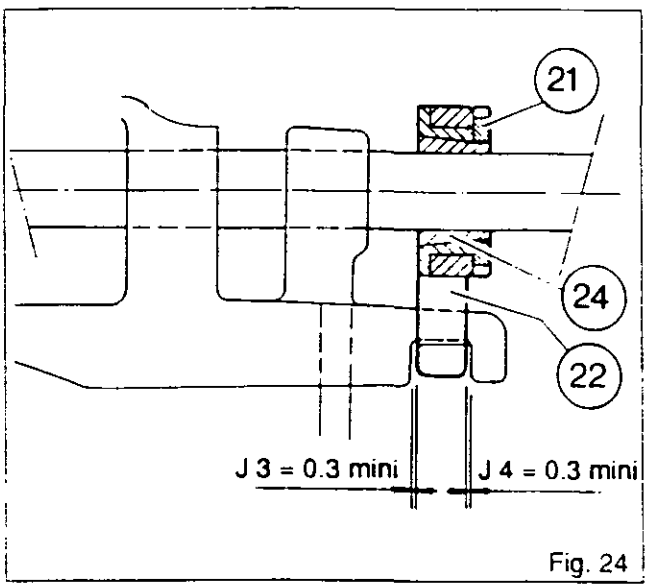
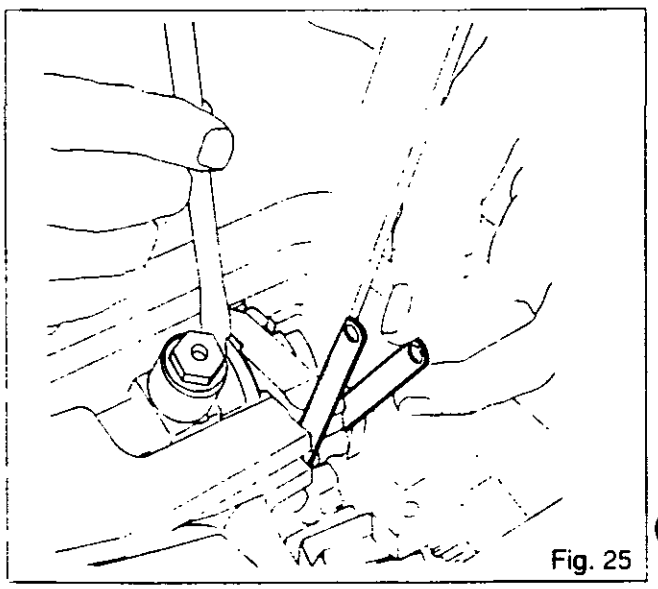


Fig. 24


Fig. 25

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86. Tighten lock ring **(21)** to 50 Nm with spanner 3615334 M01 and a spring balance (Fig.26).
87. Apply Loctite 648 to the clamping face of slider **(18)** and Loctite 648 to bolt **(17)**. Fit the bolt and washer.
88. Adjust the clearances J5 and J6 (min. of 0.3 mm) between the slider and the locking gate to be equal in the Hi and Lo positions (Figs.21, 23, 27 and 28).
89. Tighten the bolt to a torque of 27-32 Nm.
90. Check the operation of the Hi-Lo (Hare/Tortoise) range and the locking gate.
91. Check the changing of the gears and of the A/B range.

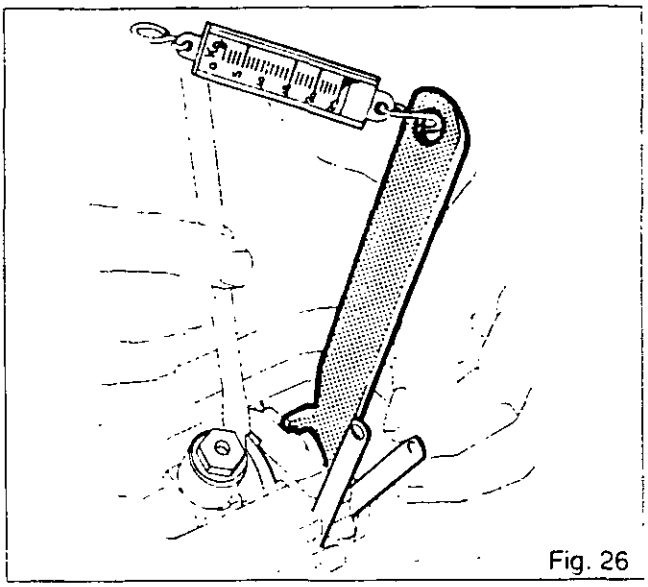


Fig. 26

F. Refitting selector cover

4 x 2 gearbox (Fig.30)

92. Clean the mating face of the cover **(56)**.
93. Set the reverse selector to the neutral position.
94. Engage 1st gear.
95. Apply a gasketing compound (Loctite Master joint 510 or equivalent) to the mating face of the gearbox housing.
N.B.: Do not forget to fit bolt (1) to the housing (Fig.29).
96. Position the two levers on the cover to the left and parallel to one another.

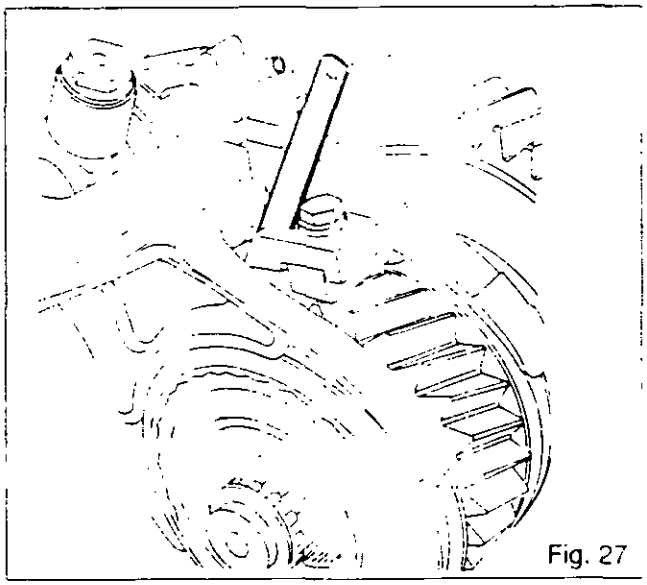


Fig. 27

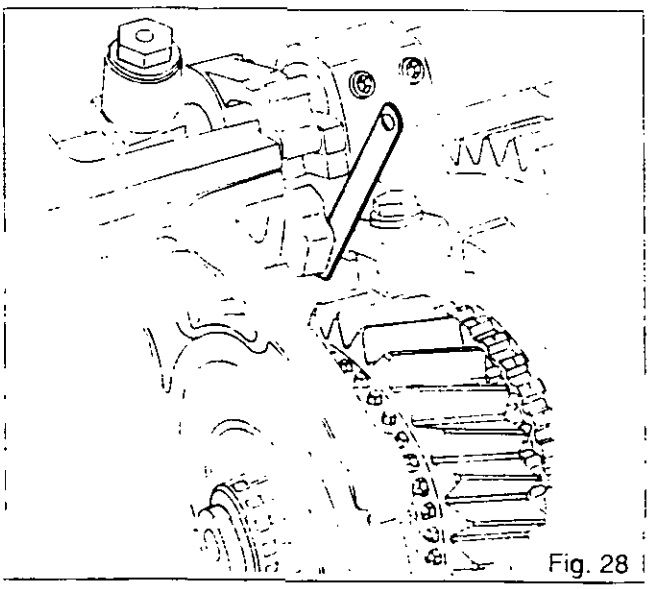


Fig. 28

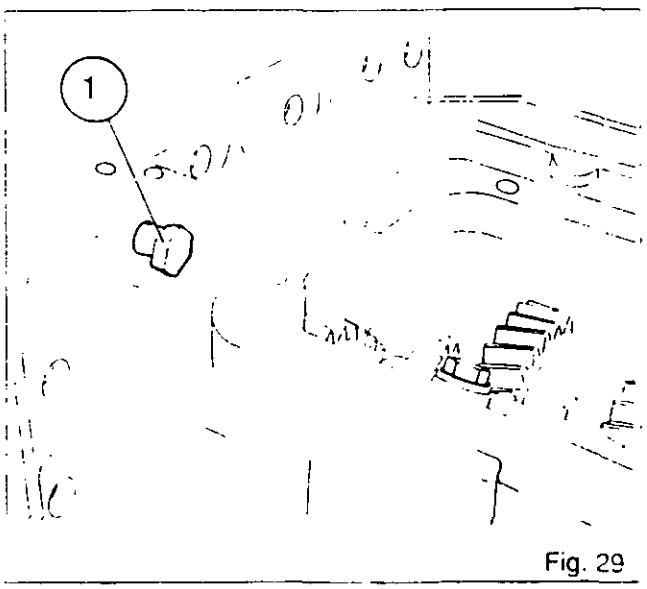


Fig. 29

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97. Fit the cover to the gearbox, making sure that the levers are correctly engaged in the selector forks (Fig.30).
98. Refit the bolts which hold the selector cover in place and tighten them to a torque of 50-70 Nm. Refit the support for the creeper gear cable (if fitted).
99. Check :
    - the changes to all the gears and the change between the Hi-Lo positions.
    - the operation of the reversing mechanism.

4 x 4 gearbox

100. Clean the mating face of the cover **(57)**.

In the gearbox :

101. Check that the reverse selector is in the neutral position and that the A/B fork is in the B position (the forward position).
102. Engage 1st gear.

At the cover :

103. Take out pressure valve **(58)** and remove plunger **(59)** (Fig.31).
104. Clamp actuating shaft **(53)** in the B position with tool 3615053 M01 (Fig.31). Tighten down moderately hard.
105. Set the finger **/61** for actuating the A/B fork to the B position (the forward position) (Fig.32).
106. Move the gear lever to the left (into 1st gear).
107. Apply a gasketing compound (Loctite Master joint 510 or equivalent) to the mating face of the gearbox housing.
N.B.: Do not forget to fit bolt (1) to the housing (Fig.29).

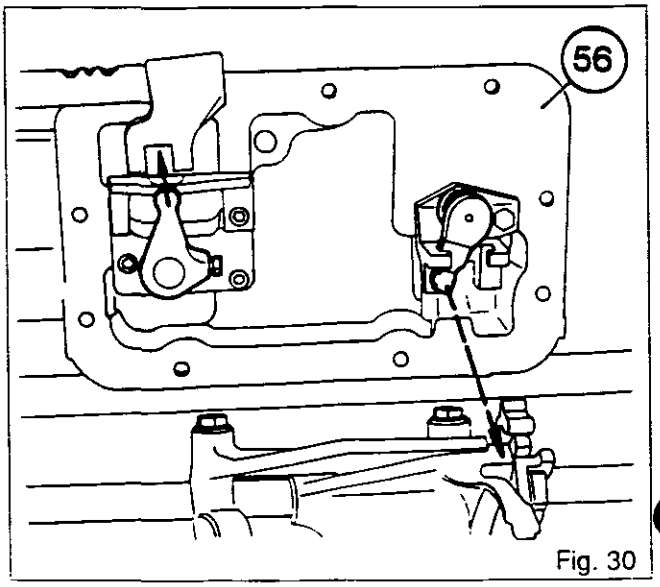


Fig. 30

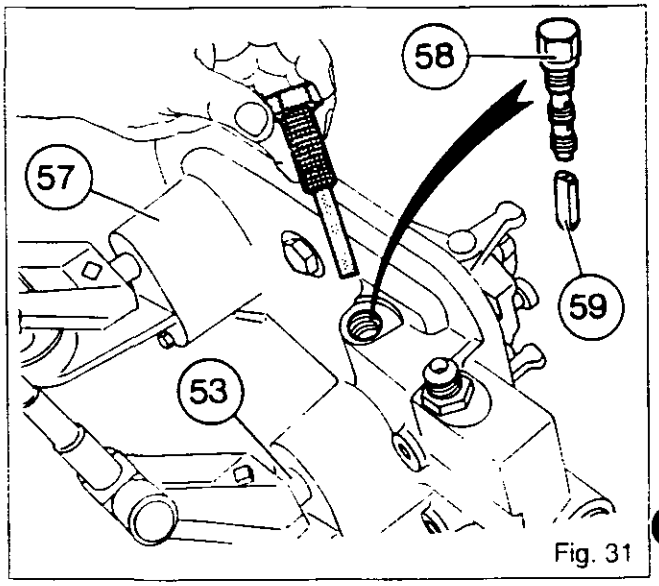


Fig. 31

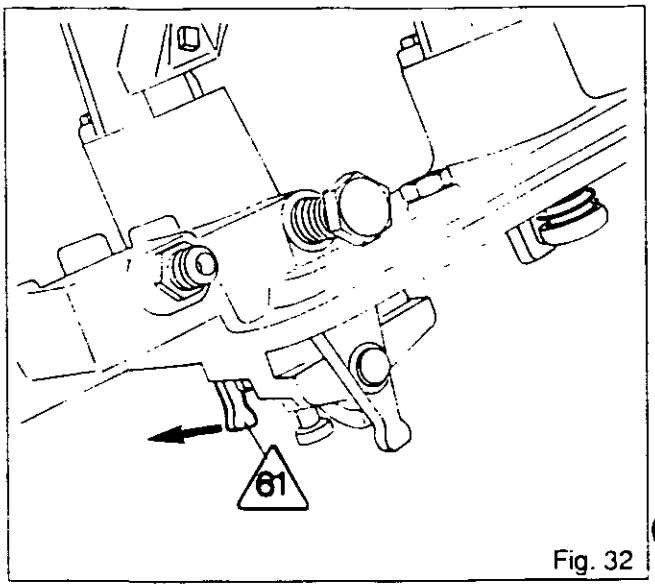


Fig. 32

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108. Offer up the cover to the gearbox, engaging fingers **(54)**, **(66)** in the reverse selector fork and finger /**61**\ in the A/B fork, and then engage actuating finger **(36)** in the 1st/2nd gear fork and the mechanical locking gate (Fig.33).
109. Seat the cover down.
110. Fit the bolts and tighten them to a torque of 50 - 70 Nm.
Remove tool 3615053 M01.
N.B.: In the case of a gearbox fitted with a creeper gearbox, fit cable support (1) (Fig.34). To ensure the cover is correctly located, first tighten bolt /3\ (Fig.34). With the help of the levers, check by hand that the actuating fingers are correctly engaged in the selector forks.
111. Fit plunger /**59**\ and screw in pressure valve **(58)** and tighten it to a torque of 18-20 Nm. Refit the A/B supply pipe.
112. Reconnect the tractor between gearbox and rear axle, Section 3 B02.
113. Check
- that none of the circuits leak
- that the electrical circuits are working.
114. Carry out a road test on the controls.
115. Check that there are no leaks at the joints between selector cover and gearbox and between gearbox and rear axle

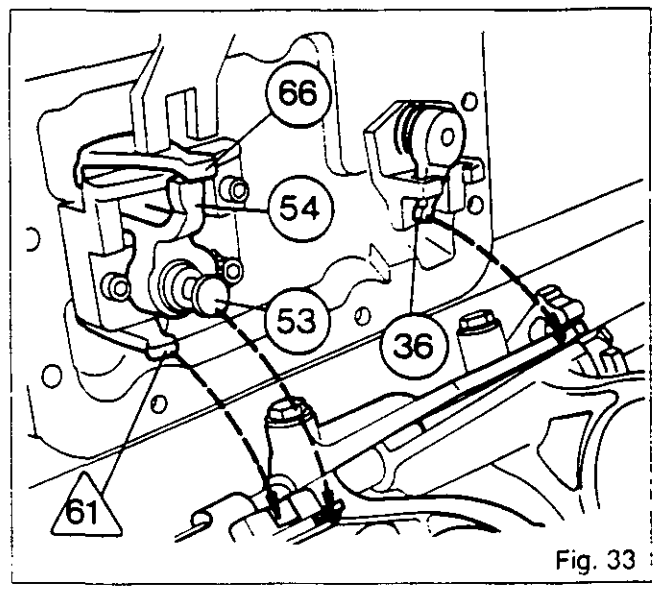


Fig. 33

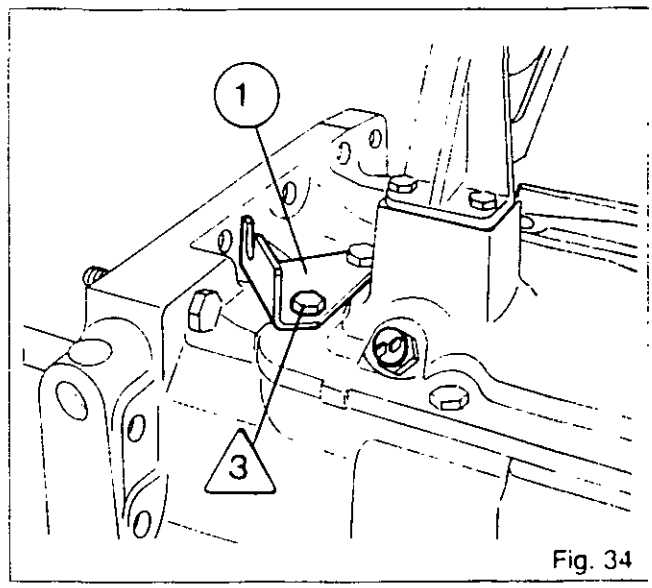


Fig. 34

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5 J01 Creeper gears

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- *Operation* ____ 2
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B. Disassembling planetary carrier ____ 4
C. Reassembling planetary carrier ____ 5
D. Refitting creeper gearbox and ring gear ____ 5
E. Adjusting control mechanism ____ 5
F. Circuit diagram ____ 6

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Gearbox - Creeper gears

General

The creeper gear reduction gearbox consists of an epicyclic gear train comprising a planetary carrier and ring gear assembly mounted at the rear of the main gearbox. It is operated from a lever situated on the console in the cab, the lever being connected by a cable to an arm fitted on the right at the front of the centre housing. The arm shifts the fork which controls the coupling sleeve.

1st generation 3000 tractors (serial numbers prior to P107048)

When the creeper gear control is engaged, the «Autotronic» system automatically permits a changeover to the Lo range.

New generation 3000 tractors and 3100 tractors

A system for locking the Hi-Lo (Hare-Tortoise) ranges was introduced as from serial number P107048.

The creeper gears should only be selected if the main gearbox is in the Lo range.

CREEPER GEAR POSITION

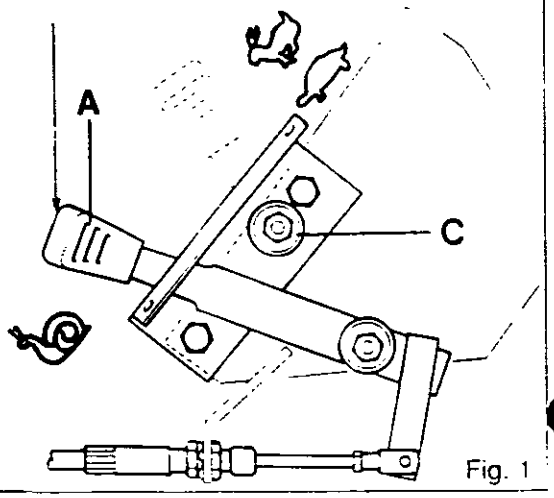


Fig. 1

CREEPER GEAR POSITION

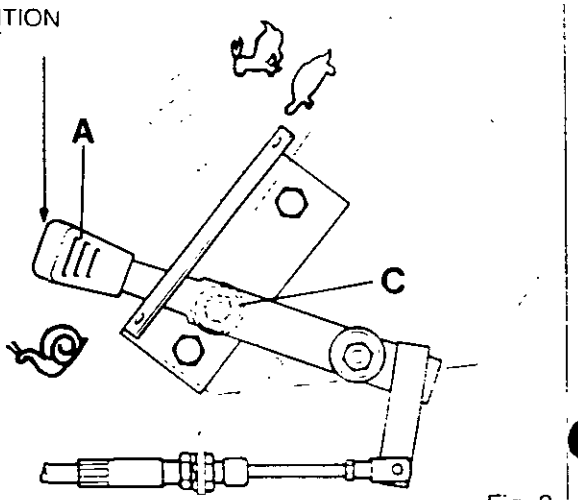


Fig. 2

Operation

Coupling sleeve **(8)** is splined to connecting shaft **(21)**. If lever A is moved towards the creeper gear position (Figs. 1 and 2), this shifts coupling sleeve **(8)** towards the rear and engages its external teeth with planetary carrier **(1)**. The speed of connecting shaft **(21)** is then 1/4 of the speed of the output shaft.

In the normal gears, coupling sleeve **(8)** is moved forward to connect the output shaft of the gearbox to the connecting shaft **(21)**, thus providing direct transmission.

Special points : New generation 3000 tractors and 3100 tractors

If the creeper speed range is selected and the Hi (hare) light flashes, this indicates to the operator that he is in the Hi position and that it is essential for him to change to the Lo position.

The electrical signal indicating that the creeper speed range has been selected is transmitted from switch C. Switch C is mounted on the control box in the manner shown in Fig. 1 in the case of tractors without an «Autotronic» or «E» and in the manner shown in Fig. 2 in the case of tractors with an «Autotronic».

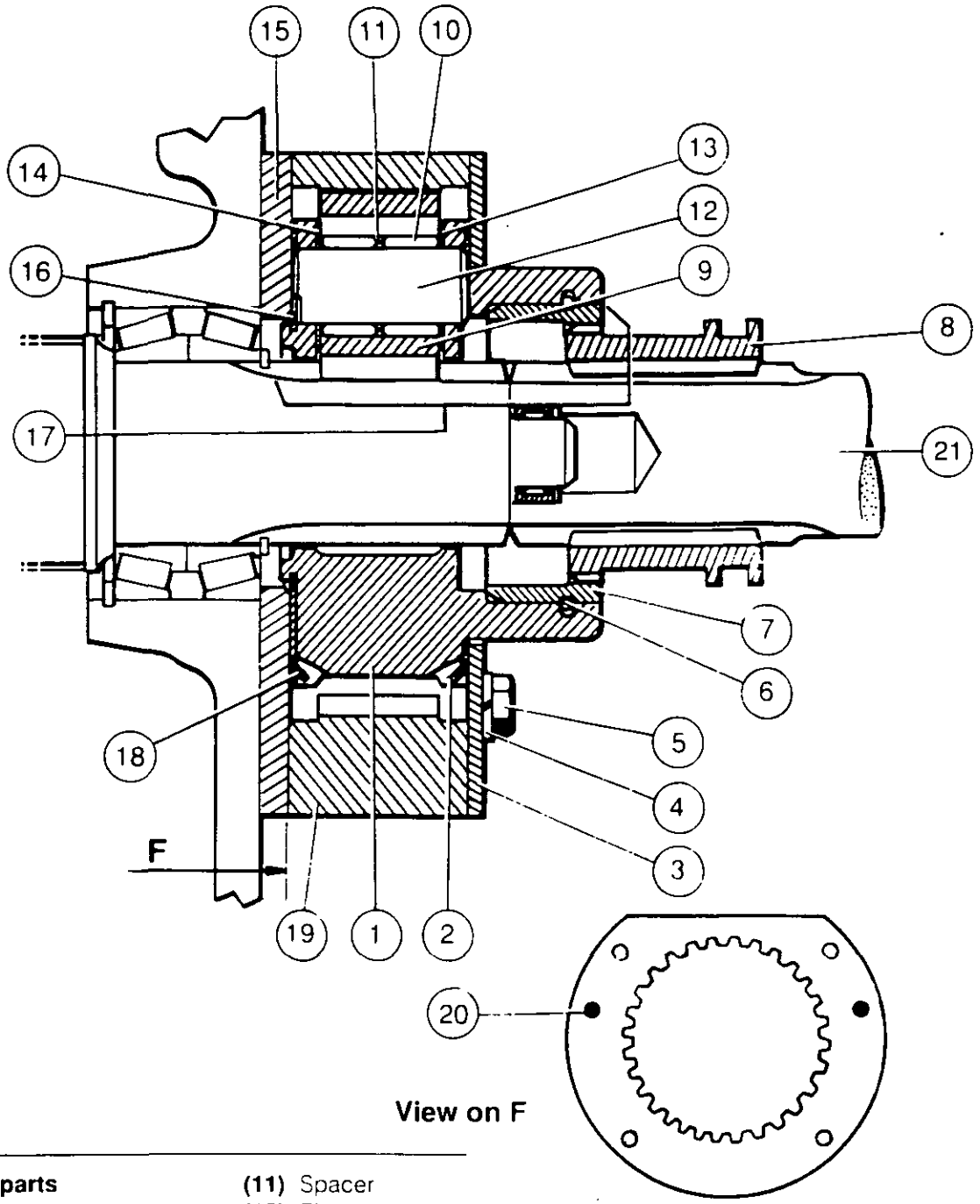
Tractors without an «Autotronic» have a button on the dashboard which permits a changeover to the Lo range.

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Gearbox - Creeper gears

General arrangement drawing (Fig.3)



View on F

List of parts

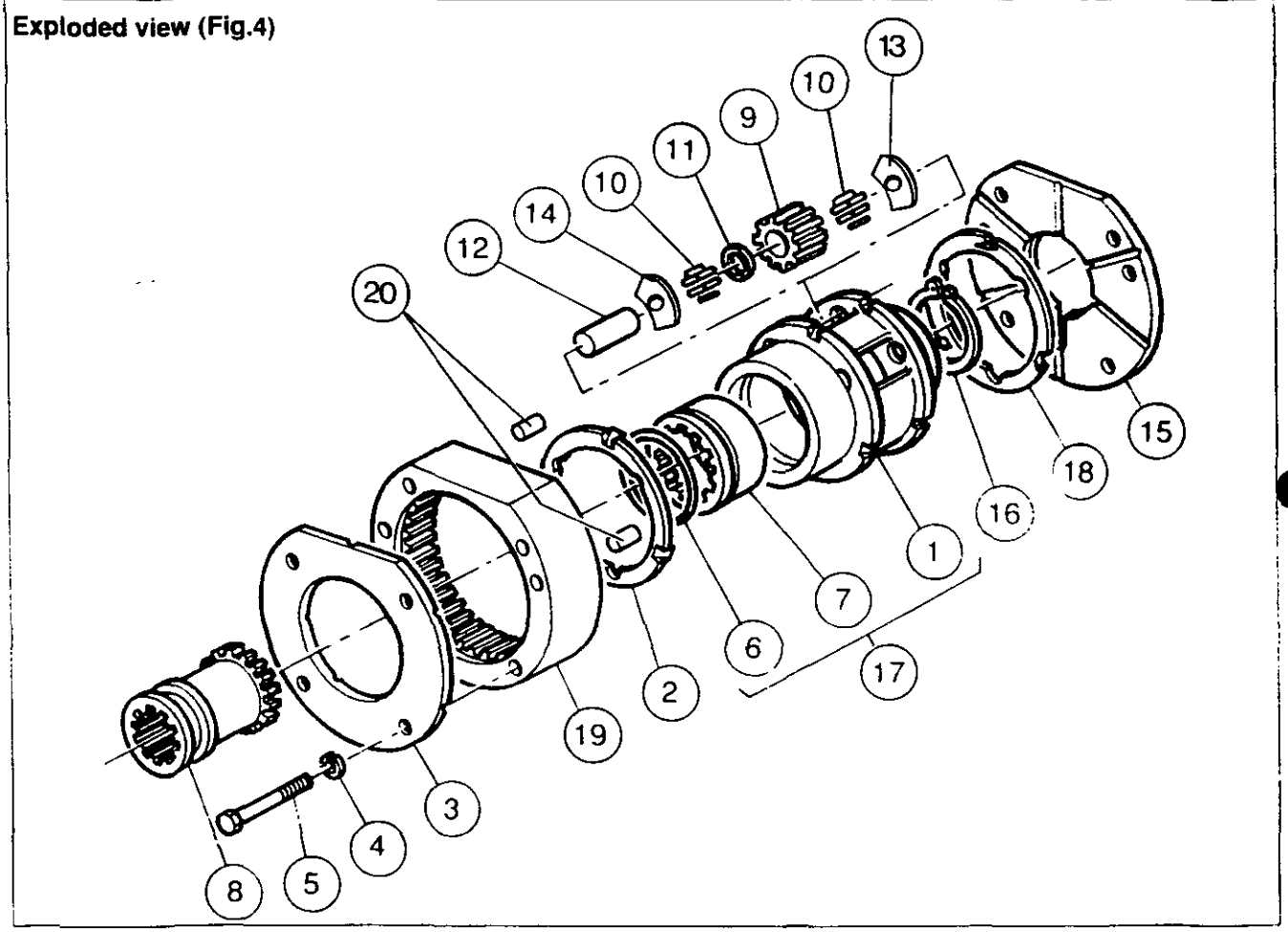
(1) Planetary carrier
(2) Thrust washer
(3) Front disc
(4) Spring washer
(5) Bolt
(6) Spring ring
(7) Internally toothed bush
(8) Coupling sleeve
(9) Planetary gears
(10) Needle rollers
(11) Spacer
(12) Pin
(13) Sector plate
(14) Sector plate
(15) Backing disc
(16) Circlip
(17) Planetary carrier assembly
(18) Thrust washer
(19) Ring gear
(20) Locating pin
(21) Connecting shaft

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Gearbox - Creeper gears

Exploded view (Fig.4)



A. Removing the creeper gearbox and ring gear

1. Take off the RH hydraulic cover.
   Carry out procedures 1 to 14, Section 8 I01.

Removing support for top link - driving gear - intermediate shaft - PTO clutch

2. **Two-speed PTO** :
   - carry out procedures 1 to 7, Section 6 D01.
   - carry out procedure 3, Section 6 G01.

   Four-speed (economy PTO) :
   - carry out procedures 60 to 76, Section 6 D01.
   - carry out procedure 14, Section 6 G01.

Removing sleeve/connecting shaft/coupling sleeve assembly and fork

3. Carry out procedures 3 to 16, Section 5 D01.A.

Removing creeper gearbox and ring gear

4. Take out bolts **(5)** and spring washers **(4)**.
5. Take off front disc **(3)**.
6. Withdraw planetary carrier assembly **(17)** and thrust washers **(2)** and **(18)**
7. Remove ring gear **(19)**.
   N.B.Locating pins (20) should be left in the ring gear.
8. Remove backing disc **(15)**.
   N.B.Be careful not to apply any traction to the output shaft.

B. Disassembling planetary carrier

9. Remove circlip **(16)**
10. Drive out pins **(12)**.
11. Take out sector plates **(13)** and **(14)**.
12. Take out planetary gears **(9)**
    N.B.: There are 54 needle-rollers (10) per planetary gear (two rows of 27 needle-rollers separated by a spacer (11). Replace the planetary carrier (1) if there is any damage to internally toothed bush (7).

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C. Reassembling planetary carrier

13. Check and clean the parts and replace any which are faulty.
14. Refit planetary gears **(9)**. Use a miscible grease («Amber Technical» or equivalent) to fit needle-rollers **(10)**.
15. Refit sector plates **(13)** and **(14)**.
16. Refit pins **(12)**, making sure they are the correct way round to allow circlip **(16)** to be fitted.
17. Fit circlip **(16)**.
    Check the end float of each planetary gear and that it turns freely by hand.

D. Refitting creeper gearbox and ring gear

18. Carry out procedures 177 to 181, Section 5 A02.N

Refitting fork and sleeve/connecting shaft/coupling sleeve assembly

19. Carry out procedures 22 to 31, Section 5 D01.A

Refitting PTO clutch, intermediate shaft, driving gear and support for top link.

20. **Two-speed PTO**
    - carry out procedures 5 to 7, Section 6 G01
    - carry out procedures 8 to 18, Section 6 D01.

    Four-speed PTO
    - carry out procedures 16 to 18, Section 6 G01
    - carry out procedures 79 to 88, Section 6 D01.

Refitting RH hydraulic cover

21. Carry out procedures 15 to 33, Section 8 I01

22. Carry out road test on creeper gears.
23. Test the operation of the PTO and its brake

E. Adjusting control mechanism (Fig.5 and 6)

N.B.: Procedures 25 to 28 should be carried out when replacing the control cable.

24. Move control lever A to the «Creeper» position.
25. Screw clevis **(1)** right to the end of the threaded part of cable **(6)**.
26. Attach clevis **(1)** to lever A with pin **(7)** and tighten up nut **(2)**.
27. Adjust cable ferrule **(5)** to bring nut **(3)** flush with the end of its threaded portion.
28. Tighten up nut **(4)**.
    N.B. Check that the cable is not under any stress.
29. Move arm B to the «Creeper gear» position (Fig.6) (external teeth on coupling sleeve **(8)** engaged in rearwards direction (Fig.3)) - fork locked.
30. Screw clevis **(9)** right to the end of the threaded portion of cable **(6)** (Fig.6).
31. Attach clevis **(9)** to arm B with pin **(10)** and tighten nut **(11)** (Fig.6).
32. Adjust ferrule **(12)** with nut **(13)**, while making sure that arm B remains properly locked.
33. Tighten up nut **(14)**.
    N.B. After tightening the nut, check that the cable is not under stress.
34. Check that the control mechanism locks in the "direct transmission" position.

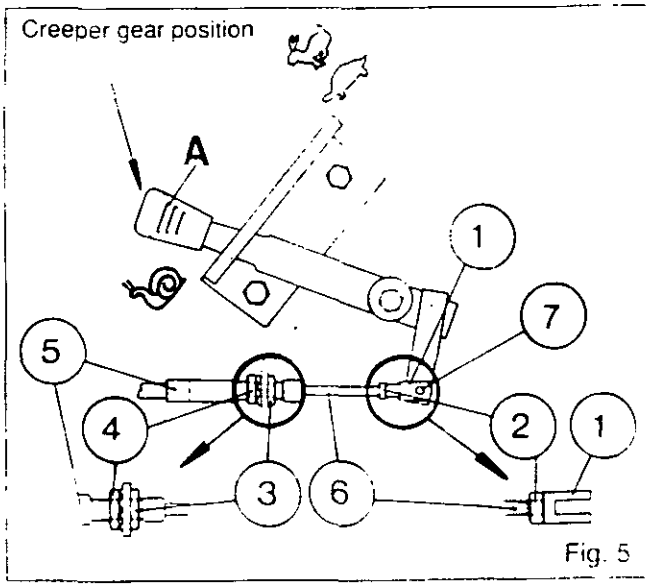


Fig. 5

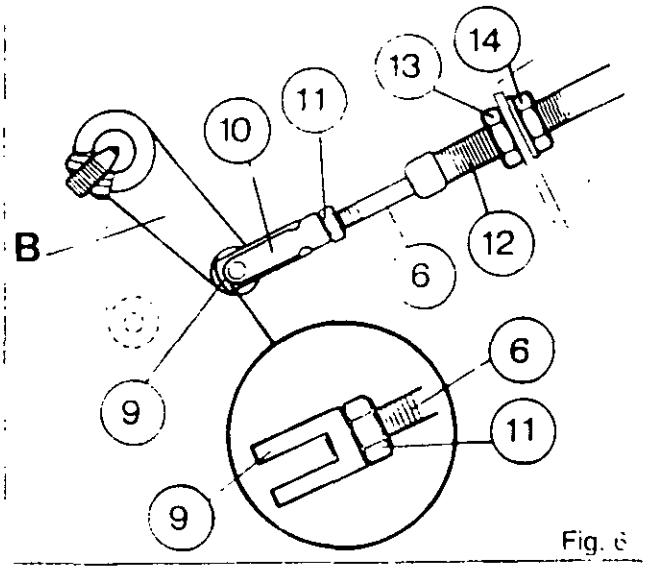
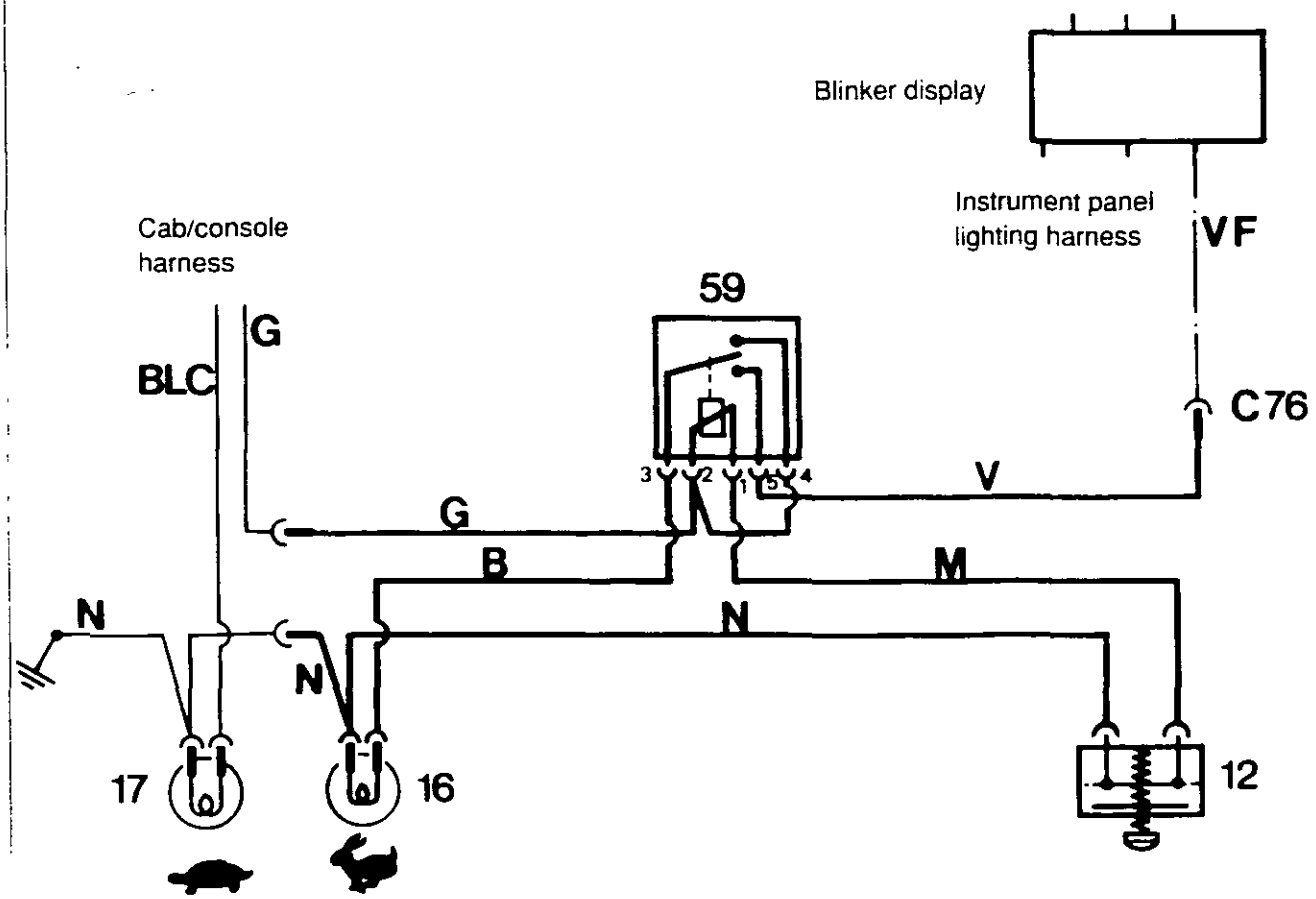


Fig. 6

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F. Circuit diagram



Key

12. Creeper gear indicating switch
16. Hi indicator light
17. Lo indicator light
59. Relay

Colour codes

B. White
BLC. Light blue
G. Grey
M. Light brown
N. Black
R. Red
V. Green
VF. Dark green

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5 J02 Super creeper speeds

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B. Refitting the accumulator ____ 2
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5J02.2

Gearbox - Super creeper speeds

General

The tractors fitted with super creeper speeds use the same mechanical reduction assembly as the standard «creeper gear» version. This reduction gear is fitted behind the main box, on the output shaft (see chapter 5 J01).
They also use the reduction function of the hydro-mechanical device included in the input housing. In this configuration, the following modifications have been made (Fig. 1):
- planet wheels / sun wheels reduction ratio increased.
- special hydraulic cover **(25)**, with a larger clutch piston.
In addition, a hydraulic accumulator is fitted to the right-hand side of the box.

Operation

Moving lever A to the snail position (Fig. 2) causes, at the same time, engagement of the two reduction devices.
The switch **(1)** closes the solenoid valve which controls the hydro-mechanical reduction device (input housing) putting the forward reduction device into the Tortoise range.
At the same time, the rear mechanical reduction gear goes into the slow position (see chapter 5 J01).
The movement of the two reduction devices into the Tortoise range drives the rear axle connecting shaft at a speed of 1 revolution per 7.8 revolutions of the box input shaft. When lever A is moved back to the Hare position, the transmission of movement is direct (ratio of 1:1). From serial number P333039, tractors having the «super creeper speeds» version are fitted with an accumulator (Fig. 3) connected to the pipe (2) coming from the 17 bar valve. The purpose of this is to reduce the pressure drop when the super creeper range is engaged. This device is held by a bracket fixed to the selection cover.

A. Removing the accumulator

1. Remove bolt **(3)**
2. Disconnect union **(4)**
3. Remove accumulator **(5)**
4. Remove fixing bracket **(6)**

B. Refitting the accumulator

1. Reverse operations 1 to 4.
   Note: Apply a sealant between the union and accumulator (Loctite 542 or equivalent).
   For correct operation, maintain nitrogen inflation pressure of 8 bar, using the valve (7) (Fig. 3).
   Pressure to be checked once a year.

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Gearbox - Super creeper speeds

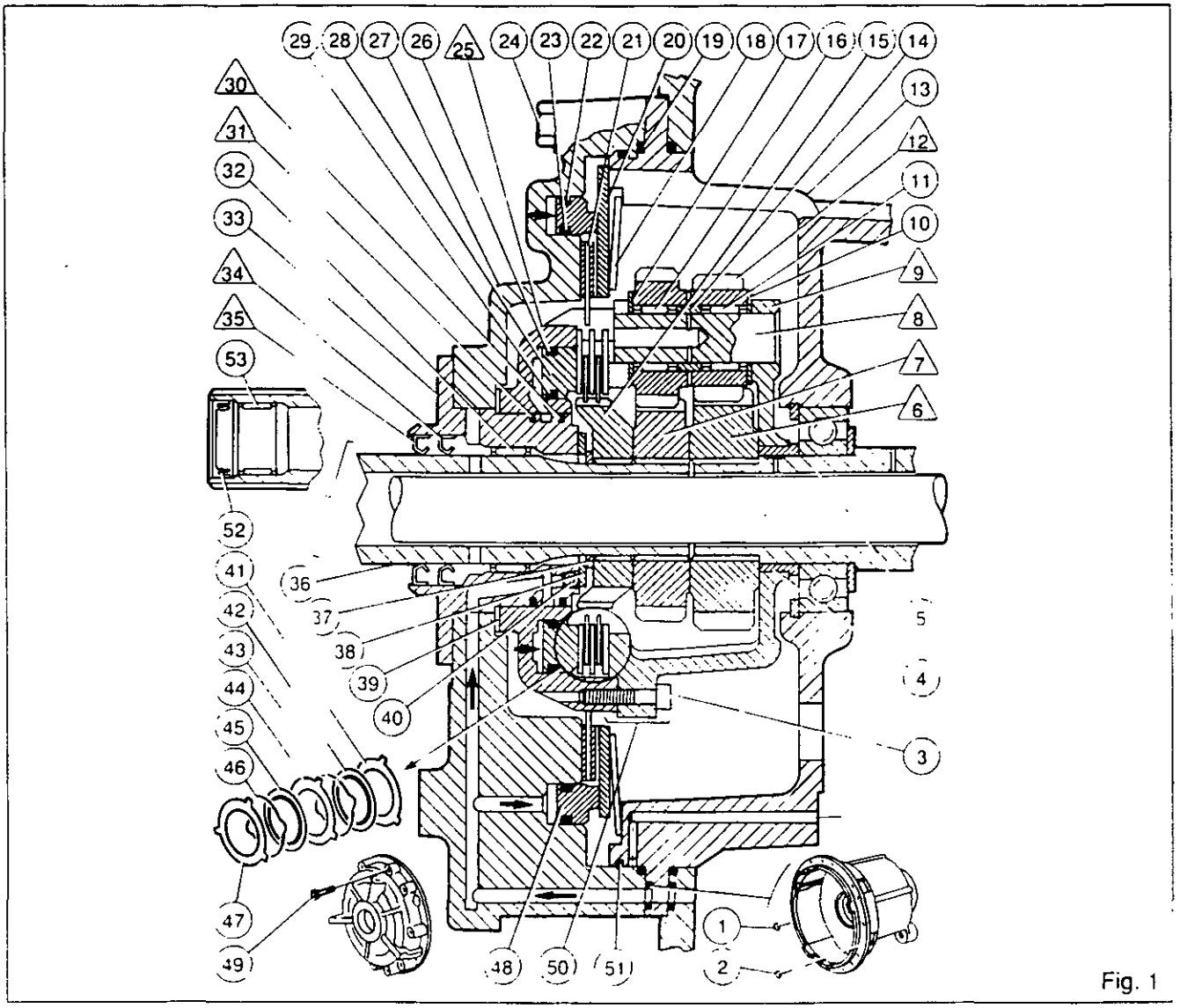


Fig. 1

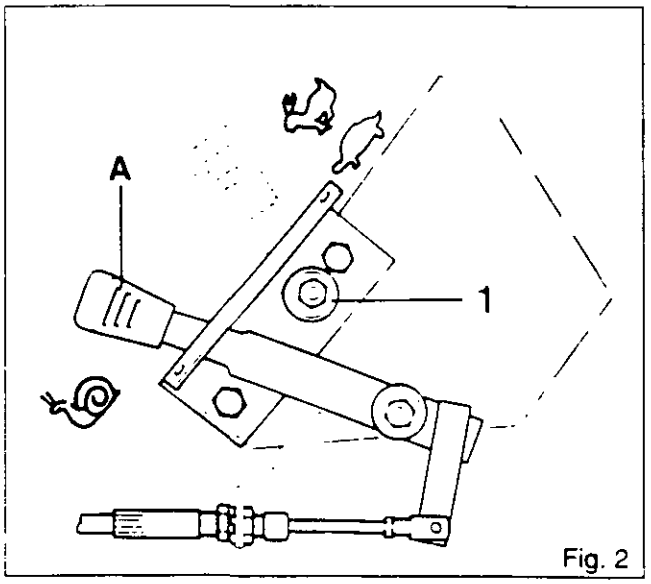


Fig. 2

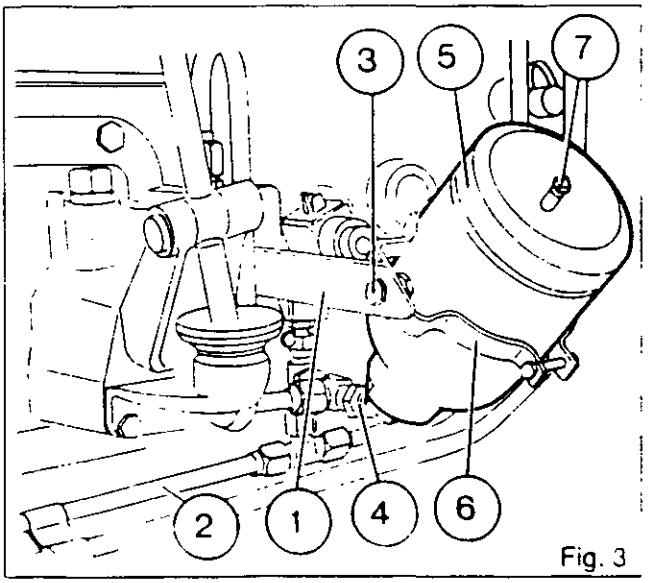
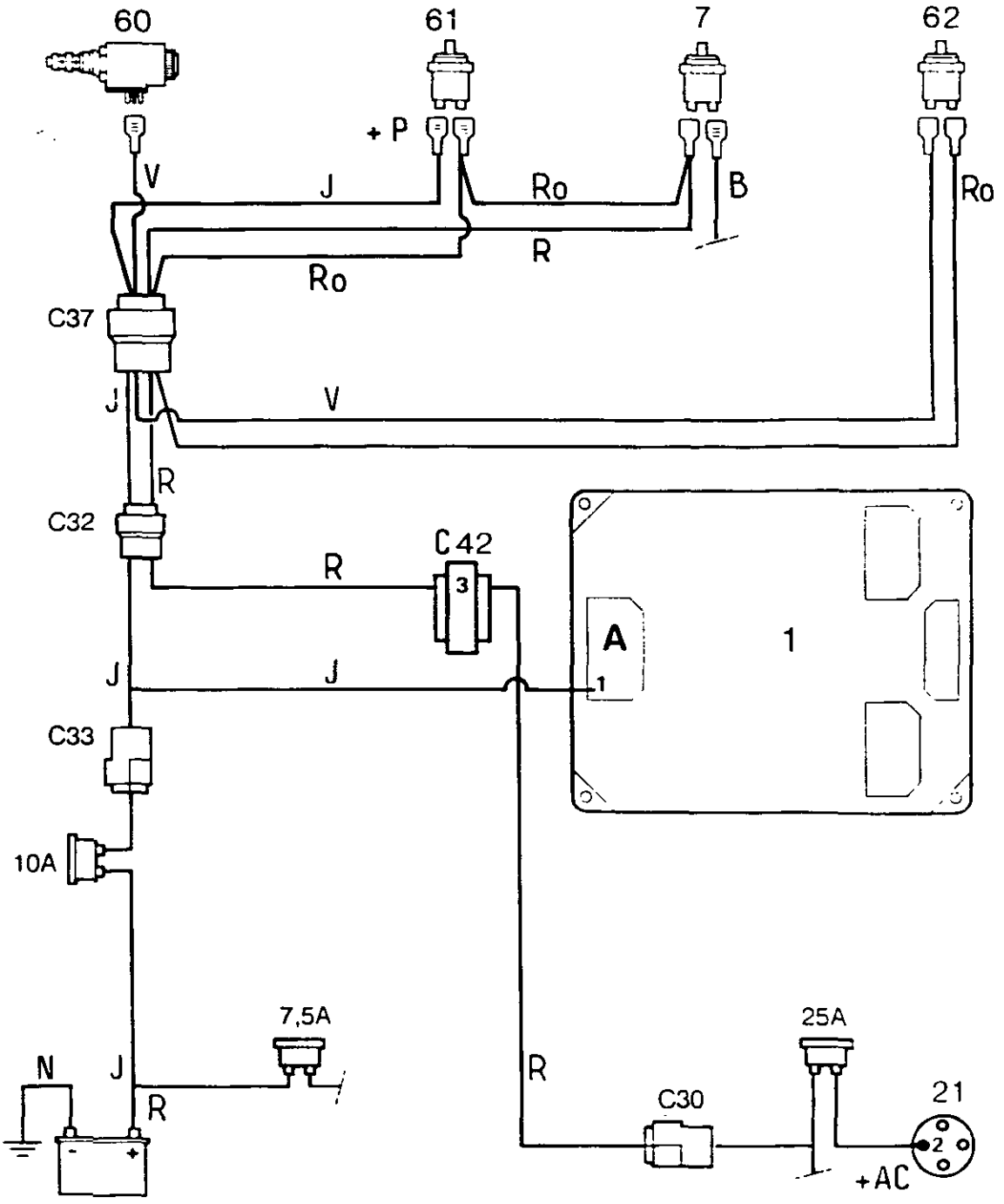


Fig. 3

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C. Electrical diagram

1.With «Autotronic»



Key

1 «Autotronic» box
7 Hi-Lo (Hare/Tortoise) switch
21. Starting switch
60. Super creeper speed solenoid valve
61. Low-pressure pressure-sensitive switch
62. Super creeper speed switch

Colour codes

B. White
J. Yellow
N. Black
R. Red
Ro. Pink
V Green

Abbreviations

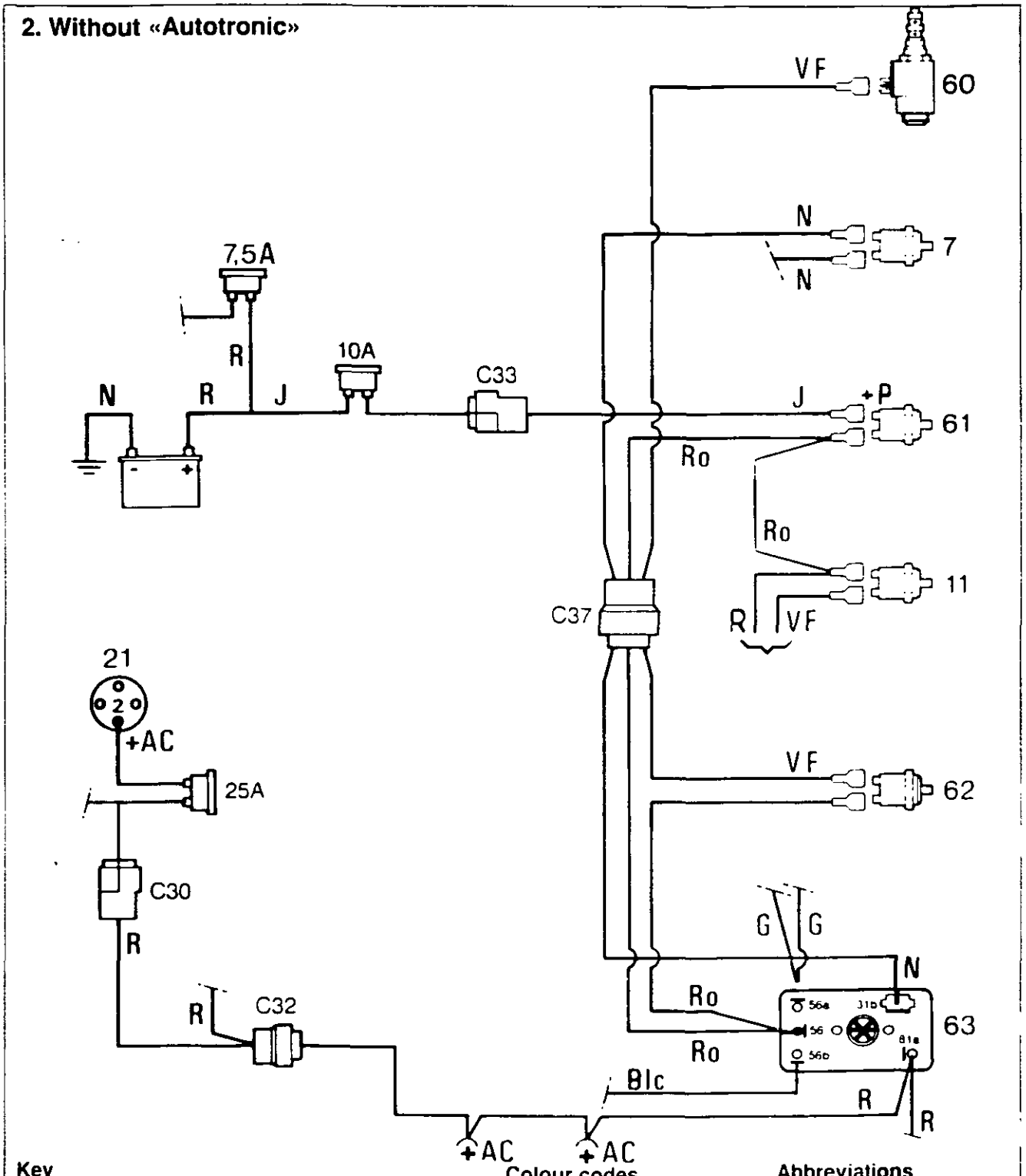
+AC = + After contact
+P = Permanent +
C = Connection
C = Connection

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Gearbox - Super creeper speeds

2. Without «Autotronic»



Key

7. Hi-Lo (Hare/Tortoise) switch
11. Low-pressure pressure-sensitive switch
21. Starting switch
60. Super creeper speed solenoid valve
61. Low-pressure pressure-sensitive switch
62. Super creeper speed switch
63. Telebreaker

Colour codes

B. White
G. Grey
J. Yellow
N. Black
R. Red
Ro. Pink
VF. Dark green

Abbreviations

+AC = + After contact
-P - Permanent +

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5 K01 Selector cover (4 x 4) 16 Speed

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E. Adjustment of sleeves on levers 11
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Gearbox - Selector cover 16 speed

General

The selector cover fitted on the RH side of the gearbox housing has two separate levers which each perform two different functions:
- Front lever: this lever controls the A/B ranges and the reversing mechanism.
- Rear lever: this lever selects the four basic gears and the Hi-Lo speeds.

Operation

1. A/B range and reverse lever (Fig.1)

A/B range function

The A/B ranges are hydro-mechanically controlled. The range and reversing lever **(23)** selects one of the two ranges when it is either pushed (A range) or pulled (B range).
Supply chamber **(F)**, ducts **(a)** and **(d)**, and chamber **(H)** are under constant pressure from the 17 bar LP circuit.

A range

Lever **(23)** is pushed. Plunger /**59**\ moves to the lowered position in the waist on shaft **(53)** and there is no supply to ducts **(b)** and **(c)**. The pressure prevailing in chamber **(F)** is transmitted to chamber **(H)** and acts on the annular face of piston **(72)**. The piston moves forward and pivots lever /**61**\, which moves fork **(T)** to the **A** position. The hydraulic oil contained in chamber **(G)** is returned to the housing via ducts **(c)** and **(b)** and pressure valve **(58)**.

B range

Lever **(23)** is pulled. Plunger /**59**\ then moves into contact with the larger-diameter circumference of spindle **(53)** and assumes its raised position. It allows hydraulic oil to flow from duct **(a)** to ducts **(b)** and **(c)** and then to chamber **(G)**. Since the force acting on the larger face of piston **(72)** is greater than that applied to its annular face, the piston moves back. Lever /**61**\ moves with the piston and shifts fork **(T)** to the **B** position.
The hydraulic oil contained in chamber **(H)** is returned to the 17 bar circuit via ducts **(d)** and **(a)**.

Reversing function

The reversing function is obtained when lever **(23)** is moved either forward (reverse gears) or back (forward gears). It can be obtained in both the A range and the B range.

A range

Moving lever **(23)** either forward or back causes shaft **(53)**, which is secured to U-arm **(54)**, to turn. The front pad on U-arm **(54)** moves selector **(S)** and the selector, as it moves, takes with it upper finger **(66)**, which is engaged in the selector **(S)**.
N.B.: In the A range, upper finger (66) remains passive and is simply carried along by selector (S) in its movement.

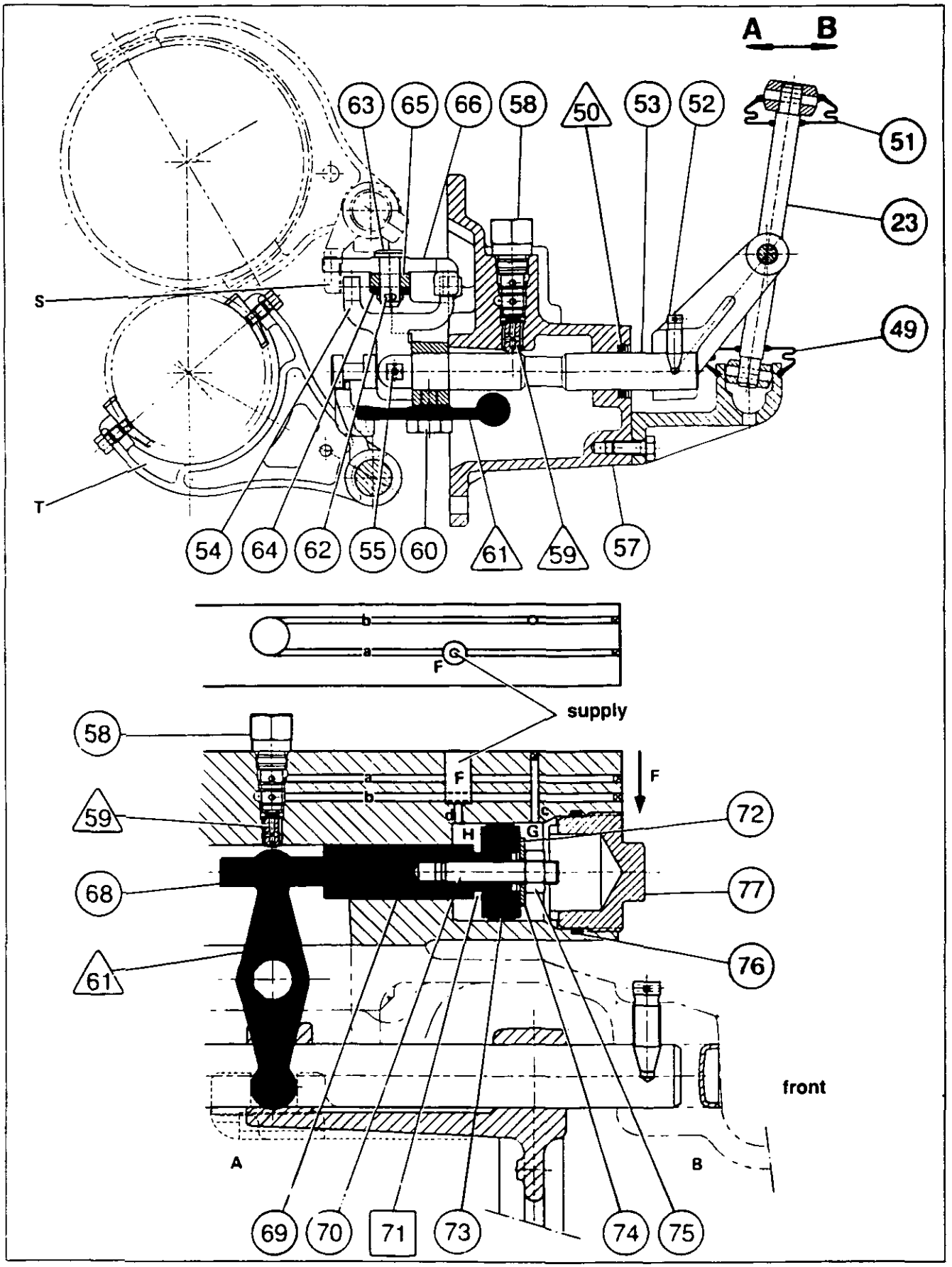
B range

In this position, when lever **(23)** is pulled, moving the lever either forward or back causes U-arm **(54)** to pivot. The rear pad on U-arm **(54)** moves upper finger **(66)** which in turn moves selector **(S)**. The front pad on U-arm **(54)** is then disengaged from selector **(S)**.

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Gearbox - Selector cover 16 speed



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Gearbox - Selector cover 16 speed

Mechanical locking of A/B ranges

Two ramps machined into the A/B range fork **(T)** allow it to be locked by the end of shaft **(53)**.

- In the A range, fork **(T)** is in the position shown in Fig. 2 and prevents an accidental change to the B range.
- In the B range, fork **(T)** is in the position shown in Fig. 3 and prevents an accidental change to the A range.

N.B.: The lever in the cab moves in the opposite direction to the lever on the selector cover ; when it is in the forward position, the forward gears are engaged.

2. Gear lever

Selecting 1st/2nd gears

To select these gears, the gear lever **(12)** is set to its intermediate position. Arm **(36)**, which is linked to lever **(12)** engages in the 1st/2nd speed fork **(P)** and lock **(V)** prevents any movement by the 3rd/4th speed fork **(Q)** (Fig. 4). 1st gear is obtained by moving lever **(12)** back and 2nd by moving it forward.

Selecting 3rd/4th gears

If gear lever **(12)** is pushed, arm **(36)** engages in the 3rd/4th speed fork **(Q)** and moves with it lock **(V)**, which then prevents movement by the 1st/2nd speed fork **(P)** (Fig. 5). 3rd gear is obtained by moving lever **(12)** back and 4th by moving it forward.

Hi-Lo (Hare-Tortoise) function

The Hi-Lo function is obtained in the neutral position by pulling lever **(12)**. Arm **(36)** linked to the lever moves lock **(V)**, which applies pressure to switch **(1)**. Switch **(1)** operates the Hi-Lo solenoid valve via the Autotronic (if fitted) or via a system of relays (tractors without Autotronic or «E»).

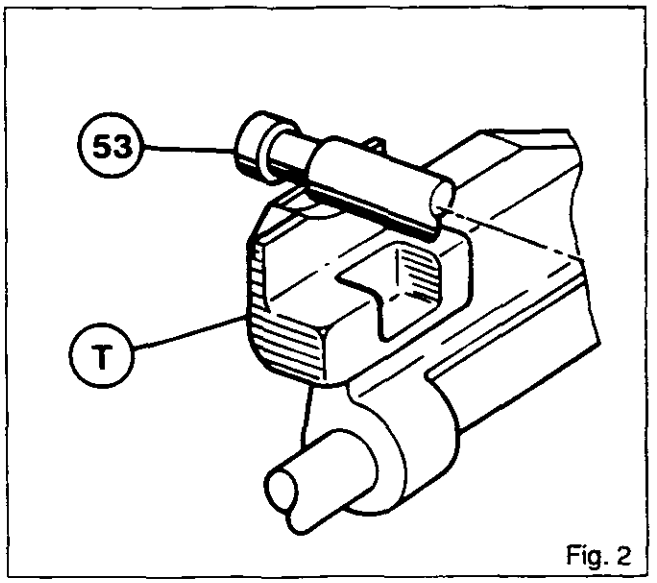


Fig. 2

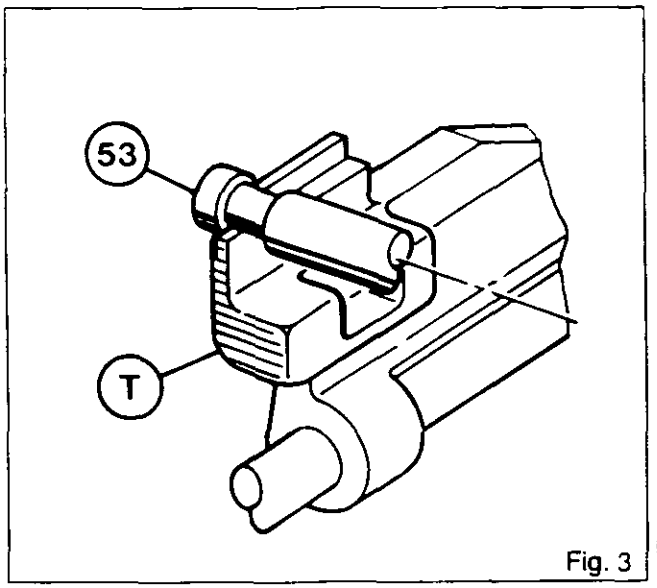


Fig. 3

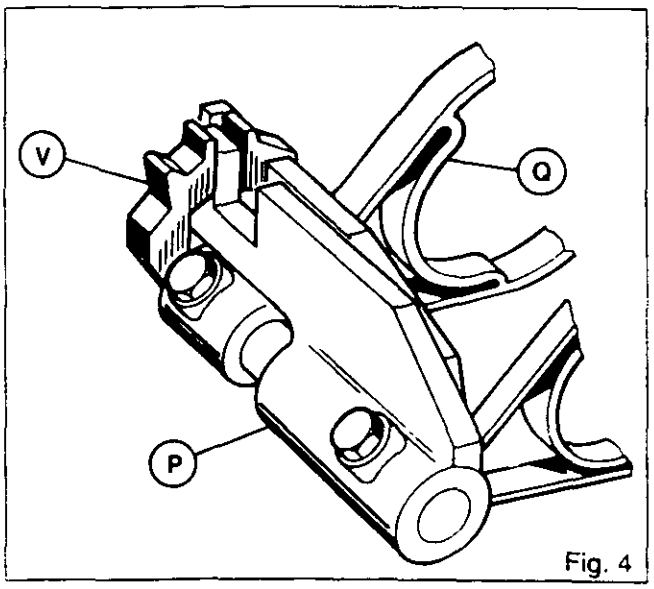


Fig. 4

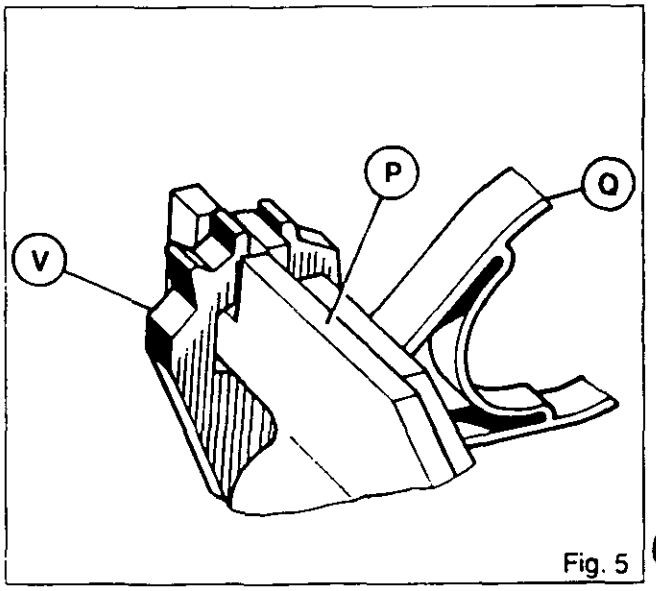


Fig. 5

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Gearbox - Selector cover 16 speed

Hare position

Solenoid valve E, which is mounted at the bottom of the RH cover (Fig. 6), opens and feeds hydraulic oil to chamber (a) situated at the rear of piston **(13)** (Fig. 9). The piston moves forward and applies pressure to fork **(20)**.

The oil contained in chamber **(b)** is forced into the Hare duct and returns to the 17 bar circuit.

Tortoise position

Switch **(1)** is again actuated via the gear lever and this causes the solenoid valve to close and the pressure in chamber **(a)** to drop. Piston **(13)** moves back under the prompting of the 17 bar pressure applied to its annular face.

The oil contained in chamber **(a)** is returned to the housing via the Hare duct and solenoid valve E.

Hare/Tortoise locking

Slider **(18)** secured to fork **(20)** is facing lock **(22)**, which prevents any accidental movement of fork **(20)** both in the Hare position (Fig. 7) and in the Tortoise position (Fig. 8).

The configuration of lock **(22)** is such that the slider and fork assembly is only released if the gear lever is pulled to select either the Hare position or the Tortoise position.

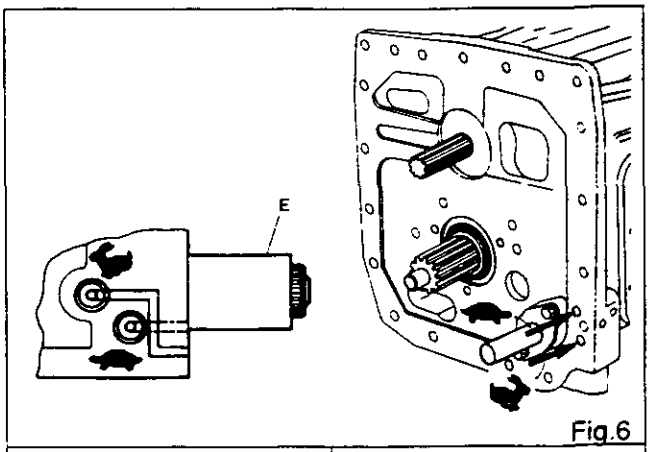


Fig.6

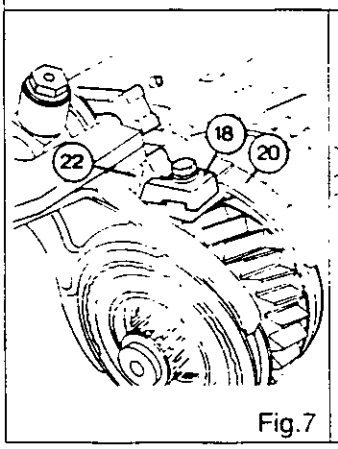


Fig.7

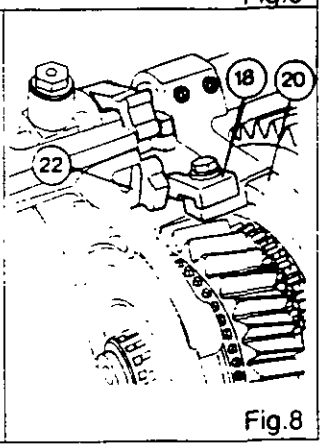


Fig.8

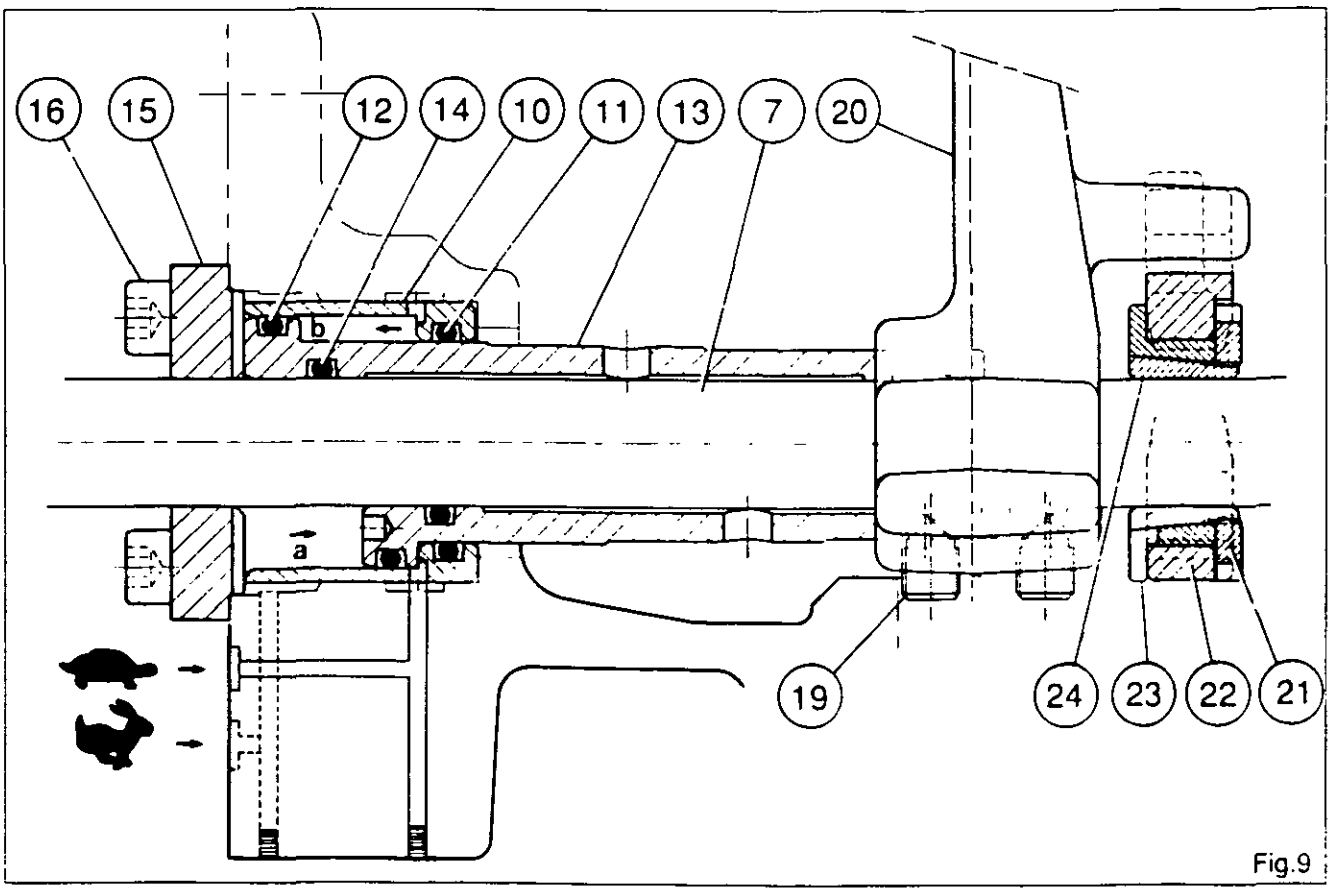
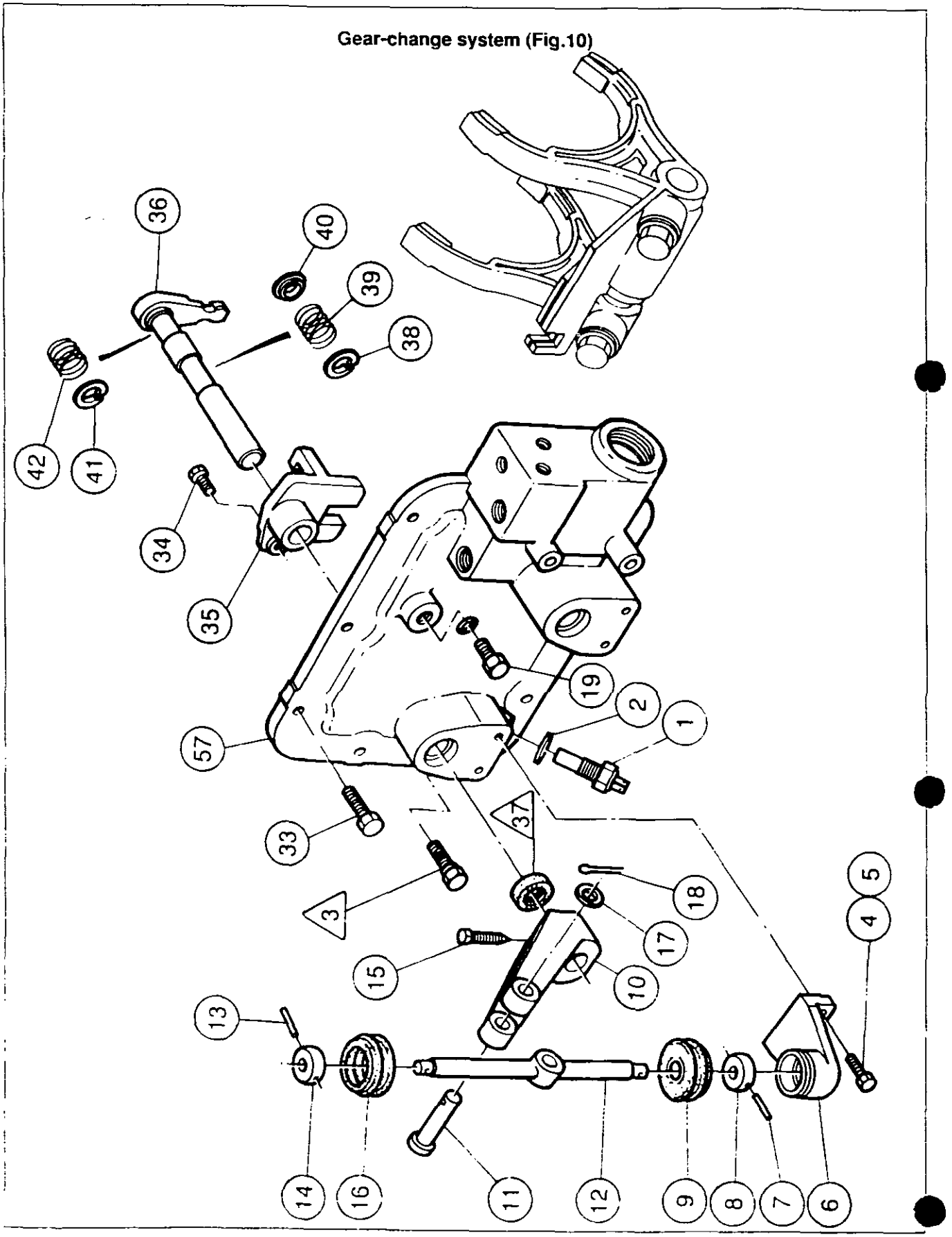


Fig.9

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Gearbox - Selector cover 16 speed

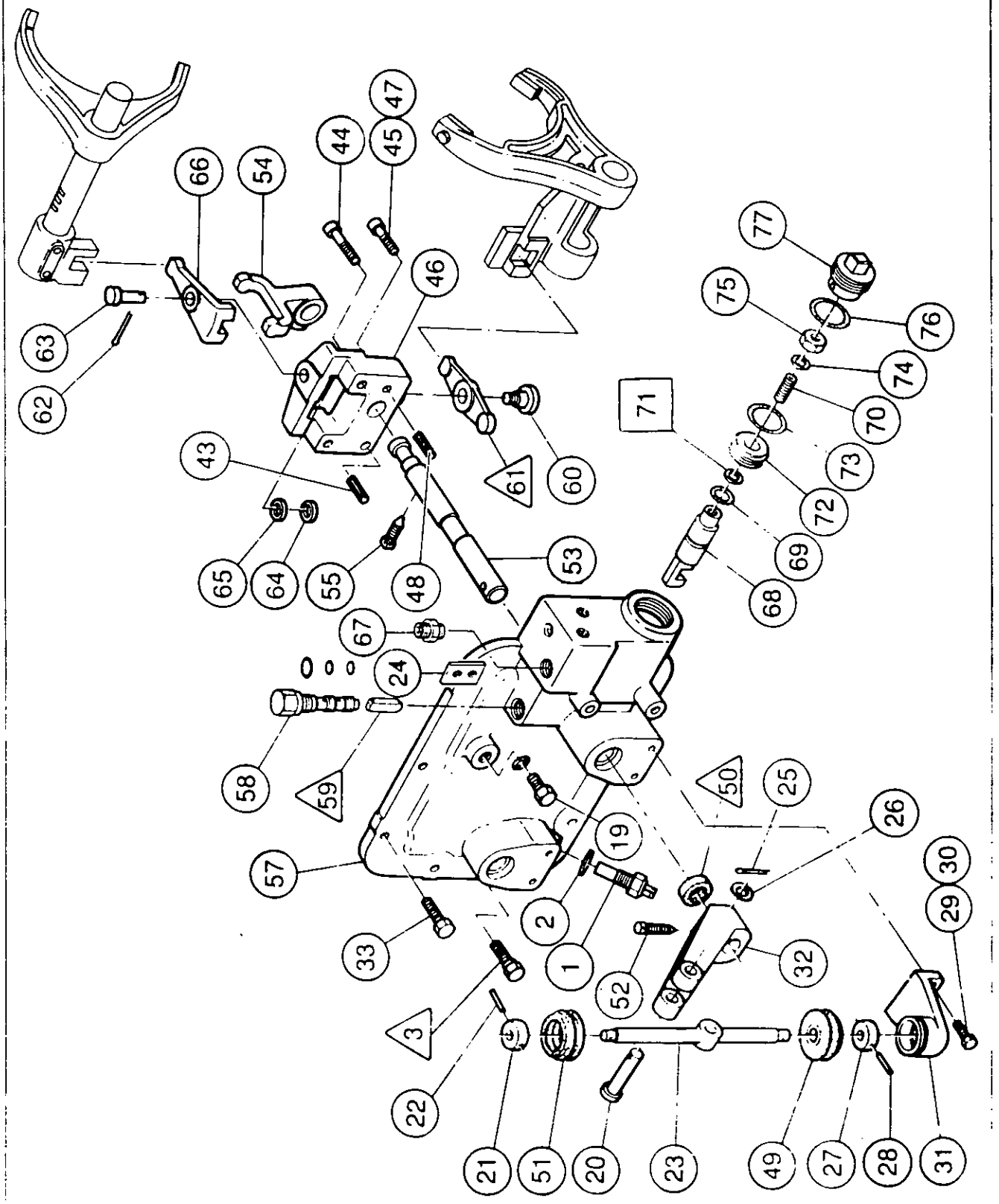
Gear-change system (Fig.10)



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Range-change and reversing system (Fig.11)



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Gearbox - Selector cover 16 speed

A. Removal

1. Immobilise the tractor. Fit wedge blocks under the LH rear wheel.
2. Apply the handbrake.
3. Fit chock between frame and front axle.
4. Drain the gearbox (only) of oil.
5. Raise the rear RH side of the tractor with a jack.
6. Place an axle stand in position.
7. Take off the wheel.
8. Take off the RH step.
9. Take out cotter pins **(18)** and **(25)** and remove washers **(17)** and **(26)**. Remove pins **(11)** and **(20)**.
10. Lift dust-covers **(49)** and **(51)**, and **(9)** and **(16)**. Take out range lever **(23)** and gear lever **(12)** and mark which fits where. Take off pipe **(2)** (Fig.12).
11. Disconnect the Hi-Lo wiring from switch **(1)** (Fig. 12).
12. On gearboxes fitted with creeper speeds, disconnect the control linkage.
    On gearboxes fitted with a speed limiter, disconnect the wiring to switch **(1)** (Fig. 13).
13. Remove bolts **(33)**.
    N.B.: Mark the positions of locating bolt /3\ and earth wire lug (24).
    On gearboxes fitted with creeper gears, take off the control cable support (1) (Fig.14).
14. Remove cover **(57)**.

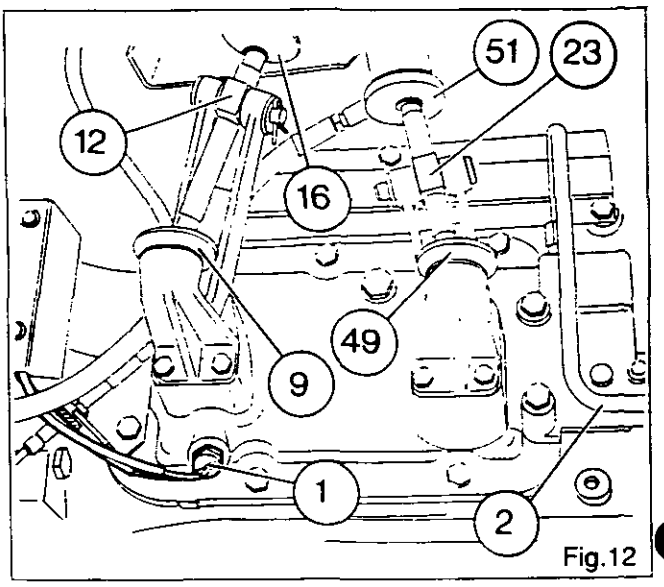


Fig.12

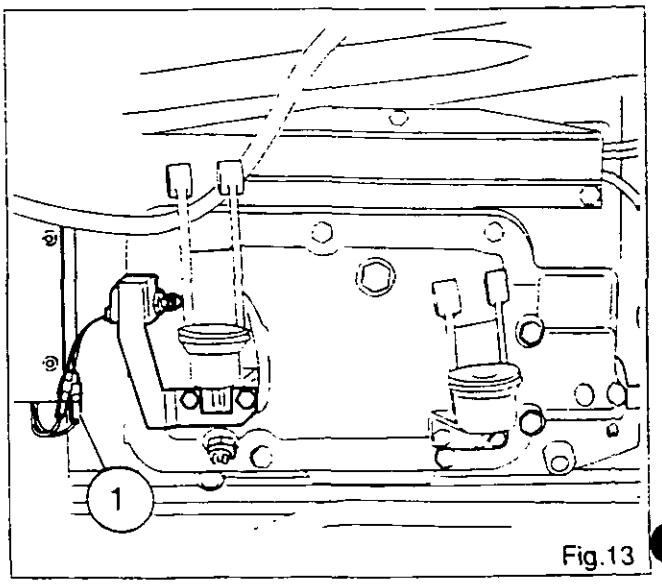


Fig.13

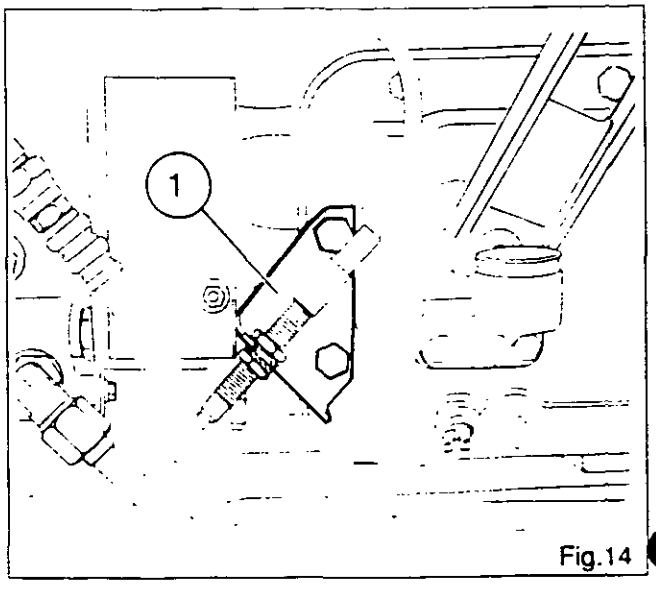


Fig.14

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B. Disassembly

15. Clamp cover **(57)** in a vice (Fig. 15).
16. Unscrew pressure valve **(58)** and plunger /**59**\.
17. Unscrew bolts **(29)** and **(30)**, and **(4)** and **(5)**, and take off supports **(6)** and **(31)**.
    N.B.: On gearboxes fitted with a speed limiter, take off support (1) (Fig. 16).
18. Unscrew setscrews **(15)** and **(52)** and remove arms **(10)** and **(32)**.
19. Unscrew setscrew **(55)**, withdraw shaft **(53)** and take off the reverse- controlling U-arm **(54)**.
20. Withdraw cotter pin **(62)**, washer **(64)**, spring wasner **(65)** and pin **(63)** and take off finger **(66)**.
21. Unscrew shoulder screw **(60)**, mark which way round A/B control finger /**61**\ fits, and remove the finger (Fig. 17).
22. Unscrew A range plug **(77)**, take off O-ring **(76)** and unscrew nut **(75)**.
23. Withdraw washer **(74)**, piston **(72)**, adjusting shims **[71]** O-ring **(73)**, piston rod **(68)** and O-ring **(69)**.
24. Unscrew bolts **(44)**, **(45)** and **(47)**.
25. Take off support **(46)**.
26. Withdraw dowel pins **(43)** and **(48)** from the cover.
27. Unscrew bolt **(34)** and withdraw the selecting arm assembly.
28. Remove cup seals **(38)** **(40)** and spring **(39)**.
29. Withdraw arm **(36)** from mounting block **(35)** and remove cup seal **(41)** and spring **(42)** from the arm **(36)**.
30. Unscrew Hi-Lo switch **(1)**, remove O-ring **(2)**, plug **(19)** and union **(67)**.
31. Remove seals /**37**\ and /**50**\.

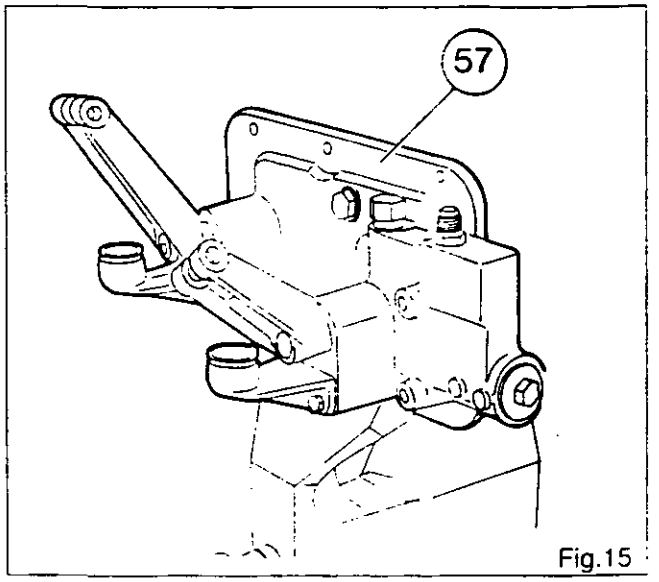


Fig.15

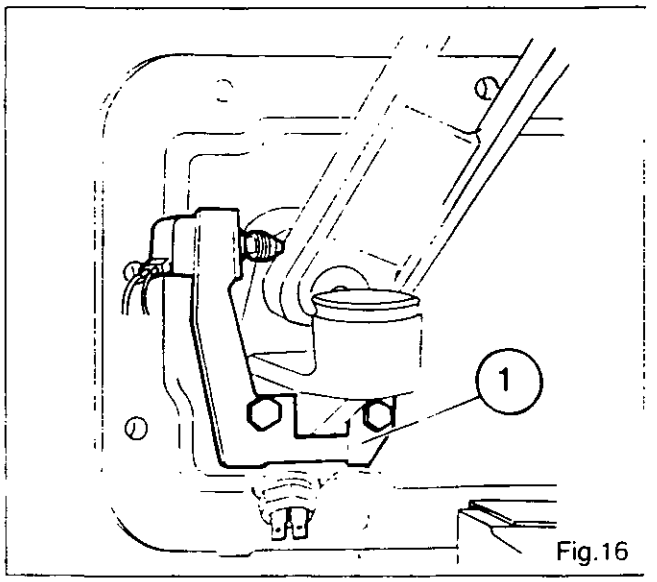


Fig.16

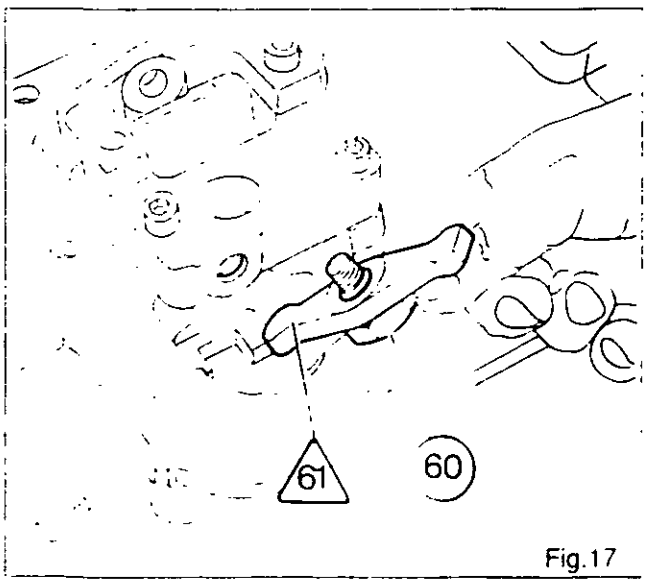


Fig.17

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C. Reassembly

32. With a jet of compressed air, check that the **A** and **B** passages are not blocked (Fig.18 and 19).
33. Clean the mating face of cover **(57)**.
34. Apply a light coating of Loctite 542 to the outer circumference of seals **/37** and **/50** and press them fully home in the cover.
35. Carry out procedures 28 to 30 in reverse.
36. Refit the selecting arm assembly and bolt **(34)**.
    N.B.: Be careful not to damage the lip of seal /37\ when refitting the assembly. Clean the bolt and coat it with Loctite 270 and tighten it to a torque of 25 - 25 Nm.
37. Carry out procedures 25 and 26 in reverse.
38. Refit bolts **(44)**, **(45)** and **(47)** and tighten them to a torque of 25 to 35 Nm
39. Replace O-ring **(69)** on piston rod **(68)**. Lubricate the combination and insert it in the bore in the cover.
    N.B. The notch in the rod must face down (Fig. 20).
40. Carry out procedure 21 in reverse.
    N.B.: Clean the tapped thread and coat it with Loctite 270 (do not coat the thread on the screw). Tighten the screw to a torque of 50 to 70 Nm. Check that the finger will pivot freely.
41. Carry out procedure 20 in reverse.
42. Carry out procedure 19 in reverse.
    N.B.: Fit shaft (53) from the inside of the cover (Fig. 21). Be careful not to damage the lip of seal /50\. Tighten the setscrew to a torque of 28 to 43 Nm.
43. Carry out procedures 17 and 18 in reverse.
44. Take the cover out of the vice.

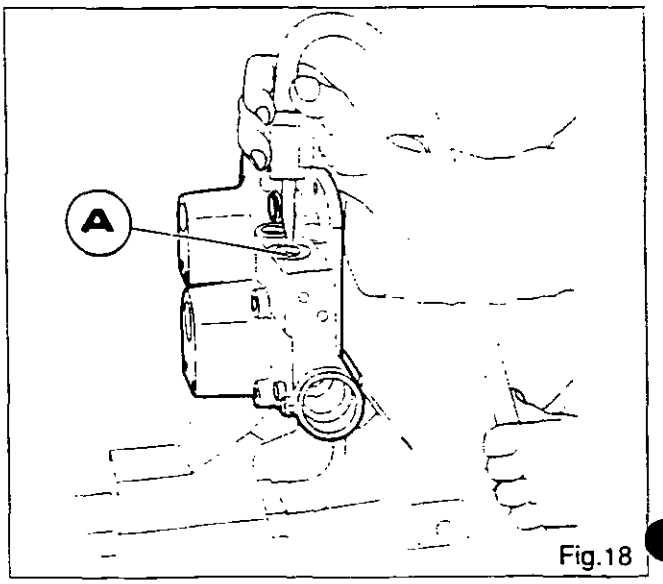


Fig.18

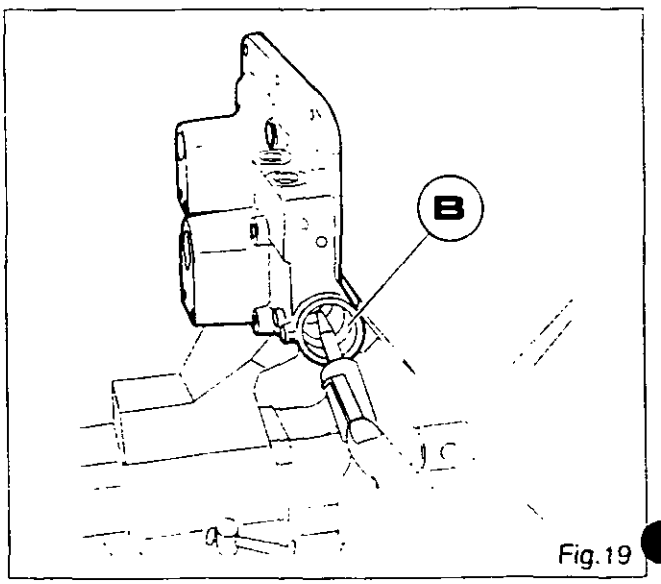


Fig.19

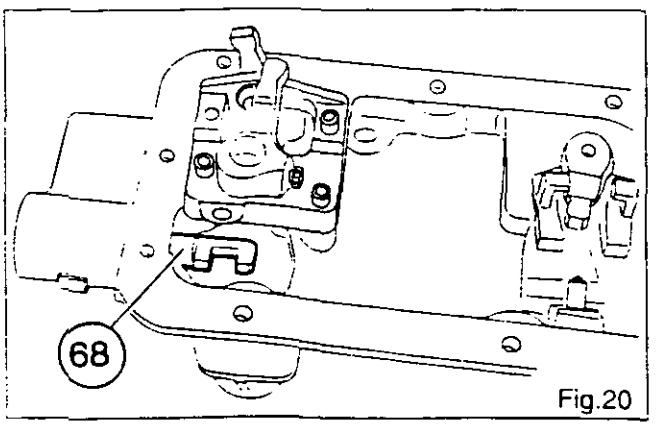


Fig.20

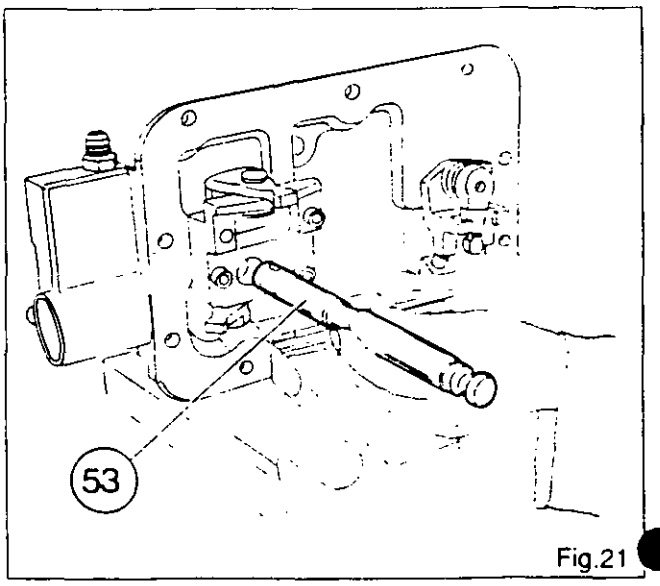


Fig.21

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Gearbox - Selector cover 16 speed

D. Refitment

45. Carry out procedures 247 and 248, 250 to 255 from Section 5 A02.S.
46. Fit the earth wire lug **(24)**.
47. Carry out procedures 256 and 257, Section 5 A02.S.
    N.B.: If nothing has been done to the A/B control mechanism, fit the cover without making the adjustments. Otherwise adjust the A/B selector mechanism as described in Section 5 K03.
48. Carry out procedures 11 and 12 in reverse.
49. Carry out procedure 10.
    N.B.: Grease ball-joints (8) (14) and (21) (27) (Loctite Anti Seize grease or equivalent).
50. On gearboxes fitted with creeper gears, adjust the control (see Section 5 J01).
    On gearboxes fitted with a speed limiter, fit switch **(1)** (Fig.13) (see Section 5 M01).
51. Carry out procedures 8 and 9 in reverse.
52. Refit the wheel.
53. Remove the axle stand and jack. Tighten the wheel nuts to a torque of 400 - 450 Nm.
54. Carry out procedures 1 to 4 in reverse.
55. **Carry out road test on the controls for** :
    A/B and reverse, gears, Hi-Lo, creeper gears (if fitted).
56. Check that there are no leaks at the cover joint or at the hydraulic unions.

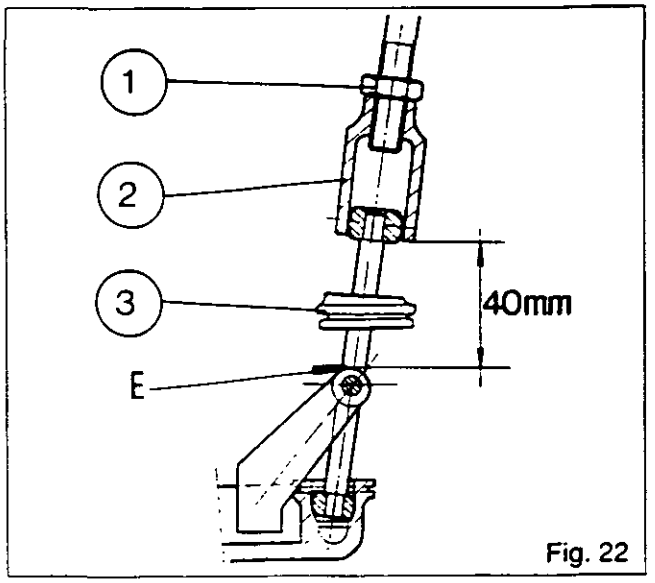


Fig. 22

E. Adjustment of sleeves on levers

Note : If an adjustment or a replacement becomes necessary slightly coat the inside of every sleeve with "Anti-Seize" grease or equivalent.

The setting dimension of the sleeve of the A/B range - reverse shuttle lever according to the shoulder of the selector cover lever which was previously 58 mm, becomes the same as for the gear lever : 40 mm. Refer to Service Bulletin 89/009, issue 1.

Adjustment (Fig. 22)

Place the A/B range-reverse shuttle lever in position A (reverse shuttle non engaged) and the gear lever to neutral.

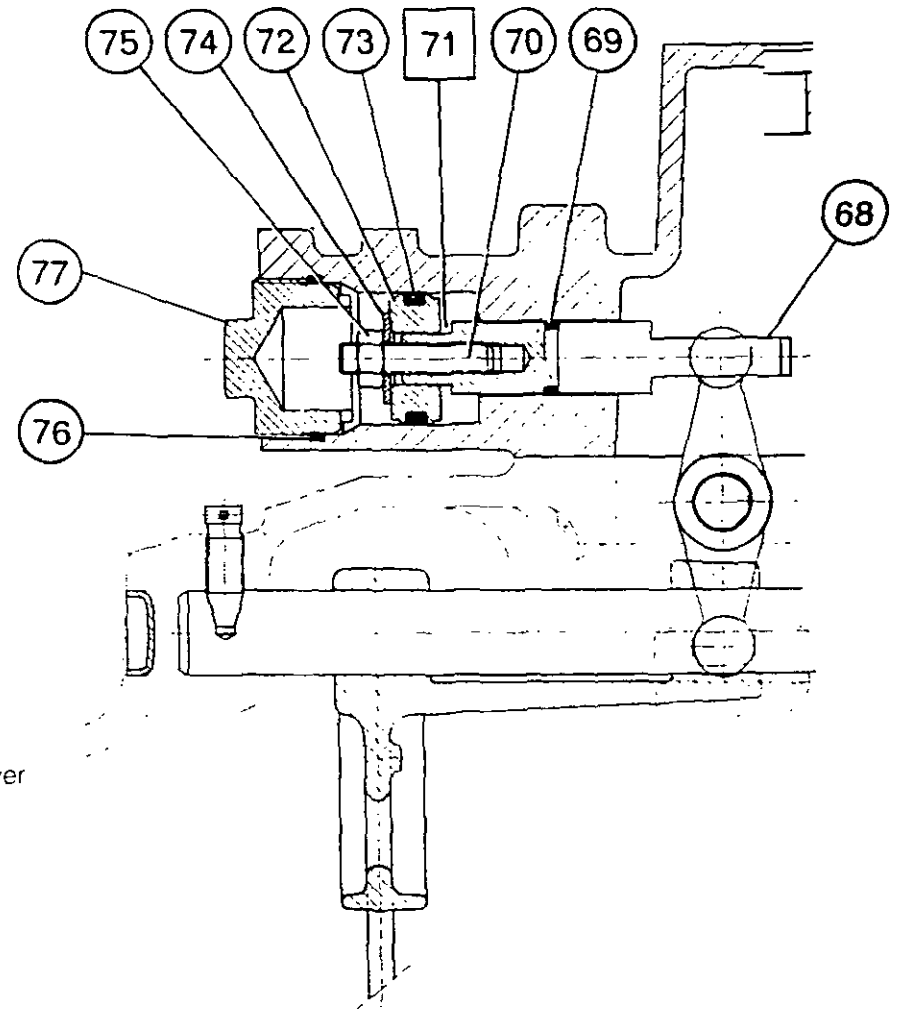
Unscrew nuts **(1)**. Set sleeves **(2)** to obtain 40 mm from the end of the sleeve to the shoulder "E" on every lever. Tighten the nuts to the torque of 50 Nm and fit the bellow **(3)**.

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5 K01.12

Gearbox - Selector cover 16 speed



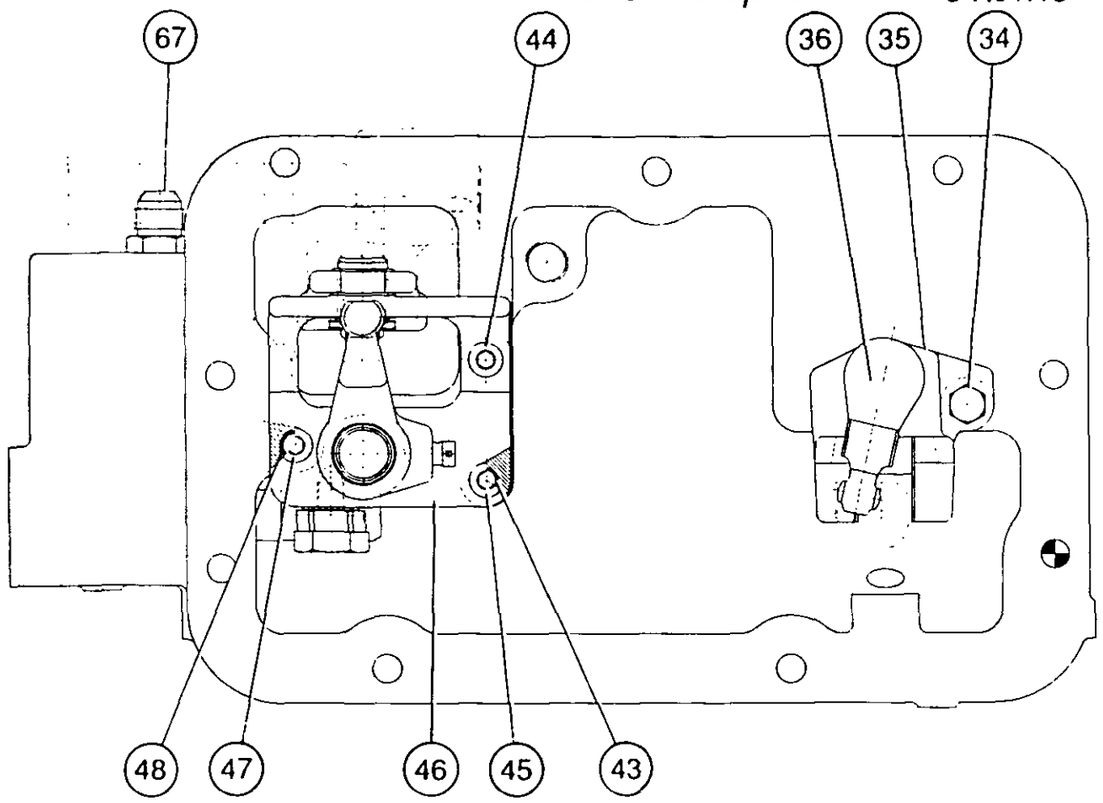
List of parts

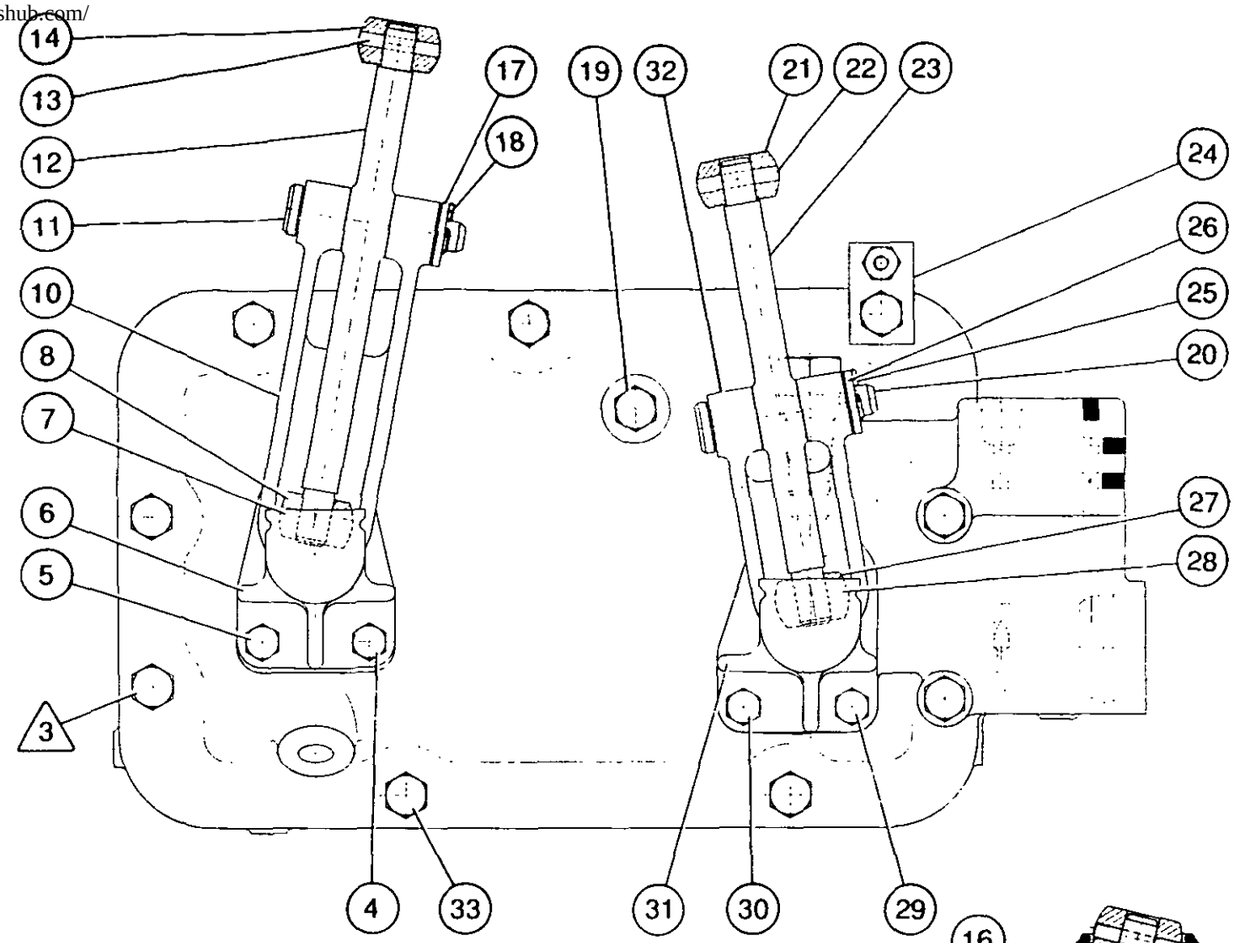
(1) Switch
(2) Seal
/3\ Locating bolt.
(4) Bolt
(5) Bolt
(6) Support
(7) Dowel pin
(8) Ball
(9) Dust cap
(10) Arm
(11) Pin
(12) Gear lever
(13) Dowel pin
(14) Ball
(15) Setscrew
(16) Dust cap
(17) Washer
(18) Cotter pin
(19) Plug
(20) Pin
(21) Ball
(22) Dowel pin
(23) A/B range and reversing lever
(24) Lug
(25) Cotter pin
(26) Washer
(27) Ball
(28) Dowel pin
(29) Bolt
(30) Bolt
(31) Support
(32) Arm
(33) Bolt
(34) Bolt
(35) Mounting block
(36) Arm
/37\ Seal
(38) Cup seal
(39) Spring
(40) Cup seal
(41) Cup seal
(42) Spring
(43) Spring dowel
(44) Bolt
(45) Bolt
(46) Support
(47) Bolt
(48) Spring dowel
(49) Dust cover
/50\ Seal
(51) Dust cover
(52) Setscrew
(53) Shaft
(54) U-arm
(55) Setscrew
(57) 4 x 4 cover
(58) Pressure valve
/59\ Plunger
(60) Shoulder screw
/61\ Finger
(62) Cotter pin
(63) Pin
(64) Washer
(65) Spring washer
(66) Upper finger
(67) Union
(68) Piston rod
(69) O-ring
(70) Threaded rod
[71] Adjusting shim
(72) Piston
(73) O-ring
(74) Washer
(75) Nut
(76) O-ring
(77) Plug

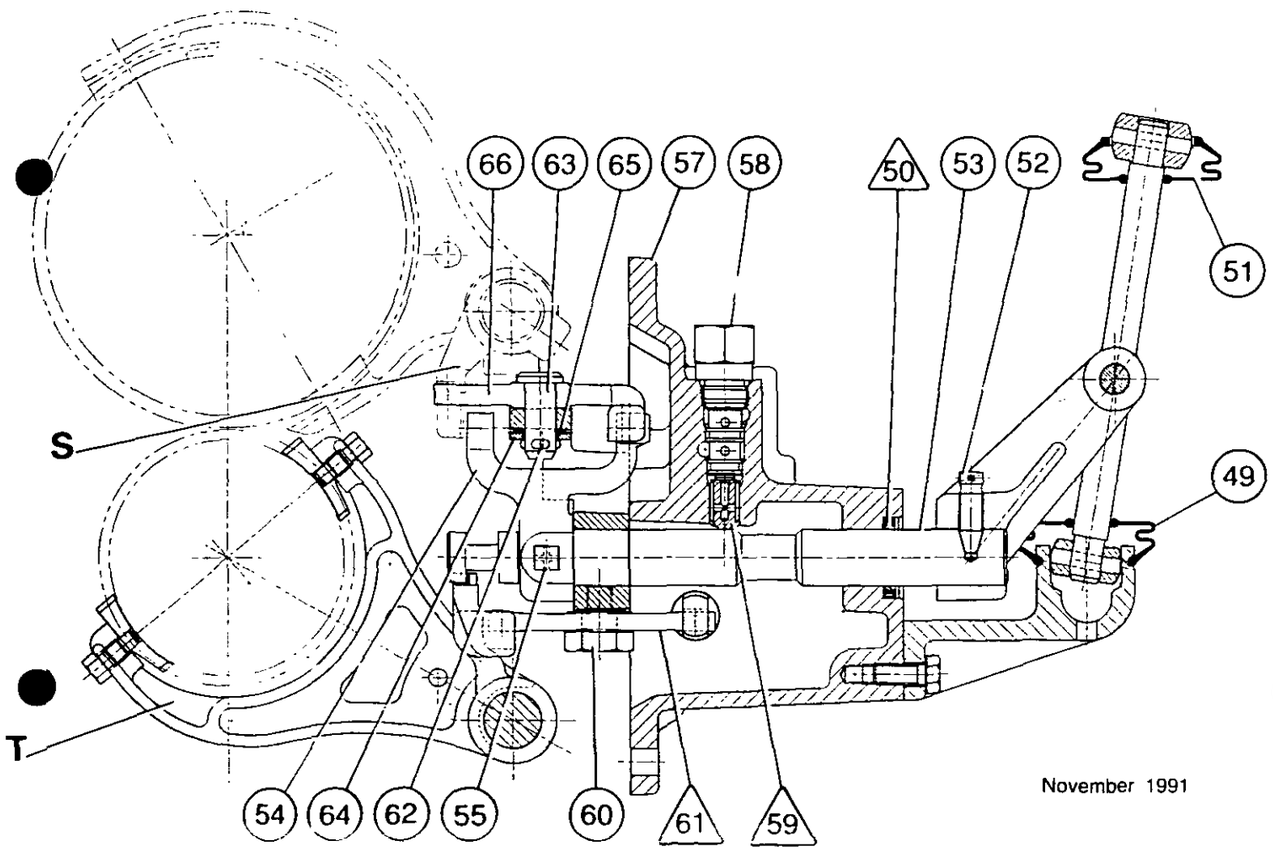
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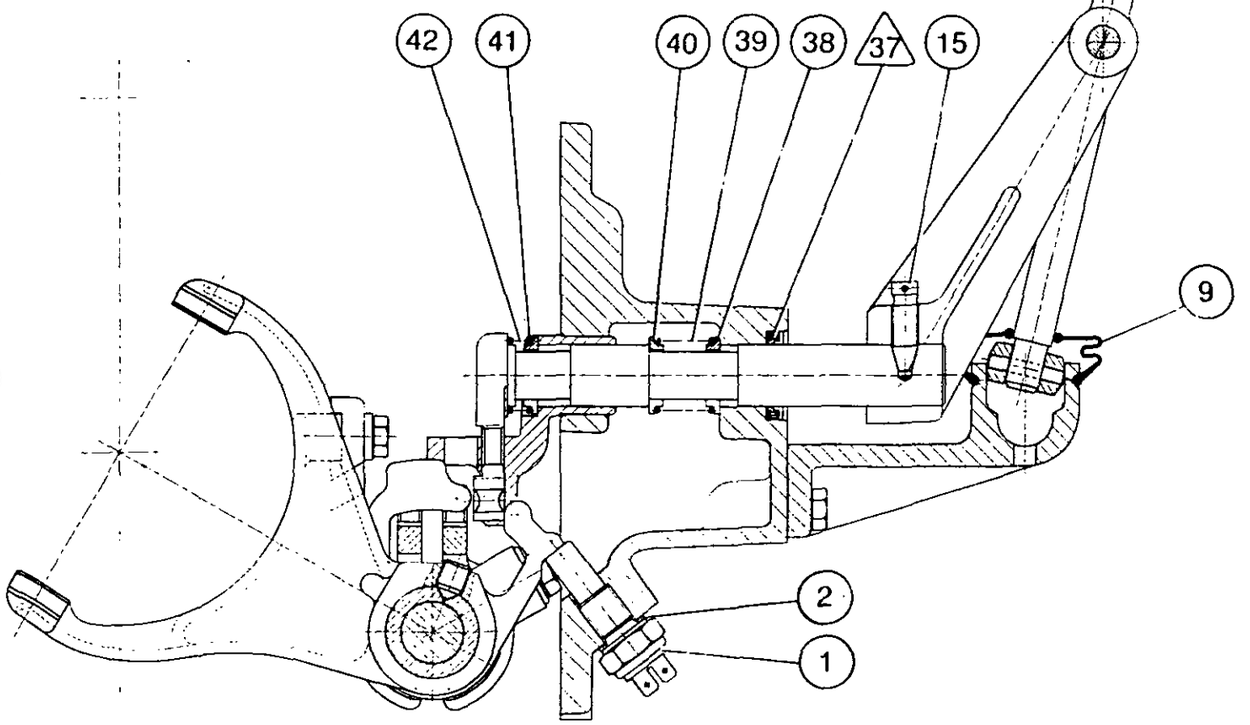
Gearbox - Selector cover 16 speed

5 K01.13









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5 K02 Selector cover (4x2)

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E. Adjustment of sleeves on levers ____ 2

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5 K02.2

Gearbox - Selector cover 8 speed

General

The selector cover fitted on the RH side of the gearbox housing has two separate levers which control the following functions:
- Front lever: controls the reverse shuttle,
- Rear lever: selects the four basic speeds and the Hare/Tortoise range.

Operation

Reverse shuttle lever

The reverse shuttle operates when the lever **(23)** is moved either forwards (for reverse) or backwards (for forward travel).
Moving the lever **(23)** causes shaft **(53)** to rotate ; this is integral with lever **(54)** which moves the selector (S).

Gear lever

1st, 2nd, 3rd, 4th and Hare/Tortoise range are selected in the same way as for the 4x4 gearbox (See 5 K01).
Note: In the 4x2 version 3rd and 4th positions are the reverse of those in the 4x4 gearbox.

A. Removal

1. Carry out procedures 1 to 13 (Section 5 K01).
2. Remove the cover **(56)**.

B. Disassembly

3. Place the cover **(56)** in a vice.
4. Carry out procedures 17 to 19 (Section 5 K01).
5. Carry out procedures 24 to 31 (Section 5 K01).

C. Reassembly

6. Clean the gasket face of the cover **(56)**. Coat the outer diameter of the seals **/37** and **/50** with Loctite 542 and press them fully home into the cover.
7. Press the pins **(43)** and **(48)** into the cover. Fit the support **(46)**.
   Refit the bolts **(44)**, **(45)** and **(47)** and tighten them to a torque of 25-35 Nm.
   Refit the lever **(54)**, refit the shaft **(53)** inside the cover. Take care not to damage the lip of the seal **/50**.
   Fit the bolt **(55)** and tighten to a torque of 28-43 Nm.
8. Reverse procedures 28 and 29 (Section 5 K01).
   Refit the gear control assembly and the bolt **(34)** after coating it with Loctite 270.
   Tighten to a torque of 25-35 Nm.
   Note: Take care not to damage the lip of the seal /37\.
9. Refit the plug **(19)**, the Hare/Tortoise switch **(1)** and its seal **(2)**.
10. Reverse procedures 17 and 18 (Section 5 K01).
11. Remove the cover from the vice.

D. Refitment

12. Carry out procedures 238 to 243 in Section 5 A02.

The following procedures not described must be carried out in Section 5 K01.

13. Reverse procedure 13.
    Tighten the bolts to a torque of 50-70 Nm.
14. Reverse procedures 11 and 12.
15. Reverse procedure 10.
    Note: Grease the balls (8) (14) and (21) (27) (use Loctite Anti-seize or equivalent grease).
16. Procedure 50.
17. Reverse procedures 8 and 9.
18. Refit the wheel.
19. Remove the stand and the trolley jack. Tighten the wheel nuts to a torque of 400-450 Nm.
20. Reverse procedures 1 to 4.
21. Road test the following controls :
    . A/B reverse shuttle, gears, Hare/Tortoise range, creeper gears (if fitted).
    . Check the cover gasket face and the hydraulic unions for leaks.

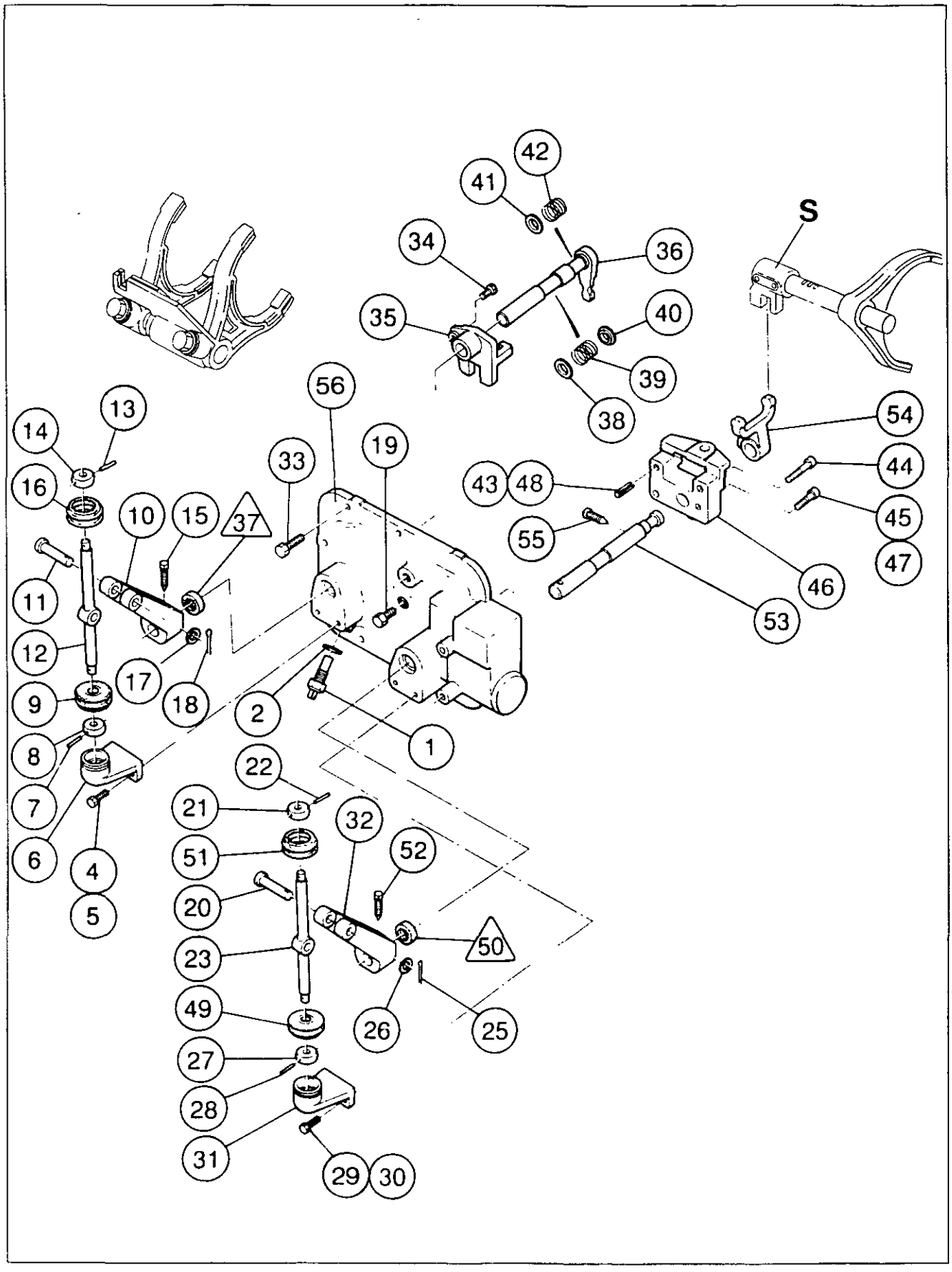
E . Adjustment of sleeves on levers

Carry out procedure from section 5K01 page 11.

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Gearbox - Selector cover 8 speed



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5 K02.4

Gearbox - Selector cover 8 speed

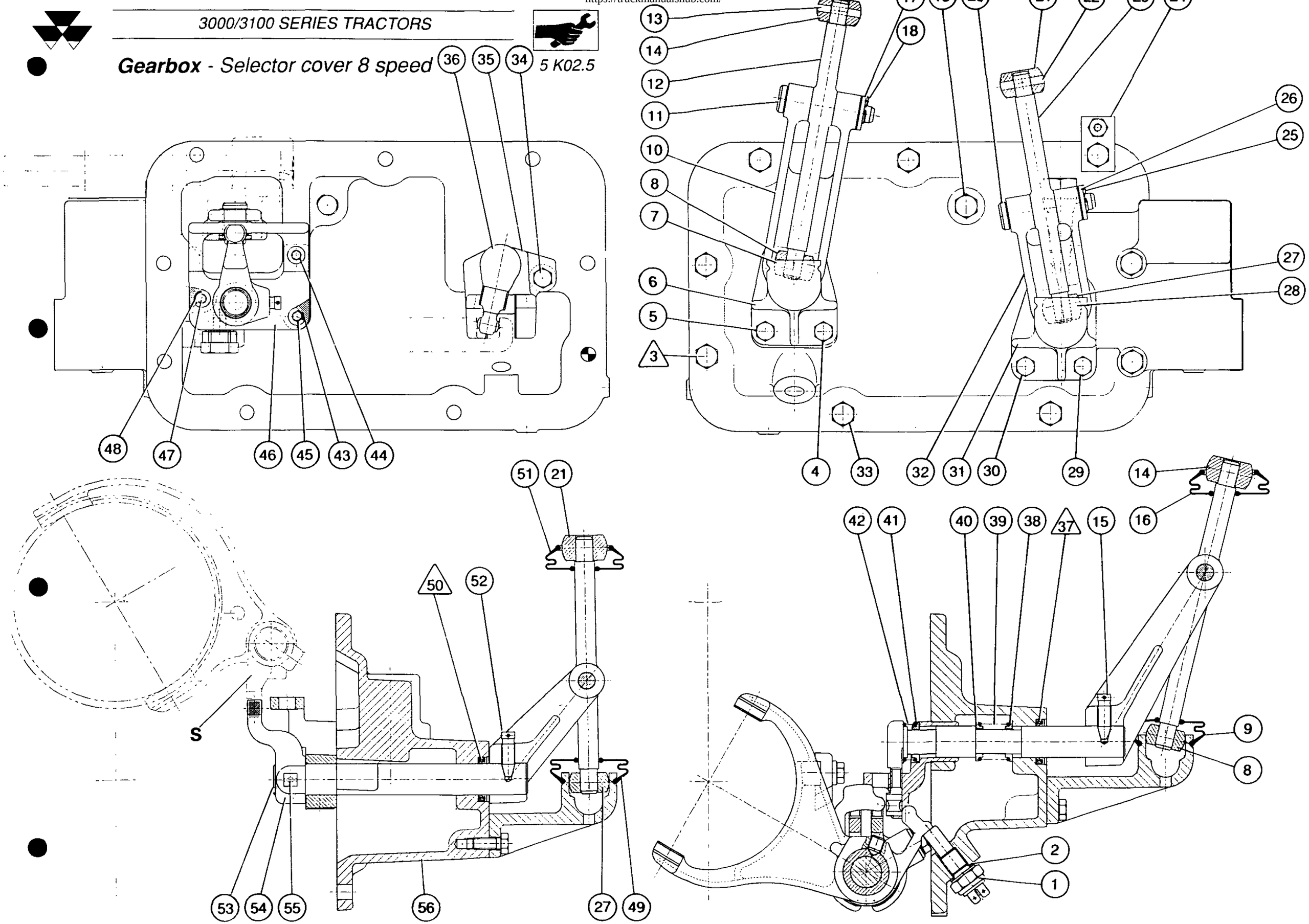
Key to Figure

(1) Switch
(2) Seal
/3 Centring screw
(4) Bolt
(5) Bolt
(6) Support bracket
(7) Pin
(8) Ball
(9) Dust cap
(10) Link
(11) Pin
(12) Gear lever
(13) Pin
(14) Ball
(15) Setscrew
(16) Dust cap
(17) Washer
(18) Pin
(19) Plug
(20) Pin
(21) Ball
(22) Pin
(23) Shuttle lever
(24) Bracket
(25) Pin
(26) Washer
(27) Ball
(28) Pin
(29) Bolt
(30) Bolt
(31) Support bracket
(32) Link
(33) Bolt
(34) Bolt
(35) Rack
(36) Lever
/37 Seal
(38) Cup
(39) Spring
(40) Cup
(41) Cup
(42) Spring
(43) Tubular split pin
(44) Bolt
(45) Bolt
(46) Bracket
(47) Bolt
(48) Tubular split pin
(49) Dust cap
/50 Seal
(51) Dust cap
(52) Setscrew
(53) Pin
(54) Lever
(55) Setscrew
(56) 4x2 cover

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Gearbox - Selector cover 8 speed

5 K02.5



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5 K03 Adjusting selector cover

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B. B range adjustment ____ 4

C. A range adjustment ____ 5

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5K03.2

Gearbox - Adjusting selector cover

General

To ensure that the A/B range will operate correctly, two adjustments need to be made. They consist of adjusting the position of the control piston so that there is a clearance of 0.2 to 0.3 mm between the pads on the A/B fork and the slider of the synchroniser in both the A and B positions.

N.B.: To rationalise the design of the hydraulic control mechanism for the A/B range, the system for reducing and regulating the pressure applied to the piston was modified mechanically and the modification was introduced:

- as from serial number N257024 in MF 3050, 3060, 3070 and 3090 tractors

- as from serial number N258024 in MF 3080 tractors, and

- as from serial number N265031 in MF 3065 tractors.

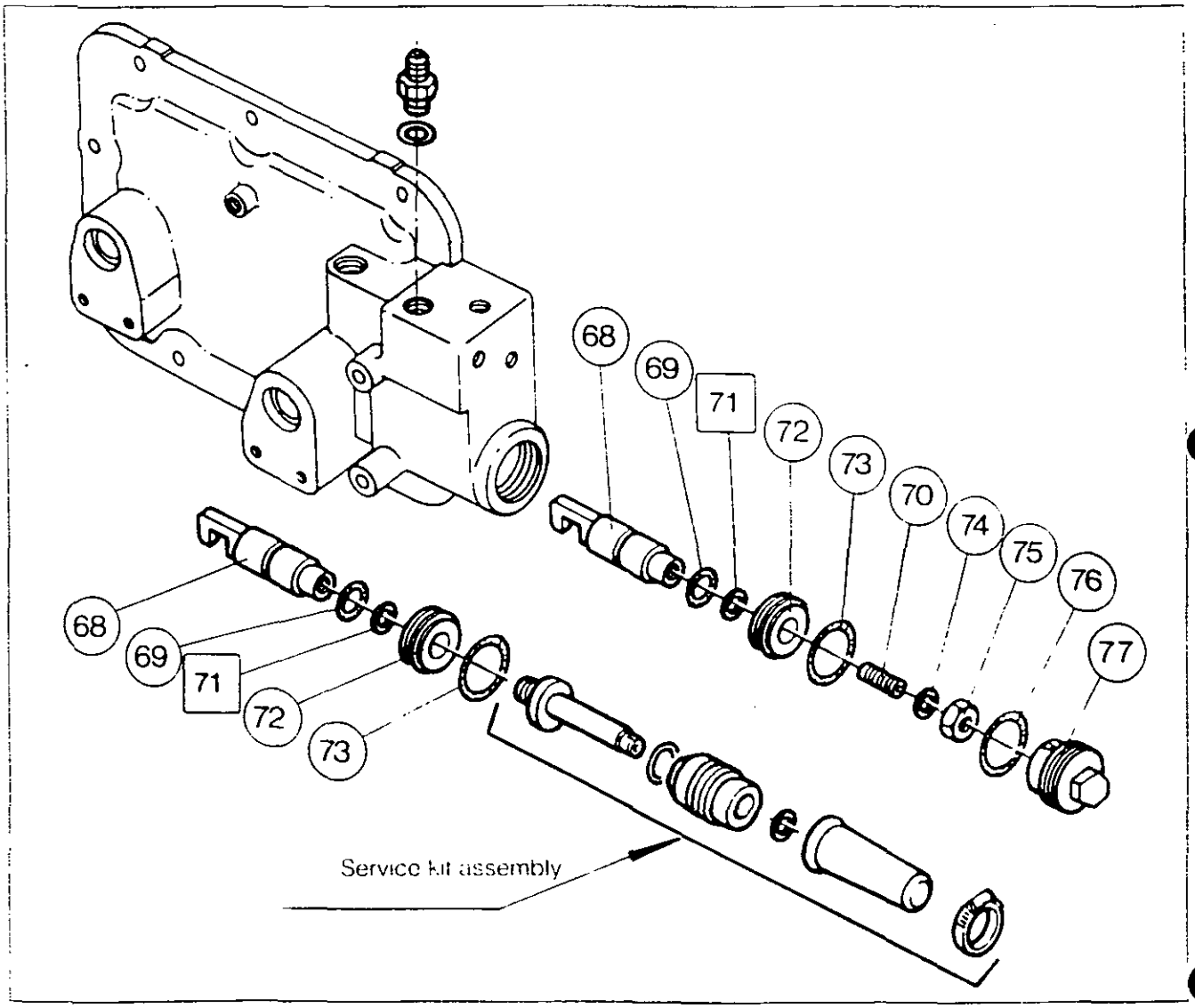
Modification by service kit

A service kit to reduce and even up the pressure applied to the A/B control piston was introduced:

- **in 40 km/h 3000 tractors:** as from serial number N161041
- **in 30 km/h 3000 tractors:** as from serial number N173012.

30 km/h tractors produced with serial numbers between N161044 and N173011 were fitted with an intermediate set-up.

For the make-up of the kit, and the fitting and adjustment procedures, see Service Bulletin 88/029, issue 2, July 1988.



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Gearbox - Adjusting selector cover

A. Preparing for adjustment

1. Unscrew plug **(77)**.
2. Remove and discard O-ring **(76)** (Fig.1).
   N.B.: In the rod of the A/B piston, the socket screw was replaced first by an M8 x 40 screw as from serial number P193024 and then by a threaded rod as from serial number R016007. For tractors with serial numbers prior to P193024, see Workshop Manual 1646640M1.
3. Unscrew nut **(75)** (Fig.2).
   N.B. If it proves necessary for the threaded rod (70) to be removed, clean it and refit it to the rod of the piston with Loctite 270, observing the dimension of 16 mm (Fig.3).
4. Withdraw flat washer **(74)** and piston **(72)** with a pair of external circlip pliers (Fig.4).
5. Keep the adjusting shims **[71]** (Fig.4).
6. Remove O-ring **(73)** from the piston and discard it.
7. Clean the parts and replace any which are faulty.

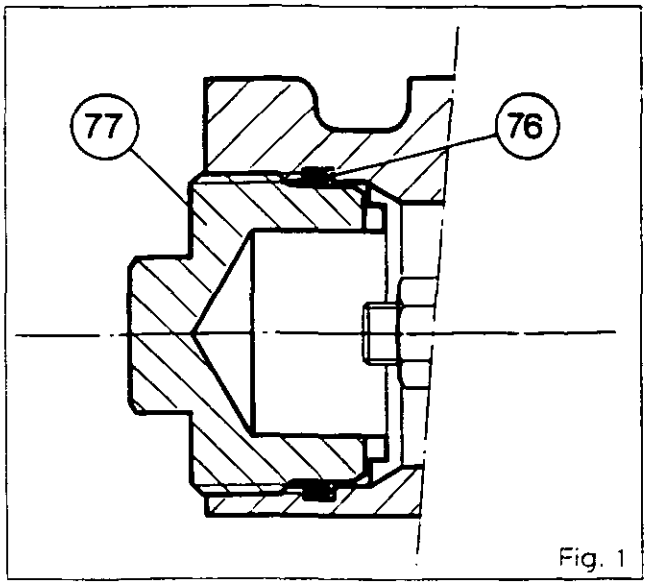


Fig. 1

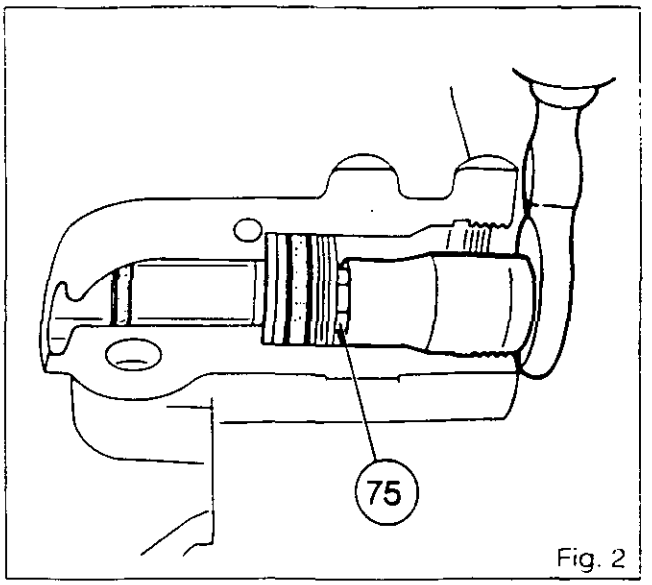


Fig. 2

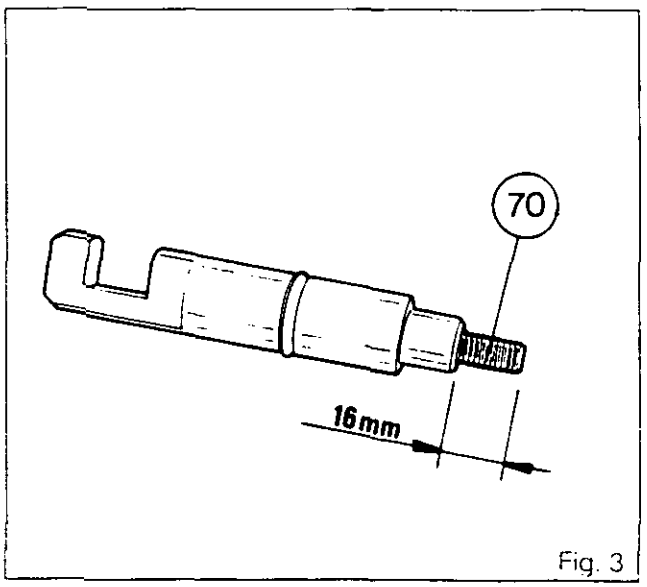


Fig. 3

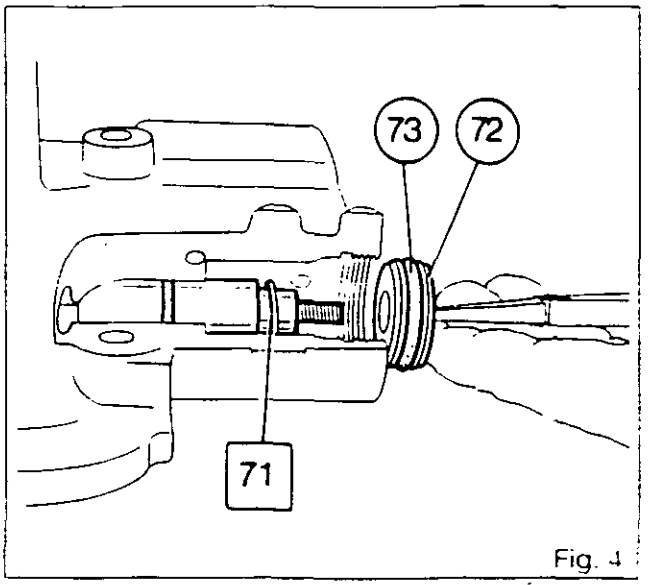


Fig. 4

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B. B range adjustment

8. Hold the control lever in the B position (Fig. 5).
9. Push rod **(68)** fully in to set it to the B position (Fig. 6)
   N.B. : Make sure that tho rod is well inserted.
10. Insert tool 3583544M1 into the bore in the cover.
11. Make sure that the outer tube of the tool is in contact with the shoulder in the cover and that its inner tube is bearing against rod **(68)** (Fig.7).
12. Tighten the screw in the tool and withdraw the tool from the cover.
13. With a depth gauge, measure the dimension **X** shown by the service tool (Fig.8).

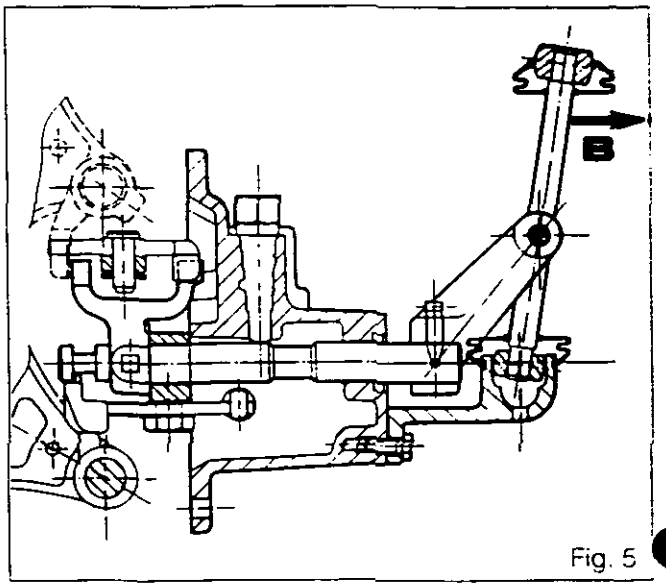


Fig. 5

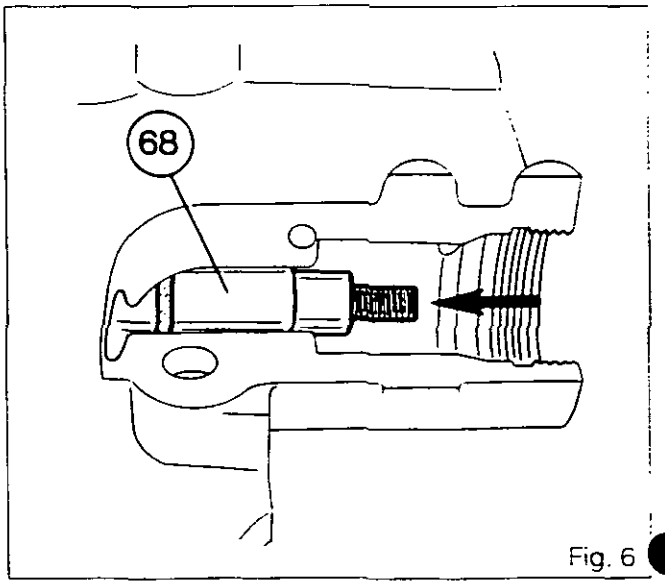


Fig. 6

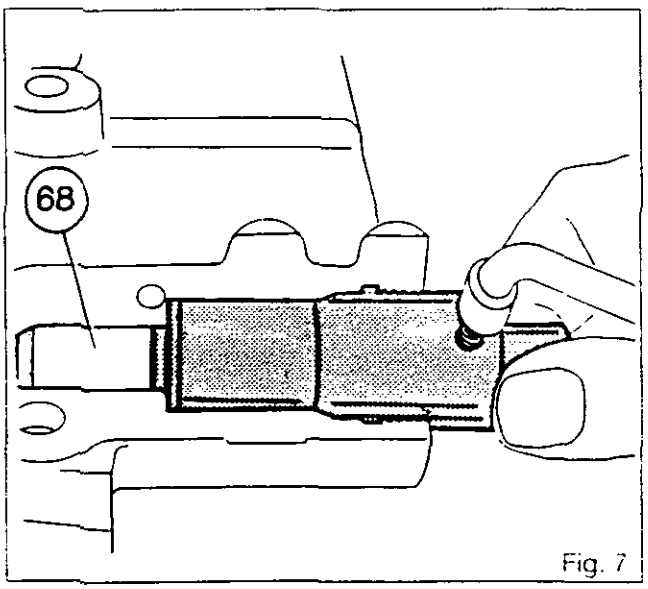


Fig. 7

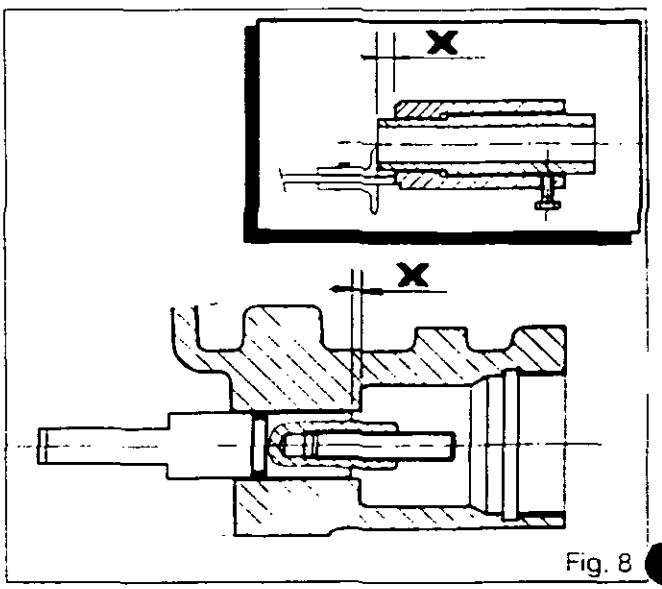


Fig. 8

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14. Determine the shim thickness **E** required to give a clearance: **J1 = +0.2 to +0.3 mm** (Fig.9).
15. Lubricate O-ring **(73)** and fit it to the piston.
16. Fit shim(s) **E [71]** of the thickness selected in procedure 14 and then piston **(72)**.
17. Slide on flat washer **(74)**, apply a light coat of Loctite 241 to nut **(75)**, fit the nut and tighten it to a torque of 25 - 35 Nm (Fig.10).

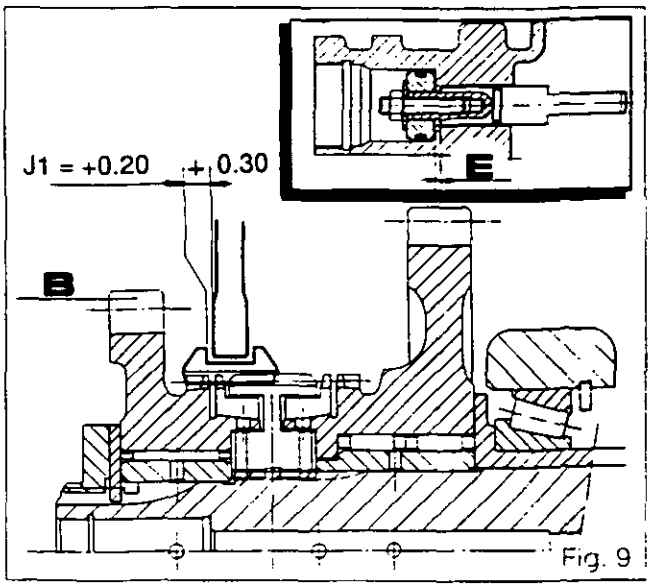


Fig. 9

C. A range adjustment

N.B.: Clean the thread on plug (77) and the tapping to receive it. For a correct adjustment to be made, it must be possible for the plug to be screwed in by hand for the full length of its thread without any resistance.

18. Connect a compressed air supply, a pressure gauge and a valve to union **(67)** (Fig.11).
19. Adjust the valve to give a pressure of not more than 3 bars on the pressure gauge.
20. Set control lever **(23)** to the A range position (Fig.12).
21. Screw in the A range plug **(77)** until it is in contact with the piston.

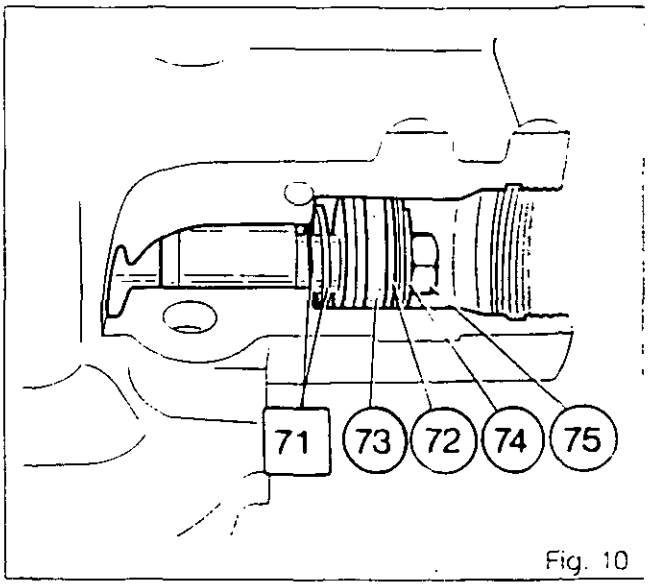


Fig. 10

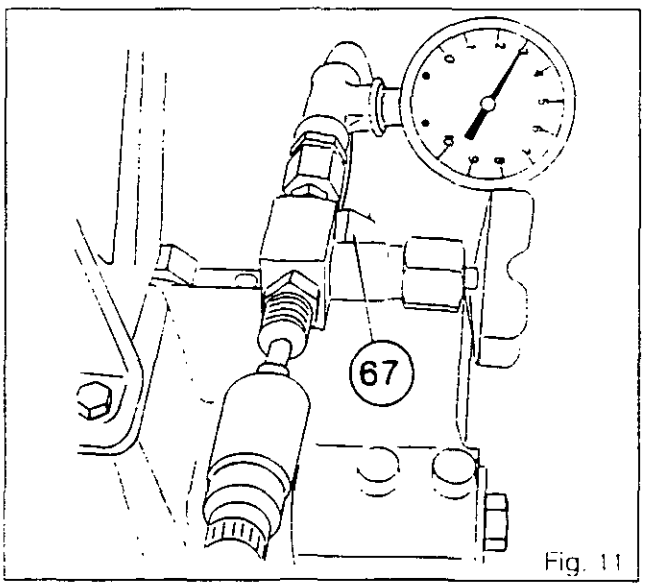


Fig. 11

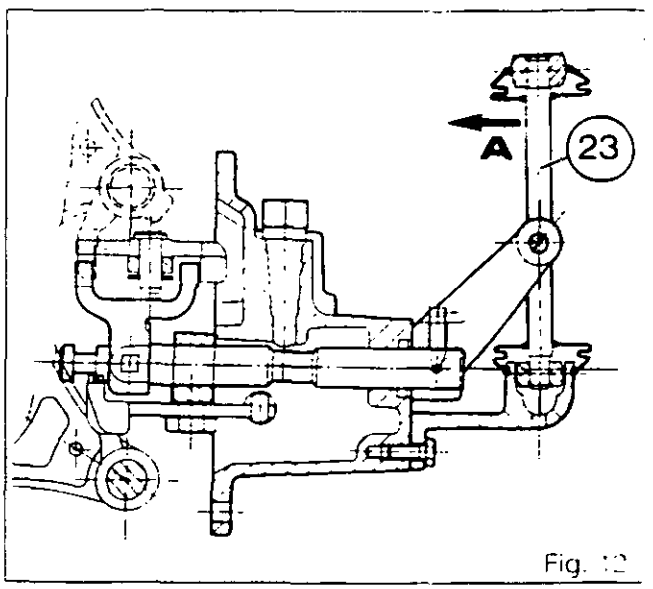


Fig. 12

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Gearbox - Adjusting selector cover

22. Mark plug **(77)** and cover **(57)** with a straight line (Fig. 13).
23. Screw the plug out, counting the number of turns.
24. Lubricate O-ring **(76)** and fit it.
25. Apply Loctite 242E to the first turns of the thread on the plug.
26. Screw the plug in for the number of turns counted in procedure 23.
27. When the mark on plug **(77)** is opposite the mark on cover **(57)**, screw the plug in by 1/6 of a turn (60°) (Fig.14) to give a clearance (Fig.15):
    J2 = +0.2 to +0.3 mm.
28. Check the operation of the A and B ranges and of the reversing gearbox.
29. Disconnect the pressure gauge and fit the supply pipe **(1)** for the A/B ranges (Fig.16)

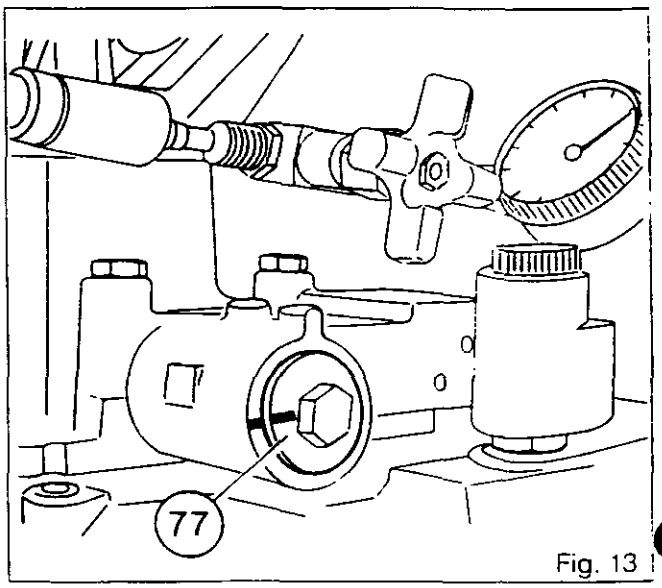


Fig. 13

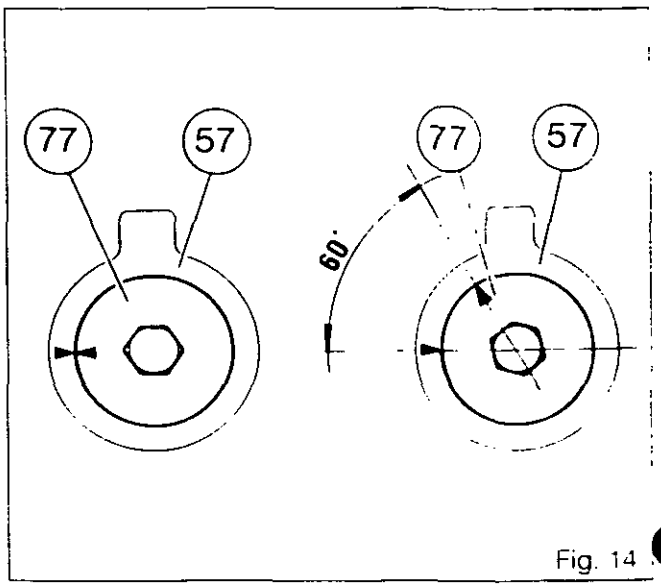


Fig. 14

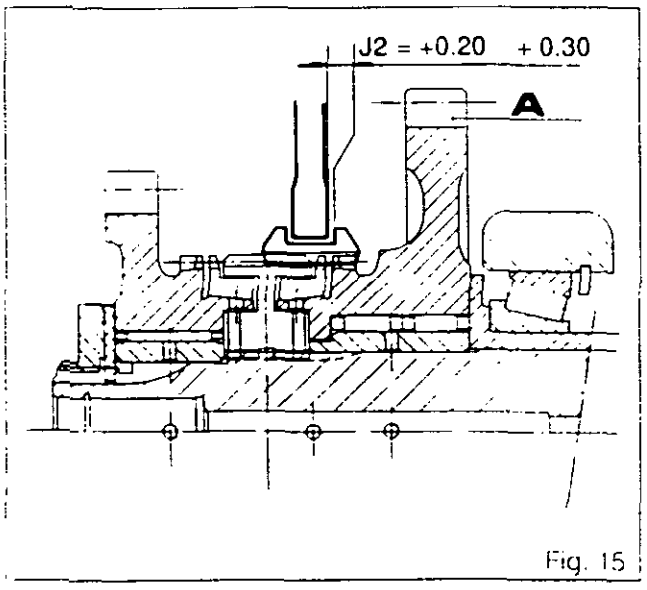


Fig. 15

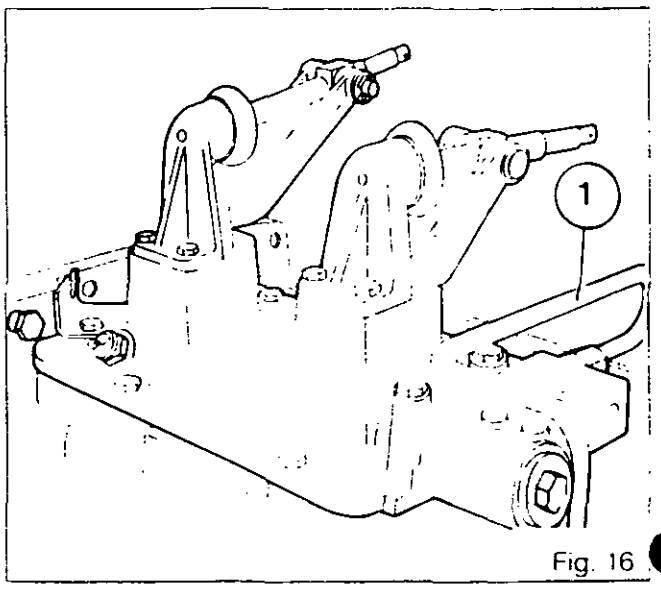


Fig. 16

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5 L01 Spacer

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A. Spacer - 3000 Tractor with 6 cylinder engine ____ 2

B. 3100 Spacer ____ 3

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Gearbox - Spacer

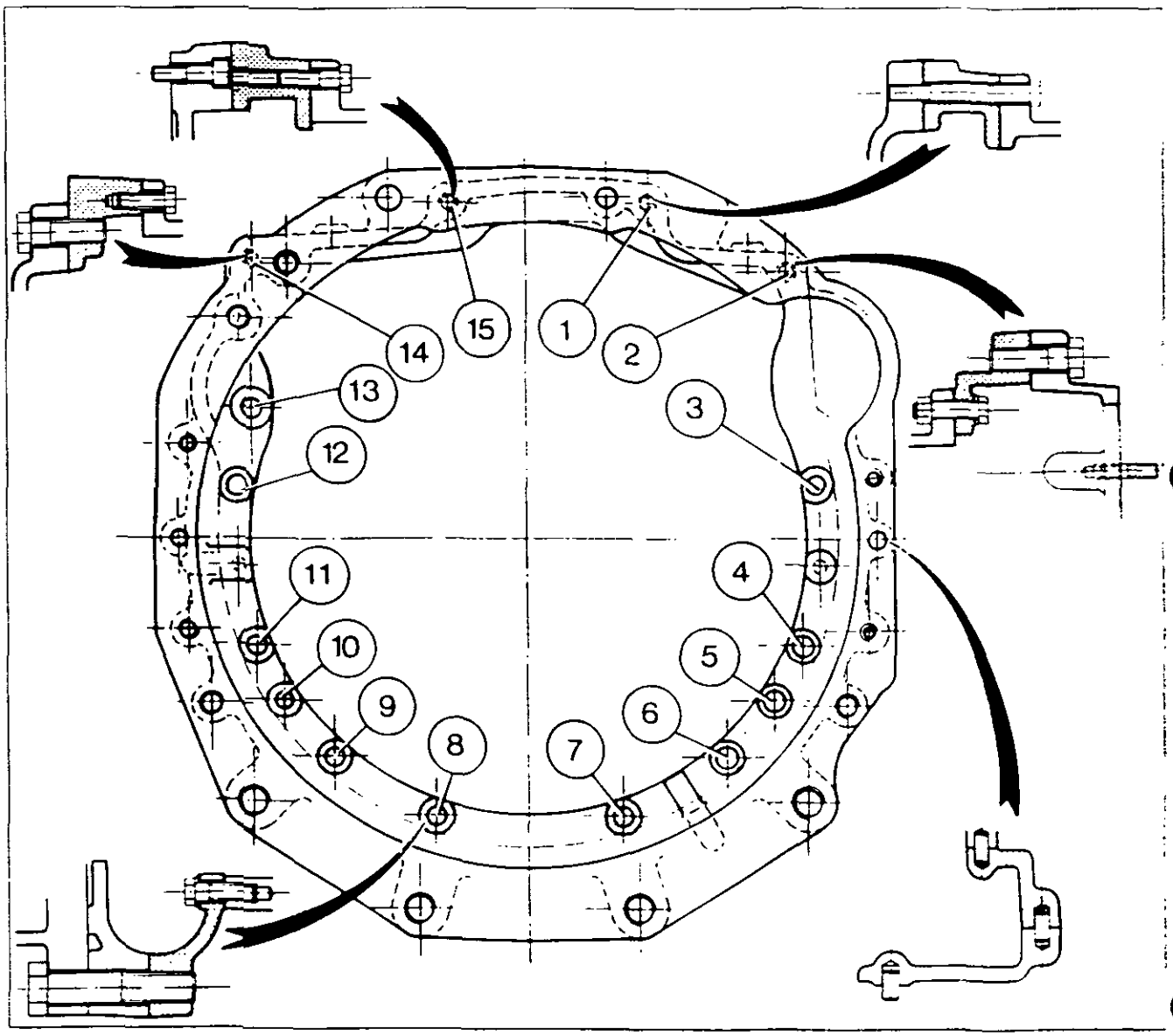
A. Spacer - 3000 Tractor with 6 cylinder engine

Disassembly

1. Split the tractor between the engine and the gear box (section 3 A01).
2. Remove the toolbox.
3. Remove two spacer attaching bolts on the gearbox.
4. Screw two guide pins in their place (use two bolts).
5. Remove the other thirteen bolts and the spacer.
6. Remove the locating dowels.

Reassembly

7. Clean the spacer and gearbox mating surfaces.
8. Refit the locating dowels.
9. Carry out procedure 4 and reverse procedure 5.
10. Remove both guide pins. Fit and tighten the fifteen bolts to a torque of 100 - 130 Nm.
11. Carry out procedures 1 and 2 in reverse.



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Gearbox - Spacer

B. 3100 Spacer

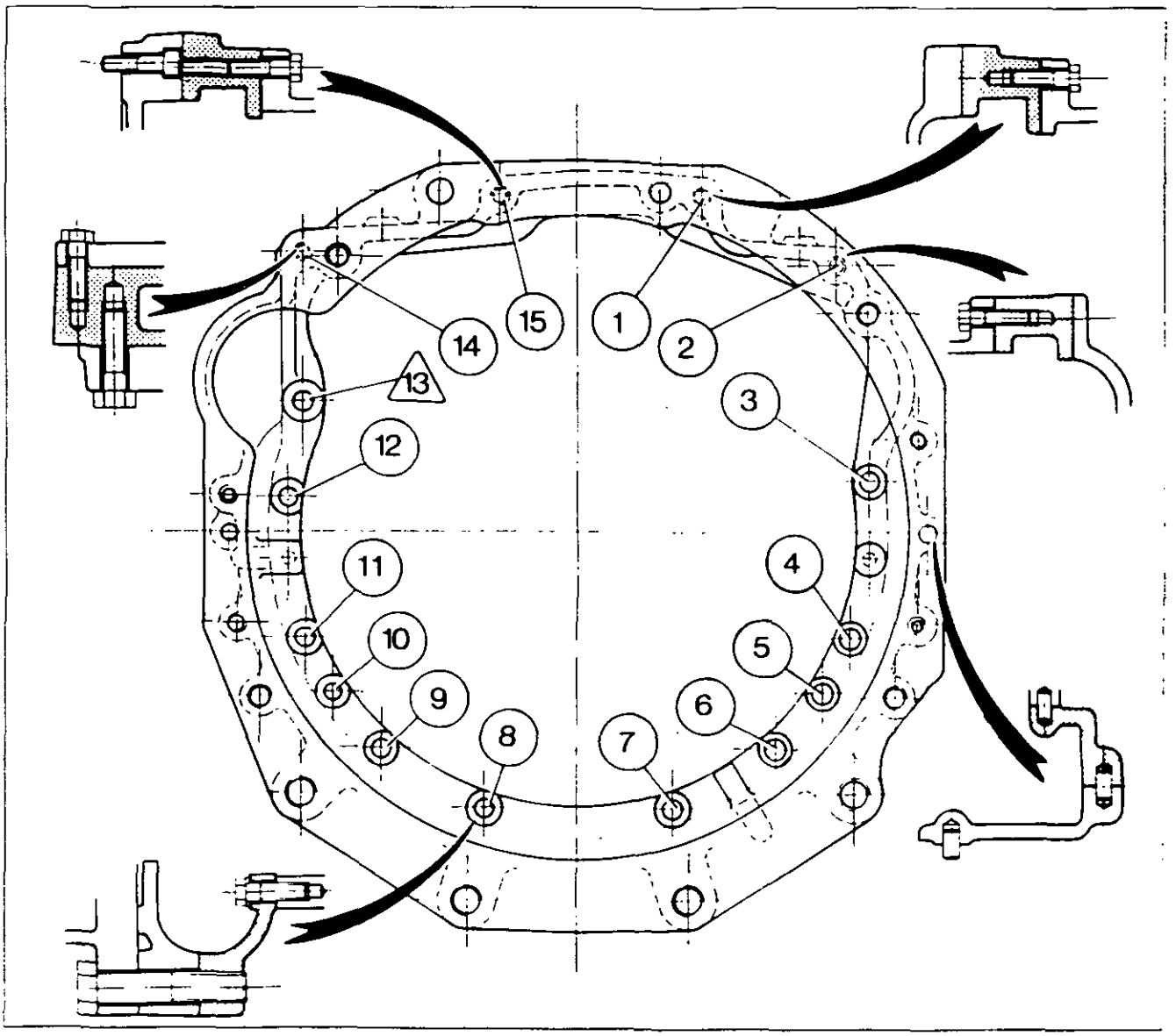
Disassembly

1. Split the tractor between the engine and the gear box (section 3 A02).
2. Remove the toolbox.
3. Remove two spacer attaching bolts on the gear-box.
4. Screw two guide pins in their place (use two bolts).
5. Remove the other thirteen bolts and the spacer.
6. Remove the locating dowels.

Reassembly

7. Clean the spacer and gearbox mating surfaces.
8. Refit the locating dowels.
9. Carry out procedure 4 and reverse procedure 5.
10. Remove both guide pins. Fit and tighten the fifteen bolts to a torque of 100 - 130 Nm. ✱
    NOTE : Make sure that the countersunk head screw /13\ is in the correct hole.
11. Carry out procedures 1 and 2 in reverse.

✱ After coating them, except screw /13\, with LOCTITE 270 (From S/N S255027)



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5 L02 Spacer

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A. **Spacer (4 Cyl. engine - 1004)** ____ 2

B. **Spacer (6 Cyl. engine - 1006)** ____ 3

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Gearbox - Dynashift

A. Spacer (4 cyl. engine - 1004)

A spacer is fitted between the gearbox and the engine on tractors of the MF 3075 Dynashift type (1004 engine). Internally, the spacer is attached by means of studs of different lengths which are screwed into the gearbox housing (Fig. 1).

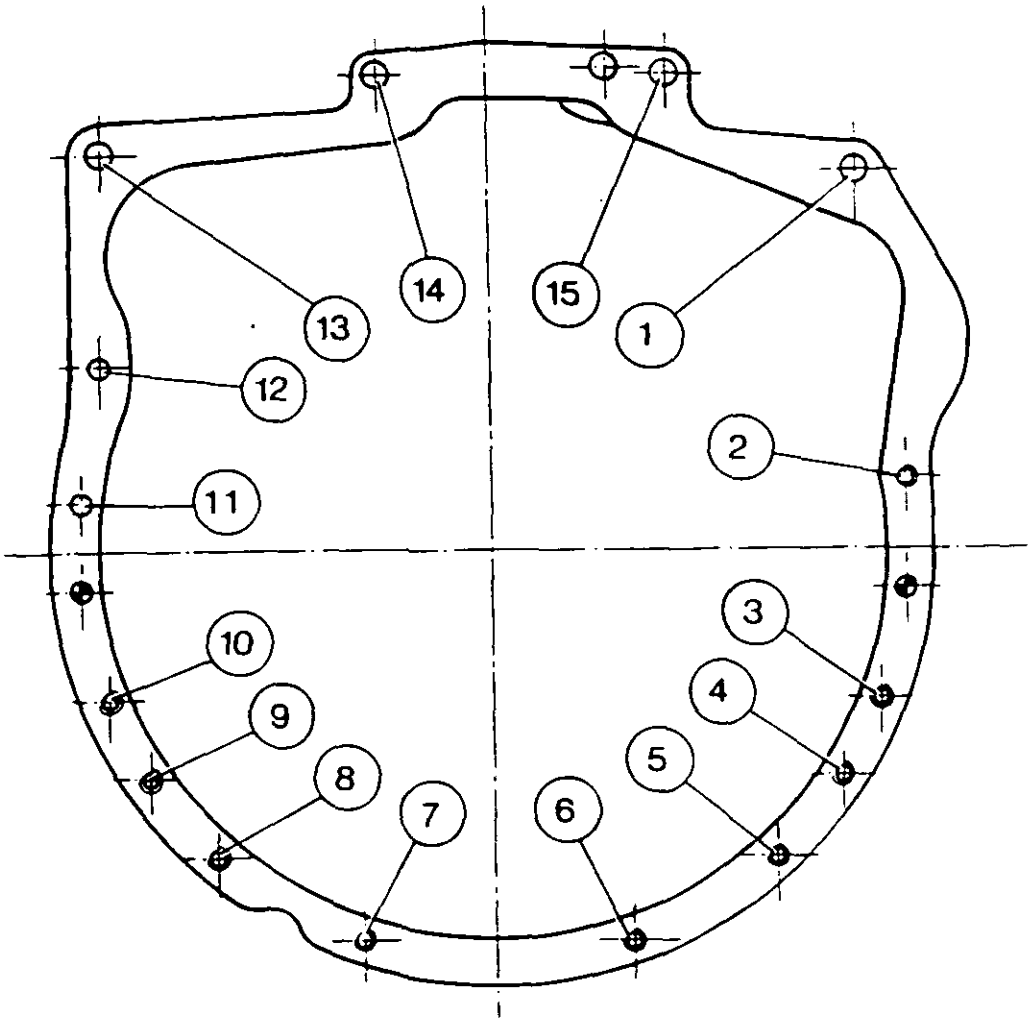
Disassembly

1. Split the tractor between the engine and the gearbox (see Section 3 A03).
2. Remove the spacer.
3. If necessary, extract the studs from the gearbox.

Reassembly

4. Cleaning the mating faces on the spacer and gearbox.
5. If they were removed, coat the studs with Loctite 270. Screw and lock into their correct locations according to their lengths, as shown in Fig. 1.
6. Recouple the tractor between the engine and the gearbox (see Section 3 A03).

Tightening torque
(1) to **(15)** = 100 - 130 Nm



Length of studs
(3) = 145
(5) (8) = 155
(6) (7) = 130

Fig. 1

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B. Spacer (6 cyl. engine - 1006)

Disassembly

1. Split the tractor between the engine and the gearbox (see Section 3 A03 or 3 A04 according to the type).
2. Remove the tool box.
3. Remove two spacer attaching bolts on the gearbox.
4. Screw two guide studs in their place (locally manufactured).
5. Remove the 13 bolts and the spacer.
6. Remove the locating pins.

Reassembly

7. Cleaning the mating faces on the spacer and gearbox.
8. Reinstall the locating pins.
9. Repeat procedure 4 and carry out procedure in reverse order.
10. Remove the guide studs. Fit and tighten the 15 bolts to a torque of 100 - 130 Nm.
    Note: Make sure that the countersunk head screw /13\ is positioned in the correct hole (Fig. 2).
11. Carry out procedures 1 and 2 in reverse order.

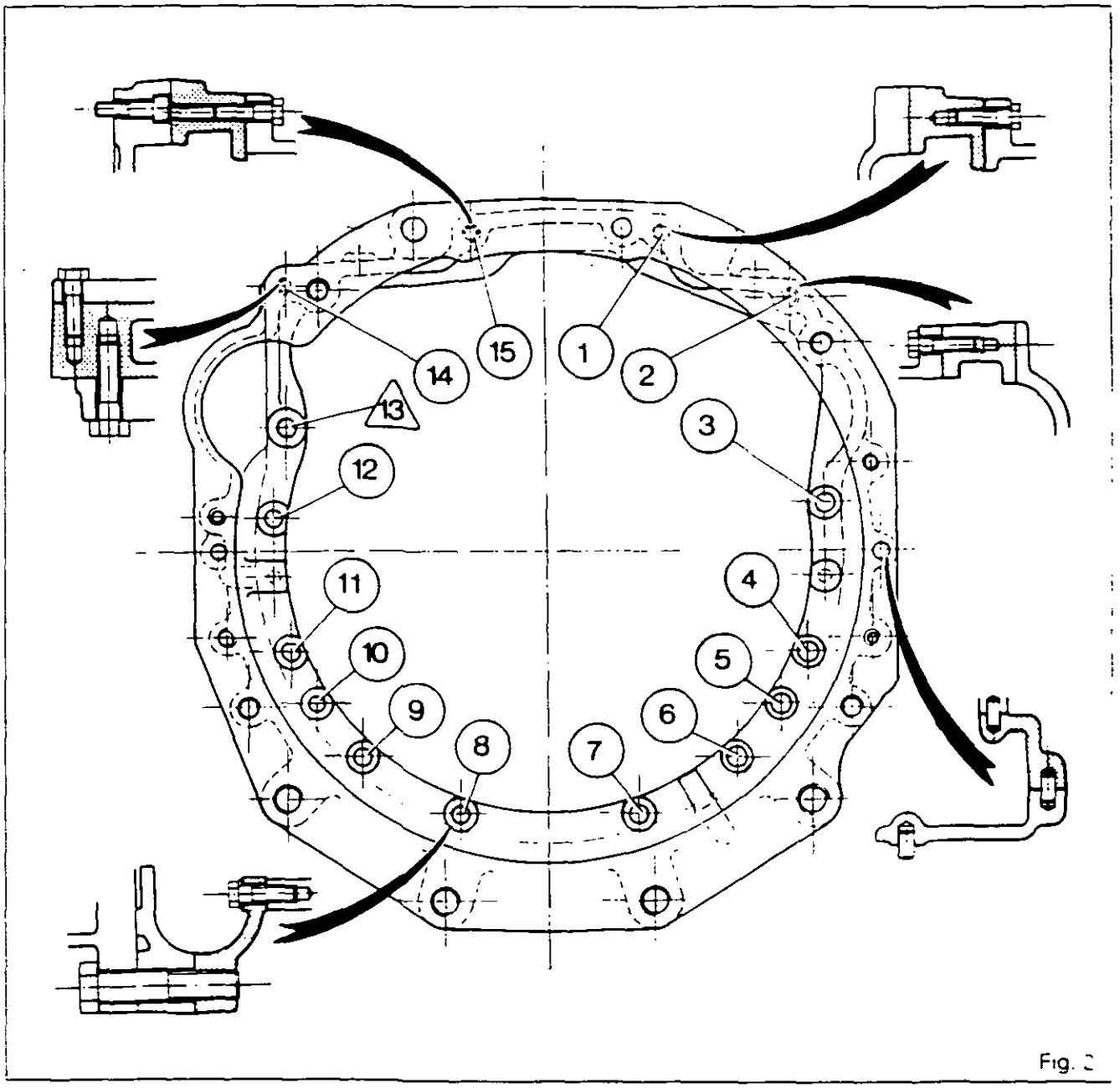


Fig. 2

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5 M01 16th gear lockout

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- General ____ 2
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A. Fitting ____ 2
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5M01.2

Gearbox - 16th gear lockout

General

The arrangement for locking out the 16th gear is fitted to 3100 series tractors which are equipped with a 40 km/h version speedshift.
It applies only to countries where the maximum speed is limited to 30 km/h.
The system is formed by a switch which bears against the gear lever (Fig.1) and by two relays mounted behind the instrument panel (Fig.2).
Moving the gear lever into 4th automatically causes the solenoid valve controlling the speedshift to open and a change to be made to the Tortoise range.

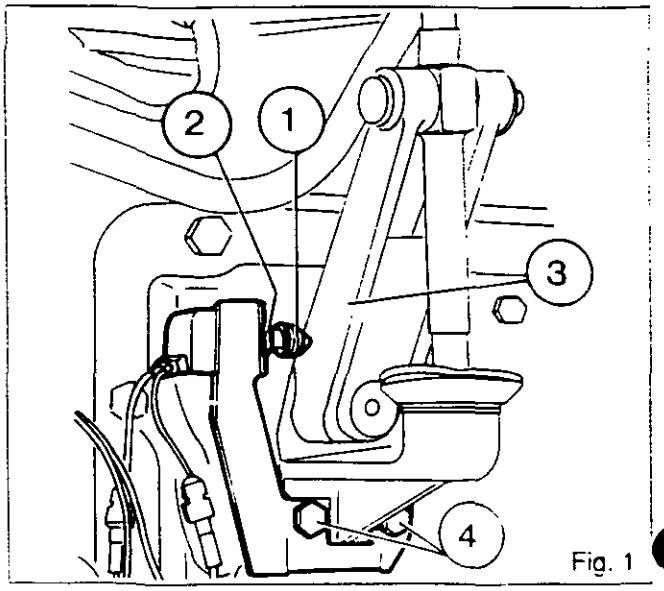
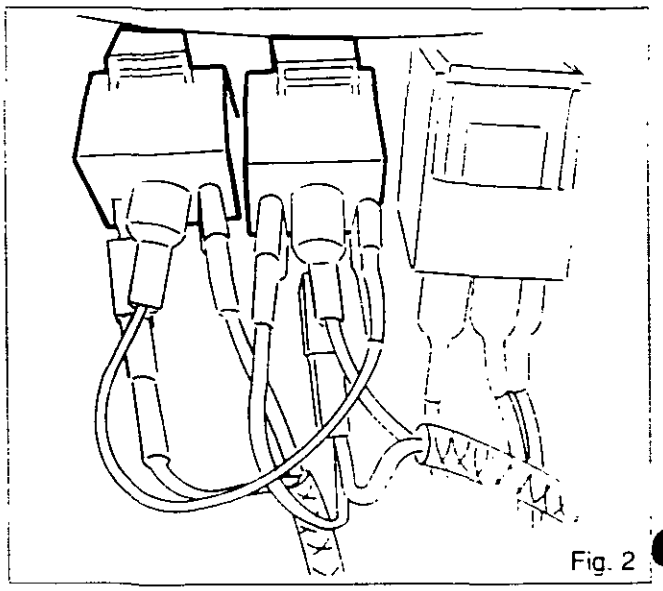


Fig. 1

Operation

The system requires three items of information which are provided by the two relays :
a) a supply in the Hare range coming from the Hare/Tortoise range solenoid valve
b) a signal that switch **(1)** is in a position indicating that 4th gear has been engaged
c) a signal controlled by the clutch pedal which indicates the clutch engagement phase.

In combination, these three items of information control the speedshift solenoid valve in the 4th Hare speed alone, without pressing the button on the console in the cab.
N.B. In all the other gear ratios, the speedshift can be controlled from the button on the console.


Fig. 2

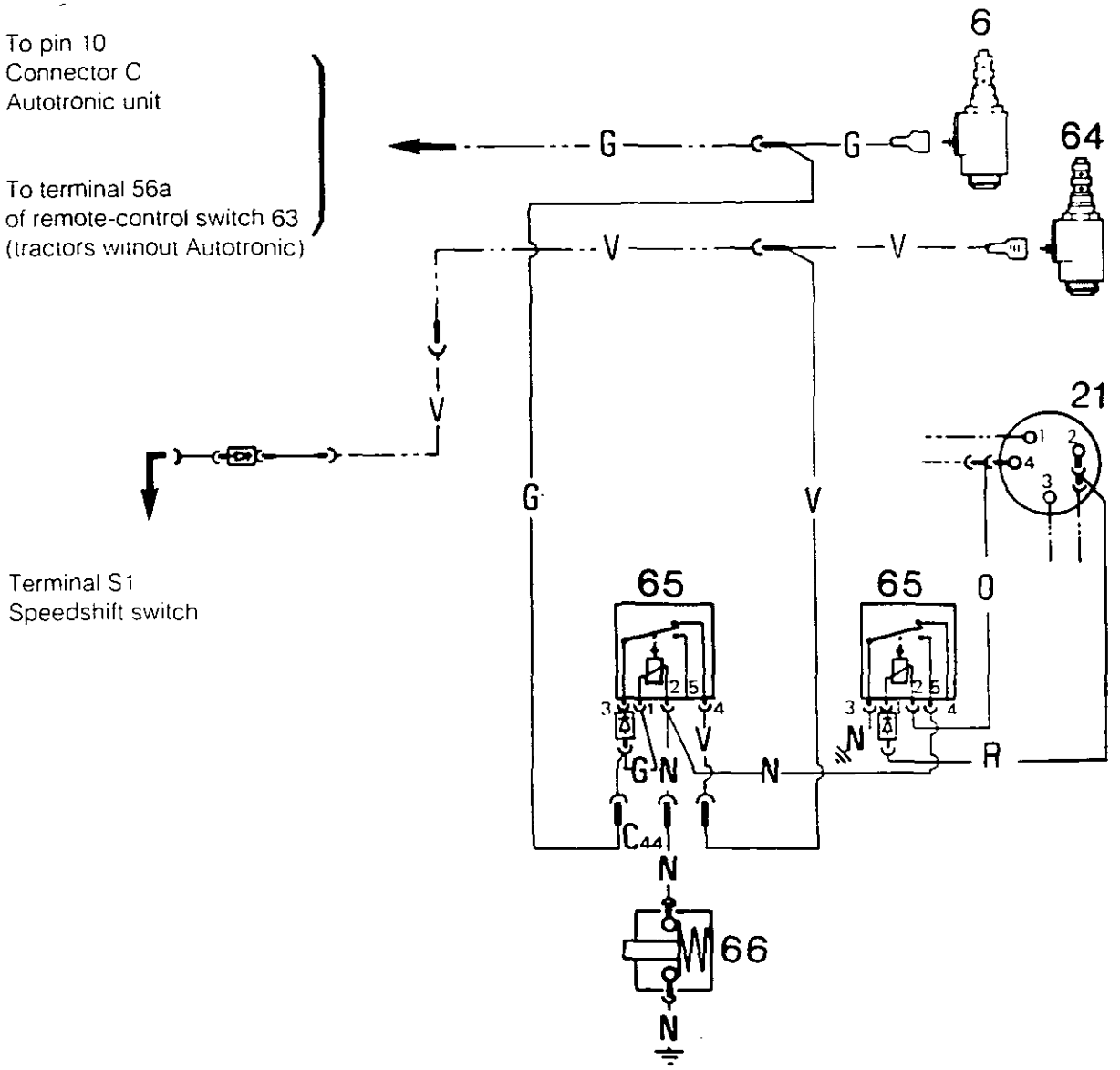
A. Fitting

With bolts **(4)** and nut **(2)**, position switch **(1)** so that it rests hard against gear lever **(3)** in the 4th gear position (Fig. 1)

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B. Circuit diagram



Key

6. Hare/Tortoise solenoid valve
21. Starter switch
64. Speedshift solenoid valve
65. Relay
66. Switch

Colour codes

G. Grey
N. Black
O. Orange
R. Red
V. Green

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5 N01 Dynashift transmission assembly

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A. Description ____ **2**

B. Gearbox assembly ____ **2**

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5N01.2

Gearbox - Dynashift

A. Description

The general configuration of the Dynashift transmission is similar to the Speedshift transmission (see Section 5 A01) except for:

- **Input unit:** This features the Dynashift function and the reversing gear function.
  The Dynashift system replaces the Speedshift and provides four gearbox input ratios in place of the two for Speedshift.
  The reverse shuttle is located in the rear enclosure of the gearbox. Its design is identical to that of the Speedshift version except that it is installed on two taper roller bearings instead of on two ball bearings.
- **Clutch:** This is identical to the clutch for the Speedshift version but its control is different and ensured by a slave cylinder with two pistons.
  The control system is pushed for the 3000 models and pulled for the 3100 models in the same way as in the Speedshift version.

B. Gearbox assembly

Main gearbox

The main gearbox has eight basic speeds. It consists of a train of four gears to which a set of two gears is added so that a slow (Tortoise) range and a fast (Hare) range can be obtained. All the gears are in constant mesh and the speeds are selected by synchromesh units. These eight speeds can be selected with a single lever.

Reverse gear assembly

This consists of an assembly of two gears placed in front of the main gearbox, fitted on a hollow shaft, and a third gear fitted on the main gearbox mainshaft.
A compound gear cluster located between the hollow shaft and the mainshaft allows the direction of rotation of the mainshaft to be reversed.

Creeper gear unit

This is identical to that in the Speedshift version (see Section 5 A01).

Lubrication (Fig. 2)

Lubrication is ensured by means of the 1.5 bar valve located on the left-hand side of the gearbox. The oil flow circulates through the Dynashift assembly, the reverse shuttle and the layshaft bearings as well as in the gears, bearings and bushes of the mainshaft and output shaft.
The lubricating efficiency is improved by the fact that the end of the reverse shaft is engaged in the layshaft and the deflector **(50)** is installed.
The Dynashift planet gears are splash lubricated.

List of parts

(1) Bearing cone
(2) Bearing cup
(3) Adjusting shims
/4 Thickness shim
(5) Circlip
(6) Washer
(7) 1st drive gear
(8) Bush
(9) 1st gear synchro cone
(10) 1st gear synchro ring
(11) 1st and 2nd gear synchro
(12) 2nd gear synchro ring
(13) 2nd gear synchro cone
(14) 2nd drive gear
(15) Circlip
(16) Bearing cup
(17) Bearing cone
(18) 4th drive gear
(19) Circlip
(20) 4th gear synchro cone
(21) 4th gear synchro ring
(22) Washer
(23) 3rd and 4th gear synchro
(24) Needle roller bearing
(25) 3rd gear synchro ring
(26) Circlip
(27) Thrust washer
(28) Combined bearing
(29) 3rd drive gear (Hare)
(30) Combined bearing
(31) Hare / Tortoise synchro
(32) Thrust washer
(33) Tortoise synchro ring
(34) Retaining ring
(35) Bush
(36) Tortoise gear
(37) Bearing cup
(38) Adjusting shims
(39) Bearing cone
(40) Bearing cone
(41) Bolt
(42) Adjusting shims
/43 Thickness shim
(44) Output shaft
(45) Circlip
(46) Lock plate
(47) Adjusting shims
(48) Bearing cup
(49) Circlip
(50) Oil deflector
(51) Adjusting shims
(53) Bearing cone
(54) Layshaft
(55) 3rd driven gear
(56) 4th driven gear
(57) Spacer
(58) Shims
(59) 2nd driven gear
(60) 1st driven gear
(61) Circlip
(62) Needle roller bearing
(63) Bearing cone
(64) Bearing cup
(65) Housing
(66) Reverse gear unit
(67) Input gear
(68) Nut
(69) Mainshaft
(70) Retaining ring
(71) Oil feed pipe
(72) Spring
(73) Tortoise synchro cone
(74) Hare synchro ring
(75) Hare synchro cone
(76) 3rd gear synchro ring

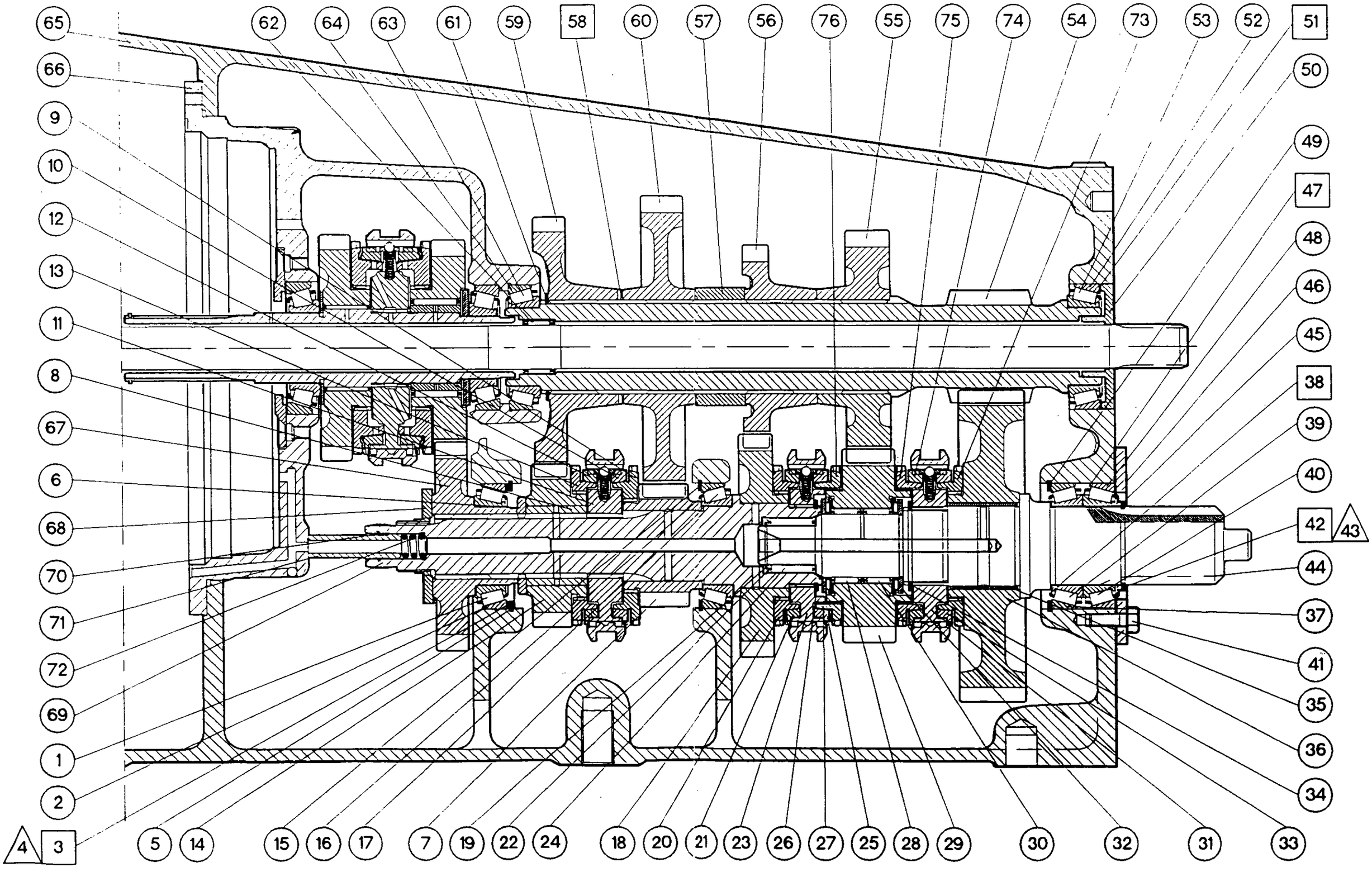
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Gearbox - Dynashift

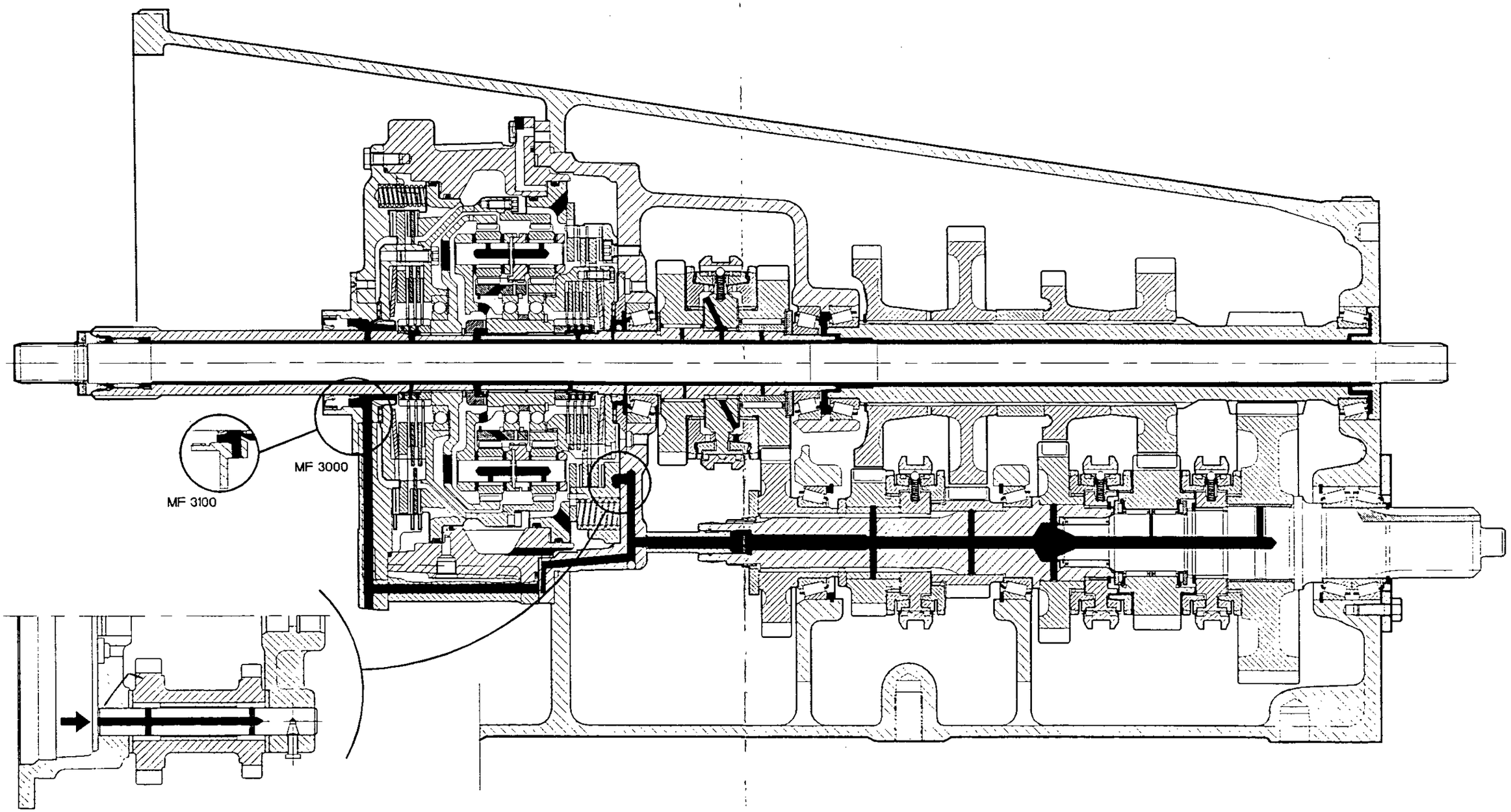
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Fig. 2



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Gearbox - Dynashift



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5 P01 Push-type clutch

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- **General** ____ 2

A. **Operation** ____ 2

B. **Engine flywheel** ____ 5

C. **Replacing the flywheel ring gear** ____ 5

D. **Removing and refitting the release bearing** ____ 6

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5P01.2

Gearbox - Dynashift

General

Description

This is a diaphragm push-type clutch. The master cylinder, which is of identical design to that on the 3600 tractor, is supplied and kept at a constant level by the low-pressure hydraulic system. Drive is obtained via the disc **(6)** which engages with the splined gearbox input shaft in rotation.

Construction

The clutch control system on tractors equipped with a Dynashift gearbox consists of:

- a slave cylinder **(24)** centred by spacer **(9)**
- two pistons **/23** housed in the slave cylinder
- a release bearing carrier **(26)** centred in the slave cylinder
- a release bearing assembly **(25)** which snaps into place on the bearing carrier.

Each piston **/23** is supported by two guide rings **/28** and tight sealing is provided by a bush **/29** and O-ring **/29A** and a scraper ring **/27**.

Operation

The force exerted on the pedal and transmitted by the control rod acts on the master cylinder. The quantity of oil displaced by the master cylinder piston enters via the upper hole (large diameter) in the slave cylinder **(24)** and causes the release bearing carrier **(26)** and the release bearing **(25)** to move forwards. The release bearing compresses the diaphragm of the clutch cover plate **(7)**, and this releases the pressure on the clutch cover plate and frees the disc **(6)**.

Clutch engagement

When the clutch pedal is released, the pressure drops in the slave cylinder. The diaphragm pushes the release bearing carrier back and the pressure plate is moved forwards. The disc **(6)** is then locked between the pressure plate and the engine flywheel and drives the gearbox input shaft.

Specifications

Clutch control	:	push-type
Plate load	:	1,100 kg
Number of vanes	:	6
Type of vane	:	non-progressive
Disc diameter	:	330 mm
Friction linings	:	cerametallic

List of parts

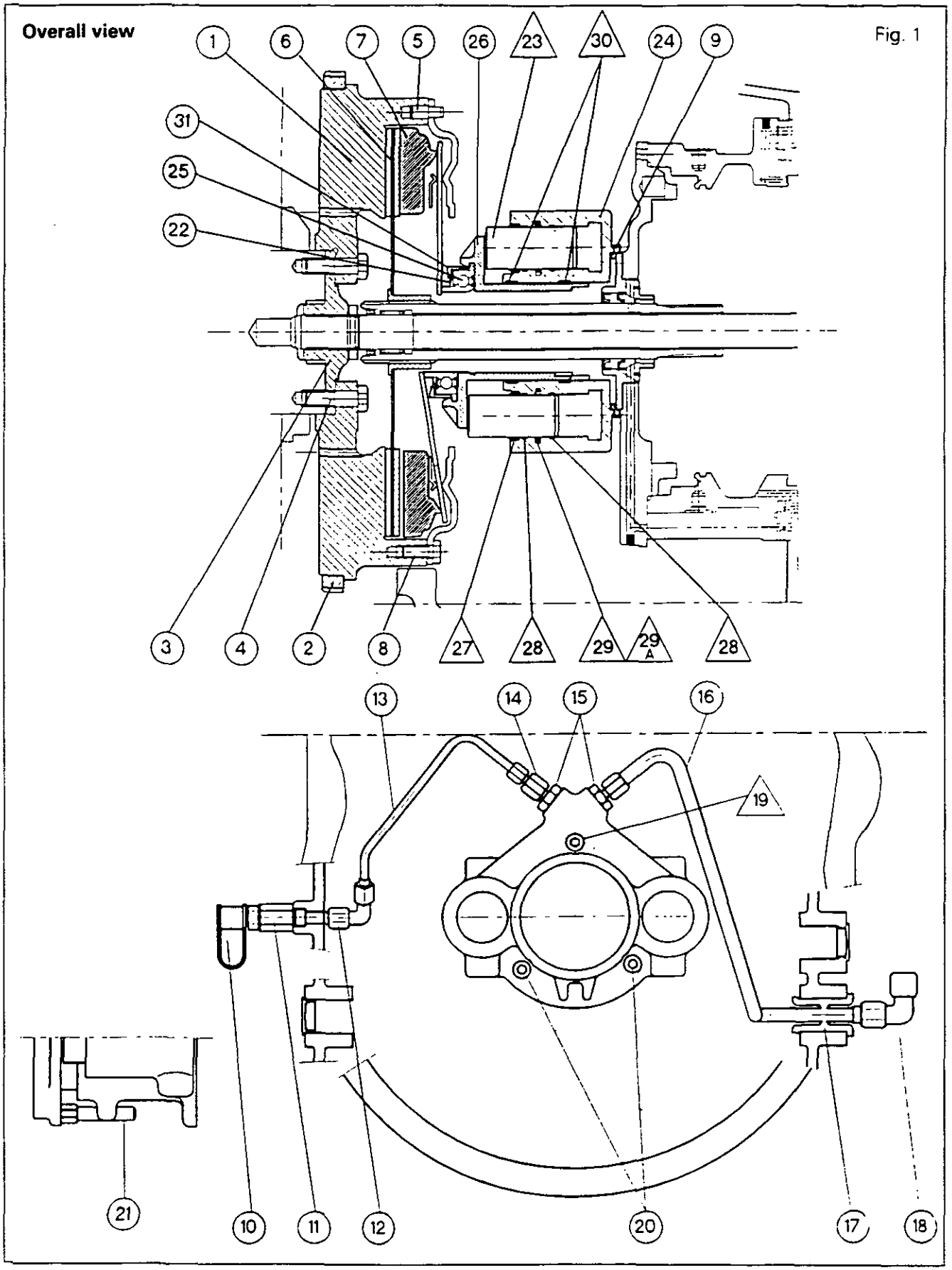
(1) Engine flywheel
(2) Flywheel ring gear
(3) PTO shaft drive hub
(4) Engine flywheel attaching bolts
(5) Dowel pins
(6) Disc
(7) Clutch cover plate
(8) Clutch cover plate attaching bolts
(9) Spacer
(10) Bleed point
(11) Grommet
(12) 90° union
(13) Bleed pipe
(14) Straight union
(15) Straight union
(16) Supply pipe
(17) Grommet
(18) 90° union
/19 Slave cylinder attaching bolt
(20) Slave cylinder attaching bolt
(21) Pin
(22) Spring washer
/23 Pistons
(24) Slave cylinder
(25) Clutch release bearing
(26) Release bearing carrier
/27 Scraper ring
/28 Guide rings
/29 Sealing bush
/29A O-ring
/30 Guide rings
(31) Flexible retainer

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Overall view

Fig. 1



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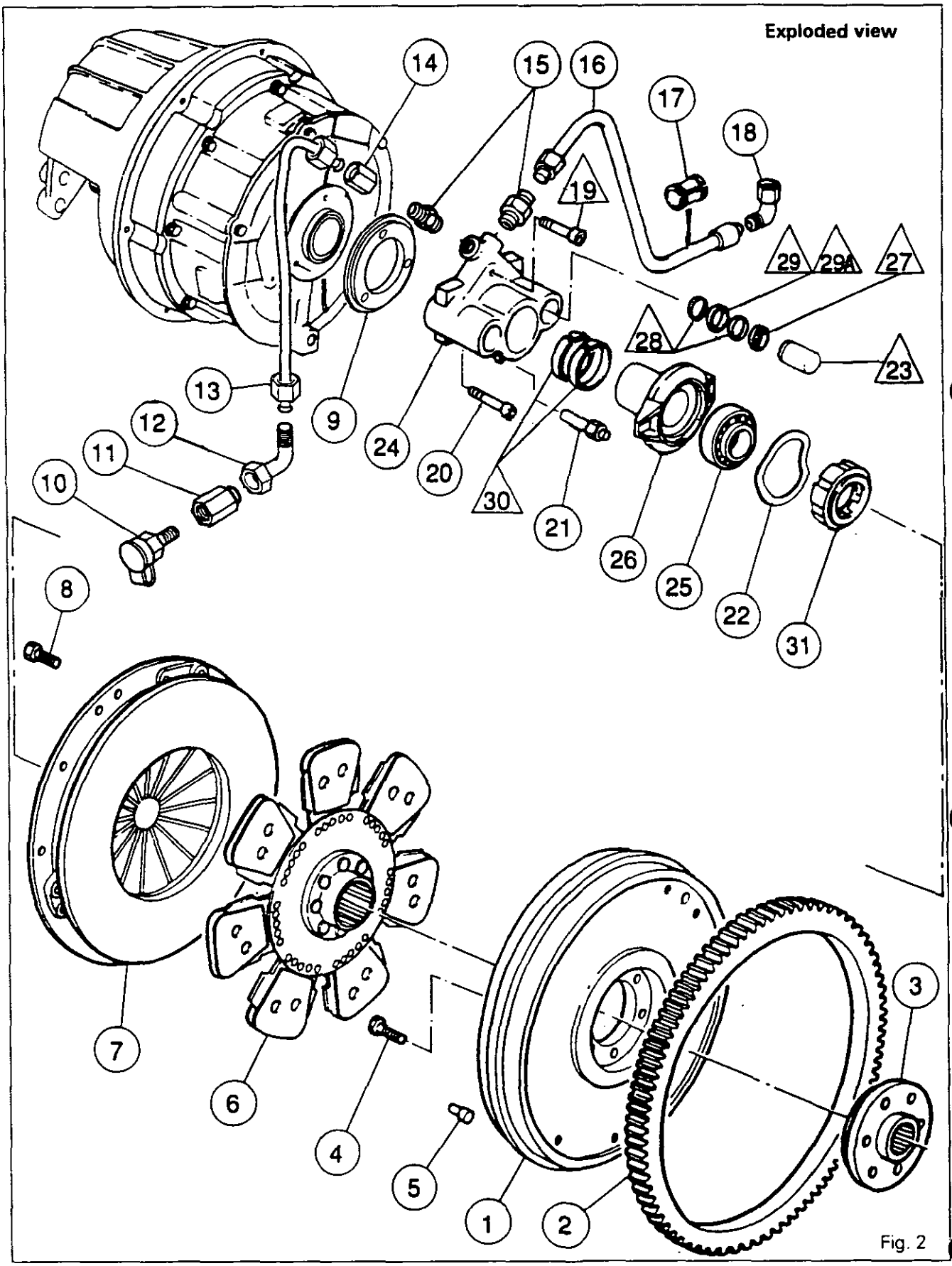


Fig. 2

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A. Clutch cover plate

Disassembly

1. Split the tractor between the engine and the gearbox (see Section 3 A03).
2. Position the centring tool MF 457 (Fig. 3) to retain the cover plate and disc assembly.
3. Gradually loosen the bolts **(8)** attaching the cover plate **(7)** to the engine flywheel (1).
4. Remove the cover plate and the disc **(6)**.
5. Remove the two dowel pins **(5)** from the flywheel.

Reassembly

6. Remove dust and clean the engine flywheel with a solvent.
7. Check the flywheel friction surface.
   Note: If the friction surface of the engine flywheel (1) is scored, it can be skimmed (see part B, operation 6).
8. Lightly grease the splines on the power take-off shaft hub in the engine flywheel (GN + Molykote type grease).
9. Reinstall the two dowel pins **(5)**.
10. Using the centring tool MF 457, centre the clutch disc **(6)** on the engine flywheel. The longest section of the hub must be facing the diaphragm.
11. Refit the clutch cover plate.
12. Gradually tighten the attaching bolts **(8)** to a torque of 50 - 70 Nm.
13. Remove the centring tool MF 457.
14. Recouple the tractor between the engine and the gearbox (see Section 3 A03).

B. Engine flywheel

Disassembly

1. Split the tractor between the engine and the gearbox (see Section 3 A03).
2. Remove the engine clutch. Carry out procedures 2 to 5, in part A.
3. Immobilise the engine flywheel **(1)**.
4. Take out the six bolts **(4)** attaching the engine flywheel to the crankshaft.
5. Remove the engine flywheel and the PTO shaft hub **(3)**.

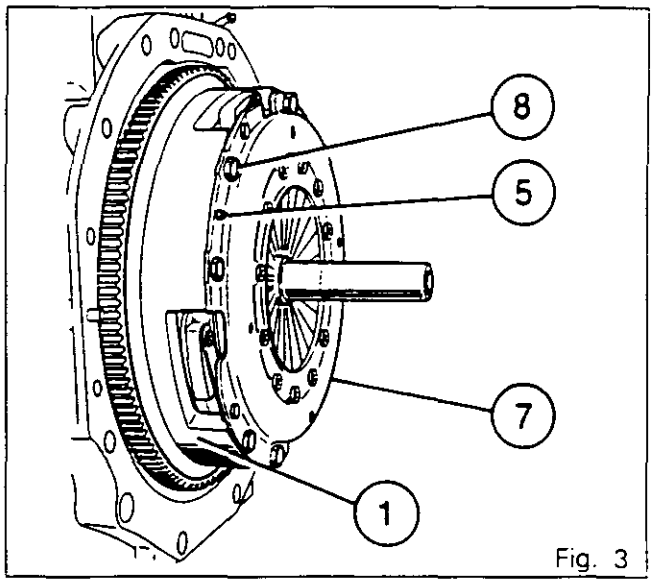


Fig. 3

Reassembly

6. If the friction surface on the engine flywheel is scored it can be skimmed.
   Skimming of the friction surface should be performed as required (removal : 1.5 mm max. - surface condition : 2.5 micrometres max.).

Important : On the flywheel, the clutch cover plate attaching face must be reduced by the same value, as well as the length of the dowel pins (if incorrect).
Check that the tapped holes for the bolts (8) attaching the mechanism onto the flywheel are deep enough. If they are not, they must be tapped.
After reworking, grease the flywheel.
Do not install a progressive clutch disc.
If skimming is performed, place two spacers (9) between the seal holders and the slave cylinder (24).
Replace bolts (19) and (20) with bolts that are 35 mm and 55 mm long, 8 dia. pitch 125, grade 10-9.

7. Screw the two dowel pins into the flywheel attaching holes.
8. Refit the engine flywheel and the hub **(3)**.
9. Coat the bolts **(4)** with Loctite 241.
10. Reinstall the six bolts **(4)** and tighten them to a torque of 110 - 140 Nm. Free the engine flywheel.
11. Refit the engine clutch, carrying out procedures 6 to 13 (in part A).
12. Recouple the tractor between the engine and the gearbox (see Section 3 A03).

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C . Replacing the flywheel ring gear

Disassembly

1. Remove the engine flywheel (part B, procedures 1 to 5).
2. Use a 5 mm dia. drill bit to drill a hole 16 mm deep between the inside diameter of the ring gear **(2)** and the bottom of a tooth (Fig. 4).
3. Crack the ring gear with a chisel positioned above the hole under the bottom of the tooth.
   Important: Wear protective equipment when breaking the ring gear to avoid possible injury by flying metal particles.

Reassembly

4. Heat a new ring gear to 245°C in an oven only. Do not use a blow torch or any other naked flame.
5. Fit the ring gear **(2)** onto the flywheel **(1)** with the chamfered lead on the teeth pointing towards the engine side, and push the ring gear quickly into position. Allow the ring gear to cool slowly.
6. Refit the engine flywheel (carry out procedures 6 to 12 in part B).

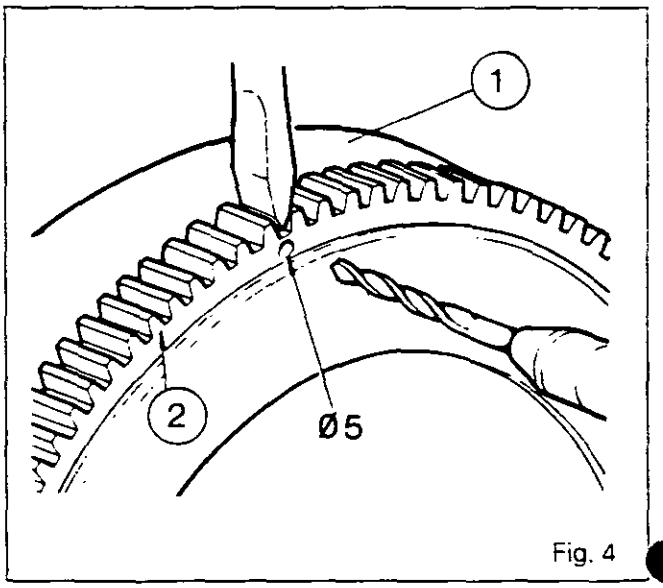


Fig. 4

D . Removing and refitting the release bearing

Preliminary operation

Split the tractor between the engine and the gearbox (see Section 3 A03).

Removal

1. Separate the release bearing carrier **(26)** from the slave cylinder **(24)**.
   Note: Do not press the clutch pedal, in order to avoid extending the slave cylinder pistons.
2. Using a screwdriver, press on the lugs **(1)** (Fig. 5) of the flexible retainer and remove it along with the spring washer and the release bearing.

Refitting

3. Clean the release bearing carrier and carry out procedure 2 in reverse.
4. Check the rotation and radial movement of the release bearing.
5. Check that the guide rings **/30** inside the slave cylinder are not damaged (Fig. 5).
6. Carry out procedure 1 in reverse.

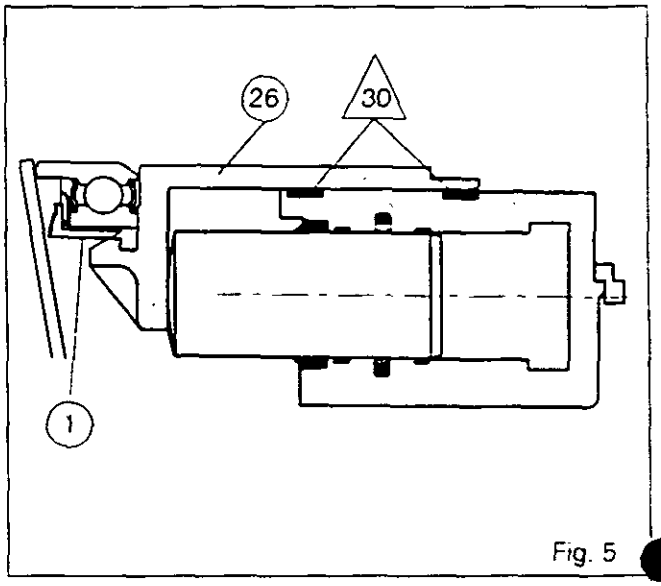


Fig. 5

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E . Replacing the slave cylinder seals

1. Disconnect the bleed pipe **(13)** and the supply pipe **(16)**.
2. Carry out procedure 1 (in part D) and remove the following (as per Fig. 6):
   - pin **(21)** (if necessary)
   - bolts **/19** and **(20)**
   - the slave cylinder **(24)**.
3. Remove the unions **(15)**, (if necessary) (Fig. 6).

Disassembly (Fig. 7)

4. Withdraw the piston **/23** by knocking the slave cylinder on a wooden block.
5. Remove the guide rings **/30** and drive out the scraper rings **/27**.
6. Remove :
   - the guide rings **/28**,
   - the sealing bushes **/29** and the O-rings **/29A**.

Reassembly

7. Clean the slave cylinder **(24)** (Fig. 6) and the seal grooves.
   Check that :
   - the bleed and supply pipes are not blocked,
   - there is no scoring in the bores and on the pistons,
8. Shape the guide rings **/28** so as to decrease their diameter by approximately one third. Using pliers and wearing protective equipment, install the rings in their grooves (Fig. 7), with the knurled face in contact with the piston **/23**.
9. Lubricate and fit the O-rings **/29A** in their groove without twisting them.
10. Shape the sealing bushes **/29** as per Fig. 8.
    Note: The sealing bushes must be positioned with their lips facing the pressure side (Fig. 7).
11. Position the sealing bushes in the grooves, gradually fitting them on the O-rings **/29A**.
12. Lubricate the sealing bushes, the guide rings **/28** and the cylinder bores.
13. Check that there are no burrs on the pistons **/23**. Fit the pistons, with the **"C"** chamfers facing the inside of the cylinders (Fig. 7).

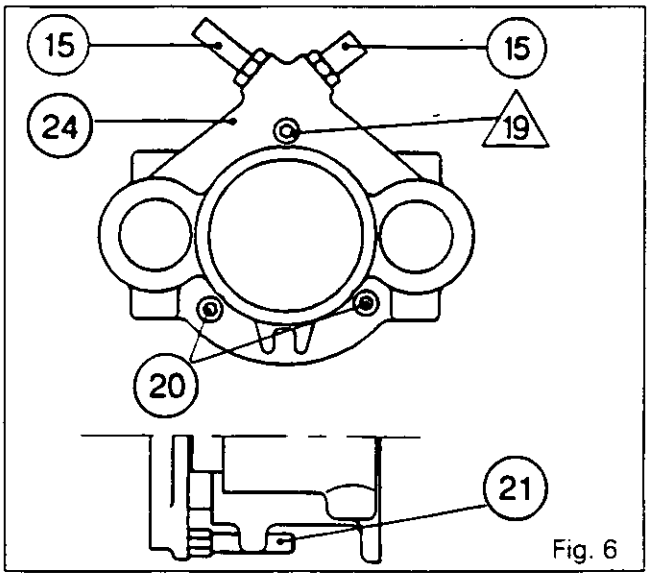


Fig. 6

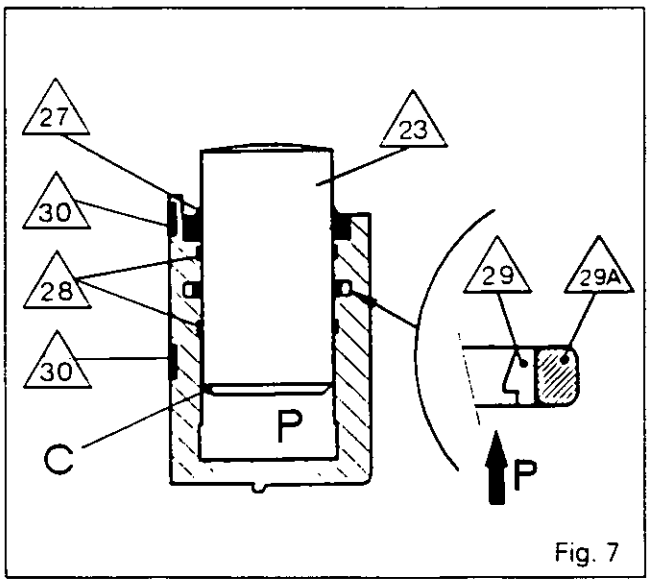


Fig. 7

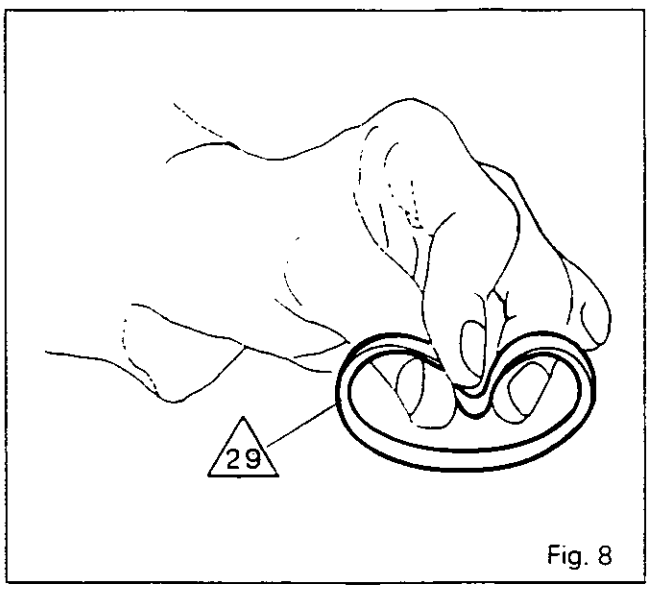


Fig. 8

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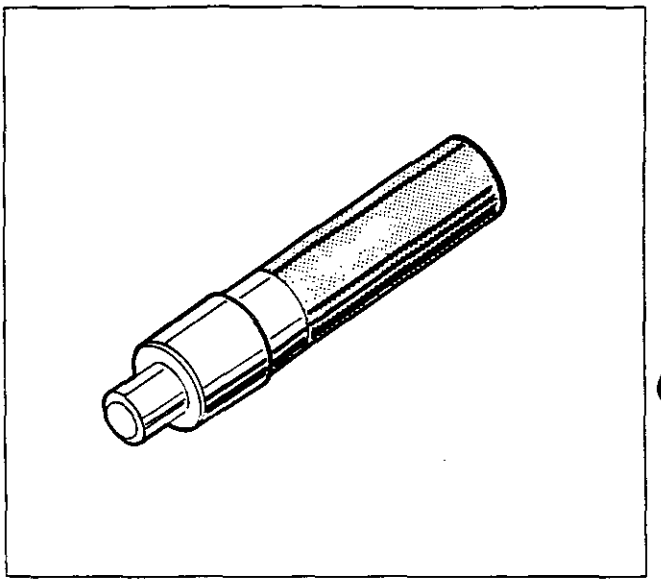
14. Using a suitable fixture, fit the scraper rings **/27** fully home on their shoulder (Fig. 7).
15. Check that the pistons move freely in their bores.
16. If they were dismantled, screw the unions **(15)** and pin **(21)** into place (Fig. 6), after coating them with Loctite 241 and tighten them to a torque of 25 - 35 Nm.
17. Shape the guide rings **/30** so as to decrease their diameter by approximately one third. Place the rings in their grooves, with their knurled faces in contact with the release bearing carrier **(26)** (see Fig. 5).
18. Lubricate the guide rings and the bore in the slave cylinder.
19. Fit the slave cylinder on the Dynashift cover, inserting spacer **(9)** between them. Coat the bolts **/19** and **(20)** with Loctite 241 and tighten them to a torque of 25 - 35 Nm (Fig. 6).
20. Fill the piston chambers with transmission oil via the supply port in the slave cylinder.
21. Reconnect the pipes **(13)** and **(16)**.
22. Check that the guide rings **/30** have not been displaced (Fig. 5).
    Assemble the release bearing carrier **(26)** with the slave cylinder **(24)**, positioning the pin **(21)** in its recess (Fig. 6).
23. Clean the clutch housing with a solvent.
24. Recouple the tractor between the engine and the gearbox (see Section 3 A03).
25. Bleed the brake and clutch systems. See Section 6 K01, parts C and D, and Section 5 Q01, part H.
26. Carry out a road test on the clutch control.
27. Check the unions for leaks.

F . Adjusting the clutch pedal

See Section 5 Q01, part I.

G . Service tool available from the MF network

Clutch disc centring tool, reference MF 457



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5 Q01 Pull-type clutch

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I. **Adjusting the clutch pedal** ____ 8

J. **Service tools** ____ 9

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Gearbox - Dynashift

General

Description

This is a diaphragm pull-type clutch. The master cylinder, which is of identical design to that on the 3600 tractor, is supplied and kept at a constant level by the low-pressure hydraulic system. Drive is obtained via the disc **(6)** which engages with the splined gearbox input shaft in rotation.

Construction

The clutch control system on tractors equipped with a Dynashift gearbox consists of:

- a slave cylinder **(24)**
- two pistons **/23** housed in the slave cylinders
- a release bearing carrier **(26)** sliding on the guide cylinder **(25)**
- a guide cylinder **(25)** screwed onto the input gearbox seal holder
- a release bearing assembly **(33)** held in place by spring clip **(31)**

Each piston **/23** is supported by two guide rings **/28** and tight sealing is provided by a bush **/29** and O-ring **/29A**, and a scraper ring **/27**.
The clutch cover plate **(7)** is connected to the release bearing by a retaining ring fitted on the cover plate and which fits into the groove in the release bearing **(33)**.
Warning: Any operation which requires the splitting of the tractor between the engine and the gearbox requires the removal of the spring clip (31) (see Section 3 A04).

Operation

Clutch disengagement

The force exerted on the pedal and transmitted by the control rod acts on the master cylinder. The quantity of oil displaced by the master cylinder piston enters via the upper holes (large diameter) in the slave cylinder **(24)**, acts on the pistons **/23** and causes the release bearing carrier **(26)** and the release bearing **(33)** to move rearwards. The release bearing pulls on the diaphragm of the clutch cover plate and this releases the pressure on the clutch cover plate and frees the disc **(6)**.

Clutch engagement

When the clutch pedal is released, the oil escapes into the slave cylinder pressure chamber and the clutch release bearing returns. The diaphragm is compressed and the disc **(6)** is held against the engine flywheel by the friction plate in the cover plate **(7)**.

Specifications

Clutch control	:	pull-type
Plate load	:	1,300 kg
Number of vanes	:	7
Type of vane	:	progressive
Type of pressure plate	:	ventilated
Disc diameter	:	330 mm
Friction linings	:	cerametallic

Service tools

See part J.

List of parts

(1) Engine flywheel
(2) Flywheel ring gear
(3) PTO shaft drive hub
(4) Engine flywheel attaching bolts
(5) Dowel pins
(6) Disc
(7) Clutch cover plate
(8) Clutch cover plate attaching bolts
(9) Slave cylinder attaching bolts
(10) Bleed point
(11) Grommet
(12) 90° union
(13) Bleed pipe
(14) 90° union
(15) 90° union
(16) Connecting pipe
(17) Grommet
(18) 90° union
(19) Supply pipe
(20) Bolts (location of slave cylinders for push-type clutch)
(21) Tee union
(22) Tee union
/23 Pistons
(24) Slave cylinders
(25) Guide bearing
(26) Release bearing carrier
/27 Scraper rings
/28 Guide rings
/29 Sealing bush
/29A O-ring
/30 Guide rings
(31) Spring clip
(32) Locking screw
(33) Clutch release bearing
(34) Cover
(35) Spring washer

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Overall view

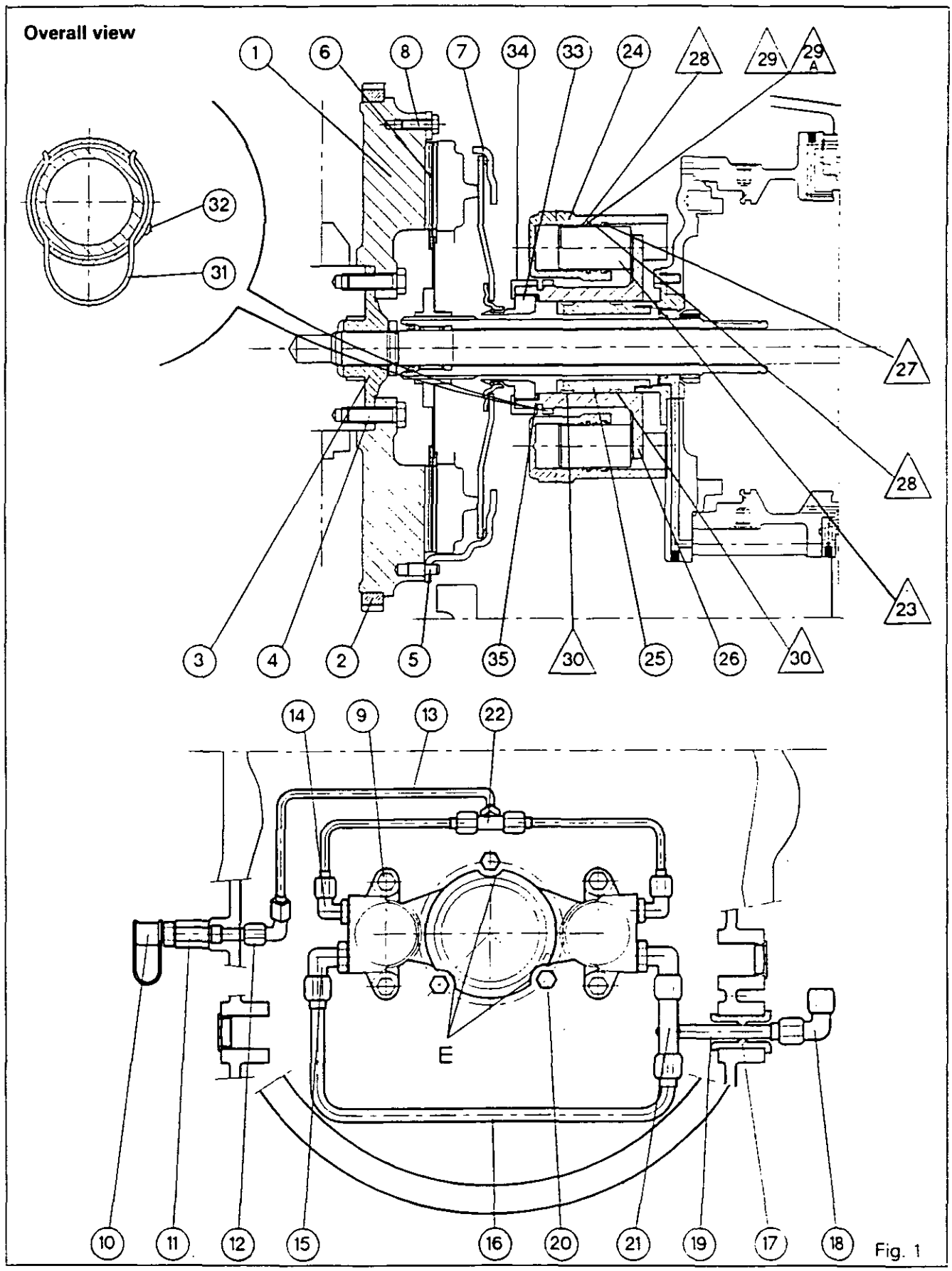


Fig. 1

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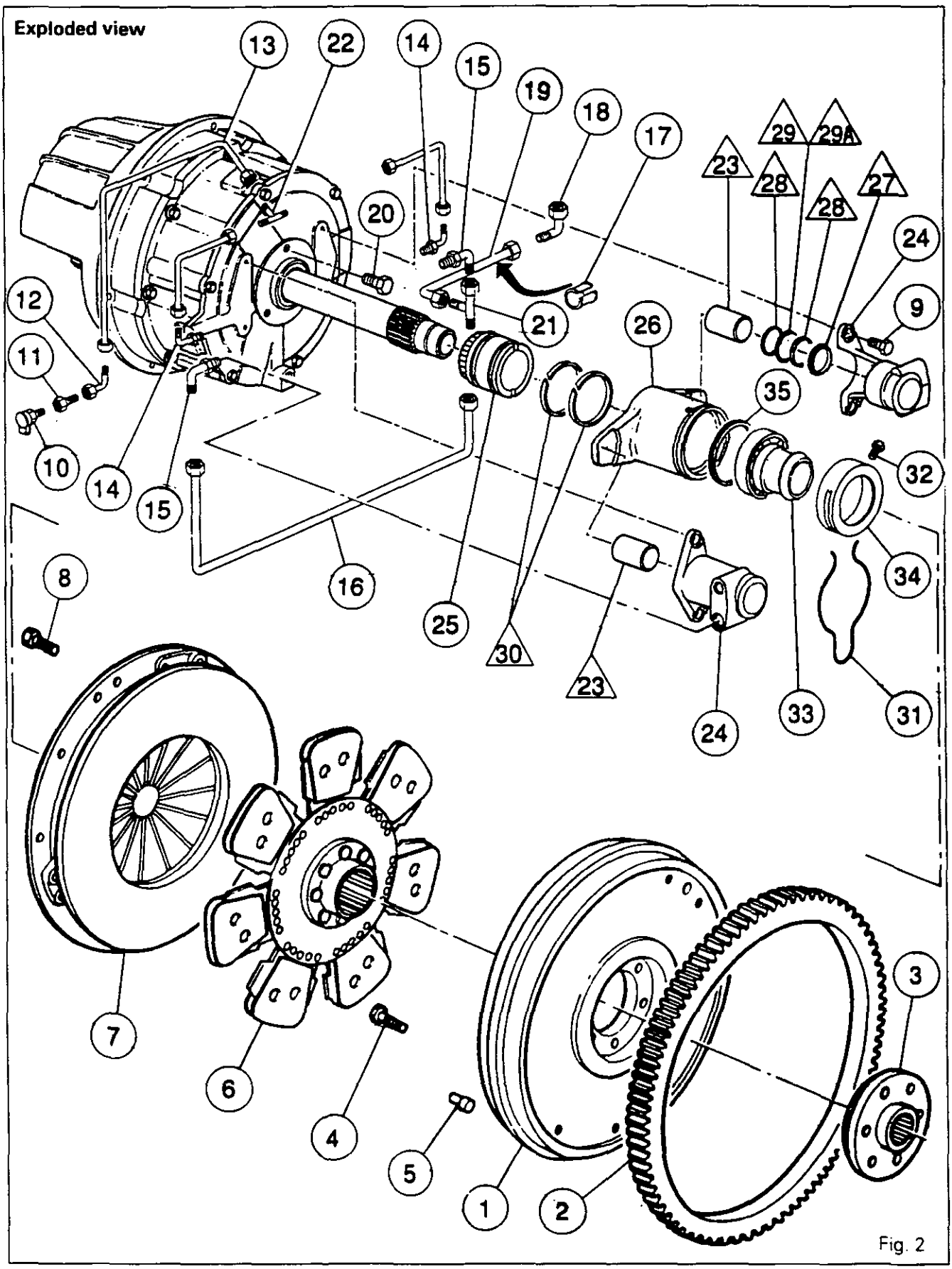


Fig. 2

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A . Clutch cover plate

Disassembly

1. Split the tractor between the engine and the gearbox (see Section 3 A04).
2. Separate the release bearing assembly from the cover plate.
3. Position the centring tool MF 457 to retain the cover plate and disc assembly (Fig. 3).
4. Gradually loosen the bolts **(8)** attaching the cover plate **(7)** to the engine flywheel **(1)** (Fig. 4).
5. Remove the cover plate **(7)** and the disc **(6)**.
6. Remove the three dowel pins **(5)** from the flywheel **(1)** (Fig. 4).

Reassembly

7. Remove dust and clean the engine flywheel **(1)** with a solvent.
8. Check the flywheel friction surface.
   Note: If the friction surface of the engine flywheel is scored, it can be skimmed (see part B, operation 6).
9. Lightly grease the splines on the power take-off shaft hub **(3)** (Fig. 4) with a molybdenum grease. Reinstall the three dowel pins **(5)** on the flywheel **(1)**.
10. Using the centring tool MF 457, centre the clutch disc **(6)** on the engine flywheel (Fig. 3). The longest section of the hub must be facing the diaphragm.
11. Refit the clutch cover plate.
12. Gradually tighten the attaching bolts **(8)** to a torque of 25 - 30 Nm.
13. Remove the centring tool MF 457.
14. Recouple the tractor between the engine and the gearbox (see Section 3 A04).

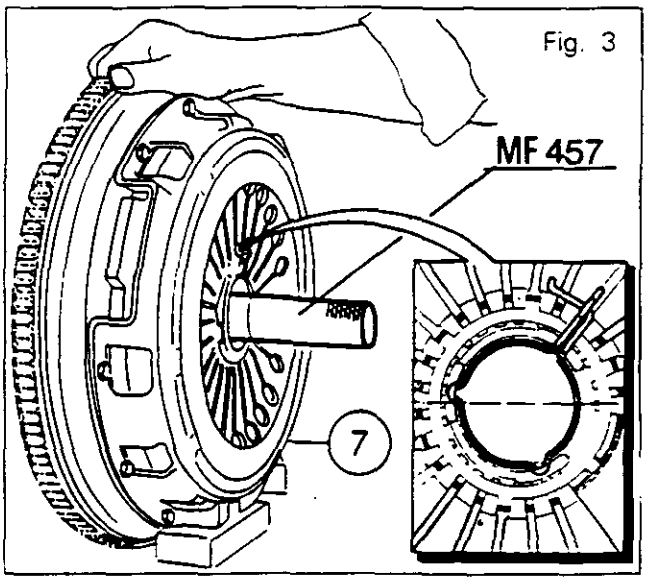


Fig. 3

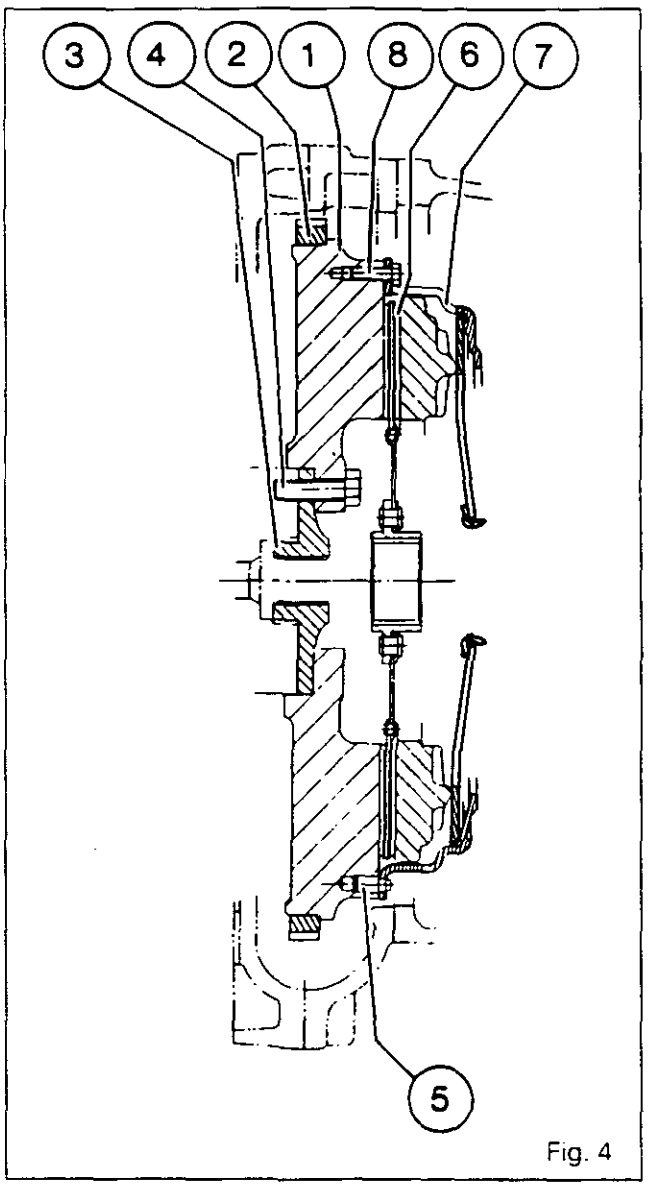


Fig. 4

B. Engine flywheel

Disassembly (Fig.4)

1. Split the tractor between the engine and the gearbox (see Section 3 A04).
2. Remove the engine clutch (see part A).
3. Immobilise the engine flywheel **(1)**.
4. Take out the six bolts **(4)**.
5. Remove the engine flywheel **(1)** and the hub **(3)**.

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Reassembly

6. If the friction surface on the engine flywheel **(1)** is scored it can be skimmed.
   Skimming of the friction surface should be performed as required (removal : 1.5 mm max. - surface condition : 2.5 micrometres max.).
   Reduce the length of the three dowel pins **(5)** by the same amount.
   Note: Check that the tapped holes for the bolts (8) attaching the mechanism onto the flywheel are deep enough. If they are not, they must be tapped. After reworking, grease the flywheel.
7. Fit two dowel pins into the flywheel attaching holes.
8. Refit the hub **(3)** and the flywheel **(1)**.
9. Clean the bolts **(4)** and coat them with Loctite 241.
10. Reinstall the six bolts **(4)** and tighten them to a torque of 110 - 140 Nm.
11. Carry out procedures 1 and 2 in reverse.

C . Replacing the flywheel ring gear

Disassembly

1. Remove the engine flywheel (see part B).
2. Carry out procedures 1 and 2, in part C of Section 5 P01.

Reassembly

3. Carry out procedures 4 and 5, in part C of Section 5 P01.
4. Refit the engine flywheel (see part B).

D . Clutch release bearing assembly

Preliminary operation

Split the tractor between the engine and the gearbox (see Section 3 A04).
Note: Do not press the clutch pedal.

Disassembly

1. Separate the release bearing assembly **(33)** from the clutch cover plate **(33)**.
2. Remove the cover **(34)**, the clutch release bearing **(33)** and the spring washer **(35)**.

Reassembly

3. Carry out procedures 15 to 17, in Section 3 A04.
4. Recouple the tractor between the engine and the gearbox. Carry out procedures 18 to 33, in Section 3 A04.

E . Hydraulic slave cylinder assembly

Preliminary operation

Split the tractor between the engine and the gearbox, as per Section 3 A04.

Removal

1. Disconnect:
   - the supply pipes,
   - the bleed pipes.
2. Take out bolts **(9)**. Remove the slave cylinders.

Refitting

3. Position the slave cylinders on the Dynashift cover.
4. Fit the bolts **(9)** and tighten them to a torque of 25 - 35 Nm.
5. Reconnect the pipes.
6. Clean the clutch housing with a solvent.
7. Recouple the tractor between the engine and the gearbox, as per Section 3 A04.
8. Bleed the clutch system (see part H).

F . Replacing the slave cylinder seals

Preliminary operation

Split the tractor between the engine and the gearbox, as per Section 3 A04.

Disassembly

1. Remove the slave cylinders (see part E).
2. Withdraw the piston **/23** by knocking the slave cylinder on a wooden block.
3. Drive out the scraper rings **/27** and their O-rings **/29A**.
4. Remove :
   - the guide rings **/28**,
   - the sealing bushes **/29** and the O-rings **/29A**.

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Reassembly

5. Clean the slave cylinder **(24)** (Fig. 5) and the seal grooves.
   Check that :
   - the bleed and supply pipes are not blocked,
   - there is no scoring in the bores and on the pistons
6. Shape the guide rings **/28** so as to decrease their diameter by approximately one third. Using pliers and wearing protective equipment, install the rings in their grooves (Fig. 5), with the knurled face in contact with the piston **/23**.
7. Lubricate and fit the O-rings **/29A** in their groove without twisting them.
8. Shape the sealing bushes **/29** as per Fig. 6.
   Note : The sealing bushes must be positioned with their lips facing the pressure side (Fig. 5).
9. Position the sealing bushes in the grooves, gradually fitting them on the O-rings **/29A**.
10. Lubricate the sealing bushes, the guide rings **/28** and the cylinder bores.
11. Check that there are no burrs on the pistons **/23**. Fit the pistons, with the **"C"** chamfers facing the inside of the cylinders (Fig. 5).
12. Position the O-rings and scraper rings **/23** in their corresponding grooves.
13. Fit the pistons and check that they move normally in their bores.
14. If they were removed, fit unions **(14)** and **(15)**.
15. Reinstall the hydraulic slave cylinders (see part E). Reconnect the pipes.
16. Clean the clutch housing with a solvent.
17. Recouple the tractor between the engine and the gearbox (see Section 3 A04).
18. Bleed the brake and clutch systems. See part H and parts C and D in Section 6 K01.
19. Carry out a road test on the clutch control.
20. Check the unions for leaks.

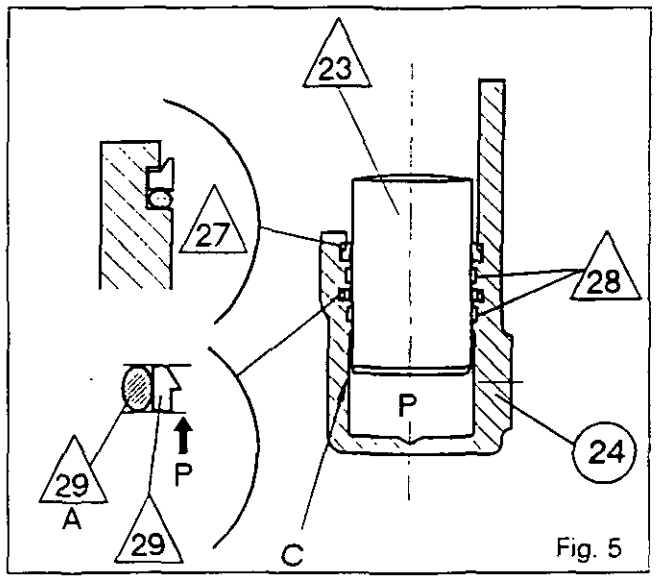


Fig. 5

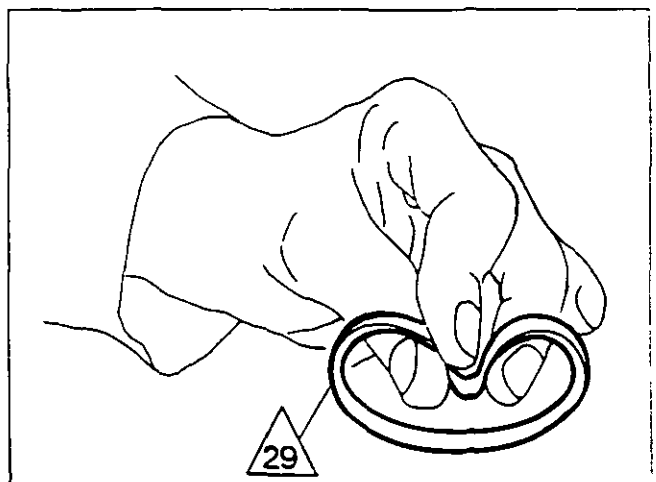


Fig. 6

G . Replacing the clutch release bearing guide rings

Preliminary operation

Split the tractor between the engine and the gearbox, as per Section 3 A04.

Disassembly

1. Remove the hydraulic slave cylinders (see part E).
2. Withdraw the release bearing carrier **(26)**. Remove the guide rings **/30**.
   Note: If necessary, remove the guide cylinder (25) using socket 3376936 M1 (see part J).

Reassembly

Note: If it was removed, apply Loctite 542 on the thread on the guide cylinder (25). Tighten to a torque of 40 - 50 Nm.

3. Shape the guide rings **/30** so as to decrease their diameter by approximately one third.
   Install the rings in their grooves, with the knurled face in contact with the release bearing carrier **(26)**.

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4. Lubricate the guide rings and the bore in the release bearing carrier.
5. Check that the rings are correctly positioned. Assemble the release bearing carrier **(26)** on the guide cylinder **(25)**. Check that the notches **E** on the rear face of the release bearing carrier are lined up with bolts **(20)** (Fig. 1).
   Check that the release bearing carrier slides freely.
6. Reinstall the hydraulic slave cylinders (see part E).
7. Recouple the tractor between the engine and the gearbox (see Section 3 A04).

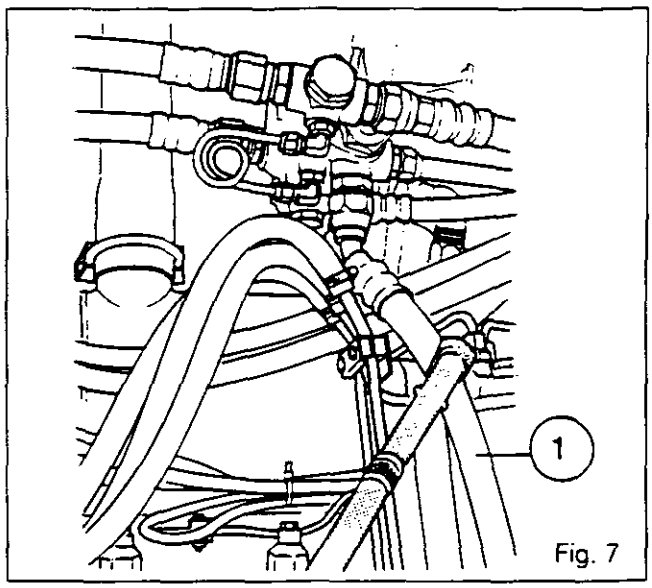


Fig. 7

H. Bleeding the system

1. Run the engine at approximately 1,200 rpm and restrict the return hose **(1)** (see Fig. 7) with suitably protected pliers or clamp.
2. Connect the union 3582045 M1 **(1)** together with its hose (Fig. 8) onto the bleed point (on the right-hand side of the gearbox).
3. Immerse the end of the hose in a receptacle partly filled with transmission oil.
4. Operate the clutch pedal. Repeat the action several times, until oil free of bubbles comes out of the hose.
5. Remove the union and release the hose.
   Note : On this type of clutch, pedal travel is taken up automatically. If, however, the clutch does not operate correctly, repeat the air bleed procedure.

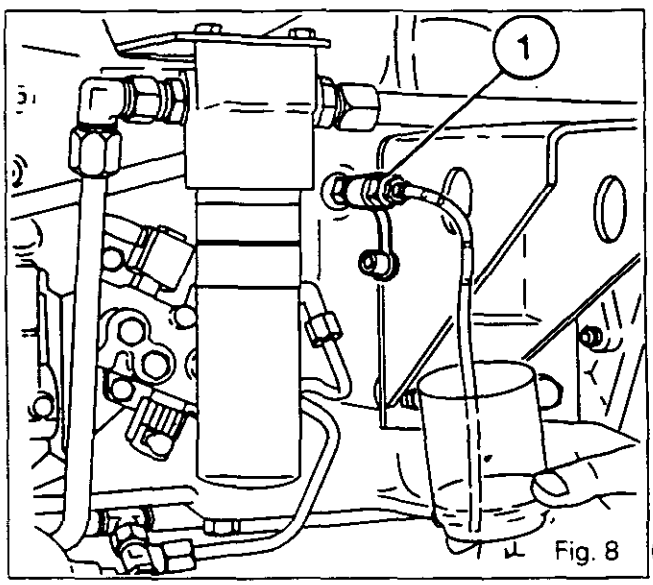


Fig. 8

I . Adjusting the clutch pedal

Before installing, coat the pins **(3)** and **(4)** with molybdenum disulphide grease.
Apply Loctite 542 on the threads of rod **(1)** (Fig. 9).
Adjust the rod to obtain a pedal travel of 200 mm between the disengaged
position (pedal against the stop **(2)**) and the engaged position.

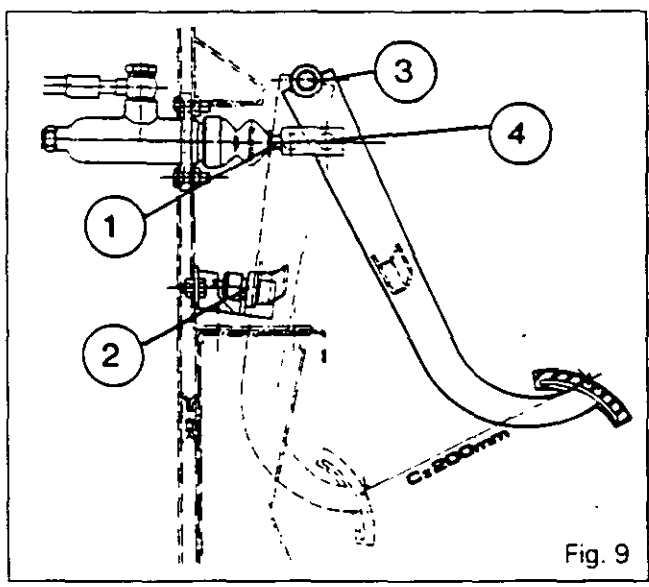
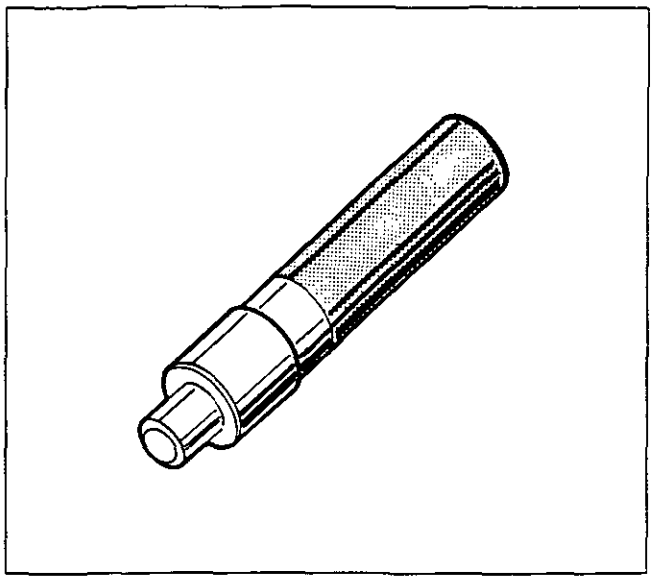


Fig. 9

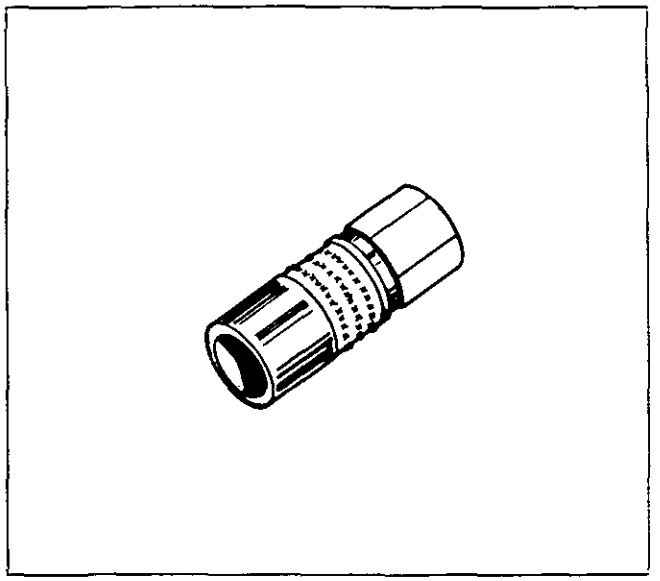
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J . Service tools available from the MF network

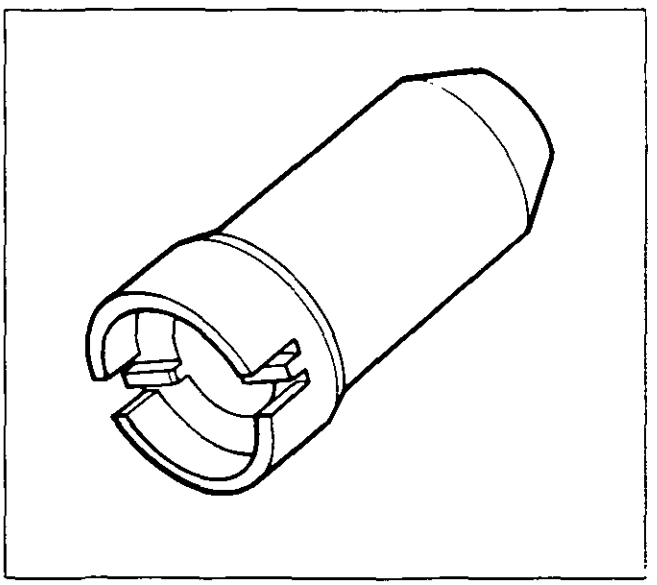
MF 457
Clutch disc centring tool



3582045 M1
Hydraulic quick coupler (union)



3376936 M1
Socket for release bearing carrier guide



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5 R01 Input unit

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B. **Refitting and adjusting the reverse gear selector** ____ 3

C **Service tool** ____ 4

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Gearbox - Dynashift

General

The input gearbox is in the form of an interchangeable module fitted at the input end of the gearbox. It is made of two quite separate parts. The Dynashift unit and the reverse shuttle.

The Dynashift: This is an independent device which allows four ratios to be selected while running, without declutching, using a lever located under the steering wheel. The Dynashift assembly is secured to the front of the input unit. It is a hydraulically controlled gear change device providing for ratios on input to the gearbox.
This function is ensured by two epicyclic gear trains associated with two hydraulic clutches.
For its operation, see Section 5 R02.

The reverse shuttle: This is housed in the enclosure to the rear of the input gearbox and consists of a set of two gears operated via a synchromesh mechanism. A pair of idler gears allows the direction of rotation to be reversed. For its operation, see Section 5 R03.

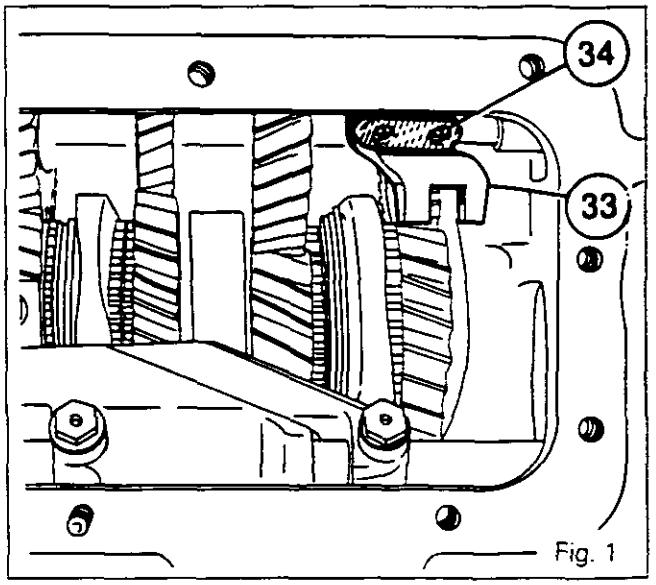


Fig. 1

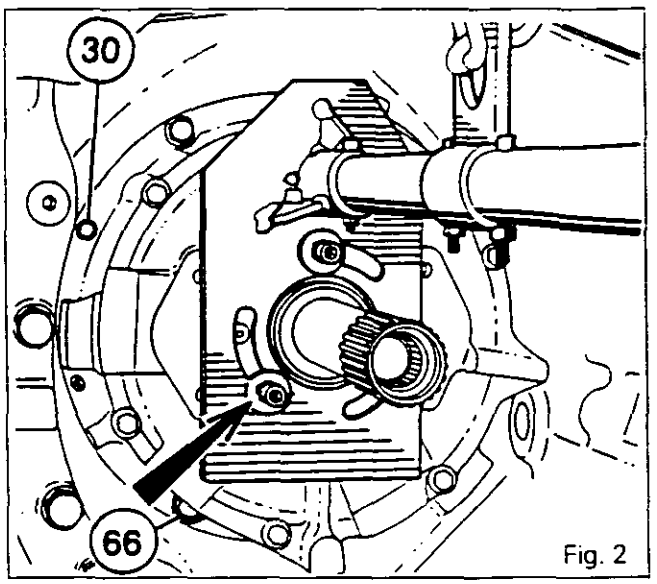


Fig. 2

A. Removal

When the input gearbox is replaced, the layshaft shimming must be adjusted. To allow the bearings to be shimmed correctly, the gearbox must be removed from the tractor.

3000-3100 tractors

1. Split the tractor between the gearbox and the rear axle (Section 3 B02).
2. Remove the selector cover and carry out procedure 11 and 12 in Section 5 X01.

3000 tractors

3. Separate the gearbox from the engine. Carry out procedures 9 and 11 to 12 in Section 3 A03. Remove the PTO shaft.

3100 tractors

4. Separate the gearbox from the engine. Carry out procedures 3 and 4, and 12 to 14 in Section 3 A04. Remove the PTO shaft.

3000 - 3100 tractors

5. To facilitate the removal of the input unit, remove the bolts **(34)**. Remove the selector **(33)** (Fig. 1).
6. Remove the clutch slave cylinder or cylinders (depending on the type) and install the sling 3376883M1 (see part J of Section 5 R02), using bolts of the correct length (Fig. 2).
7. Remove the eight bolts **(30)** (Fig. 2).
Note: Do not remove the three bolts (66), dimensioned across flats 13 (Fig. 2).

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8. Detach and remove the input unit, pulling it forwards.
9. Discard the O-rings **(2)** and **(3)**. Recover the cup **(64)** and the locating pin **(4)** (Fig. 3 and 4).

B. Refitting and adjusting the reverse gear selector

Refitting

10. On the input unit, check that the cup **(64)** O-ring **(2)** are in position (Fig. 3).
11. On the housing, position the new O-rings **(3)** and the locating pin **(4)** (Fig. 4).
12. On the gearbox, screw in two locating studs **"G"**, as per Fig. 4. Offer up the gearbox in the housing, using the sling.
13. At a first stage, with the help of an operator, slightly lift the layshaft through the opening of the selector cover in order to engage the cone of the shaft in the cup **(64)**.
14. Position the housing with respect to the locating pin. Tighten the bolts to a torque of 45 - 60 Nm.
15. Remove the sling.
16. Refit the clutch slave cylinder or cylinders, depending on the type (see Section 5 P01 or 5 Q01, part G, procedure 5). Fit the bolts:
    - 3000 series: First coat them with Loctite 542 and tighten to a torque of 36 - 46 Nm,
    - 3100 series: Tighten to a torque of 25 - 35 Nm.
17. Shim the layshaft. Carry out procedures 25 to 35, in Section 5 T01.

3000 tractors

18. Recouple the gearbox to the engine. Carry out procedures 13 to 16, in Section 3 A03.
19. Carry out procedures 17 and 18, in Section 3 A03.

3100 tractors

20. Recouple the gearbox to the engine. Carry out procedures 15 to 23, in Section 3 A04.

3000/3100 tractors

Adjusting the reverse gear selector

21. Position the selector **(33)** to the neutral position. Fit and tighten tool 3582434 M1 (see Part C) with two bolts (Fig. 5).
22. Coat the adjusting bolts with Loctite 221.
23. Position face **F** of the reverse gear selector in contact with the tool using bolts **(34)** (Fig. 5).

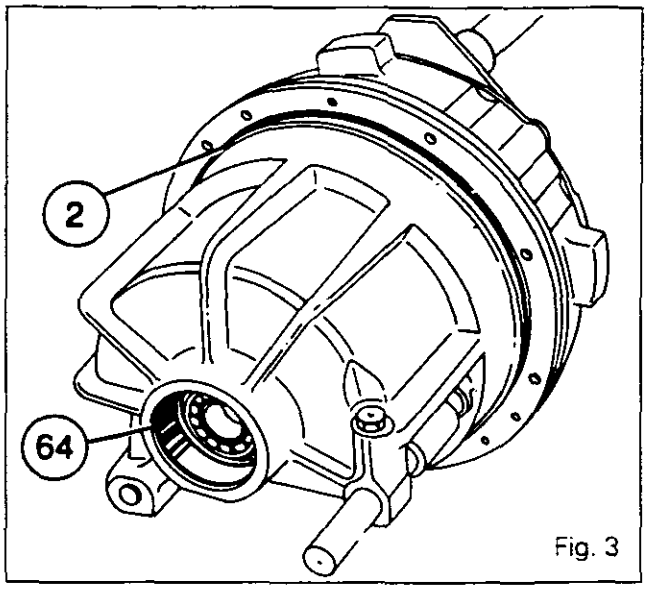


Fig. 3

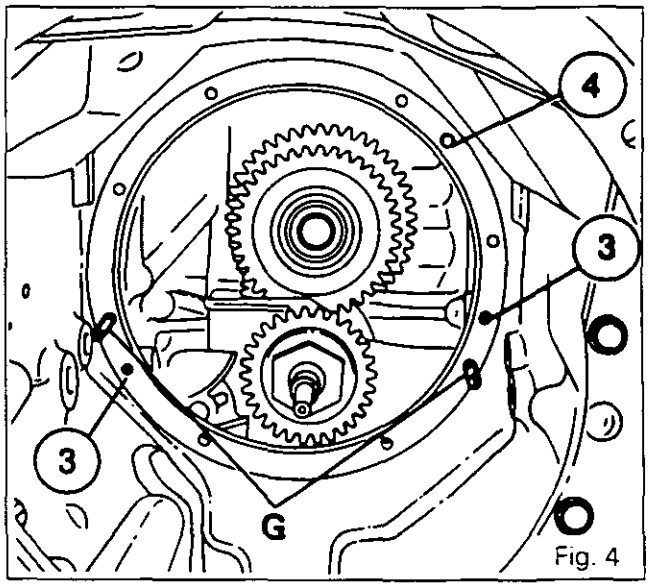


Fig. 4

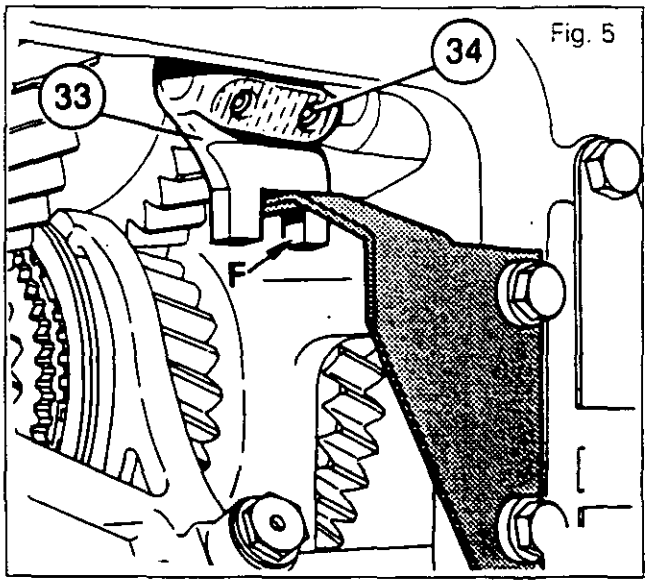


Fig. 5

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Principle of adjustment

The selector **(33)** is positioned on the basis of the difference in the spacing **Y** of the holes and the spacing **Z** of the spot-faced depressions in the guide rail **(31)**. The selector can be adjusted to move to different points by acting either on the front or the rear screw **(32)** depending on the adjustment required (Fig. 6).

24. Refit the selector cover. Carry out procedures 33 to 38, in Section 5 X01.
25. Recouple the tractor between the gearbox and the rear axle (Section 3 B02).
26. Carry out road test on ratios A, B, C and D of the Dynashift, reverse shuttle and gears.
27. Check the mating faces on the selector cover as well as the gearbox on the rear axle for leaks.

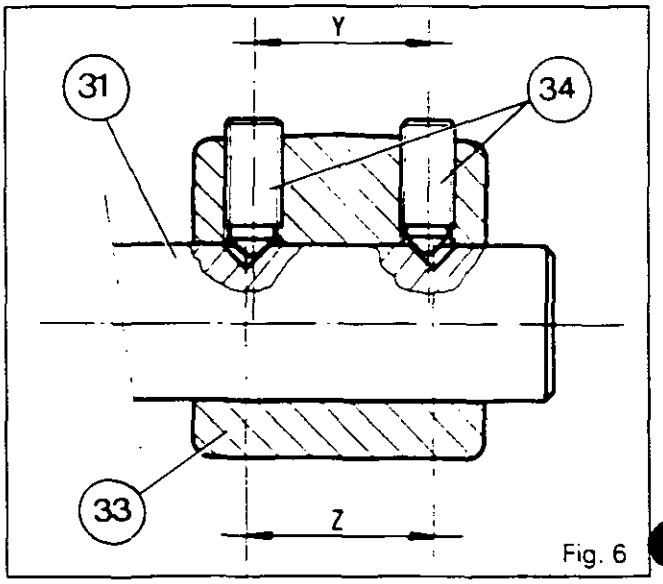
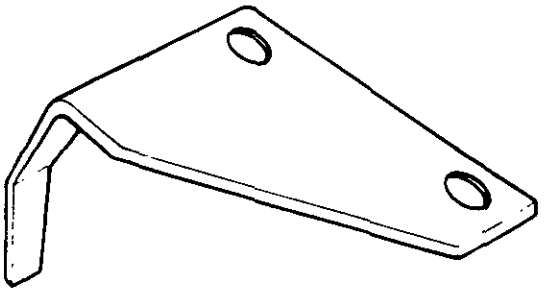


Fig. 6

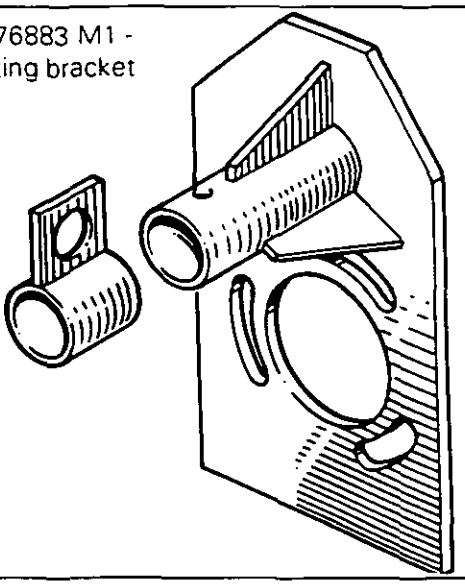
C. Service tools

1. Tool available through MF network

3583434 M1 - Reverse shuttle setting gauge

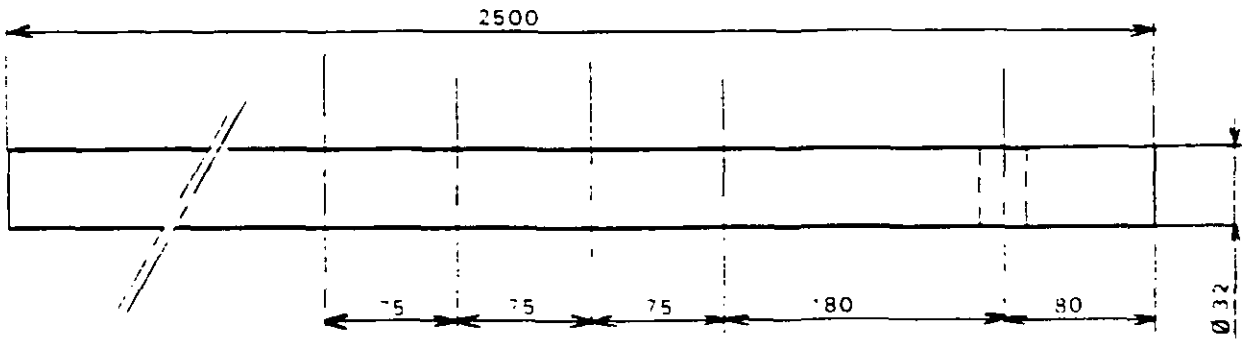

Fig. 7

3376883 M1 - Lifting bracket


Fig. 8

2. Tool to be made locally

Handling bar



5 holes, 7 mm dia.

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5 R02 Dynashift input unit

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J. **Service tools** ____ 16

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Gearbox - Dynashift

General

Description

The general conception of the Dynashift input unit 3000/3100 is the same as the tractor 3600.
But it's important to note that the spacer **(21)** is fixed on the gearbox housing instead of being mounted on the reverse shuttle housing.
Only a Belleville spring **/52** operates on the brake and the rear clutch

Particularities 3100

The front of the support hub **(11)** is threaded and supports the guide of the release bearing carrier.
Sealing with the primary shaft is obtained by a wide seal **(77)** only.
The Dynashift assembly is fitted at the front of the input unit. It is a hydraulically controlled gearchange device which provides four input ratios to the main gearbox.
It does this by means of two epicyclic gear trains connected to two hydraulic clutches.
The Dynashift design allows four ratios to be selected on the move, without declutching, using a control located under the steering wheel.
The Dynashift unit is controlled by two solenoid valves fitted in the low flow hydraulic circuit.
The two solenoid valves are themselves controlled by an electronic control unit located under the instrument panel and connected to the tractor's Autotronic unit.

Operation

The dynashift input unit includes two epicyclic gear trains :
- The primary epicyclic unit is the major component of the input unit and is used to transmitting engine motion to the gearbox.
- The secondary epicyclic unit controls the speed of the primary sun gear.

Primary epicyclic gear train

Motion enters via the primary ring gear **(31)** which is splined onto the primary shaft **(7)**. It turns at engine speed.
The motion is transmitted via the planetary carrier **(28)** which is splined onto the secondary shaft **(53)**. The primary sungear **(64)** is driven by the secondary epicyclic gear train. The speed of this sungear determines the unit reduction ratio.

Secondary epicyclic gear train

This epicydic gear train is controlled by hydraulic clutches and brakes.

The secondary ring gear **(34)** is :
- either locked onto the primary shaft **(7)** by the three clutch discs **(3)** and the Belleville spring **/4** located in the front part of the unit.
- or immobilized in relation to the housing by three brake discs **(15)** and one piston **(22)**.

With no pressure, the piston **(22)** is pushed to the rear by the twelve springs **(20)** and the Belleville spring **/4** via the brake plate **(16)**.

When pressure from the 17 bar circuit acts on piston **(22)**, it moves forward, locks the brake discs **(15)** and pushes plate **(16)**, which compresses the Belleville spring **/4**.
The secondary ring gear speed is established as follows :
- speed equal to engine speed when the front piston is not under pressure.
- speed zero when the front piston is under pressure.

The sungear **(61)** is either :
- locked on the secondary shaft by means of the four clutch discs **(50)** and one Belleville spring **/52** located at the rear part of the unit.
- or immobilized in relation to the housing by means of the three brake discs **(41)** and one piston **(37)**.

With no pressure, piston **(37)** is pushed towards the front by the Belleville spring and the six springs **(65)**.

Under 17 bar pressure, piston **(37)** moves towards the rear and locks the brake discs **(41)**. It compresses the Belleville spring **/52** via the brake plate **(45)**, which frees up the secondary shaft clutch discs.

When the secondary ring gear **(34)** or the sungear **(61)** is immobilized, the speed of the secondary planetary carrier **(39)** changes. The secondary planetary carrier drives the primary sungear **(64)** and produces the unit reduction ratio.

Service tools

Tools available for MF dealers (See section J)
- Lifting bracket for front cover unit, No. 3376883 M1
- Centering tool, No. 3376887 M1
- Secondary ring gear retaining tool, No. 3376888 M1
- Sling for shaft and cover assembly, No. 3376889 M1
- Planetary carrier compression tool, No. 3376920 M1
- Calibrated pins, No. 3376925 M1

Tool to be made up locally
- Adaptor bar

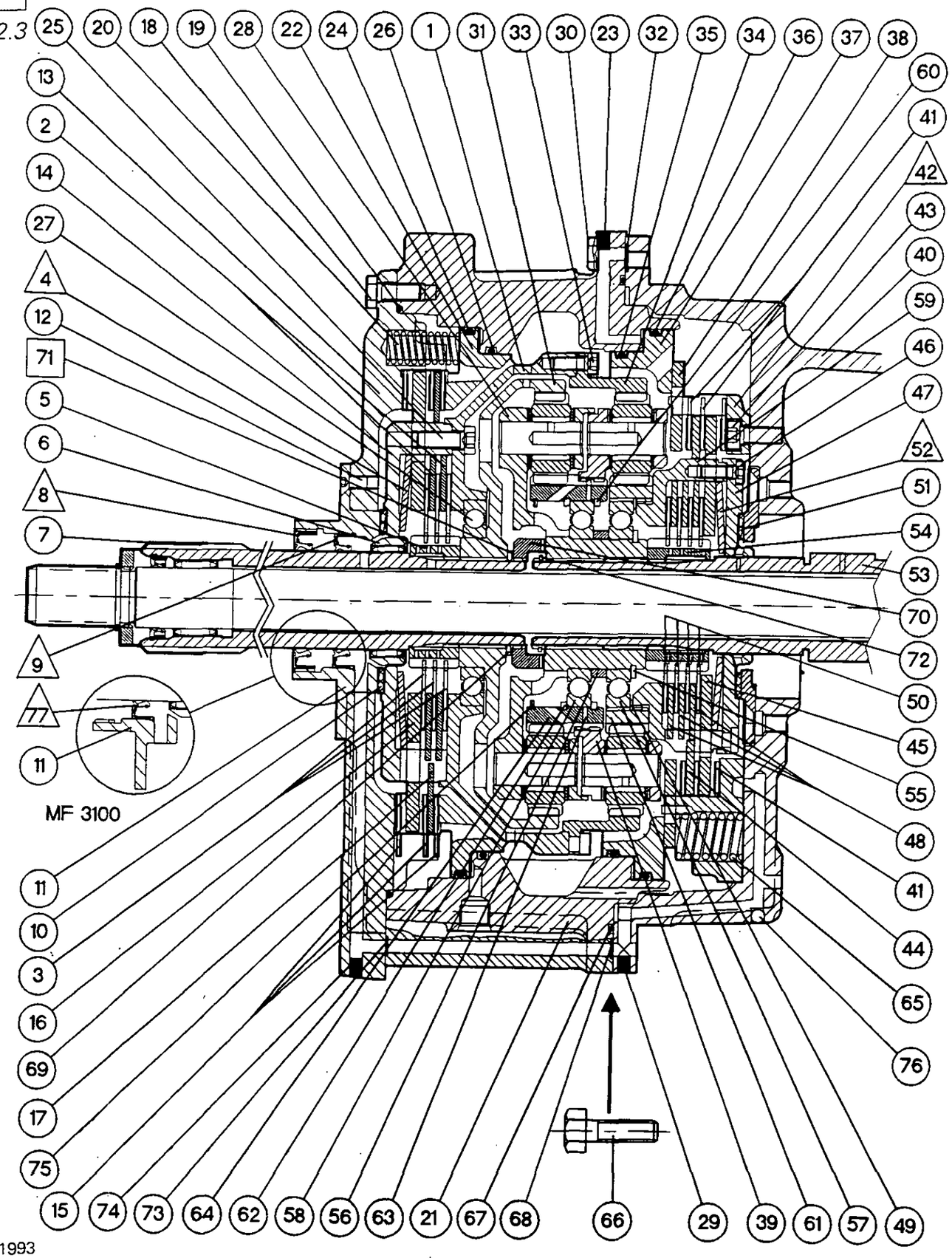
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Gearbox - Dynashift

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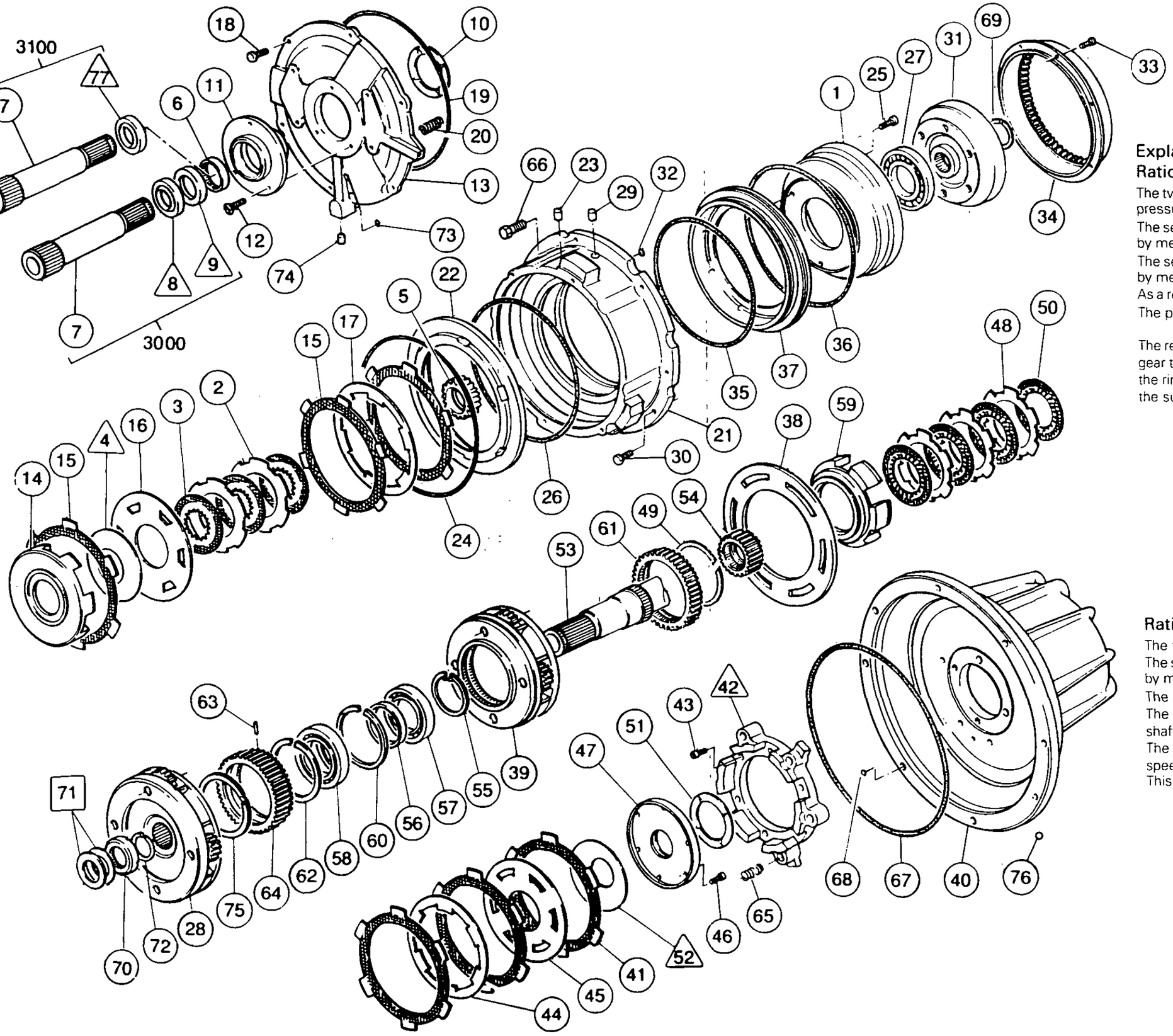
Key (Fig. 1)

(1) Secondary ring gear carrier
(2) Clutch driven plates
(3) Clutch driving plates
/4 Belleville spring
(5) Splined hub
(6) Needle bearing
(7) Primary shaft
/8 Wide seal
/9 Narrow seal
(10) Thrust washer
(11) Support hub
(12) Bolt
(13) Front cover
(14) Clutch housing
(15) Front brake discs
(16) Brake plate
(17) Pressure plate
(18) Bolt
(19) O-ring
(20) Springs
(21) Spacer (piston housing)
(22) Front piston
(23) Blanking plug
(24) O-ring
(25) Bolt
(26) O-ring
(27) Ball bearing
(28) Primary planetary carrier
(29) Blanking plug
(30) Screw
(31) Primary ring gear
(32) O-ring
(33) Bolt
(34) Secondary ring gear
(35) O-ring
(36) O-ring
(37) Rear piston
(38) Pressure plate
(39) Secondary planetary carrier
(40) Reverse shuttle housing
(41) RH Brake disc
/42 Secondary brake housing
(43) Bolt
(44) Pressure plate
(45) Brake plate
(46) Bolt
(47) Cover
(48) Driven plate
(49) Retaining ring
(50) Rear clutch driving plate
(51) Thrust washer
/52 Belleville spring
(53) Secondary shaft
(54) Splined hub
(55) Circlip
(56) Spacer
(57) Ball bearing
(58) Ball bearing
(59) Rear clutch housing
(60) Retaining ring
(61) Secondary sungear
(62) Retaining ring
(63) Locating needles
(64) Primary sungear
(65) Springs
(66) Bolt
(67) O-ring
(68) O-ring
(69) Circlip
(70) Thrust plate
[71] Shim(s)
(72) Retaining ring
(73) O-ring
(74) Plug
(75) Oil deflector
(76) Ball
(77) Wide seal (serie 3100)



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Gearbox - Dynashift



Explanation of ratios

Ratio A = 1:1.620 reduction (Fig. 3)

The two pistons **(22)** and **(37)** are simultaneously under pressure from the 17 bar circuit.
The secondary ring gear **(34)** is locked onto the housing by means of the front brake.
The secondary sungear **(61)** is locked onto the housing by means of the rear brake.
As a result, the secondary epicyclic gear train is locked.
The primary sungear **(64)** is locked.

The reduction ratio is fixed only by the primary epicyclic gear train. It uses traditional gearing: motion enters via the ring gear and leaves via the planetary carrier, while the sungear remains immobile.

Ratio B = 1:1.386 reduction (Fig. 4)

The front piston **(22)** is under pressure.
The secondary ring gear **(34)** is locked onto the housing by means of the front brake.
The rear piston **(37)** is not under pressure.
The secondary sungear **(61)** turns with the secondary shaft **(53)** (the clutch is engaged).
The secondary planetary carrier **(39)** turns at slow speed, driving the primary sungear **(64)**.
This causes the reduction ratio to be less.

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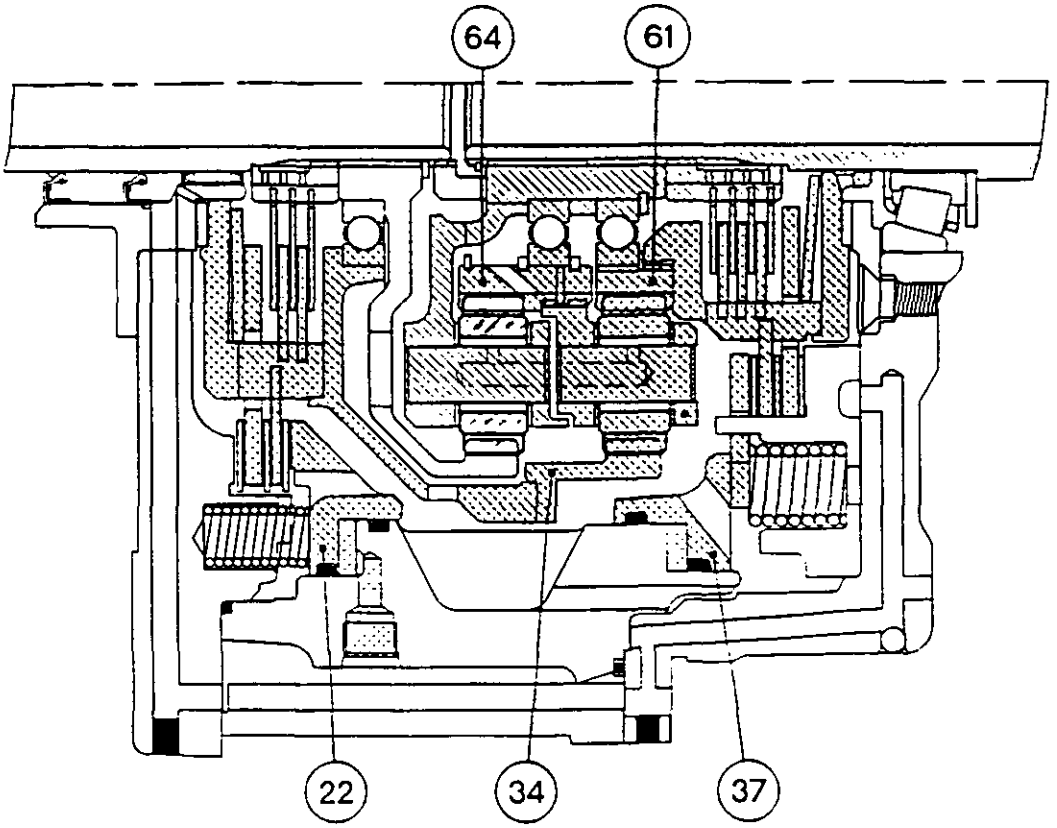


Fig. 3

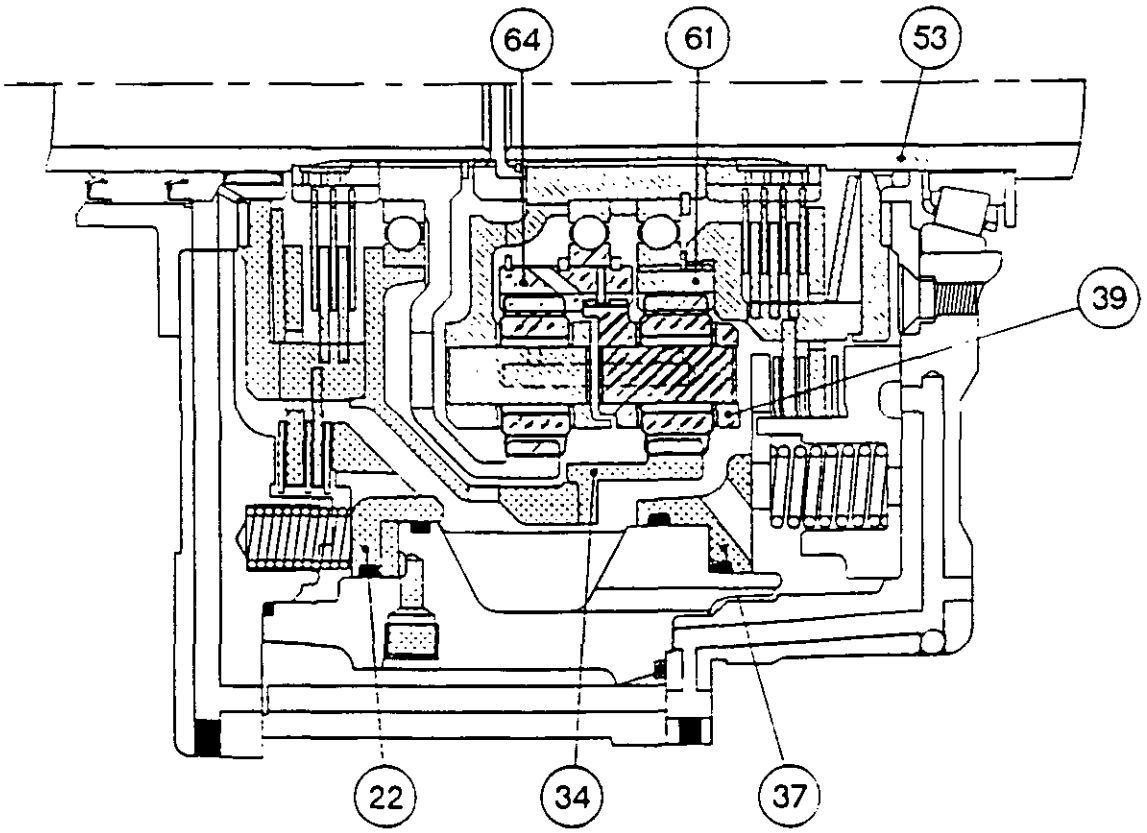


Fig. 4

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Ratio C = 1:1. 1704 reduction (Fig.5)

The rear piston **(37)** is under pressure.
The secondary sungear **(61)** is locked onto the housing by the rear brake.
The front piston **(22)** is not under pressure.
The secondary ring gear **(34)** turns with the primary shaft **(7)**, thus imparting a higher speed to the secondary planetary carrier **(39)**.
The primary sungear **(64)** is driven by the secondary planetary carrier **(39)** at a higher speed than in ratio B.
This therefore gives less reduction.

Ratio D = 1:1. reduction (Fig.6)

Neither of the two pistons is under pressure. The two clutches are therefore engaged.
The secondary ring gear **(34)** turns with the primary shaft **(7)**
The secondary sungear **(61)** is locked onto the secondary shaft **(53)** thus mechanically locking the entire system.
The ratio is therefore 1:1 (direct drive).

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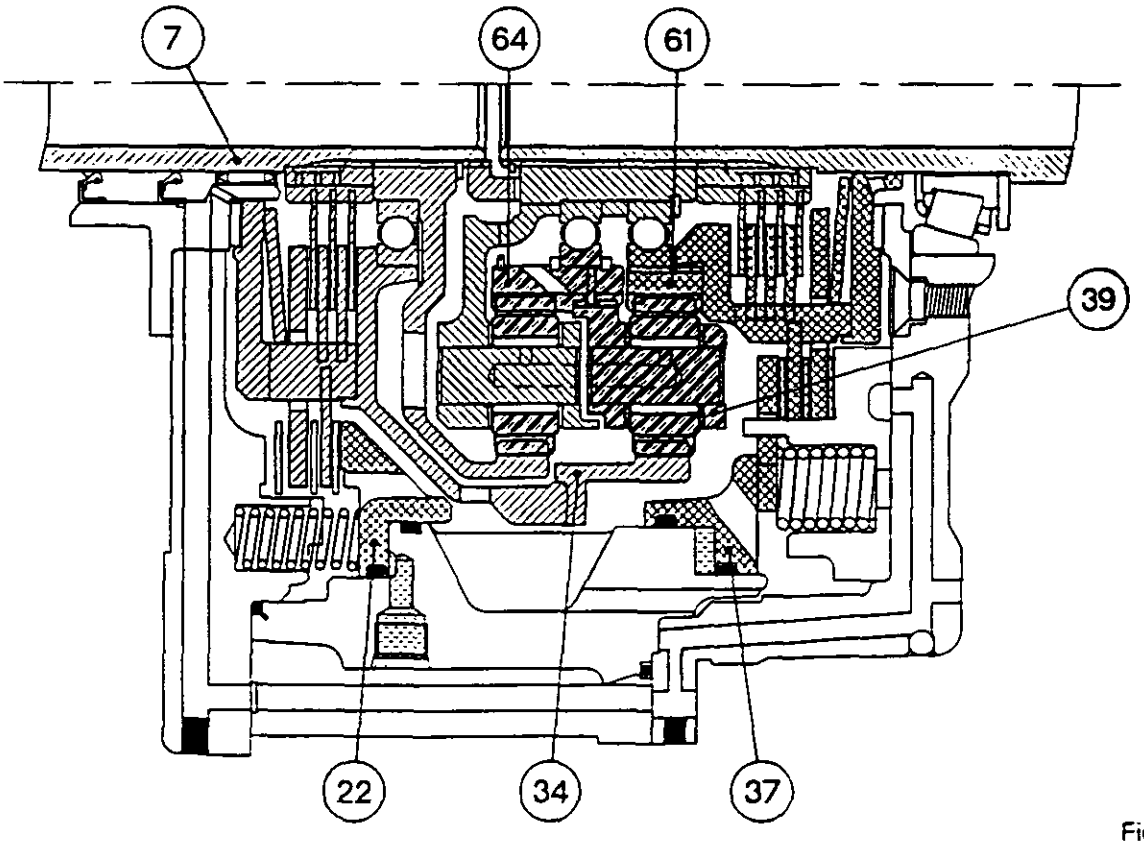


Fig. 5

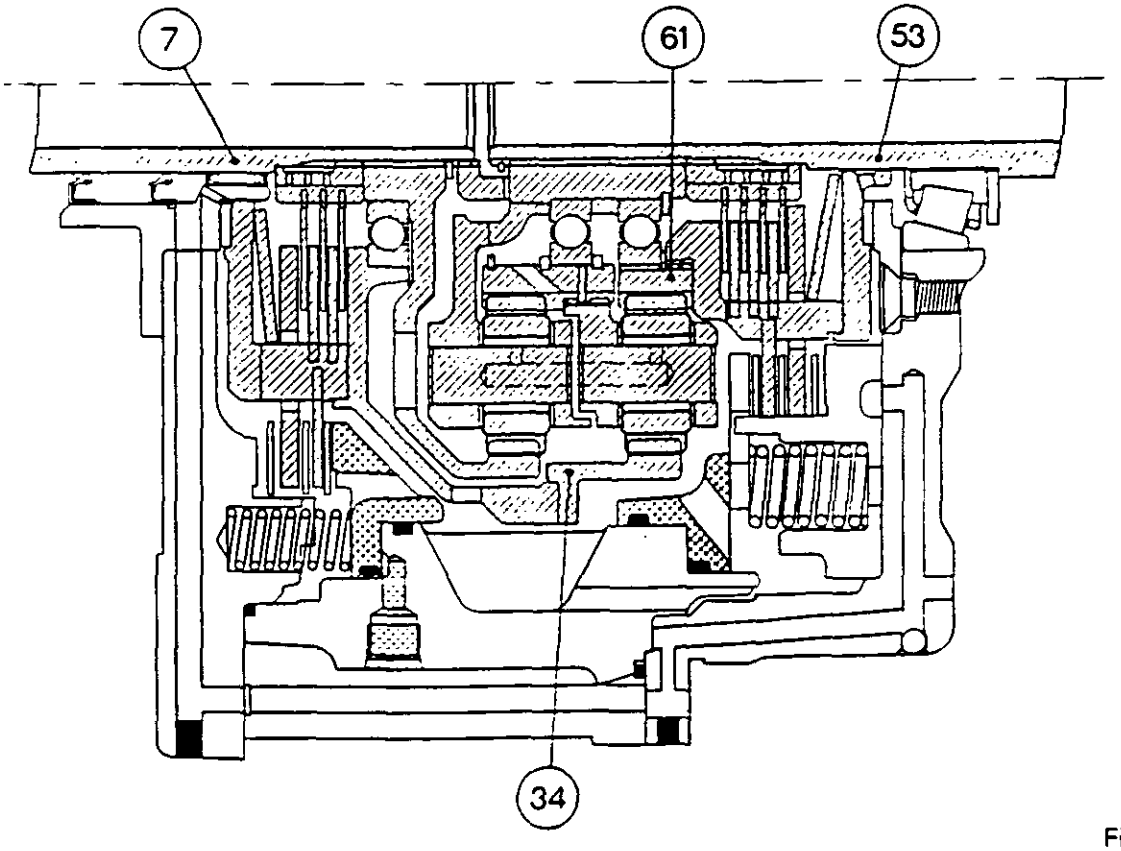


Fig. 6

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A. Preliminary operations

1. Split the tractor between the engine and the gearbox :
   - see section 3 A03 (3000)
   - see section 3 A04 (3100)
2. Drain only the gearbox.
3. At the left hand front of the gearbox, disconnect the clutch slave cylinder(s) supply hose (tractors 3000 or 3100).
4. Inside the clutch housing, disconnect :
   - pipes **(13)** and **(16)**, the union **(12)** (Fig. 7 and 8) (tractors 3000 and 3100)
   - the tube **(1)**.

   Remove the union **(10)** (Fig. 7 and 8) (tractors 3000 and 3100).

   Disassemble the grommets **(2)**, **(11)** and **(17)** (Fig. 7 and 8) (tractors 3000 and 3100).
5. Remove the PTO shaft.
6. Remove the clutch slave cylinder(s). Fit the lifting bracket 3376883 M1, using bolts of the correct length (Fig.9).

   Immobilize the reverse shuttle lever in forward position so as to retain the reverse shuttle housing (Fig.10).

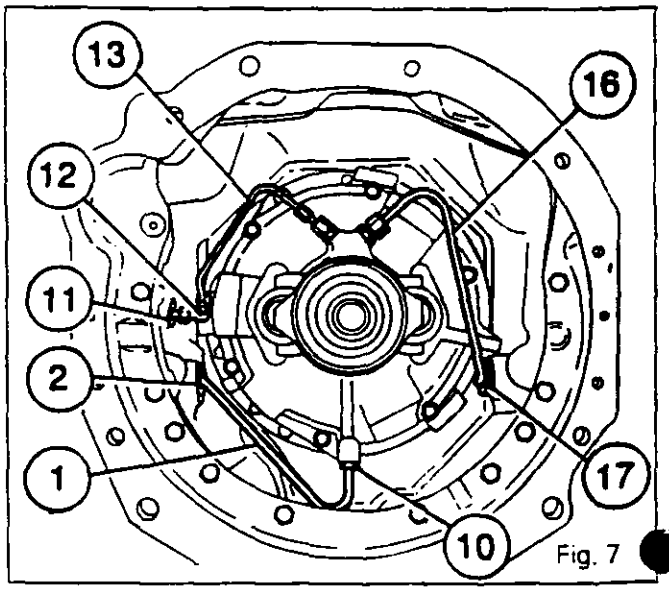


Fig. 7

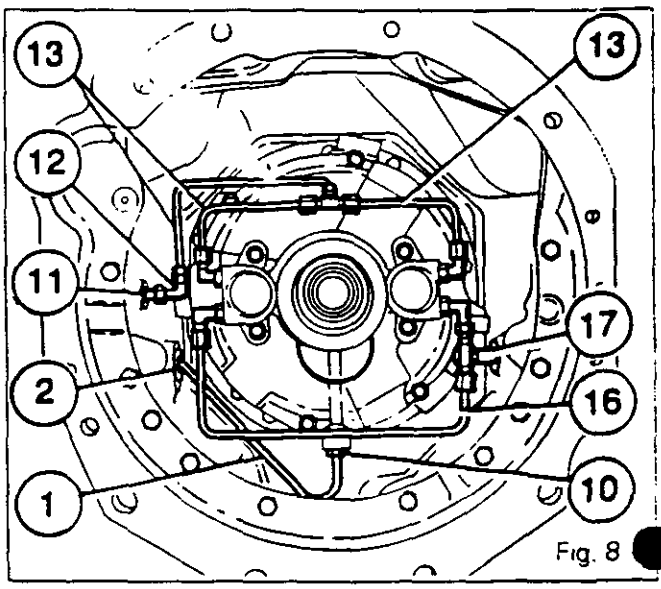
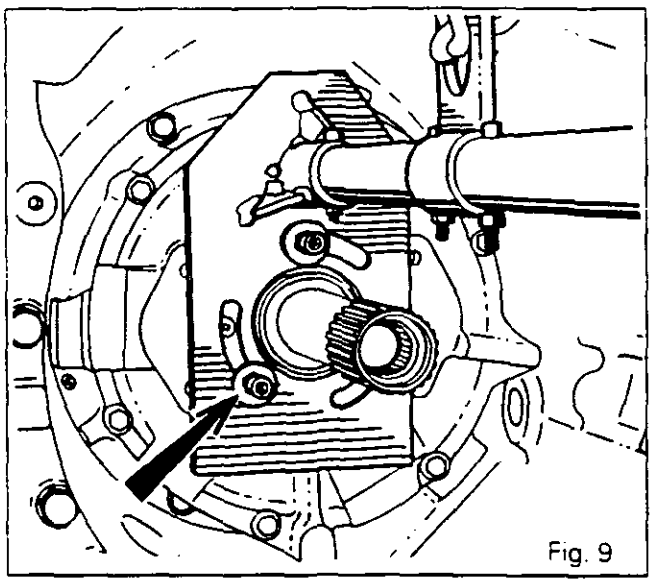
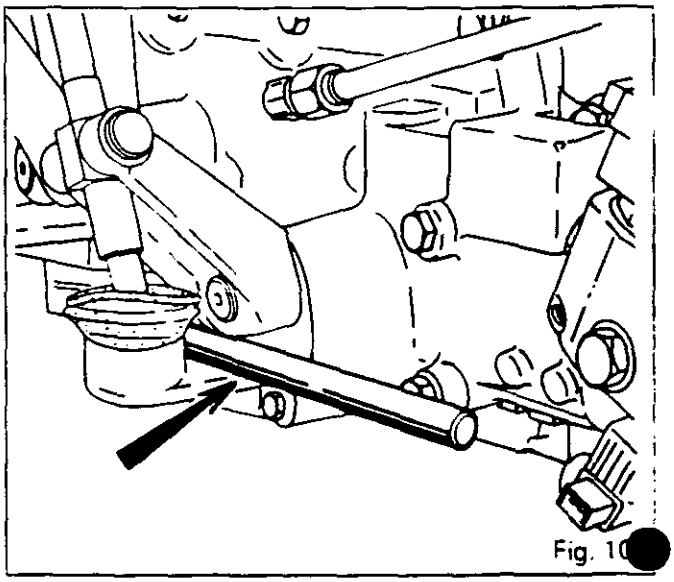


Fig. 8


Fig. 9


Fig. 10

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7. Remove two screws **(30)** diametrically opposed and screw two guide studs **"G"** (Fig.11). Remove the other six screws.
8. Unscrew the three bolts **(66)** gradually and alternately (Fig. 11) (flat to flat dimension 13 mm) *fixing the housing* **(21)** *on the reverse shuttle* housing **(40)**.

B. Disassembling the cover, the housing, front clutch and brake

9. Remove the primary shaft assembly **(7)**, cover **(13)** and housing **(21)**. Discard the O'rings **(32)**, **(67)** and **(68)**.
10. Remove the lifting bracket.
11. Turn the front cover/housing assembly over onto a suitable support (Fig.12).
12. Retain the thrust washer **(70)** and the shims **[71]**.
13. Remove the circlip **(69)**, take out the primary shaft **(7)** downwards, taking care not to damage :
    - the seals **/8** and **/9** (tractor 3000)
    - the seal **/77** (tractor 3100)
14. Take the piston **(37)**out the housing **(21)**. Remove the seals **(35)**, **(36)** and discard them.
15. Turn the ring gear **(31)** so as to have access to the bolts **(25)**.
16. Using tool 3376888 M1, immobilize the ring gear **(34)**. Remove the bolts **(25)** (Fig.13).
17. Take out the ring gear assembly **(34)**, its carrier **(1)**, ring gear **(31)**, bearing **(27)**.
18. If necessary, remove the bolts **(33)**, to separate the ring gear **(34)** from its carrier **(1)**. Remove the bearing **(27)** from the ring gear **(31)**.
19. Unscrew the bolts **(18)** gradually and alternately, remove the housing **(21)**. Discard the seal **(19)**.
20. If necessary, take the piston **(22)** out of the housing, discard the seals **(24)** and **(26)**.
21. Remove the discs **(3)**, the driven plates **(2)** and the splined hub **(5)**.
22. Remove the springs **(20)**, the discs **(15)** separated by the brake plate **(16)** and the pressure plate **(17)**.
23. Take out the Belleville spring **/4**, the clutch housing **(14)**, and its the thrust washer **(10)**.
24. If necessary, take the seals **/8** and **/9** out (tractor 3000), the seal **/77** (tractor 3100) and the needle bearing **(6)**. Discard the parts. Remove screws **(12)**, separate the support hub **(11)** from the cover **(13)** (hit the back of the support, using a plastic hammer).

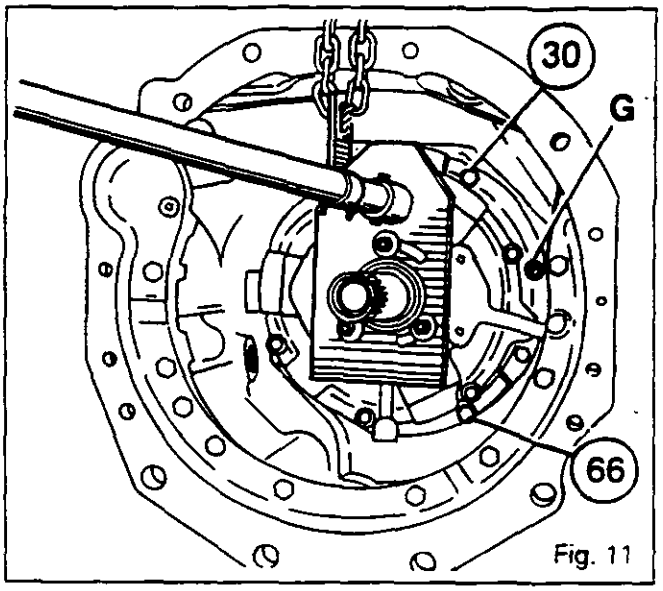
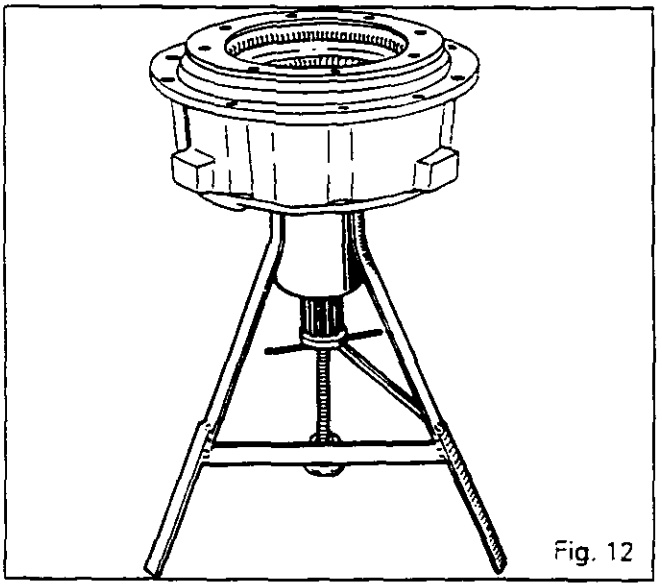


Fig. 11


Fig. 12

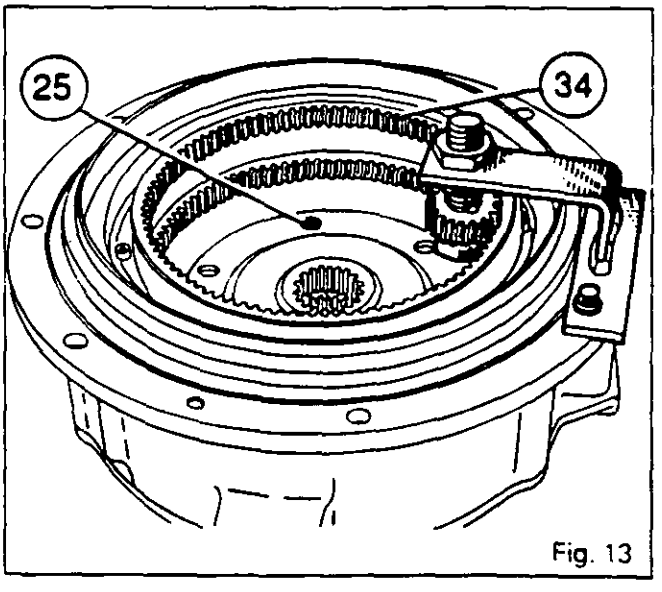


Fig. 13

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C. Removing and separating the planetary carrier assembly

25. Compress the planetary carrier assembly using special tool 3376920 M1 (Fig.14).
26. Remove the retaining ring **(72)**. Lift off the primary planetary carrier assembly.
27. Remove the secondary sungear **(61)** and the retaining ring **(49)** (if necessary).
28. Remove the circlip **(55)**. Remove the planetary carrier bearing **(57)** and the spacer **(56)**.
29. Separate the secondary planetary carrier **(39)** from the primary planetary carrier **(28)**.
30. Remove the retaining ring **(60)** and the bearing **(58)**.
31. Place the secondary carrier in vertical position. Tapping lightly on a wooden block, remove the needles **(63)** (Fig.15). Separate the planetary carrier from the primary sungear **(64)**, with the ring **(62)** and the deflector **(75)**.

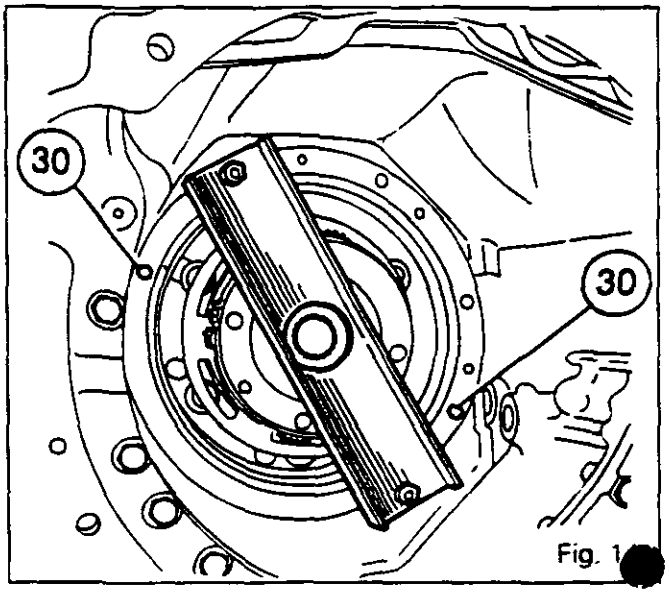


Fig. 1

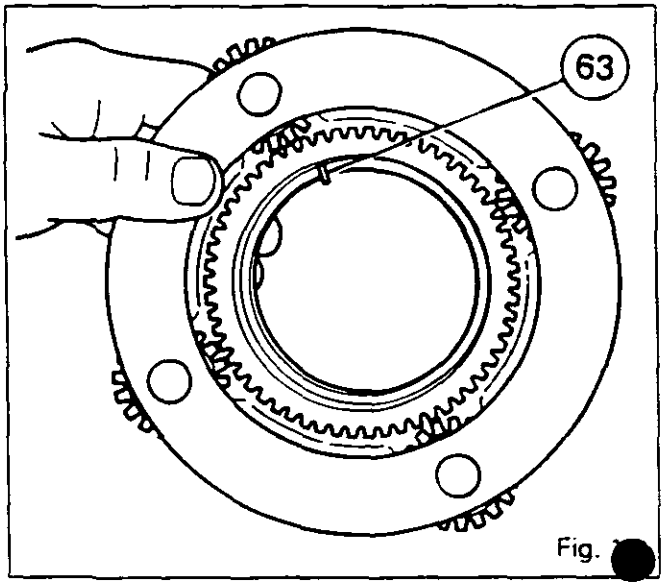


Fig.

D. Disassembling the rear clutch and brake

32. Remove the pressure plate **(38)**, the pressure plate springs **(65)**, the brake discs **(41)**, separated from the pressure plate **(44)**.
33. Remove the clutch housing assembly **(59)**, incorporating brake plate **(45)** and the last disc **(41)**. Remove the thrust washer **(51)**.
34. Remove the clutch cover screws **(46)**. Remove the cover **(47)** and the Belleville spring **/52**. Separate the brake/clutch plate **(45)**, the clutch discs **(50)** and the driven plates **(48)**. Remove the hub **(54)**.
35. Remove the screws **(43)**. Separate and remove the secondary brake housing **/42**. Mark its position.

E. Assembling the planetary carriers

36. Clean and inspect the parts. Replace any which are defective.
37. Make sure that the secondary shaft lubrication holes are not obstructed.
38. Check axial play and rotation of each planetary manually.
39. Onto the secondary planetary carrier **(39)**, fit the primary sungear **(64)** along with its bearing retaining ring **(62)** and the deflector **(75)**.

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40. Slide the three needles **(63)** into each hole of the primary sungear. They must be fully home to the bottom of the groove in the secondary planetary carrier.
41. Fit the ball bearing **(58)** and the retaining ring **(60)**.
42. Assemble the secondary planetary carrier on the primary planetary carrier **(28)**. To facilitate the entry of the gearteeth, turn the planetary gears.
43. Fit the spacer **(56)** and the ball bearing **(57)**. Install the circlip **(55)**.
44. Check the backlash between the primary planetary gears manually.
45. Fit the ring **(49)** (if it was removed) into the secondary sungear **(61)**.

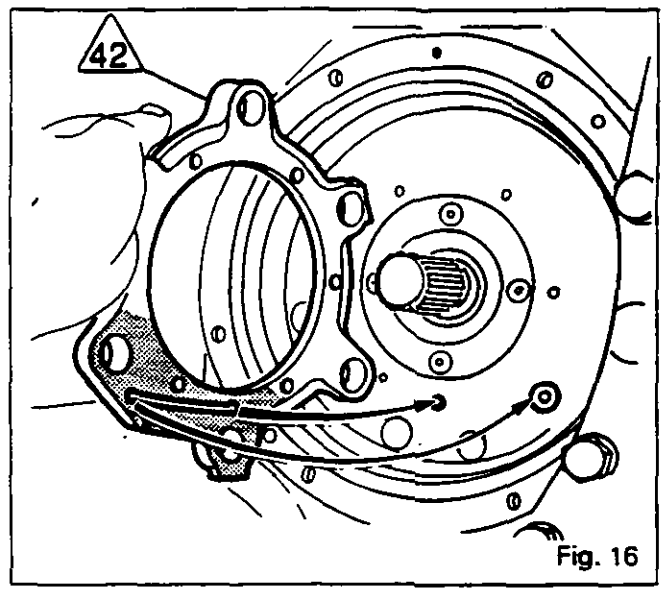


Fig. 16

F. Reassembling the rear clutch and brake

46. Clean and inspect the parts, replace any which are defective.
47. Direct a jet of compressed air into the reverse idler gear port to ensure that it is not obstructed.
48. Coat the seal mating surface of the brake housing **/42** with a sealing compound in the area of the lubrication passage (Fig.16).
49. Fit the input unit like it was during the dismantling. Coat the screws **(43)** with Loctite 241 and tighten them to a torque of 29 - 37 Nm.
50. To gain access to the bolts **(46)**, turn over the planetary carriers. Place the secondary planetary **(61)**, the housing **(59)** and the splined hub **(54)** with the internal splines facing downwards (Fig.17). Install the rear discs **(50)**, the driven plates **(48)** and the pressure plate **(45)**, the Belleville spring **/52** as Fig.1, then the cover **(47)**.
51. Centre the clutch housing assembly **(59)** using tool 3376887 M1 (Fig.18). Coat the bolts **(46)** with loctite 241 and torque them to 12 - 16 Nm. Remove the tool. Separate the housing assembly from the pla-netary carriers.
52. Coat the washer **(51)** with miscible grease and place it on the cover **(47)**.
53. Fit a disc **(41)** in the brake housing **/42**.

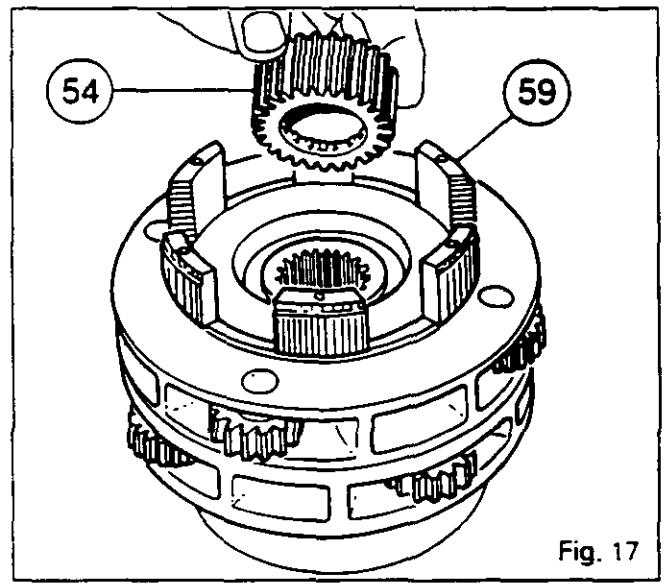
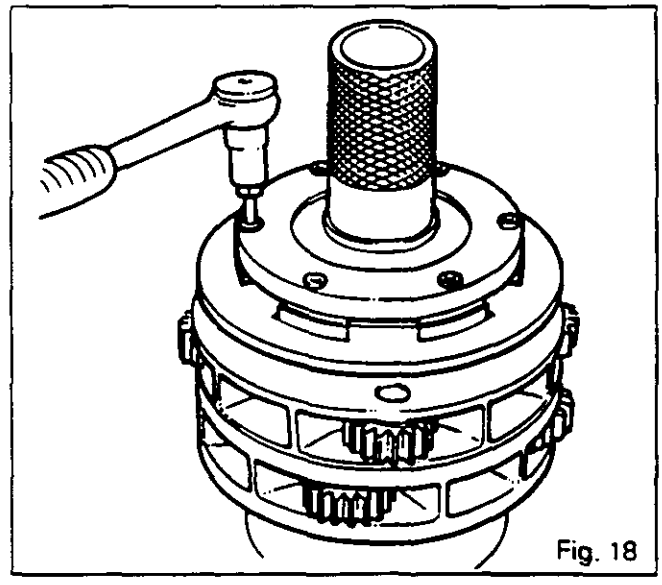


Fig. 17


Fig. 18

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54. Fit the clutch housing assembly **(59)** and the washer **(51)** on the shaft **(53)**. Fit the splined hub **(54)**, with its internal splines pointing upwards (Fig.19).
55. Fit the two other brake discs **(41)**, separated by the pressure plate **(44)**. Position the sungear **(61)** together with the ring **(49)**, on the clutch housing **(59)**.

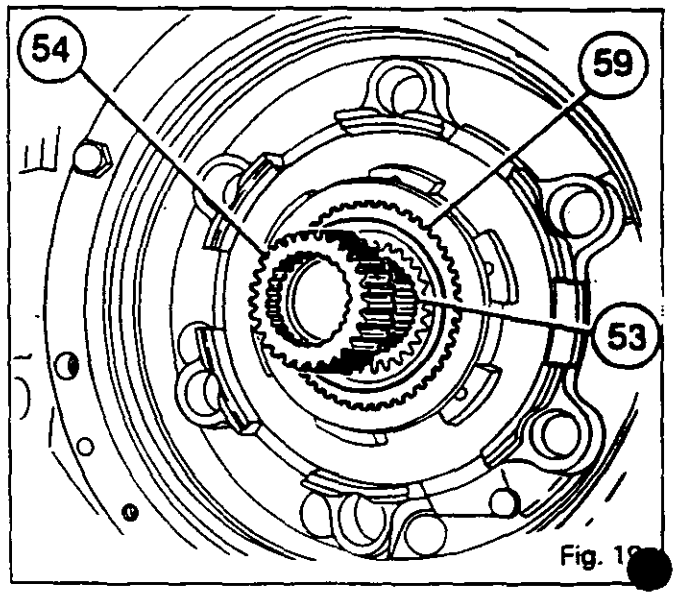


Fig. 19

G. Reassembling the cover, front clutch, brake and spacer housing

56. Clean the seal mating surface and the cover **(13)**. Check that the plug **(74)** is fitted. Make sure that the *lubrication passage is not obstructed.*
57. Clean the support hub **(11)**. Check that the lubrication holes are not obstructed.
58. *If necessary, fit and then position :*
Tractor 3000 (Fig. 20)
- The needle bearing **(6)** at 0 - 0,3 from face **H**
- The narrow seal **/9** pressing on shoulder **E**
- The wide seal **/8** at 0,2 - 0,6 from face **G**

Tractor 3100 (Fig. 21)
- The needle bearing **(6)** at 0 - 0,3 from face H
- the seal **/77** pressing on shoulder **E**.

Note : Use a press and a suitable assembly device to fit the bearing and the seals correctly.
59. After fitting the seals **/8** and **/9** make sure that orifices **O** are not obstructed (Fig. 20).
60. *Coat the surface of the cover which contacts the* support **(11)** with sealing compound.
61. Screw in two guide studs **G**. Position the support (Fig. 22) making sure that lubrication hole meets up with the corresponding passage in the cover (Fig. 22).
62. Fit the support into the cover (Fig. 22).
63. Remove the guide studs. Coat the screws **(12)** with Loctite 542, fit and torque to 14 - 20Nm.
64. Place the cover on a suitable support (Fig. 23).
65. Make sure that lubrication holes of the primary shaft **(7)** are not obstructed. Protect the splines to avoid damage to the seals **/8** and **/9** or **/77** (following type). Lubricate the shaft and slide it into the support from below. Retain the shaft in position *using the locally made tool (Fig. 23).*

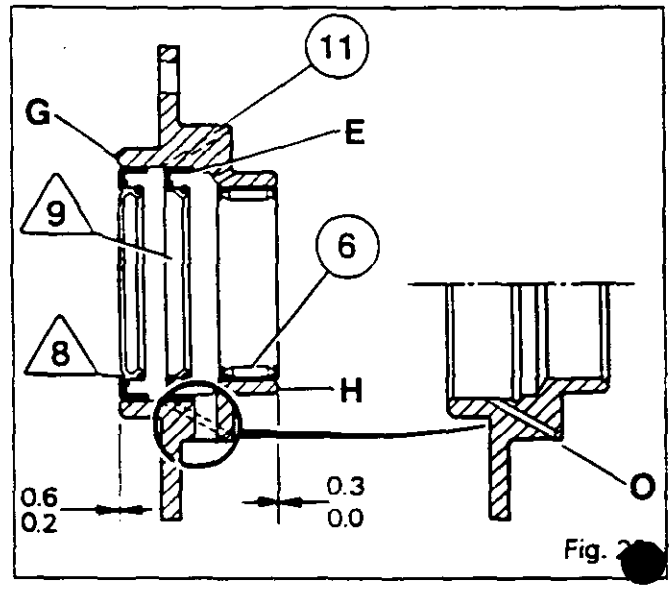


Fig. 20

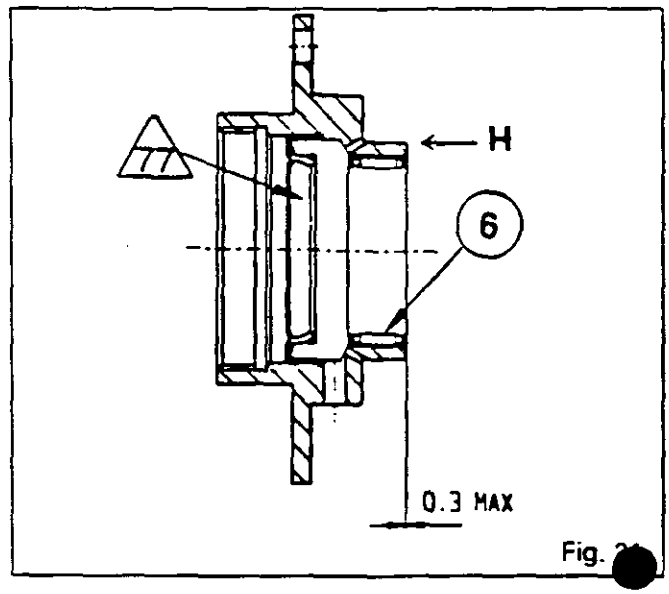


Fig. 23

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66. *Remove the spline protection.*
67. Coat the thrust washer **(10)** with miscible grease and place it on the housing **(14)**.
68. Place the housing with the thrust washer on the support **(11)**.
69. Fit the Belleville spring **/4** the correct way round (Fig. 1), a brake disc **(15)** and a brake plate **(16)**.
70. On the primary shaft **(7)** fit the splined hub **(5)** with its internal splines pointing upwards (Fig. 24). Fit the discs **(3)** and the driven plates **(2)**.
71. Fit the two other brake discs **(15)**, separated by the pressure plate **(17)**.
72. Reinstall the springs **(20)**. Fit the O'rings **(19)** and **(73)**.
73. Check that the blanking plugs **(23)** and **(29)** are in place. Make sure that the supply holes to the front and rear piston chambers in the spacer housing **(21)** are not obstructed.
74. Lubricate O'rings **(24)** and **(26)** and fit them respectively in the front piston **(22)** and in the spacer housing **(21)**.
75. Position the front piston in the spacer housing and drive in it using a plastic hammer, tapping gradually and alternately around its circumference.
76. Screw two diametrically opposed guide studs into the spacer housing **(21)** and position it on the front cover **(13)**, making sure that the spacer housing lubrication hole meets up with the corresponding passage in the cover.
77. Remove the guide studs. Fit and tighten the bolts **(18)** to a torque of 29 - 37 Nm. Connect a pressure gauge fitted with a shut-off valve to the front piston orifice. Connect a 0,3 bar compressed air line to the circuit. Close the shut-off valve and check that no pressure drop occurs within 1 minute.
78. If it was removed, reinstall the bearing **(27)** on the primary ring gear **(31)**. Place the secondary ring gear **(34)** on the secondary ring gear carrier **(1)**. Coat the bolts **(33)** with Loctite 241, fit and tighten to a torque of 12 - 16 Nm.
79. Screw two guide studs into the clutch housing **(14)**. Fit the secondary ring gear **(34)**, carrier **(1)**, primary ring gear **(31)** and bearing **(27)** assembly onto the primary shaft **(7)**. Remove the guide studs. Fit the bolts **(25)**. Immobilize the secondary ring gear **(34)** as Fig.13. Coat the bolts (25) with Loctite 241 and tighten to a torque of 29 - 37 Nm.
80. Fit the circlip **(69)**.
81. Lubricate, then fit seals **(35)** and **(36)** on the rear piston **(37)**.
82. Position the piston in the housing and drive it home using a plastic mallet , tapping gradually around its circumference. Maintain the rear piston in place by means of a suitable device. Check that the seals are leakproof using operation 77 above.

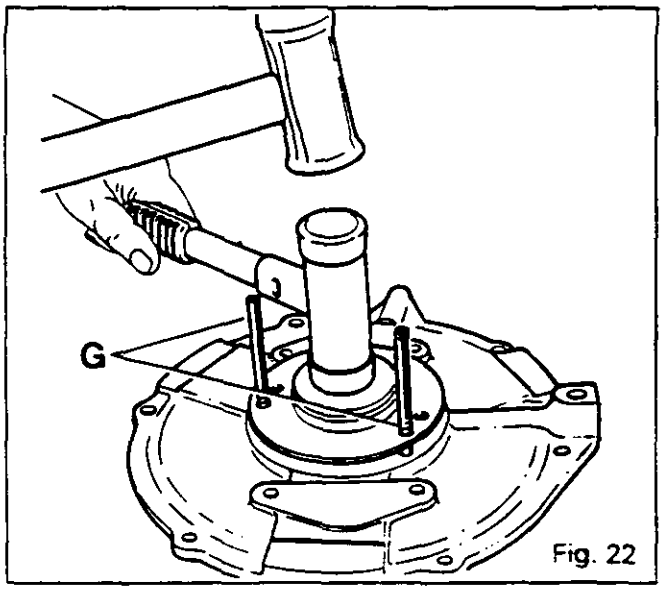
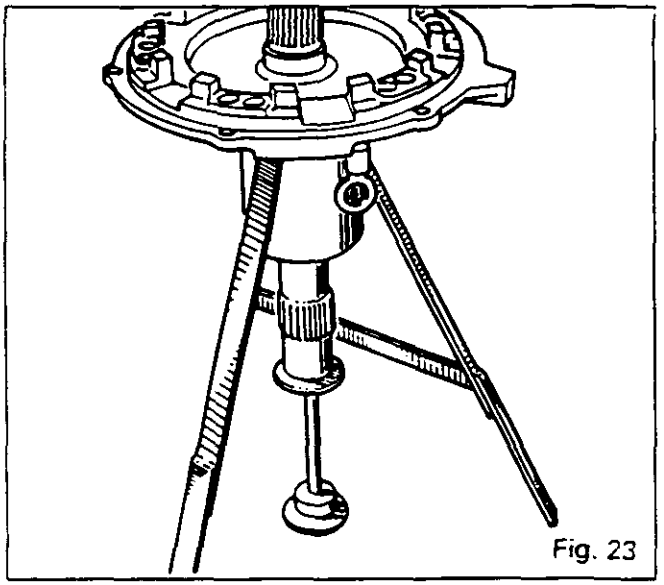


Fig. 22


Fig. 23

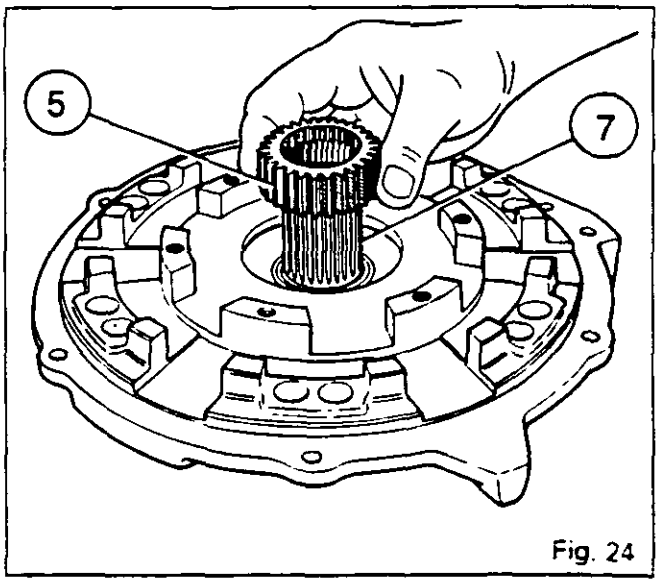


Fig. 24

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H. Shimming the planetary carriers

This operation consists of obtaining a play **J1 from 0,50 to 0,70** between the stop **(70)** and the front face of the primary planetary carrier **(28)** (Fig. 25).
This shimming must be carried out if any operation is performed on the following parts :

- housing **(21)**,
- cover **(13)**,
- support **(11)**,
- washer **(10)**,
- housing **(14)**,
- ring gear carrier **(1)**,
- bearing **(27)**,
- ring gear **(31)**,
- circlip **(69)**,
- stop **(70)**,
- planetary carrier **(28)**,
- bearing **(58)**,
- spacer **(56)**,
- bearing **(57)**,
- ring **(49)**,
- housing **(59)**,
- cover **(47)**,
- washer **(51)**.

To do this shimming correctly, the springs **(65)**, the pressure plate **(38)** and the shims **[71]** must not be fitted.

Note : If shimming is not necessary, continue operations as from 89 to 104.

83. Fit stop **(70)** on the primary shaft **(7)**.

On the spacer housing (21)

84. Using calibrated pins "**P**" 3376925 M1 and a depth gauge with an engineer straight edge, measure dimension **X** (Fig. 26) at two opposing points. Calculate the mean of the two measurements.
Note : Substract the thickness of the straight edge.

On the reverse shuttle housing (40)

85. Remove the guide studs. Retain the housing using two bolts **(30)** diametrically opposed (Fig. 14).

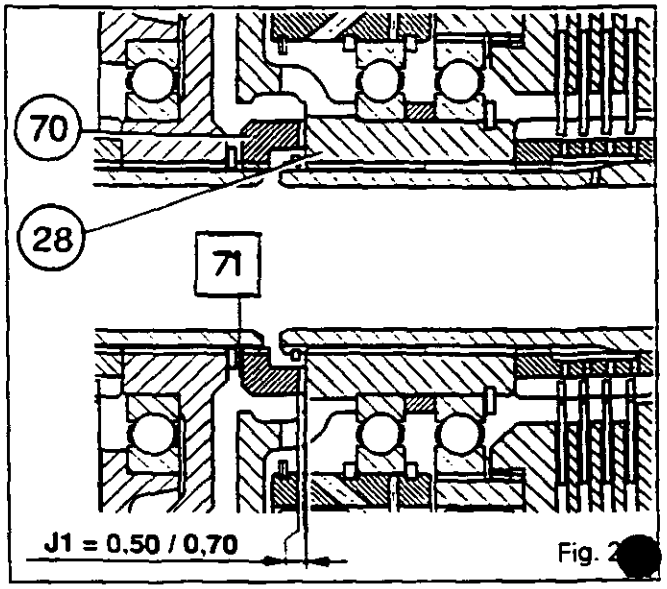
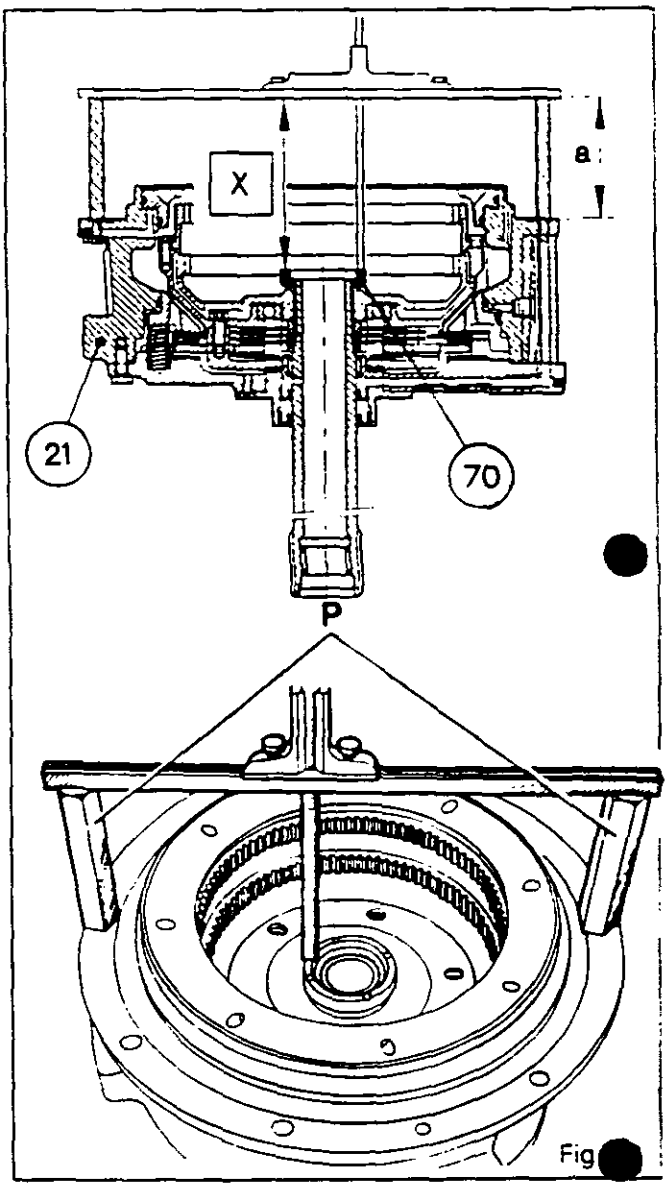


Fig. 2



Fig

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86. Slide the planetary carrier assembly on the shaft and place it fully home, using a compression tool 3376920 M1 (Fig. 27).
87. Screw the pins **P** (Fig. 27) in contact with the housing. Using depth gauge with an engineer straight edge, measure dimension **Y** (Fig. 27).
Note : Substract the thickness of the straight edge.
88. Calculate the play to obtain :
J1.= 0,50 to 0,70
Find the initial play from the formula :
J1 = (X+Y) - 220
where 220 = 2a
a = lengh of calibrated pins
Depending of the initial play, select the thickness of shims needed **[71]** to obtain **J1** at the tolerance shown.
89. Place the shim pack **[71]** between circlip **(69)** and stop **(70)** coated with miscible grease (Amber Technical or equivalent).
90. Remove the compression tool and the planetary carriers (if shimming). Coat the springs **(65)** with miscible grease and reinstall them. Position the pressure plate **(38)**, making sure that the notches line up with the lugs on the brake housing **/42**. Place the planetary carriers on the shaft **(53)** and compress them using tool 3376920 M1 (Fig. 14).
91. Fit the retaining ring **(72)**. Remove the tool. Check manually the play between the secondary planetary gears backlash.

I. Reinstall primary shaft , cover and housing assembly

92. Place new O'rings **(32)**, **(67)**, **(68)** coated with grease, on the reverse shuttle housing. Remove the two bolts **(30)** retaining the reverse shuttle housing. Screw two guide studs in diametrically opposed.
93. Fix the lifting bracket 3376883 M1 on the cover **(13)**. Reinstall the primary shaft assembly **(7)**, cover and housing **(21)** (Fig. 11) lining up the lubrication holes and the circuit 17 bar.
94. Turn the shaft so as to engage the planetary gears in the ring gears.
95. Fix two screws **(30)**. Remove the guide studs. Fit six other bolts (Fig. 11). Fit screws and tighten to a torque of 45 - 60 Nm.
96. Fit three screws **(66)** and tighten to a torque of 25 - 35 Nm (Fig. 11).
97. Remove the lifting bracket. Reinstall the clutch slave cylinder(s) (for different type, see section 5P01 or 5Q01). Coat only the bolts 3000 with Loctite 542 and tighten to a torque of :
- 36 - 46 Nm (3000)
- 25 - 35 Nm (3100)

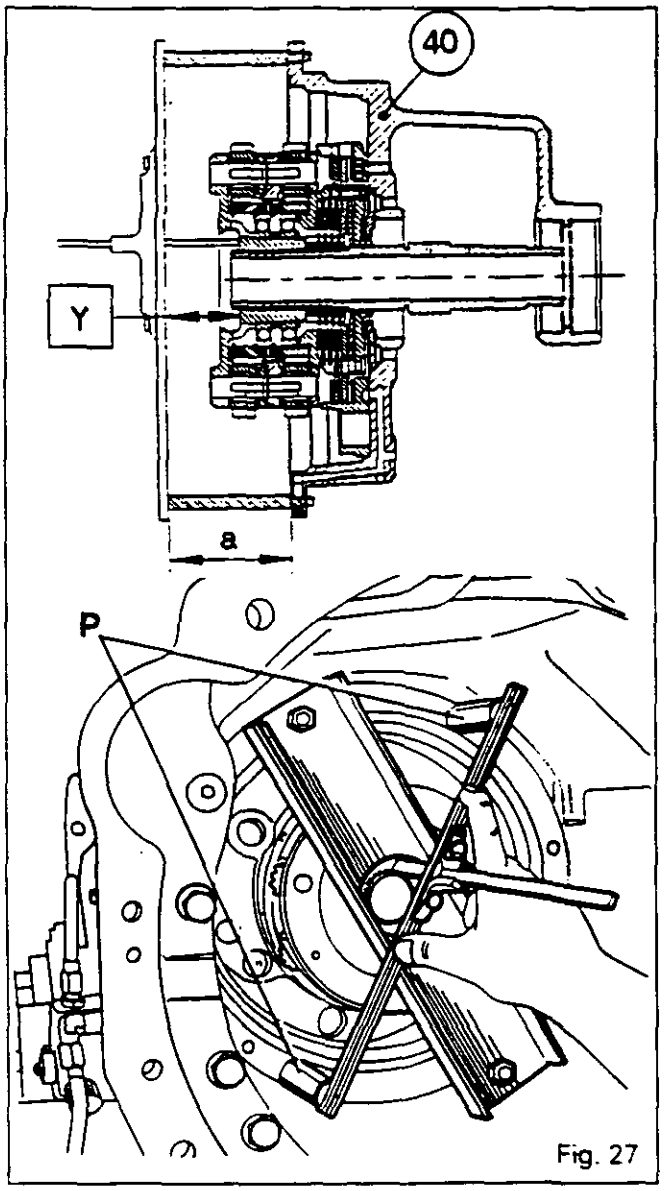


Fig. 27

98. Reverse operations 3 and 4.
99. Clean the clutch housing with a solvent.
100. Replace the sealing of the input shaft
- **3000 serie tractors** : see operation 14, section 3A03.
- **3100 serie tractors** : see operation 19, section 3A04.
101. Couple the tractor together at the engine and the gearbox (section 3A03 - 3000 serie tractor, section 3A04 - 3100 serie tractor).
102. Fill the rear axle with oil to the correct level.
103. Road test all controls and Dynashift A, B, C and D ratios.
104. Check the sealing of the unions.

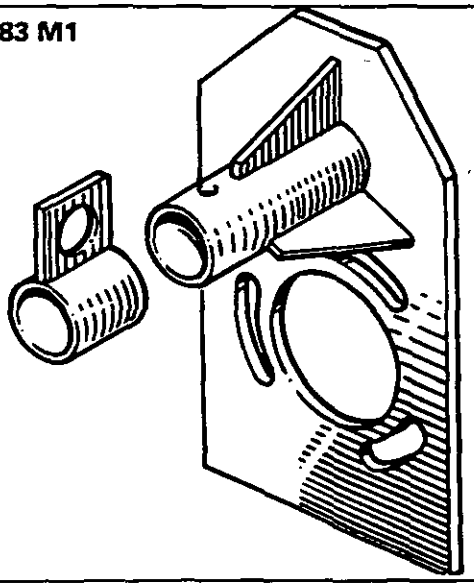
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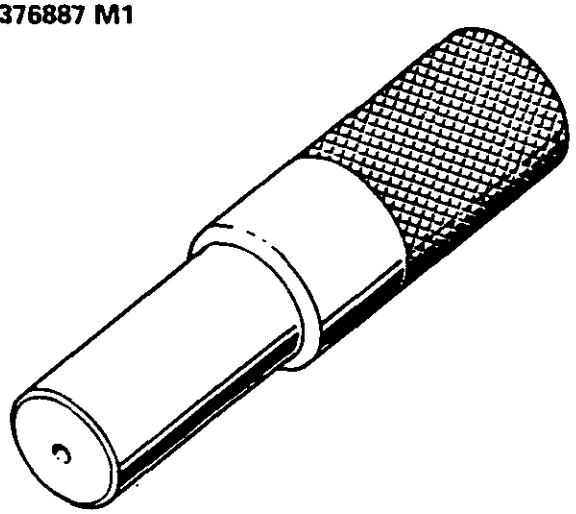
J . Service tools

- Lifting bracket for input unit No 3376883 M1
- Centering tool No 3376887 M1
- Secondary ring gear retaining tool No 3376888 M1
- Planetary carriers compression tool No 3376920 M1
- Calibrated pins No 3376925 M1.

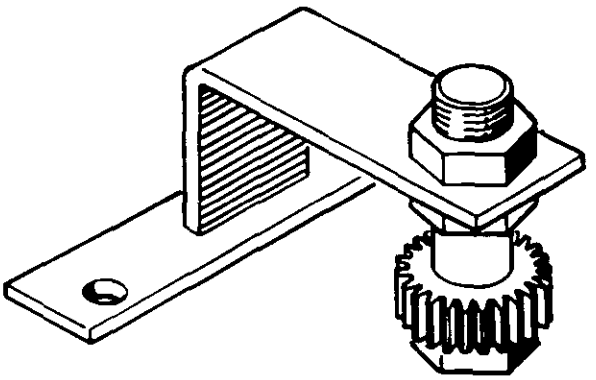
3376883 M1



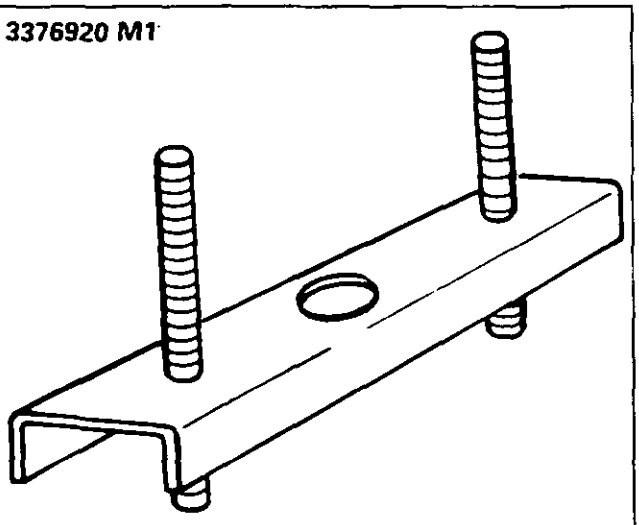
3376887 M1



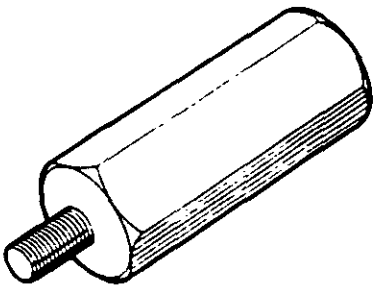
3376888 M1



3376920 M1



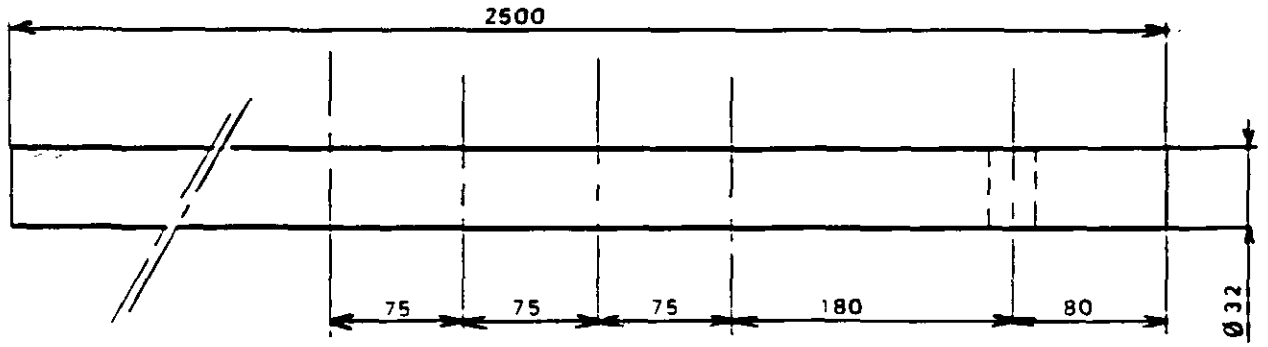
3376925 M1



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Tool to be made up locally

- Adaptor bar



5 holes Ø 7 mm

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5 R03 Reverse shuttle

CONTENTS

- **General** ____ 2
- **Operation** ____ 2

A. **Input unit removal** ____ 5

B. **Dynashift dismantling** ____ 6

C. **Reverse shuttle dismantling and reassembly** ____ 6

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E. **Input unit assembly and refitting** ____ 8

F. **Service tool** ____ 9

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Gearbox - Dynashift

General

The reverse shuttle transmits drive from the dynashift to the mainshaft located at the front of the main gearbox.

The reverse shuttle assembly is located at the rear of the input unit behind the Dynashift. It comprises :
- two helical gears **(5)** and **(23)** running on two needle roller bearings **(6)** and **(20)**.
- a synchromesh assembly which the hub **(2)** is splined onto the secondary shaft **(19)**.
- a synchromesh selector rail and fork assembly
- a secondary shaft **(19)** mounted on taper roller bearings **(24)** **(37)** and **(9)** **(38)** supported at both ends in the reverse shuttle housing.
- a compound gear **(15)** in constant mesh with the gear **(23)** and the gearbox input gear **(67)**.

Operation

Forward drive

When moved rearwards the synchromesh coupler connects gear **(5)** with shaft **(19)** and gear **(67)** with shaft **(69)**. Gear **(5)** transmits drive to main shaft **(69)** via gear **(67)** in constant mesh with gear **(5)**.

Reverse drive

When moved forward the synchromesh coupler connects gear **(23)** with shaft **(19)**. The drive is transmitted to main shaft **(69)** via gear **(23)**, theth of gear **(15)** and gear **(67)**.

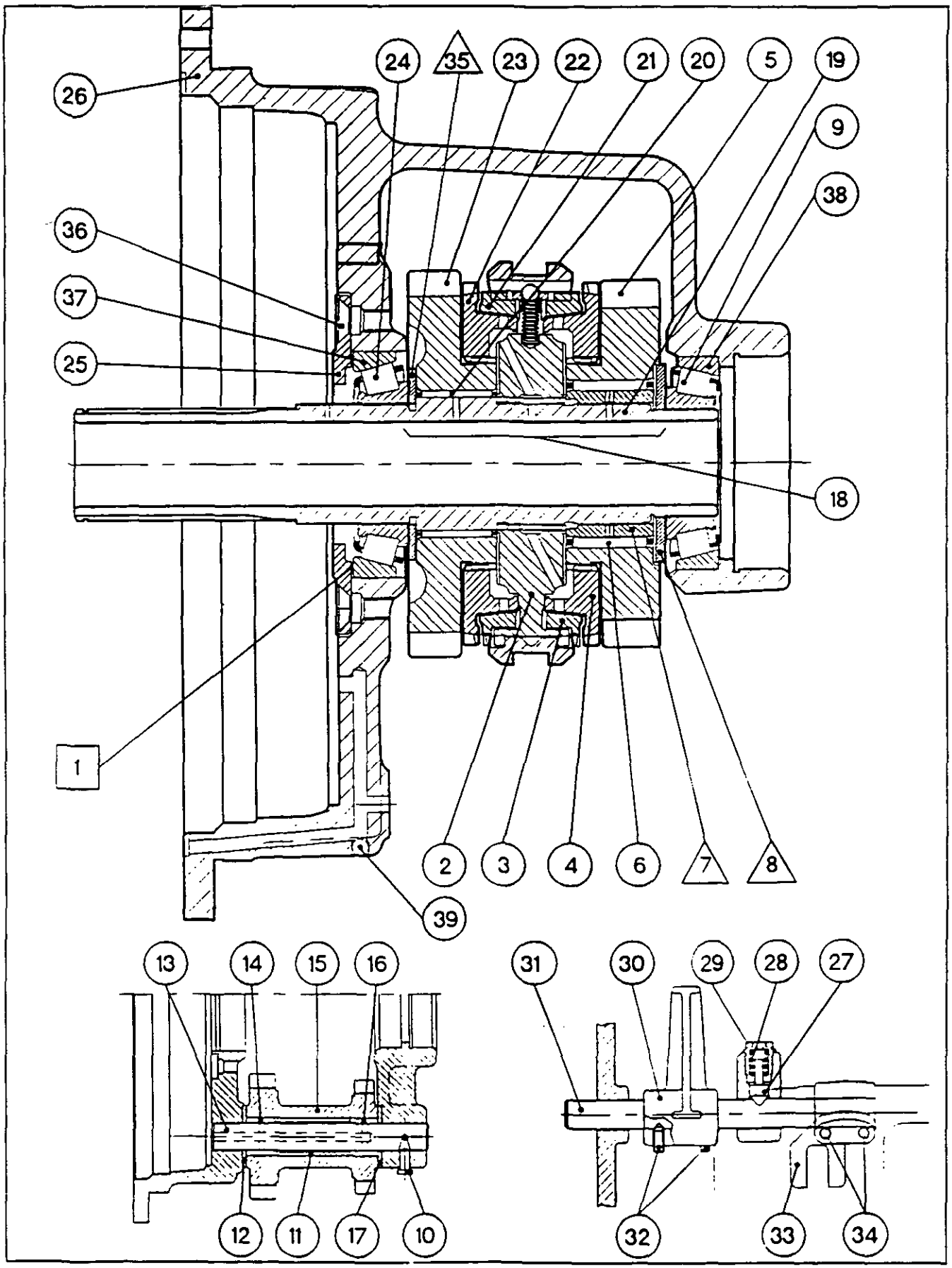
Service tool

Lifting bracket for input unit, No 3376889 M1 (see paragraph F).

Key

(1) Shims
(2) Synchromesh hub
(3) Synchromesh ring
(4) Synchromesh cone
(5) Gear
(6) Needle roller bearing
(7) Bush
(8) Thrust washer
(9) Rear bearing cone
(10) Screw
(11) Spacer
(12) Thrust washer
(13) Reverse gear pin
(14) Needle roller bearing
(15) Compound gear
(16) Needle roller bearing
(17) Thrust washer
(18) Synchromesh/gear assembly
(19) Secondary shaft
(20) Needle roller bearing
(21) Synchromesh ring
(22) Synchromesh cone
(23) Gear
(24) Front bearing cone
(25) Retaining plate
(26) Housing
(27) Locking pin
(28) Spring
(29) Plug
(30) Fork
(31) Selector rail
(32) Adjusting screw
(33) Selector
(34) Adjusting screw
(35) Thrust washer
(36) Screw
(37) Front bearing cup
(38) Rear bearing cup
(39) Ball

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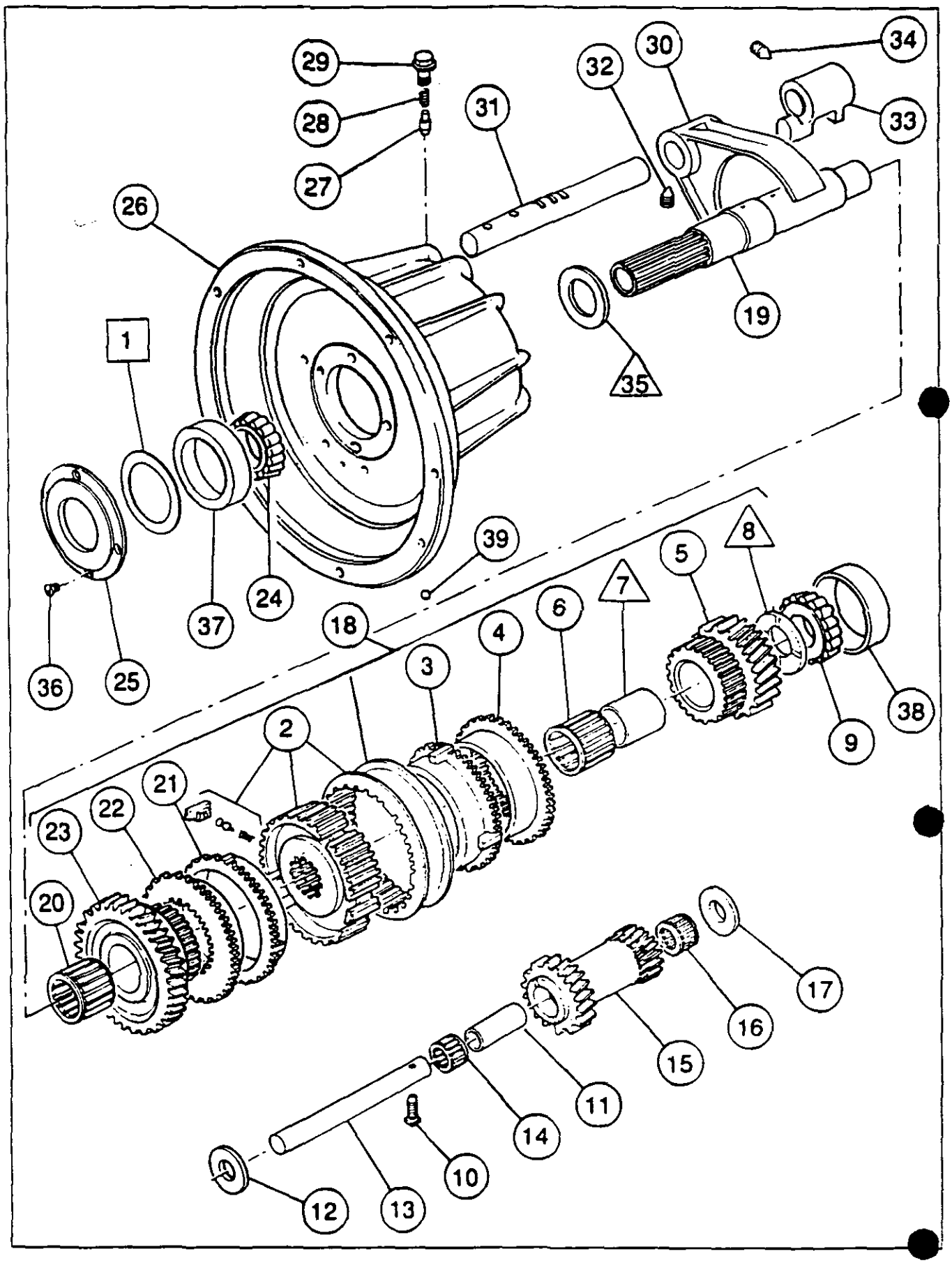


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5 R03.4

Gearbox - Dynashift



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Gearbox - Dynashift

A. Input unit removal

Version with shimming of layshaft

Example : Replacement of reverse shuttle housing **(26)**. To obtain a correct shimming of the layshaft bearings, the gearbox removal is necessary.

3000/3100 series tractors

1. Split the tractor between the gearbox and the rear axle (section 3B02).
2. Remove the selector cover, carry out operations 11 and 12, section 5X01.

3000 series tractors

3. Disconnect the gearbox from the engine, carry out operations 9 and 11-12, section 3A03. Remove the PTO shaft.
4. Remove the pipes and the clutch slave cylinder.

3100 series tractors

5. Disconnect the gearbox from the engine, carry out operations 3, 4 and 12 to 14, section 3A04. Remove the PTO shaft.
6. Remove the pipes and the clutch slave cylinders.

Version without shimming of layshaft

3000 series tractors

7. Split the tractor between the engine and the gearbox (section 3A03). Remove the PTO shaft.
8. Remove the pipes and the clutch slave cylinder.
9. Drain the gearbox only.
10. Remove the selector cover, carry out operations 7 to 12, section 5X01.

3100 series tractors

11. Split the tractor between the engine and the gearbox, section 3A04.
    Remove the PTO shaft.
12. Remove the pipes and the clutch slave cylinders.
13. Drain the gearbox only.
14. Remove the selector cover, carry out operations 7 to 12, section 5X01.

Version with or without layshaft shimming

3000/3100 series tractors

15. Remove the input unit, carry out operations 5 and 7 to 9, section 5R01.
16. Remove the plug **(29)**, the spring **(28)** and the locking pin **(27)**. Remove the screws **(32)**. Remove selector rail **(31)** and the fork **(30)**.
    Note : The locking pin (27) can not be replaced by those of 1st/Snd and 3rd/4th of the gearbox.
17. Place the input unit in vertical position.

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B. Dynashift dismantling

18. Unscrew the three bolts **(66)** (Fig. 3) gradually and alternately.
19. Using the lifting bracket 3376889 M1, remove the primary shaft assembly **(7)**, cover **(13)**, housing **(21)** (Fig. 3). Discard O'rings **(32)**, **(67)** and **(68)** (Fig. 4).
20. Remove the planetary carrier assembly, carry out operations 25 and 26, section 5R02.
21. Remove the rear clutch and brake, carry out operations 32 - 33 and 35, section 5R02.

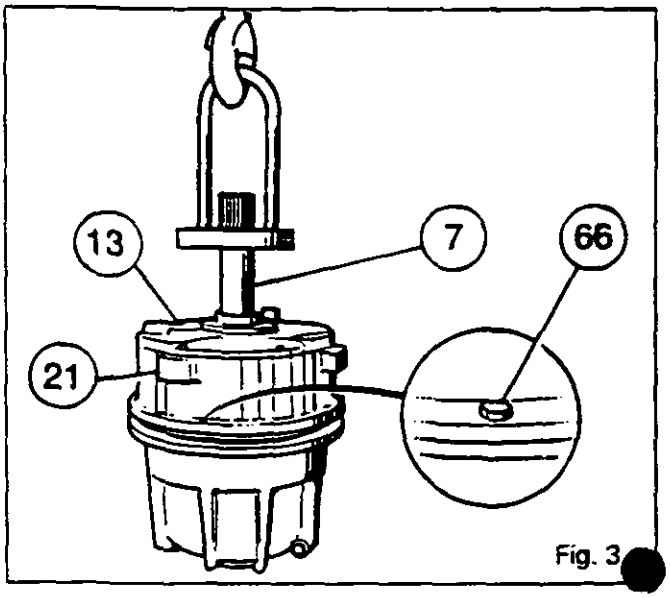


Fig. 3

C. Reverse shuttle, dismantling and reassembly

Dismantling

22. Remove the screws **(10)**. Take out pin **(13)**. Remove the compound gear, the washers **(12)**, **(17)**, the needle roller bearings **(14)** **(16)** and the spacer **(11)**.
23. Remove the bolts **(36)**. Remove the retaining plate **(25)**, the shims **(1)** and the cup **(37)**.
24. Take out the secondary shaft **(19)** (Fig. 5).
25. Remove gear/synchro assembly **(18)** (Fig. 5) and the washer **/8**.
26. Remove the cone **(9)** and the cup **(38)**.
27. On the gears/synchro assembly, separate : the gear **(5)**, the bush **/7**, the needle roller bearing **(6)**, the cone **(4)**, the ring **(3)**, the synchromesh **(2)**, the ring **(21)**, the cone **(22)**, the gear **(23)**, the needle roller bearing **(20)**.
28. If necessary, take out the cone **(24)** from the shaft and remove the washer **/35**.

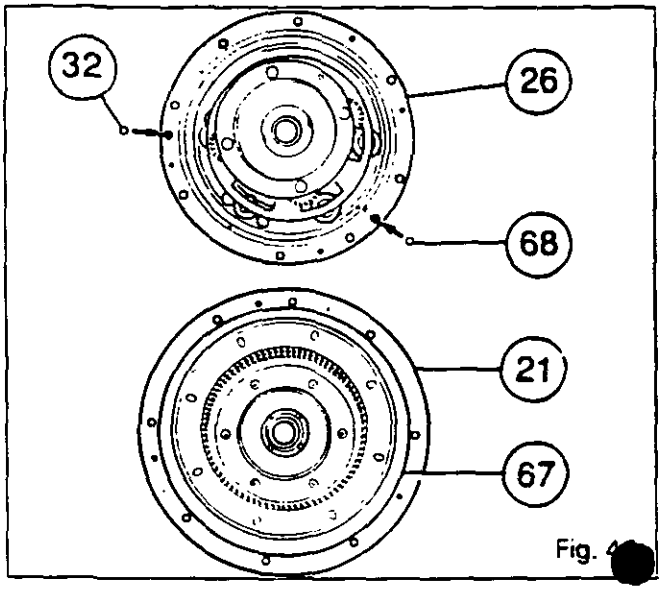


Fig. 4

Refitting

29. Clean and check the parts, replace any parts which are defective.
30. Check the parts and oilways on secondary shaft **(19)**, pin **(13)** and housing **(26)** are all clear. Check ball **(39)** is present.
31. Lubricate the shaft, the cones and the bearing cups.
32. Check for the end float between the synchromesh rings and the cones (section 5A01, p 9).

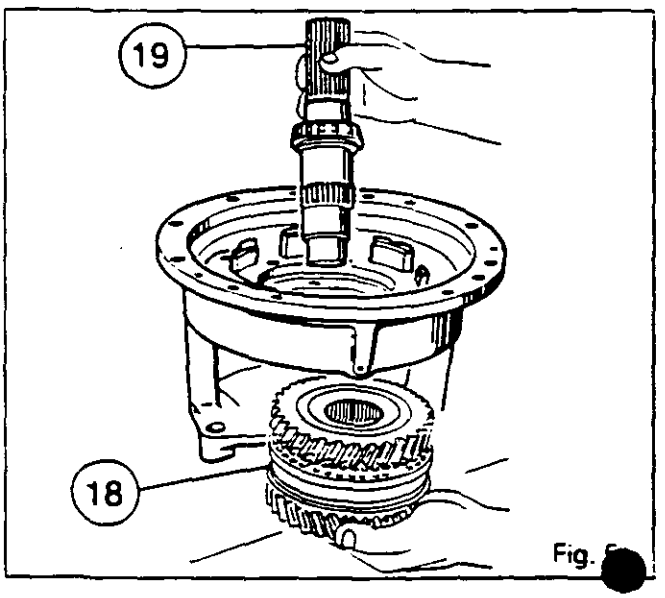


Fig. 5

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33. If removed, place the washer **/35** pointing the grooves towards the gear **(27)**. Unsing a press and an appropriate device, fit the cone **(24)** fully home on the washer.
34. Fit gear **(5)** and bush **/7**. Fit the needle roller bearing **(6)** the cone **(4)**, the ring **(3)**, the synchromesh, the ring **(21)**, the cone **(22)**, the gear **(23)**, the needle roller bearing **(20)**.
35. Reverse operations 25 and 26.
    Note : Place the washer /8\ pointing the lubrication grooves towards the gear (5) (Fig. 6).
36. Centre the washer **/8**. By the front bore of the unit, fit the secondary shaft **(19)** in synchromesh/gear assembly **(18)**. Place recess **"E"** fully home on the synchromesh **(2)** (Fig. 7).
37. Position the cup **(37)** and the retaining plate **(25)** without the shims **[1]**.
38. Fit and tighten screws **(36)** to a torque of 36 - 46 Nm.
39. Position the unit in a vice.
40. Shim (Fig. 8) to obtain a preload :
    P1 = 0,05 to 0,15

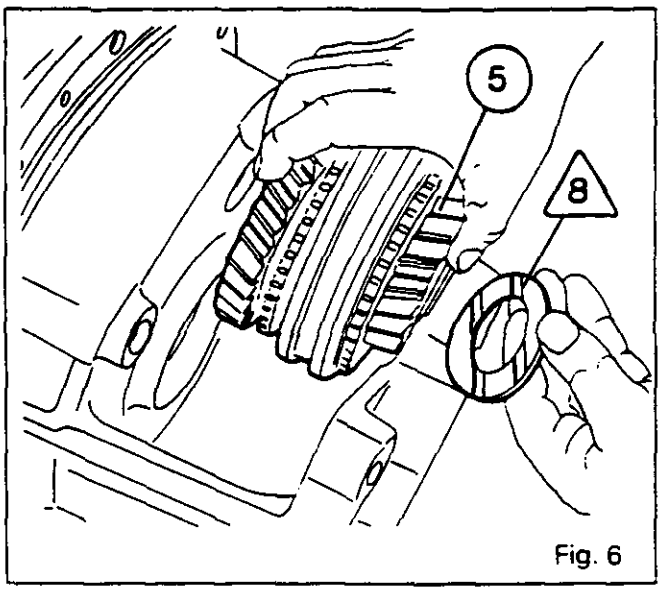


Fig. 6

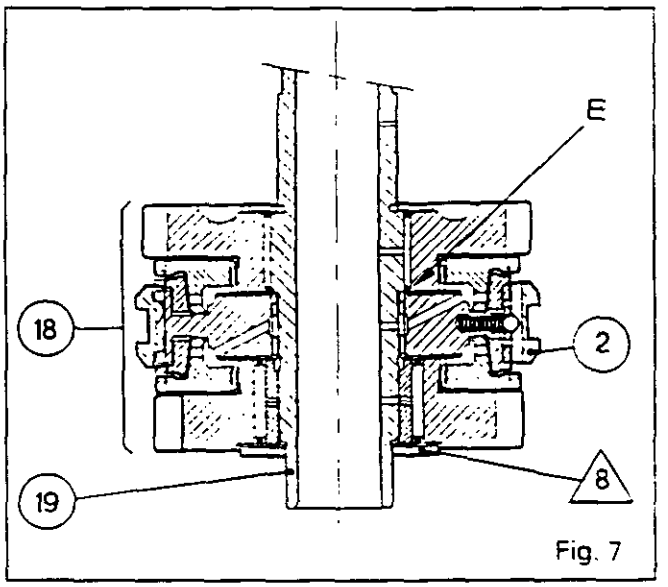


Fig. 7

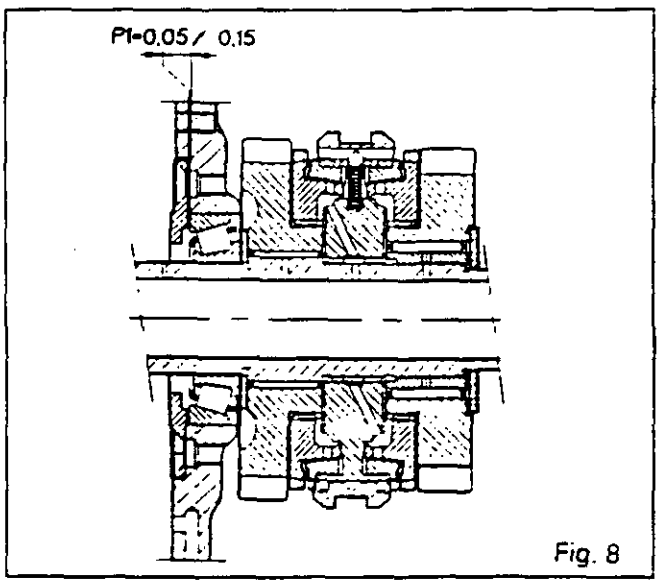


Fig. 8

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41. Place the tip of the dial gauge at the end of shaft **(19)** (Fig. 9).
42. Pull on the shaft while turning it alternately from right to left to seat the cones correctly in the cups.
43. Set the dial gauge to zero.
44. Repeat operation 42 while pushing.
    Note : To get the correct preload, reduce the end float to obtain a value between 0,10 and 0,15.
45. Depending of the end float noted, select shims thickness **[1]** to obtain **P1**.
46. Place the unit in vertical position. Remove the screws **(36)**. Remove the retaining plate **(25)**.
47. Place shims selected during operation 45, making sure that they are correctly centered on the cup **(37)**.
48. Refit retaining plate **(25)**. Fit and tighten bolts **(36)** coated with loctite 241 to a torque of 36 - 46 Nm.
49. Check the end float and the gears **(5)** and **(23)** running. Manually, check the free running of shaft **(19)**.
50. Refit compound gear **(15)**. Reverse operation 22.
51. Coat the screw **(10)** with Loctite 241 and tighten to a torque of 28 - 43 Nm.
52. Check manually the end float and the backlash of the compound gear.

D. Dynashift reassembly

53. Refit rear clutch and brake, carry out operations 46, 48, 49 and 52 to 55, section 5R02.
    Note : The planetary carrier shimming is required in case of intervention on the housing (26) and the retaining plate (25).
    If shimming is necessary (see paragraph H, section 5R02). With or without shimming, carry out operations 89 to 91, section 5R02.

E. Input unit assembly and refitting

54. Place new O-rings **(32)** **(68)** and **(67)** respectively on the reverse shuttle housing **(26)** and the housing **(21)** (Fig. 4).
55. Using the lifting bracket 3376889 M1, refit primary shaft assembly **(7)**, cover **(13)** and housing **(21)** (Fig. 3) lining up the galleries of the lubrication circuit and the low pressure circuit 17 bar.
56. Turn the shaft so as to engage the planetaries in the ring gears.

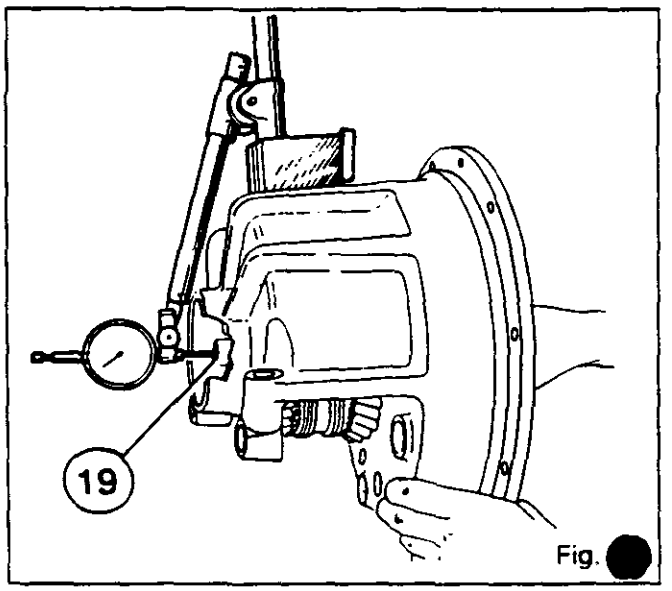


Fig.

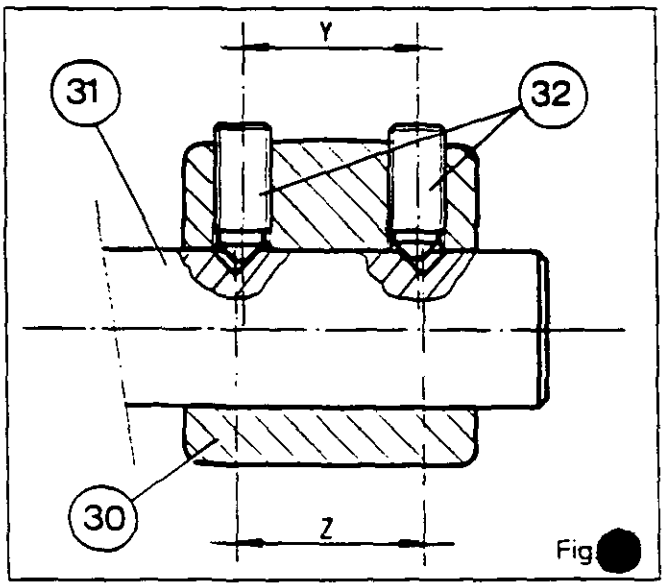


Fig.

57. Fit bolts **(66)** (Fig. 3) and tighten gradually to a torque of 25 - 35 Nm.
58. Manually check that shaft rotates correctly.
59. Clean the fork threaded holes.
60. Fit and adjust the fork.

Principle :
The fork **(30)** is positioned by means of the difference in the spacing **Y** to the tapped holes and the spacing **Z** of the spot facings in the guide rail **(31)**.
The fork can be adjusted to move to different points by acting on either the front or rear screws **(32)** depending on what adjustment required (Fig. 10).

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61. Fit the fork **(30)**, the locking pluger **(27)**, the spring **(28)** and the plug **(29)**. Tighten the plug to a torque of 50 - 70 Nm. Fit the screws **(32)** coated with Loctite 221.
62. Select forward gear. Hold the sliding coupler to the gear.
63. Check that a clearance exists between the sliding coupler and the fork pads. If there is no clearance adjust via screws **(32)**.
64. Repeat operations 62 and 63 but in this time select reverse gear. Adjust as required.
65. Tighten the screws to a torque of 35 Nm without changing the setting.
66. Refit the input unit, carry out operations 10 to 15, section 5R01.
67. Refit the clutch slave cylinder(s) (different types, see section 5P01 or 5Q01, paragraph G, operation 5). Fit the screws.
    - 3000 series tractors : coat with Loctite 542 and tighten to a torque of 36 - 46 Nm.
    - 3100 series tractors : tighten to a torque of 25 - 35.
    Reconnect the pipes.

Version with shimming of layshaft

68. Shim the layshaft carry out operations 25 to 35, section 5T01.
69. Adjust reverse shuttle selector, carry out operations 21 to 23, section 5R01.
70. Remove the selector cover, carry out operations 33 to 38, section 5X01.

3000 series tractors

71. Connect gearbox to engine, carry out operations 13 to 16, section 3A03.
72. Carry out operations 17 and 18, section 3A03.

3100 series tractors

73. Connect, gearbox to engine, carry out operations 15 to 23, section 3A04.

3000/3100 series tractors

74. Connect the tractor between the gearbox and the rear axle, section 3B02.

Version without shimming of layshaft

75. Adjust reverse shuttle selector, carry out operations 21 to 23, section 5R01.
76. Refit the selector cover, carry our operations 33 to 43, section 5X01.

3000 series tractors

77. Connect the tractor between the engine and the gearbox, section 3A03.

3100 series tractors

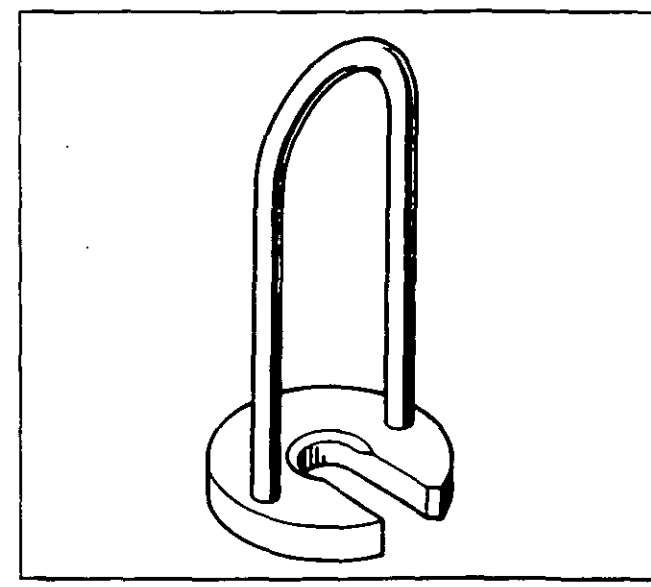
78. Connect the tractor between the engine and the gearbox, section 3A04.

3000/3100 series tractors

79. Top up the oil in the rear axle housing. Bleed the clutch circuit, section 5Q01, paragraph H.
80. Road test all the controls.
81. Check for leaks at the selector cover seal mating surface.

F. Service tool

- Lifting bracket, No 3376889 M1



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5 S01 Mainshaft

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B. **Disassembling and reassembling the mainshaft** ____ 4

C. **Final operations** ____ 6

D. **Service tools** ____ 7

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Gearbox - Dynashift

General

The mainshaft **(69)** is fitted on the two taper roller bearings **(1) (2)** and **(16) (17)** which are supported by the two lower bearings of the main gearbox. The front end houses the input gear **(67)**.
Between the two lower bearings, it supports the 1st **(7)** and 2nd **(14)** driving gears which run free and the 1st and 2nd gear synchromesh assembly **(11)** whose hub is splined onto it.
At the rear end, it supports the 3rd and 4th gear synchromesh assembly **(23)**.
The bore in the rear end carries a needle-roller bearing which supports the front end of the output shaft. The moving parts are lubricated by a central oilway and radially-drilled holes. The taper roller bearings are preloaded by means of a shim **/4** and shim adjusters **[3]** located behind the bearing cup **(2)**.

Service tools

See part D.

A. Preliminary operations

The gearbox must be removed in order to dismantle the mainshaft.

3000 - 3100 tractors

1. Split the tractor between the gearbox and the rear axle, as per Section 3 B02.

3000 tractor

2. Separate the gearbox from the engine, as per Section 3 A03.
   Support the gearbox with a sling and carry out procedures 9 and 11 to 12. Remove the power take-off shaft.
   Remove the grommets and the clutch slave cylinder pipes at the front end of the gearbox.

3100 tractor

3. Separate the gearbox from the engine. Support the gearbox with a sling and carry out procedures 3, 4 and 12 to 14 (as per Section 3 A04). Remove the PTO shaft.
   Remove the grommets and the clutch slave cylinder pipes at the front end of the gearbox.

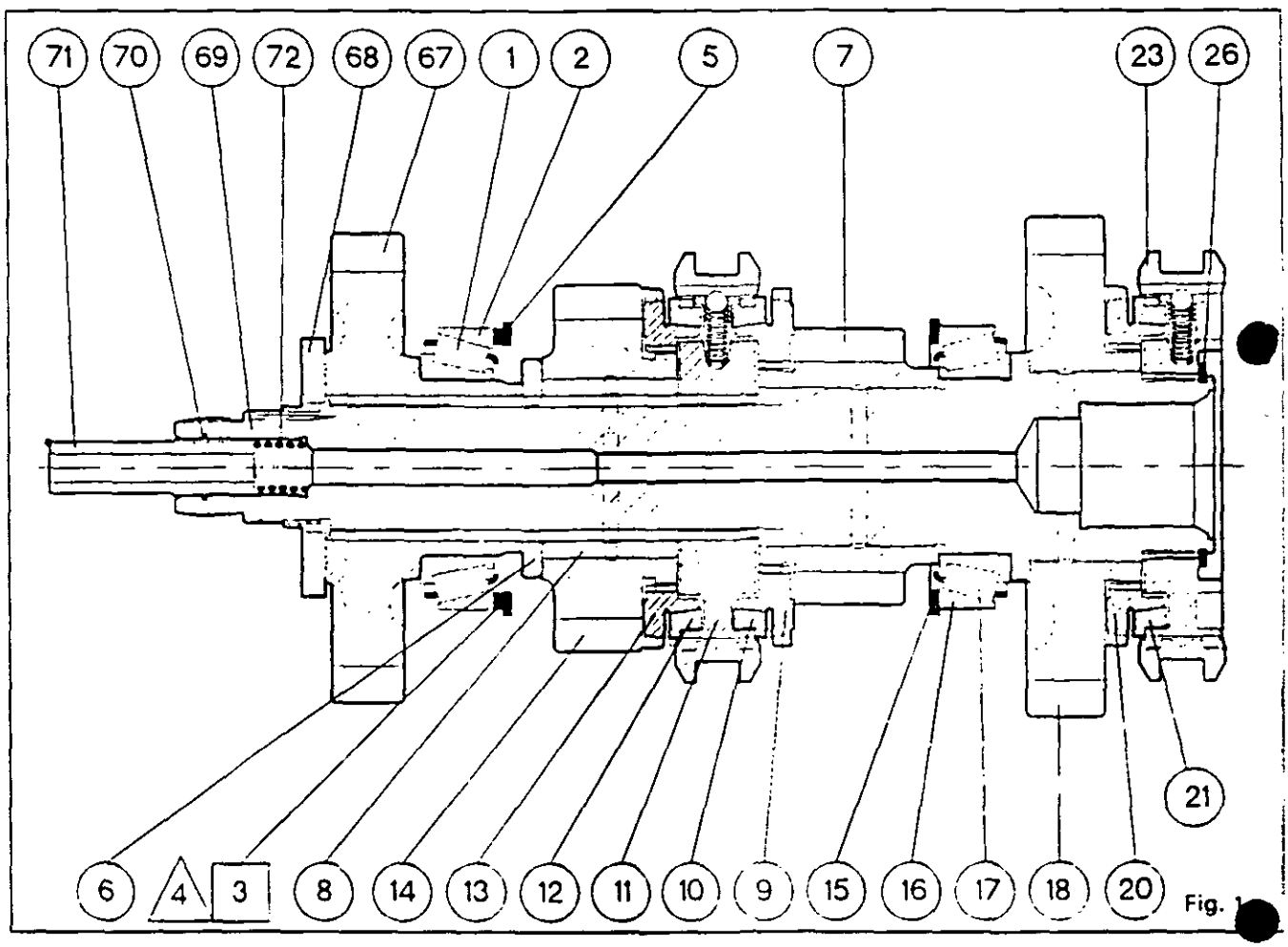


Fig. 1

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Gearbox - Dynashift

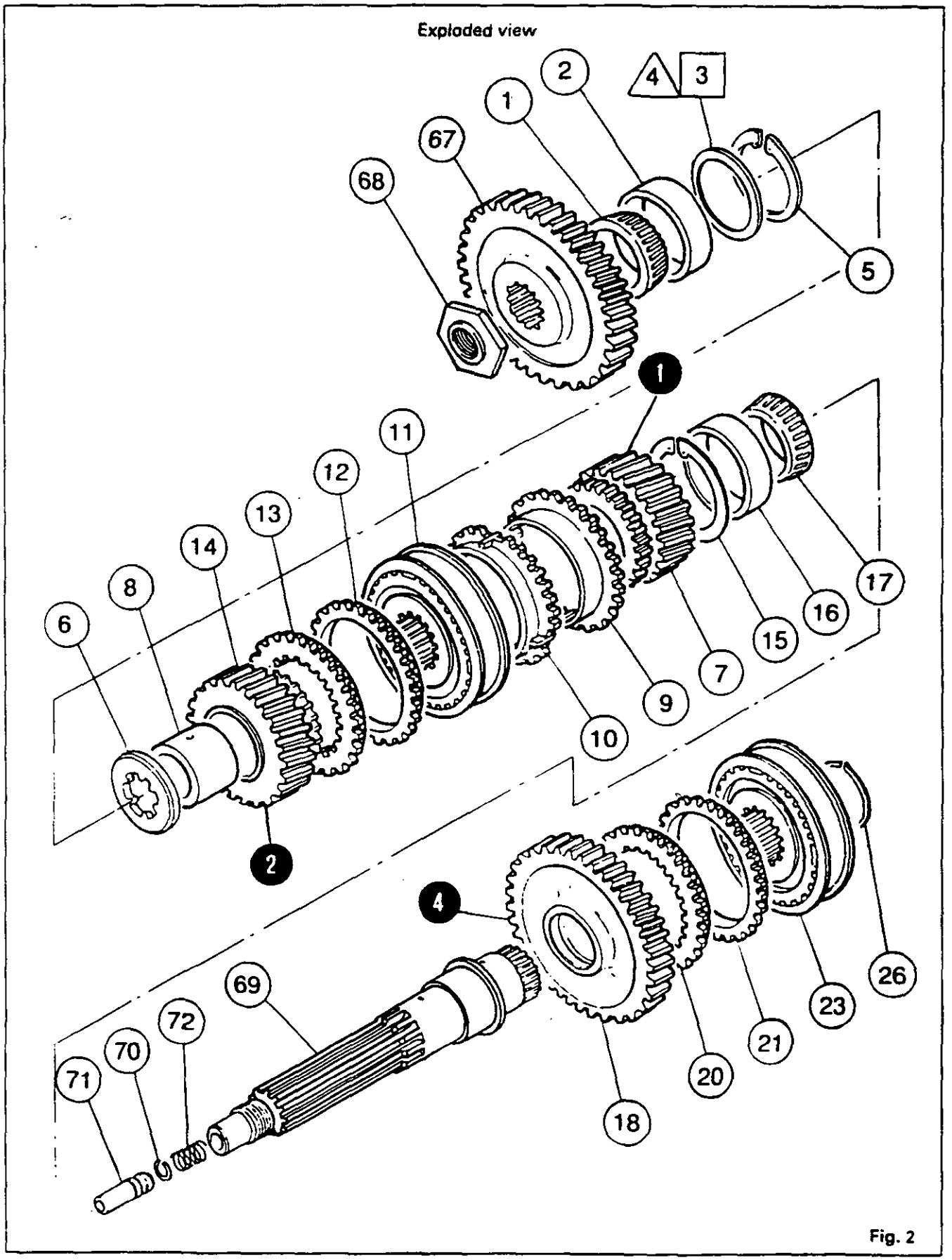


Fig. 2

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3000 - 3100 tractors

4. Remove the selector cover. Carry out procedures 11 and 12, in Section 5 X01.
   Remove the bolts **(1)** (Fig. 5) as per Section 5 X01.
5. Remove the guide rail and the forks. Carry out the procedures in part C, Section 5 V01.
6. Remove the input gearbox assembly. Carry out procedures 5 to 9, in Section 5 R01.
7. Remove the layshaft. Carry out procedure 8, in Section 5 T01.
8. Remove the output shaft. Carry out procedures 11 to 23, in Section 5 V01.

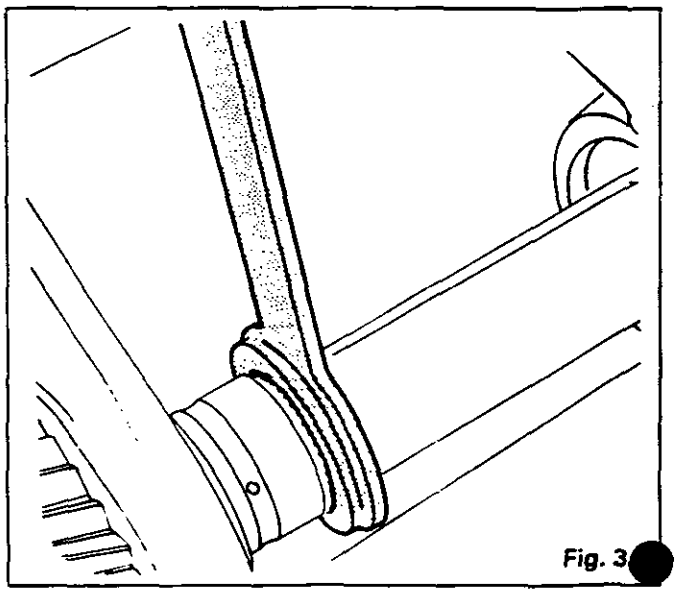


Fig. 3

B. Disassembling and reassembling the mainshaft

Disassembly

9. Remove the circlip **(26)**.
10. Remove the 3rd and 4th gear synchromesh **(23)**. Mark the direction of fitting.
11. Remove the synchromesh ring **(21)**.
12. Remove the synchromesh cone **(20)** and the gear **(18)**.
    Note: Keep the synchromesh ring and cone as a pair for possible re-use.
13. Position the retaining tool MF 458 (Fig. 3) and the locally manufactured holding sleeve for the mainshaft **(69)** (Fig. 4). (See part D).
14. Remove the oil feed pipe **(71)** and spring **(72)**.
15. Unlock the nut **(68)** and loosen it using socket 3376805 M1 (Fig. 5).
16. Remove the input gear **(67)** and cone **(1)**.
17. Remove the washer **(6)**.
18. Remove tool MF 458 and the sleeve (Fig. 3 and 4).
19. Withdraw the shaft rearwards from the housing, holding the 1st and 2nd gear train in place.
20. From inside the housing and in the following order, remove: the 2nd gear **(14)** with bush **(8)**, cone **(13)**, 2nd gear synchromesh ring **(12)**, 1st and 2nd synchromesh **(11)**, cone **(9)**, 1st gear synchromesh ring **(10)** and the 1st gear **(7)**.
21. Withdraw the cups **(16)** and **(2)**.
    Note: Keep the cups and cones in pairs for possible re-use.

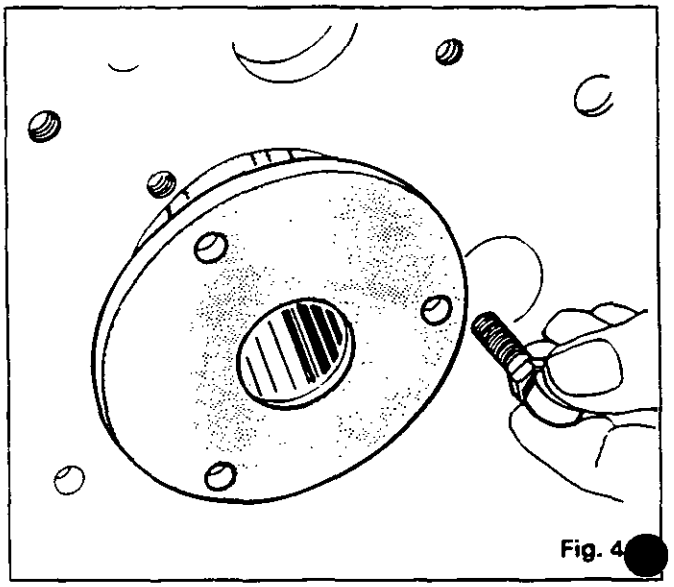


Fig. 4

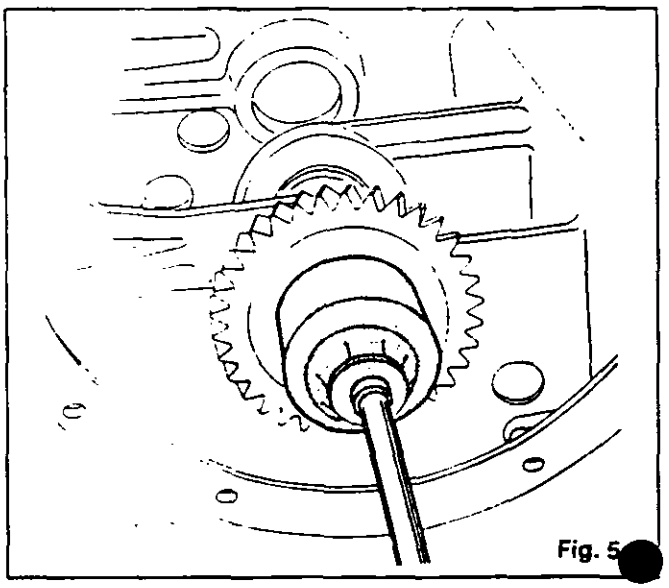


Fig. 5

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22. Remove the adjusting shims **[3]**, the shim **/4** and circlips **(15)** and **(5)**.
Note: Measure the thickness of the adjusting shims for use on the mainshaft during reassembly operations.
23. Remove the cone **(17)** and retaining ring **(70)**.

Reassembly

24. Clean the housing and the mating faces.
25. Using a jet of compressed air, check that all the oilways in the gearbox and the shaft are free of obstructions. Clean and check the parts, and replace any that are faulty.
26. Lubricate the cones, the cups, the bearing bores and the bush.
27. Using a press, fit the bearing cone **(17)** onto the shaft **(69)**.
28. Fit the retaining ring **(70)**. Fit the circlips **(5)** and **(15)**.
29. Position the shim **/4** against circlip **(5)** (Fig. 6).
30. Reduce the thickness of the shims **[3]** whose measurements were noted during disassembly by approximatley 0.3 mm so as to obtain an end play of between 0.10 and 0.15 maximum so as to obtain an exact fit.
31. Install the shims **[3]** and the cups **(2)** and **(16)**.
32. In the housing and in the following order, assemble the 1st gear **(7)**, cone **(9)**, the 1st gear synchromesh ring **(10)**, the 1st and 2nd speed synchromesh **(11)**, the 2nd gear synchromesh ring **(12)**, cone **(13)** and the 2nd gear **(14)** with bush **(8)**.
33. Insert the shaft through the rear of the housing, while supporting the synchromesh gear assembly (Fig. 7).
Note: Check that the bush (8) is correctly positioned in the gear (14).
34. Fit the retaining tool MF 458 and the locally made holding sleeve (Fig. 3 and 4).
35. Fit the washer **(6)**.
36. Fit the cone **(1)** onto the gear **(67)**.
37. Fit the gear **(67)** onto the shaft **(69)**.
38. Fit the nut **(68)** using the special socket 3376805 M1. Tighten to a torque of 80 - 100 Nm (Fig. 8).
39. Shim the shaft. Remove tool MF 458 and the sleeve (Fig. 3 and 4).

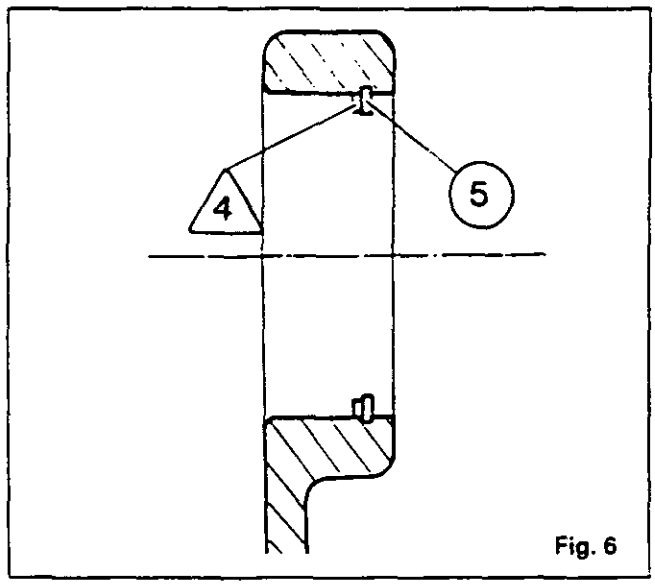
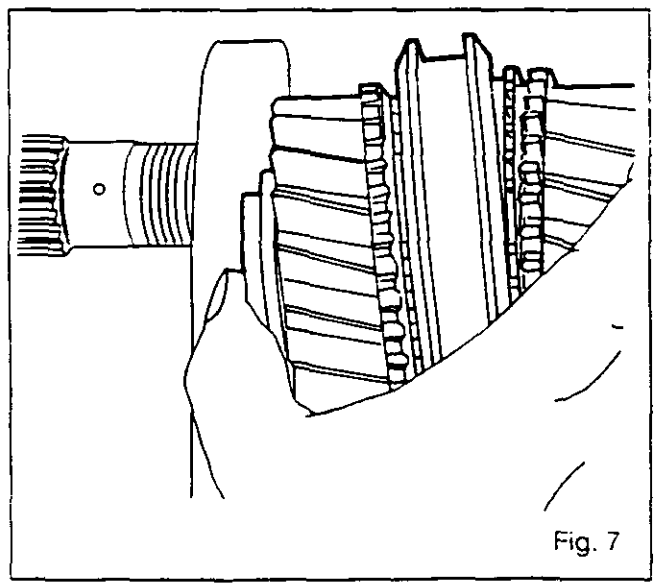
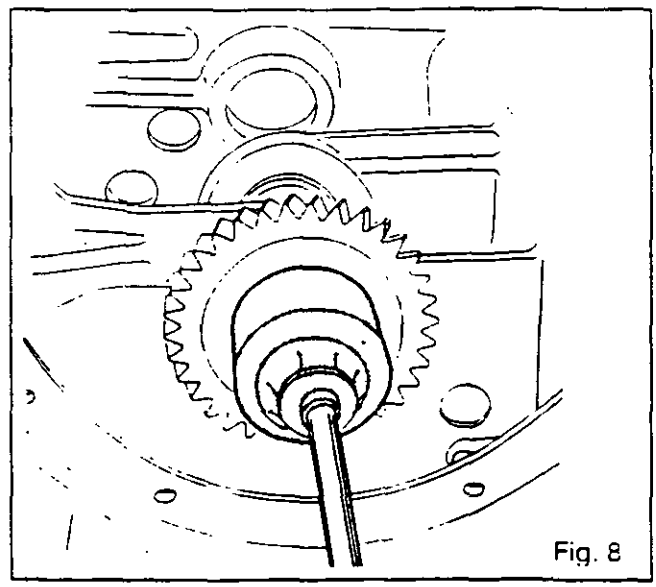


Fig. 6


Fig. 7


Fig. 8

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40. Position the pointer of a dial gauge at the end of the shaft (Fig. 9).
41. From the front of the housing, pull on the shaft and turn it 1st to the right and then to the left, so that the cones are properly seated in the cups.
42. Set the dial gauge to zero.
43. Repeat procedure 41, while pushing on the shaft.
44. According to the play measured, select the shim thickness required to obtain a preload of:
    P1 = 0.14 to 0.20
45. Fit the retaining tool MF 458 and the locally manufactured holding sleeve (Fig. 3 and 4).
46. Unlock nut **(68)**. Remove the gear **(67)**.
47. Take out the cup **(2)**.
48. Fit the adjusting shims **[3]** selected during procedure 44.
    Note: The shim /4\ must be positioned on the same side as the circlip (5) (Fig. 6).
49. Reinstall the cup and the gear.
50. Degrease the thread on the shaft with a solvent.
51. Lightly coat the nut **(68)** with Loctite 270 and then tighten to a torque of 80 - 100 Nm.
52. Lock the nut, bending the collar into the groove with a suitable drift punch.
53. Insert the spring **(72)** and the oil feed pipe **(71)** into the shaft.
54. Remove tool MF 458 and the holding sleeve.
55. Fit the gear **(18)** and the synchromesh cone **(20)**, as well as the ring **(21)** and the 3rd and 4th synchromesh **(23)**.
56. Fit the circlip **(26)**.
    Note: Check that the synchromesh is facing the right way.
57. Check the following by hand:
    a) the end play on gears,
    b) the rotation of the shaft and gear train.
58. Check that the 1st and 2nd gear synchromesh functions correctly.

C. Final operations

59. Refit and shim the output shaft. Carry out procedures 25 to 63, in Section 5 V01.
60. Refit the layshaft. Carry out procedure 23, in Section 5 T01.
61. Refit the input gearbox assembly. Carry out procedures 10 to 16, in Section 5 R01.
62. Shim the layshaft. Carry out procedures 25 to 35, in Section 5 T01.
63. Reassemble the forks and the guide rail. Repeat the operations in part F, Section 5 V01.

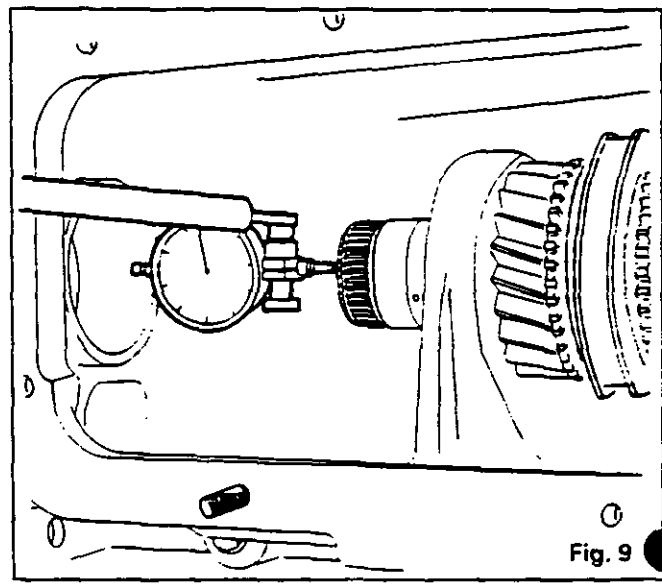


Fig. 9

64. Adjust the reversing selector. Carry out procedures 21 to 23, in Section 5 R01.
65. Refit the selector cover. Carry out procedures 33 to 38 in Section 5 X01.
    Note: Do not forget to install the bolt (1) on the housing (see Fig. 5, Section 5 X01).

3000 tractors

66. Recouple the gearbox with the engine. Carry out operations 13 to 16, Section 3 A03.
67. Carry out procedures 17 and 18 (after supporting the gearbox in a sling, as per Section 3 A03).

3100 tractors

68. Recouple the gearbox with the engine. Carry out procedures 15 to 23 (after supporting the gearbox in a sling) as per Section 3 A04.

3000 - 3100 tractors

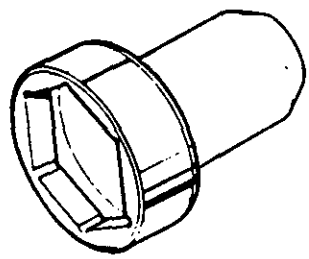
69. Reconnect the gearbox and the rear axle (Section 3 B02).
70. Check the operation of the electrical circuits.
71. Carry out a road test on the controls.
72. Check the unions and mating faces for leaks (selector cover, and gearbox on rear axle).

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D. Service tools

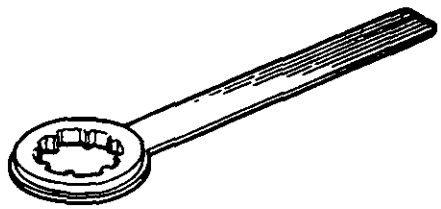
1. Tools available from the MF network

Socket for mainshaft nut



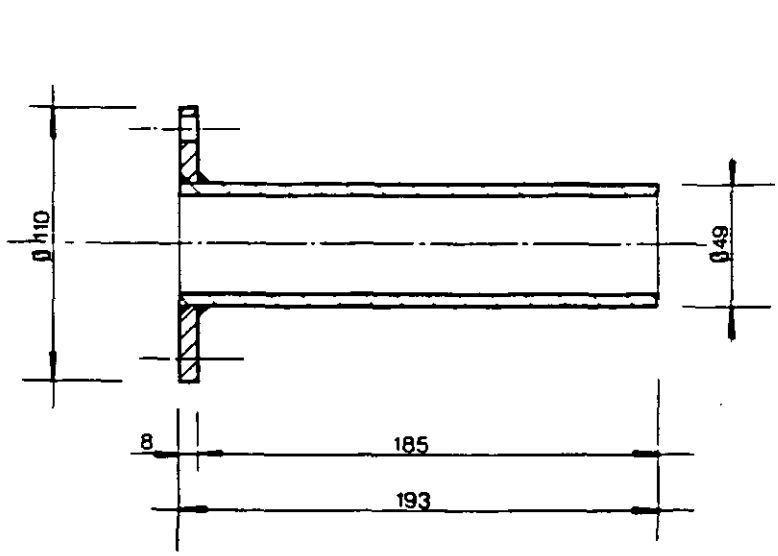
3376805 M1

Mainshaft retaining tool



MF 458

2. Locally manufactured tool



Mainshaft holding tool

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5 T01 Layshaft

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- **General** ____ 2

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D. **Refitting the input gearbox and shimming the layshaft** ____ 4

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Gearbox - Dynashift

General

The layshaft and its gears make up the upper drive line of the gearbox. The shaft **(54)** carries the driven gears for 1st speed **(60)**, 2nd speed **(59)** 3rd speed **(55)** and 4th speed **(56)**. The rear set of teeth is constantly meshed with the Tortoise (Lo) gear.

The front of the shaft is carried by the taper roller bearing **(63) (64)** in the rear of the input gearbox and by a bearing **(52) (53)** mounted in the bearing at the rear of the gearbox.

The gears **(56)** and **(60)** are held in position by spacer **(57)**. End play on the gears is obtained by mounting shims **[58]** between the gears **(59)** and **(60)**.

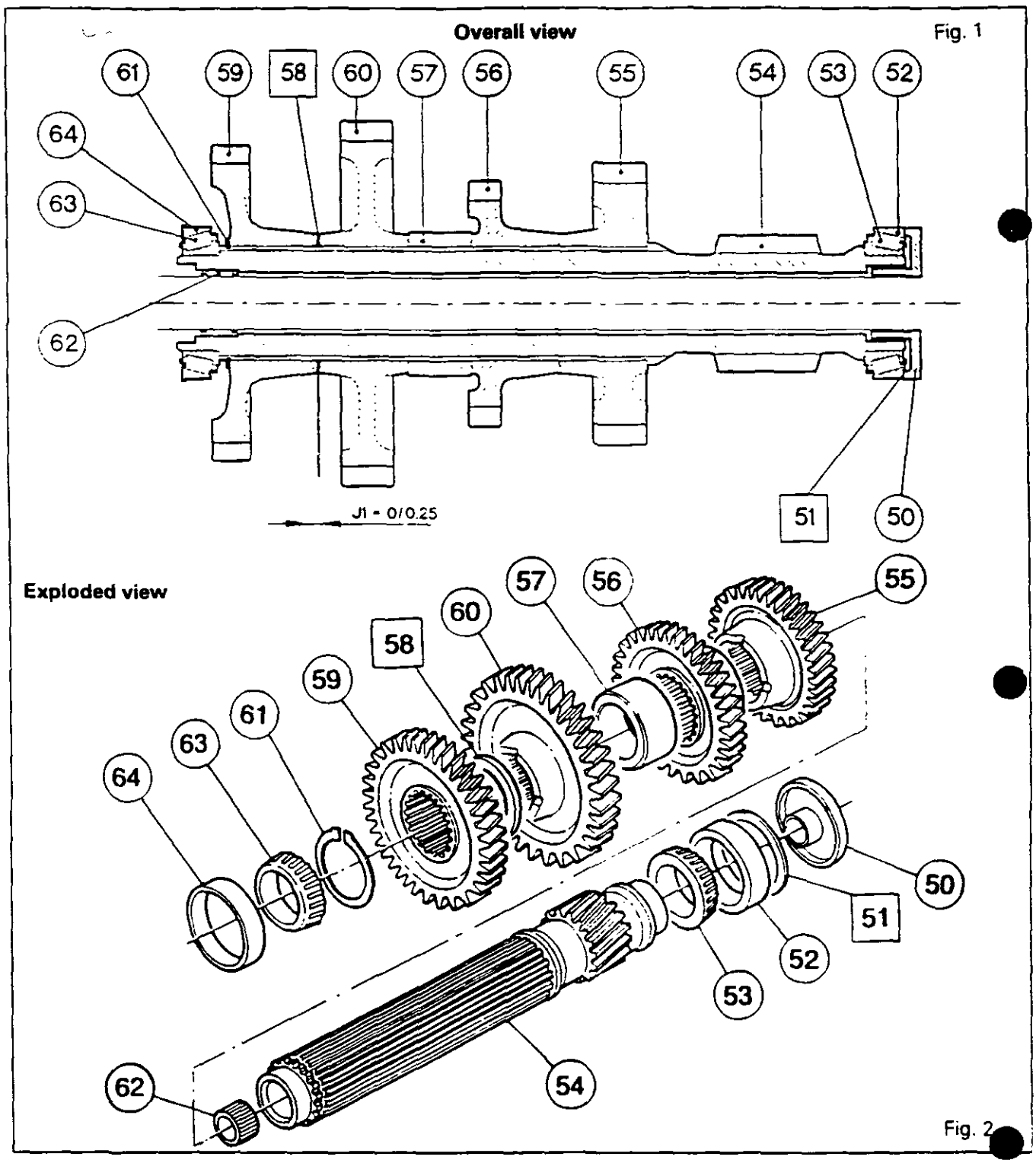


Fig. 1

Fig. 2

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Gearbox - Dynashift

A. Preliminary operations

To allow the bearings to be correctly shimmed when replacing the laysahft the gearbox must be removed.

3000-3100 tractors

1. Split the tractor between the gearbox and the rear axle (see Section 3 B02).

3000 tractors

2. Separate the gearbox from the engine. Carry out procedures 9 and 11 to 12, in Section 3 A03 (having suspended the gearbox in slings). Remove the PTO shaft.
3. Remove the pipes and the clutch slave cylinder.

3100 tractors

4. Separate the gearbox from the engine. Carry out procedures 3 to 4 and 12 to 14, in Section 3 A04 (having suspended the gearbox in slings). Remove the PTO shaft.
5. Remove the pipes and the clutch slave cylinders.

3000-3100 tractors

6. Remove the selector cover. Carry out procedures 11 and 12, in Section 5 X01).
7. Remove the input gearbox. Carry out procedures 5 to 9, in Section 5 R01).

B. Disassembly

8. Remove the deflector **(50)**, the shims **(51)** and the cup **(52)**. Withdraw the shaft assembly (Fig. 3).
9. Extract the bearing cones **(53)** and **(63)**.
   Note: Keep the cones and cups in pairs if they are to be re-used.
10. Remove the circlip **(61)**.
11. Remove the 2nd gear **(59)**, the shims **(58)**, the 1st gear **(60)** and the spacer **(57)**.
12. Remove the 4th gear **(56)** and the 3rd gear **(55)**.
13. Drive out the needle-roller bearing **(62)** and discard it.

C. Reassembly

14. Clean and check the parts, and replace any that are defective.
15. Fit the needle-roller bearing **(62)** fully home on the shoulder of the shaft **(54)**, using a press.
    Note: After this fitting operation, check that the needle-rollers turn normally in the cage.
16. Reinstall the 3rd gear **(55)** and the 4th gear **(56)**.
17. Slide the spacer **(57)** into position. Install the 1st gear **(60)** and the 2nd gear **(59)**.
18. Fit the circlip **(61)**.

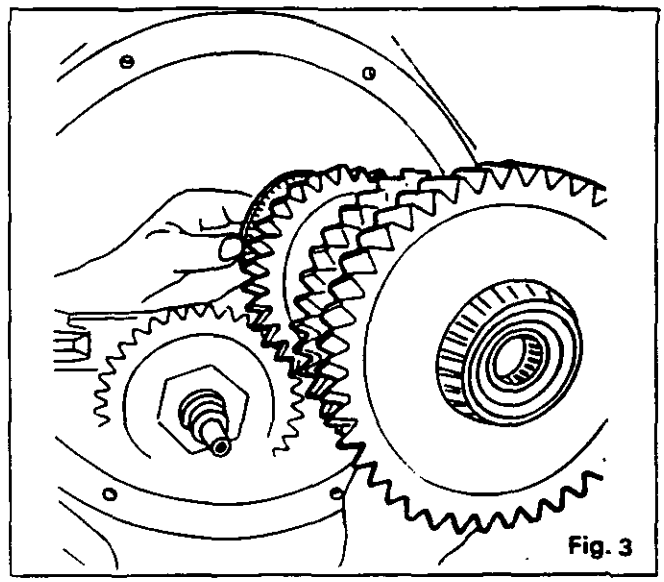


Fig. 3

19. Using a set of shims, measure the space between the 1st gear **(60)** and the 2nd gear **(59)**.
    According to the measurement obtained, use the shim thickness required to obtain a play of:
    J1 = 0 to 0.25 mm
20. Remove the circlip **(61)** and the gear **(59)**.
21. Slide the previously selected shims onto the shaft. Fit the pinion and the circlip.
22. Use the press and a suitable fixture to fit the cones **(63)** and **(53)**.
23. Reinstall the assembled shaft and the cup **(52)**.

Note : When replacing the gears, it is not necessary to shim the bearings again. Disassembly of layshaft can be made without removing the gearbox according to the following method.

Disassembly

. Remove the 1st , 2nd plunger and position the lock so as to free the fork.
. Refer to section 5 N01. Remove lubrication tube **(71)** and the spring. Loosen nut **(68)**.
In order to facilitate the disengagement of 1st gear **(60)** to remove the complete shaft, take out the input gear **(67)** to the front with its bearing, the 1st, 2nd gears **(7)** - **(14)** and the synchromesh.
. Remove the gears (see § B).

Reassembly

. Reverse the disassembly operations. Replace nut **(68)** as described section 5 S02 § B, op. 50 to 53.
. Tighten the plunger plug to a torque of 50 - 70 Nm.
. Check the axial play of the 1st - 2nd gears and the synchromesh operation.

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D. Removing the input gearbox and shimming the layshaft

24. Remove the input gearbox. Carry out procedures 10 to 16, in Section 5 R01.
25. Shim the layshaft (see Fig. 4) to obtain a play of:
    J2 = 0.04 to 0.12 mm (Fig. 5)
26. Install the locally manufactured tool (see Section E) in the layshaft (Fig. 6).
27. Compress the spring moderately by tightening the nut on the tool in order to bed the cones correctly in the cups.
28. Rotate the shaft through a few turns.
29. Using a depth gauge, measure the dimension **X** between face **A** of the cup **(52)** and face **B** on the housing (see Fig. 5).
30. Measure the thickness **Y** of the deflector **(50)**.
31. Calculate the difference between **X** and **Y**.
32. Determine the shim thickness required to obtain a play of between 0.04 and 0.12.
33. Remove the compression tool.
34. Position the shims **[51]** selected in procedure 32.
35. Fit the deflector in the housing.
36. Adjust the reversing selector. Carry out procedures 21 to 23, in Section 5 R01.
    Refit the selector cover. Carry out procedures 33 to 38 in Section 5 X01.
    Note: Do not forget to fit the bolt (1) on the housing (Fig. 5), Section 5 X01.

3000 tractors

37. Recouple the gearbox with the engine. Carry out procedures 13 to 16, Section 3 A03.
38. Carry out procedures 17 and 18, in Section 3 A03.

3100 tractors

39. Recouple the gearbox with the engine. Carry out procedures 15 to 23, in Section 3 A04.

3000 - 3100 tractors

40. Recouple the tractor between the gearbox and the rear axle (Section 3 B02).
41. Check :
    - the systems for leaks
    - the operation of the electrical circuits.
42. Carry out a road test on all the controls.
43. Check the unions and mating faces for leaks (selection cover, and gearbox on rear axle).

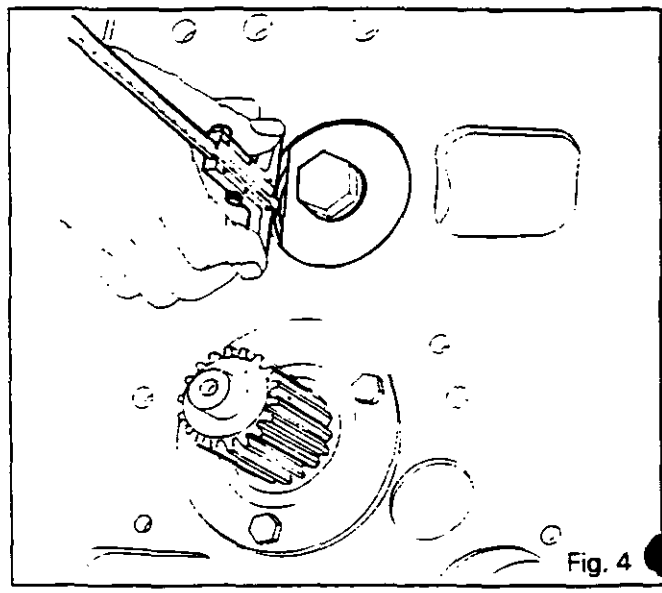


Fig. 4

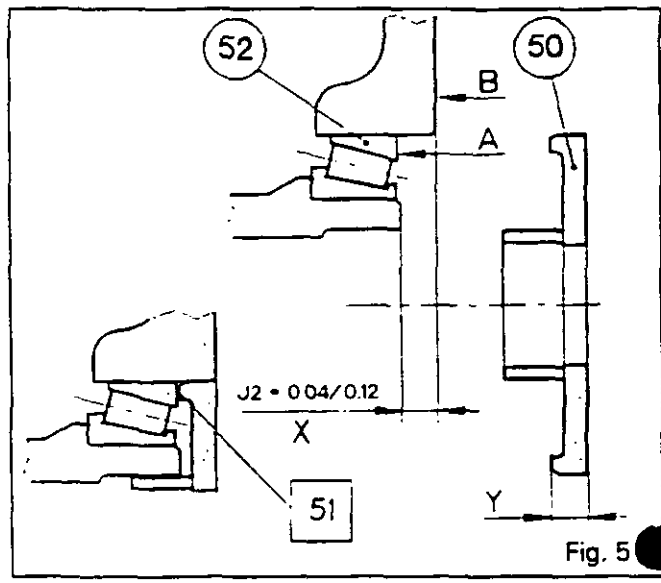


Fig. 5

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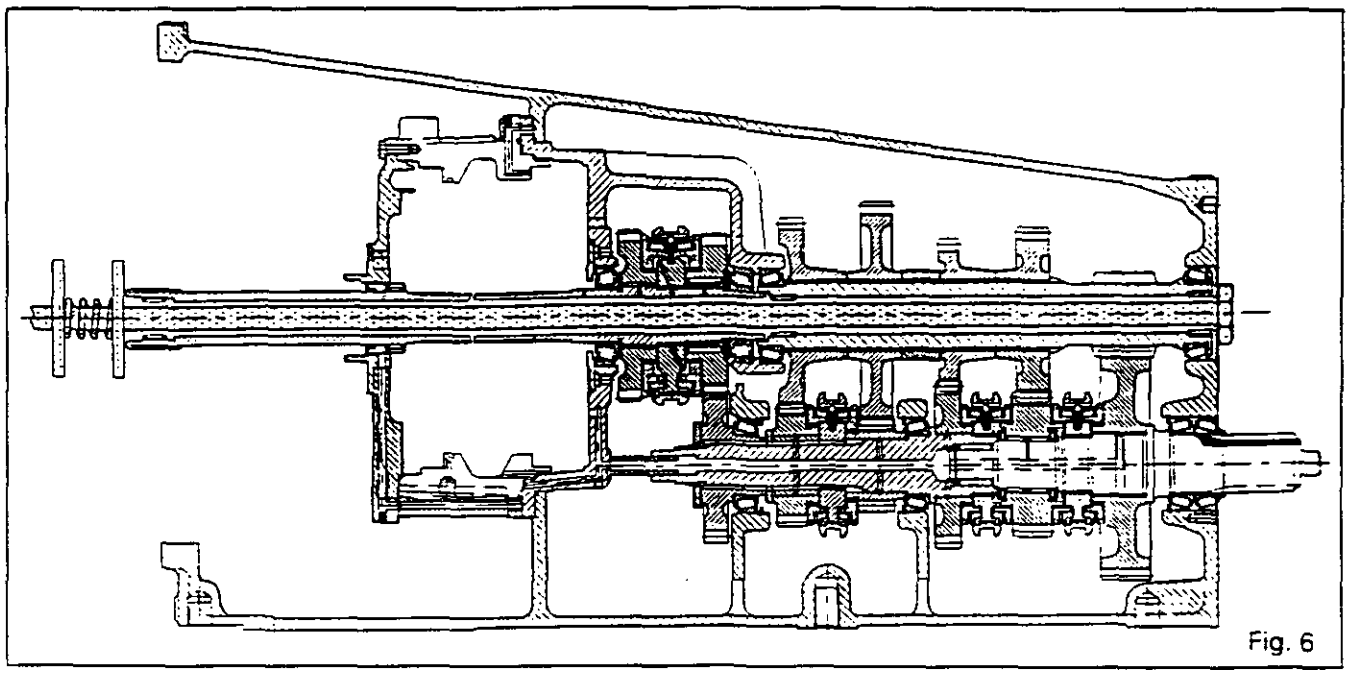


Fig. 6

E. Service tool

Layshaft holding tool, to be manufactured locally.

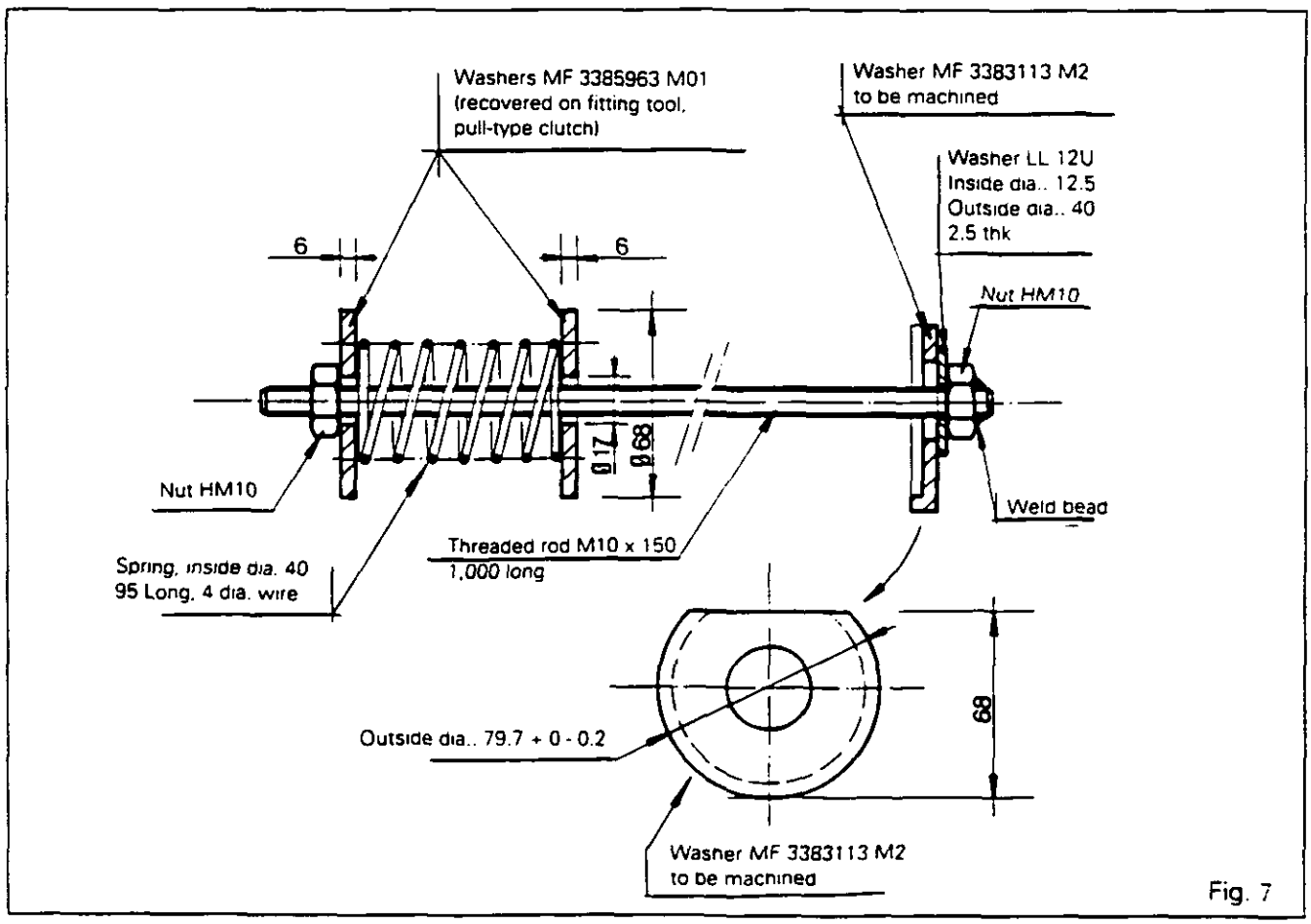


Fig. 7

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5 V01 Output shaft

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Gearbox - Dynashift

General

The output shaft transmits the drive provided by the various gear ratios to the rear axle transfer shaft. It is mounted on the lower transmission drive line at the rear of the gearbox.

At the front end, it is supported by a needle-roller bearing located in the bore in the mainshaft and, at the rear end, in two taper bearings fitted with their tapers in opposition.

The shaft **(44)** carries:

- the driving gear **(29)** which is mounted to rotate freely on combination bearings **(28)** and **(30)**,
- the gear **(36)** and bush **(35)** assembly which are mounted to rotate freely,
- the Hare/Tortoise (Hi/Lo) coupler **(31)** and its hub which are splined to rotate together.

To ensure that the assembly will operate correctly under the forces applied to the transmission, several settings have to be made with shims:

- **Setting J3**: with shim or shims **[47]**, this setting allows the clearance to be taken up between the cones **(39)** and **(40)** and their respective cups.
- **Setting J4**: shim or shims **[38]** placed between the shoulder on the shaft **(44)** and the cone **(39)** allow(s) end play on the gear **(29)**.
- **Setting J5**: shim or shims **[42]** placed between the cone **(40)** and packing shim **/43** take up the end play of cones **(39)** and **(40)** on the shaft **(44)**.

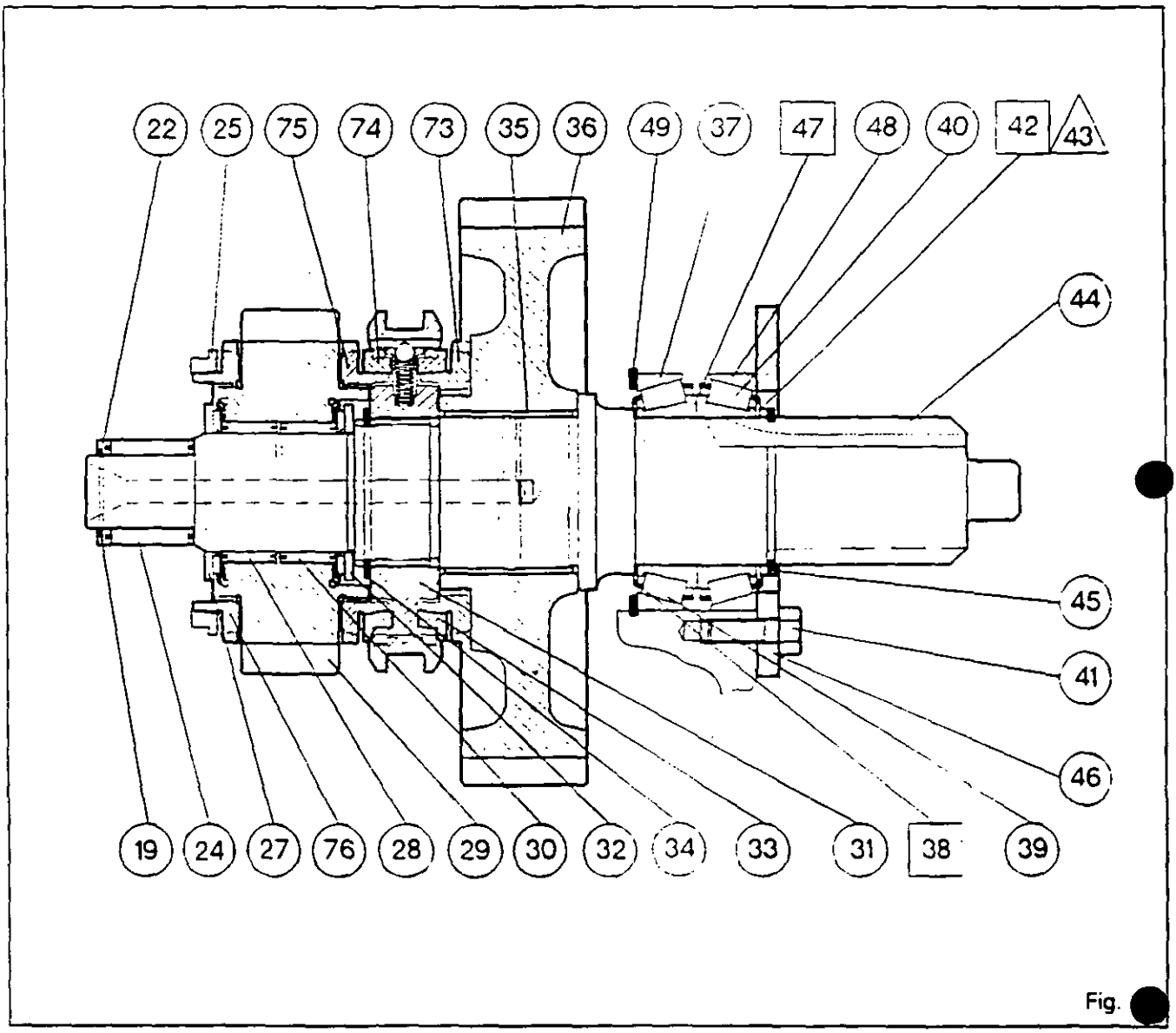


Fig.

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Exploded view

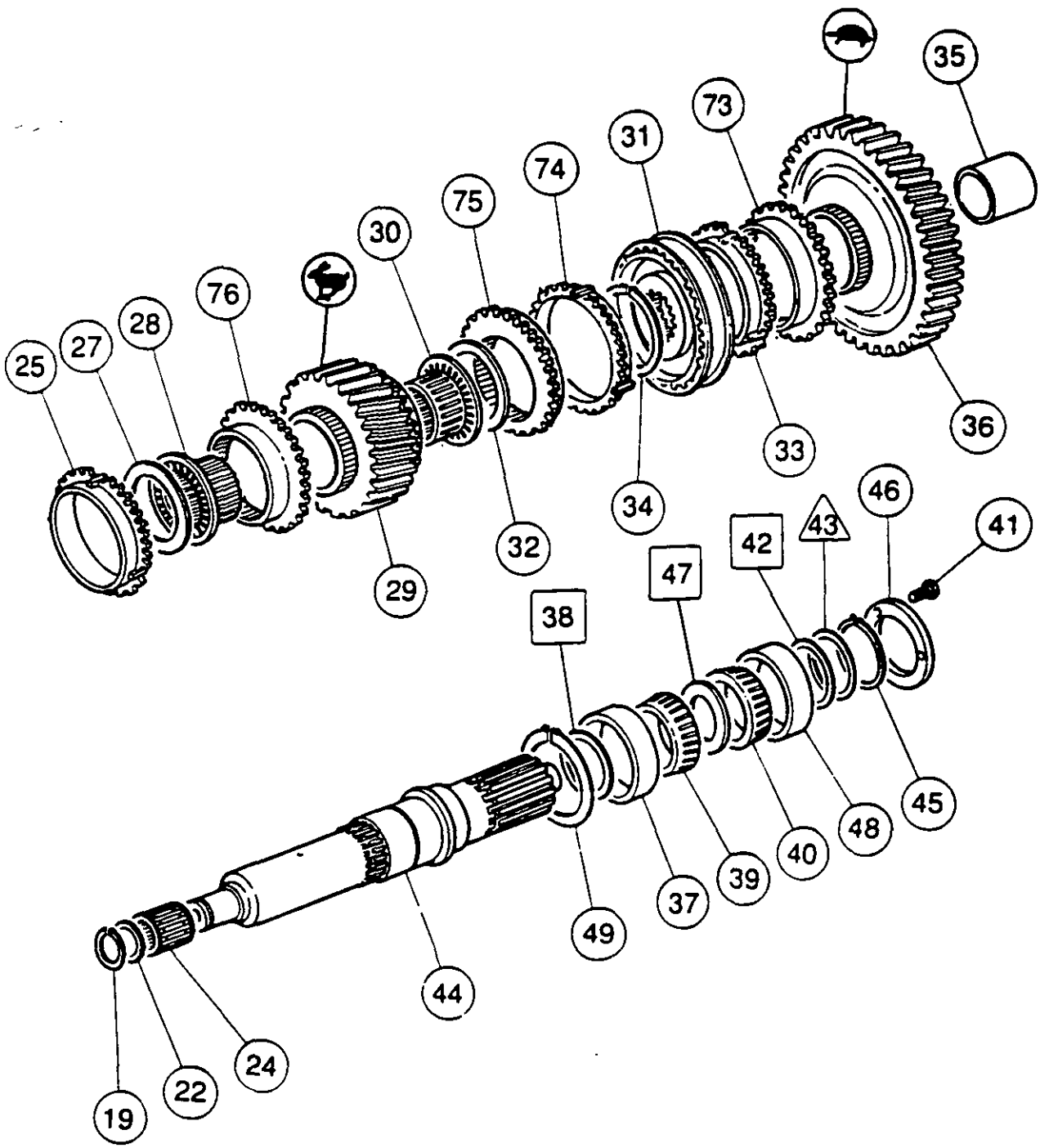


Fig. 2

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Gearbox - Dynashift

A . Preliminary operations

1. Split the tractor between the gearbox and the rear axle (Section 3 B02).

B . Removing the selector cover

2. Carry out procedures 11 and 12, in Section 5 X01.
3. If necessary, remove the bolt **(1)** (see Fig. 13).

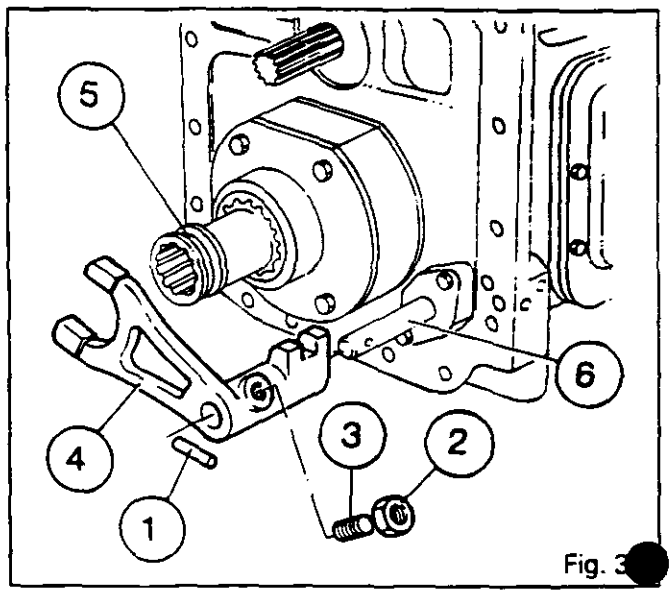


Fig. 3

C . Removing the guide rail and forks

Note: Gearbox equipped with creeper gears. Remove pin (1) locknut (2), adjustable locking screw (3), and fork (4) with sleeve (5) (see Fig. 3).

4. Remove the plugs **(1)**, springs **(2)** and locking plungers **(3)** (See Fig. 5).
5. Slacken off the castellated nut **(21)** using spanner 3615334 M1 (see Fig. 4).
6. Engage 4th gear.

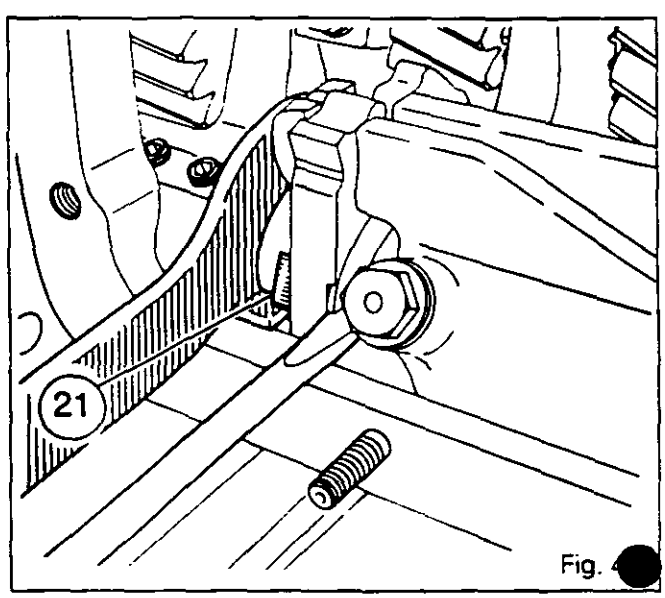


Fig. 4

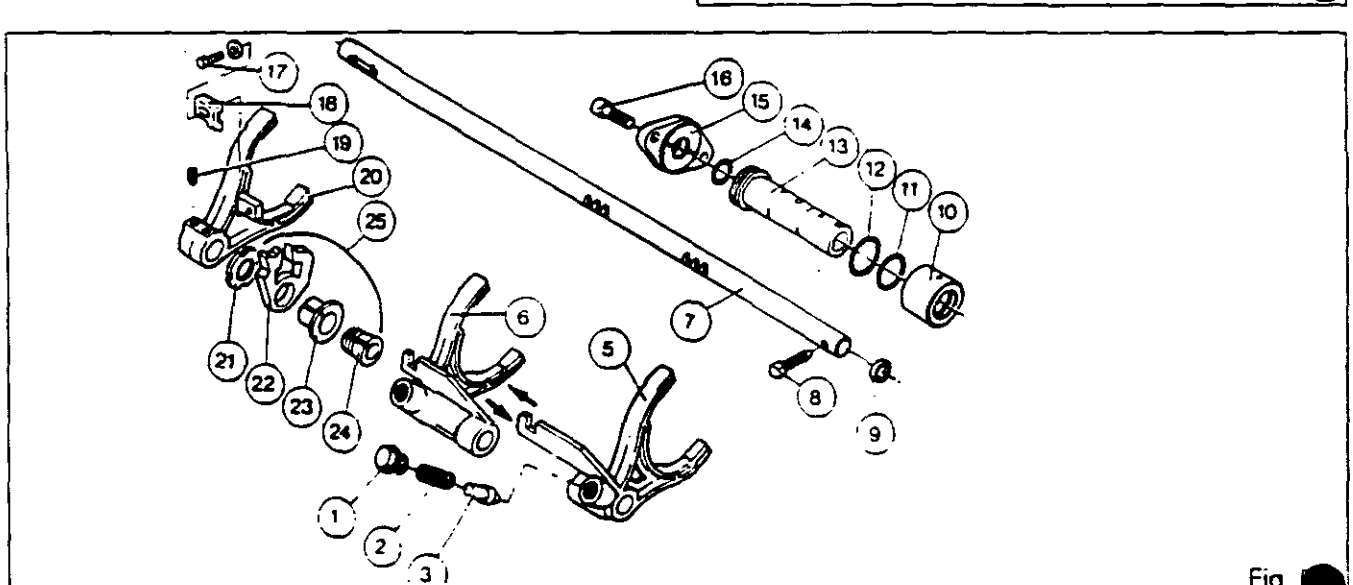


Fig. 5

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7. Free the cone **(24)** on the guide rail **(7)** using a bronze drift (see Fig. 6).
8. Remove the set screw **(8)**.
9. Remove the bearing **(15)**, the guide rail **(7)** from the rear, the forks **(5)** and **(6)** and the locking assembly **(25)**.
10. Dismantle the castellating nut **(21)**, locking device **(22)**, bearing **(23)** and cone **(24)**.
    Remove the bolts **(19)**, piston **(13)**, the Hare/ Tortoise (Hi-Lo) fork **(20)**, the bolt and washer assembly **(17)** slider **(18)** and cylinder **(10)**.
    Note: Discard the seals (11), (12) and (14).

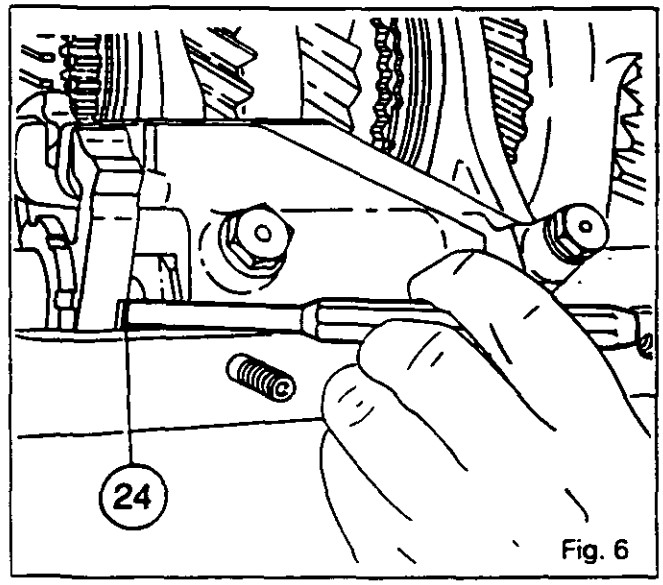


Fig. 6

D . Removing the output shaft

Note: Remove the creeper gearbox if the tractor is fitted with one.

11. Move the three screws **(41)**.
12. Remove the locking ring **(46)**.
13. Remove the bearing cup **(48)**.
    Note : Keep the cones and cups in pairs if they are to be re-used.
14. Remove the circlip **(45)**.
15. Remove the packing shim **/43** and the adjusting shims **(42)**.
16. Remove the bearing cone **(40)**.
    Note : If shimming was required between the cones, remove the shim or shims (47).
17. Remove the cone **(39)**.
18. Remove the adjusting shims **(38)**.
19. Pull the shaft **(44)** towards the rear.
20. Remove the snap ring **(34)** using tool MF 460 and discard it (see Fig. 7).
21. Remove the shaft.
22. Through the opening in the selector cover, take out the synchromesh **(31)**, the synchromesh rings **(33)** and **(74)**, the gear **(29)** with cones **(75)** and **(76)**, the ring **(25)**, the two thrust washers **(27)** and **(32)** and the Tortoise gear **(36)**.
    Note: Keep the synchromesh rings (25) and (74) paired with the cones (75) and (76), and ring (33) with cone (73).
23. Remove the cap **(37)** and circlip **(49)**.
24. Remove circlip **(19)**, washer **(22)** and the needle-roller bearing **(24)**.

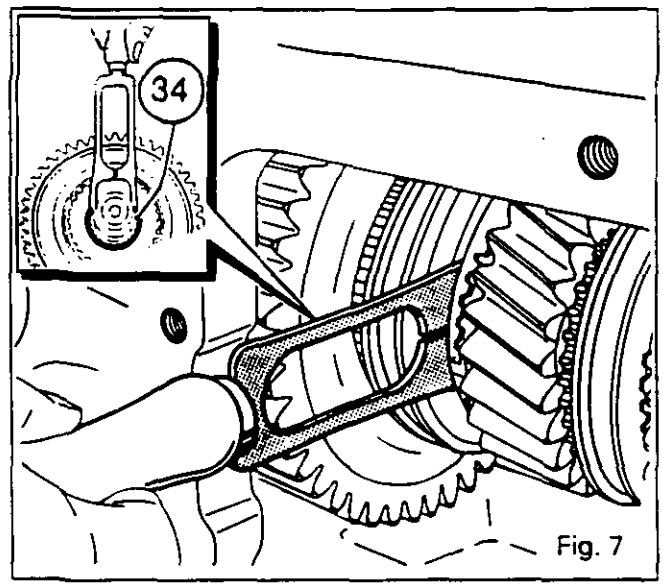


Fig. 7

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E. Reassembling and shimming the output shaft

25. Check and clean the parts, and replace any that are faulty.
26. Fit the circlip **(49)** and cup **(37)**.
27. Reinstall the needle-roller bearing **(24)**, washer **(22)** and circlip **(19)** on the shaft **(44)**. Engage the shaft in the housing without gears.
28. Slide the cones **(39)** and **(40)** onto the shaft.

Setting J3

29. The purpose of this operation is to prepare for setting **J3** (Fig. 8). Hold the cones **(39)** and **(40)** fully home against the shoulder of shaft **(44)** by pressing on them by hand.
    Fill the gap **Y** between the rear of the cone **(40)** and the groove for circlip **(45)** with shims **[42]** and the packing shim **/43**. Choose a new circlip that provides a slightly tight fit in the groove (Fig. 10).
30. Perform the setting (Fig. 9) with shims in order to obtain :
    J3 = -0.05 to +0.05.
    This shimming operation consists in taking up the clearance between the cones **(39)** and **(40)** and the cups **(37)** and **(48)**, while complying with the setting tolerance specified above.
31. Fit the circlip **(45)**.
    Note : Position the packing shim on the circlip side.
32. Fit the cup **(48)** and the locking ring **(46)**.
33. Tighten the bolts **(41)** to a torque of 27 - 32 Nm.

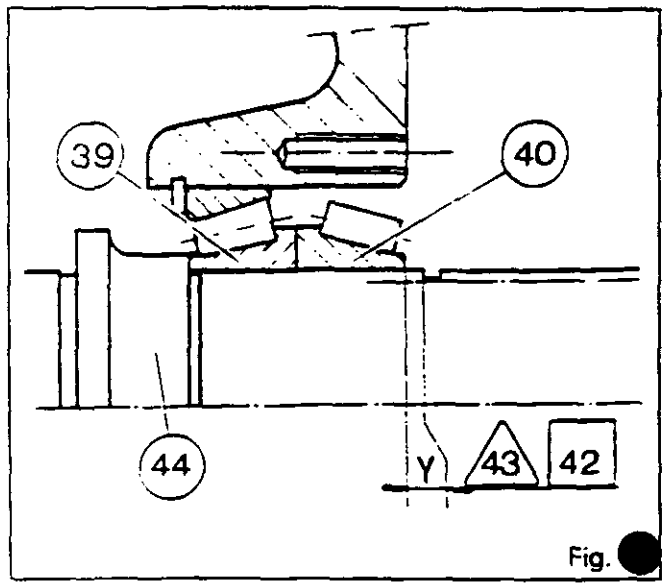


Fig.

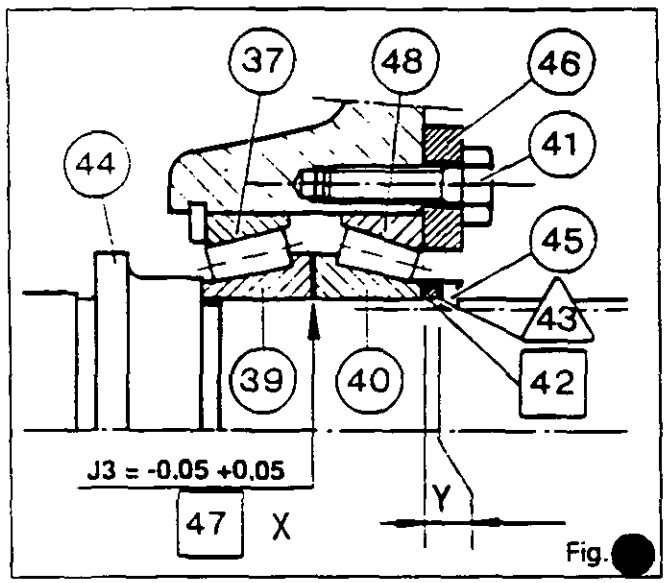


Fig.

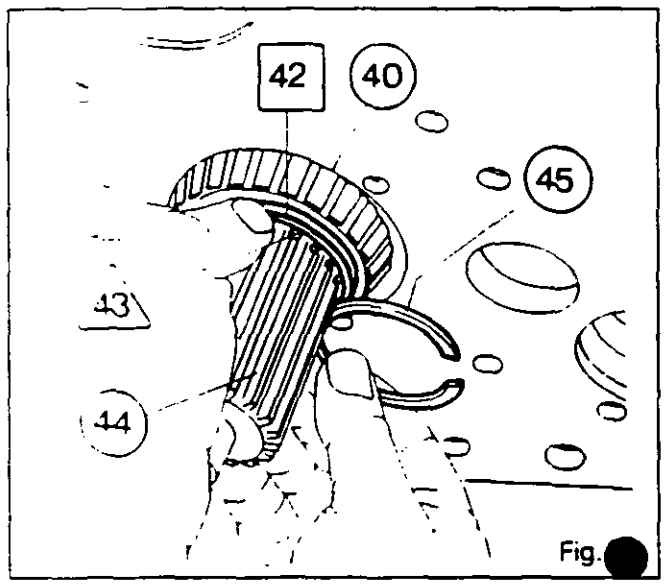


Fig.

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34. Position a dial gauge on the end of the shaft **(44)** (Fig. 11).
Note: In the case of gearboxes equipped with creeper gears, use the gearbox locking ring (see Fig. 12) in place of the locking ring. Tighten the bolt to a torque of 34 - 52 Nm.
35. Push on the shaft while turning it alternately clockwise and then anticlockwise to seat the cones correctly in the cups.
36. Reset the dial gauge to zero.
37. Repeat procedure 35 while pulling on the shaft.
38. If the end play measured is greater than 0.05 mm select a thickness of shims X **[47]** to obtain : **J3 = -0.05 to +0.05**
Important: The shim or shims X [47] selected for J3 must be installed between the cones for the following setting operations.

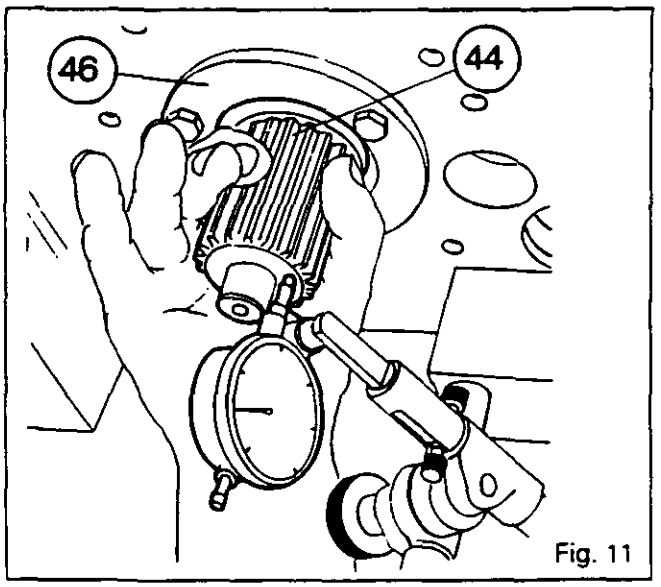


Fig. 11

Setting J4

39. Remove the circlip **(45)**.
40. Remove the packing shim **/43** and the adjusting shims **[42]**.
41. Measure the thickness **Y** of the set of shims **[42]** and **/43**. (This measurement will be useful for setting **J5**.)
42. Remove the bolts **(41)** and the locking ring **(46)**.
43. Remove the cup **(48)**, cones **(40)** and **(39)**, and the shaft **(44)**.
44. Fit the following in the housing: the Tortoise gear **(36)**, the synchromesh and its rings **(33)** and **(74)**, the thrust washer **(32)**, the gear **(29)** with its needle-roller bearings **(30)** and **(28)** and its synchromesh cones **(75)** and **(76)**, thrust washer **(27)** and synchromesh ring **(25)**.
Note: If bush (35) shows signs of wear, replace the complete gear assembly. (The bush is reamed after fitting). If the combination bearings (30) and (28) are worn, replace the complete gear assembly. (Bearings are fitted in the factory).
45. Insert the output shaft **(44)** while holding the gear assembly in position (see Fig. 13).
46. Pull the shaft slightly back in order to expose the groove for the snap ring **(34)**.

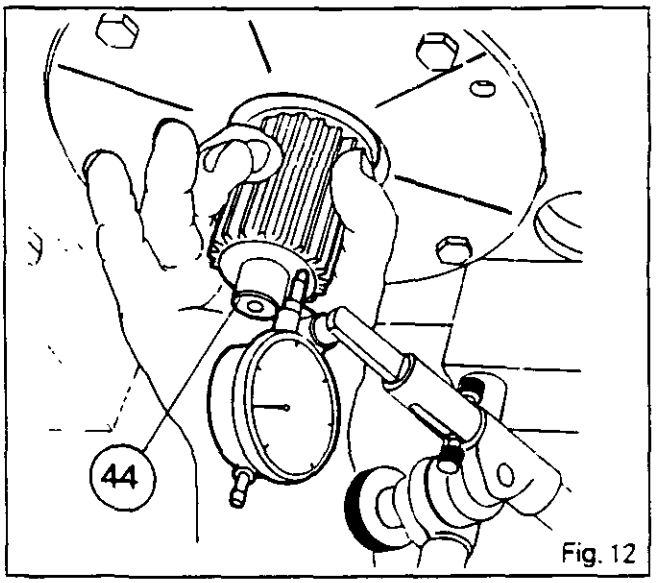


Fig. 12

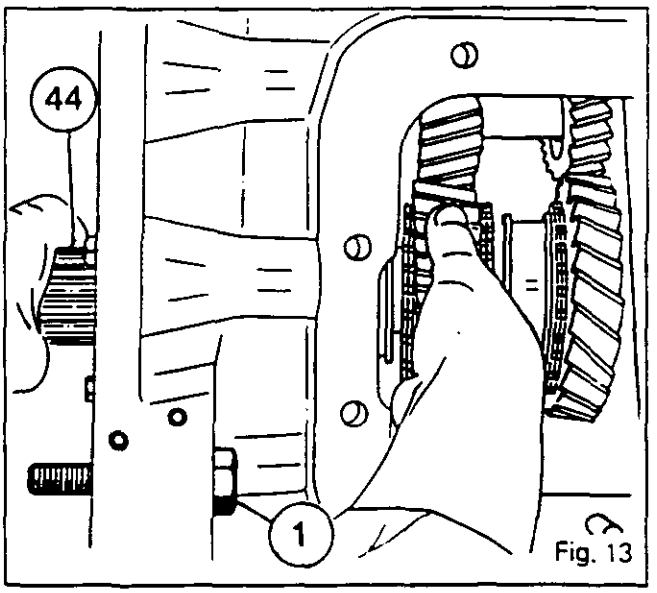


Fig. 13

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47. Fit the snap ring **(34)** with tool MF 459 (Fig. 14).
Note: Check that the snap ring is correctly installed.
48. Slide the following components onto the shaft: cone **(39)**, shim or shims **X [47]** selected in procedure 38, cone **(40)** and cup **(48)**.
49. Fit the locking ring **(46)**. Tighten the bolts **(41)** to a torque of 27 - 32 Nm.
50. Perform the setting (Fig. 15) to obtain a play of :
J4 = 0.20 to 0.40
This setting operation consists in providing an end play on the gear **(29)**.
51. Carry out procedures 34 to 37.
52. According to the measurement read on the dial gauge, determine the thickness of shims **Z [38]** to obtain play **J4**.
53. Remove the bolts **(41)** and the locking ring **(46)**.
54. Remove the cup **(48)**.
55. Withdraw the cones **(40)** and **(39)**, and the shim or shims **X [47]**.
56. Slide the following components onto the shaft: the required thickness of shims **Z [38]**, cone **(39)**, shim or shims **X [47]**, and cone **(40)**.

Setting J5

57. Perform the setting (Fig. 16) to obtain :
J5 = no end play
This setting consists in taking up the end play of cones **(40)** and **(39)** on the shaft **(44)**.
58. Use the thickness of shims **Y [42] /43** measured in procedure 41, to deduce the thickness of shims **Z [38]** and **X [47]** to obtain : **J5 = Y - (Z + X)**.
59. Carry out procedures 32 and 33.
60. Slide the thickness of shims selected in procedure 58 onto the shaft.
61. Fit the circlip **(45)**.
Note: Position the packing shim /43\ on the circlip side.
The circlip must be a slightly tight fit in its groove. Check that it is correctly positioned.
Note: Refit the creeper gearbox (if fitted).
62. Check by hand that the shaft and its gears turn freely.
63. Check that the 3rd and 4th gear and Hare/Tortoise synchromeshes operated normally.

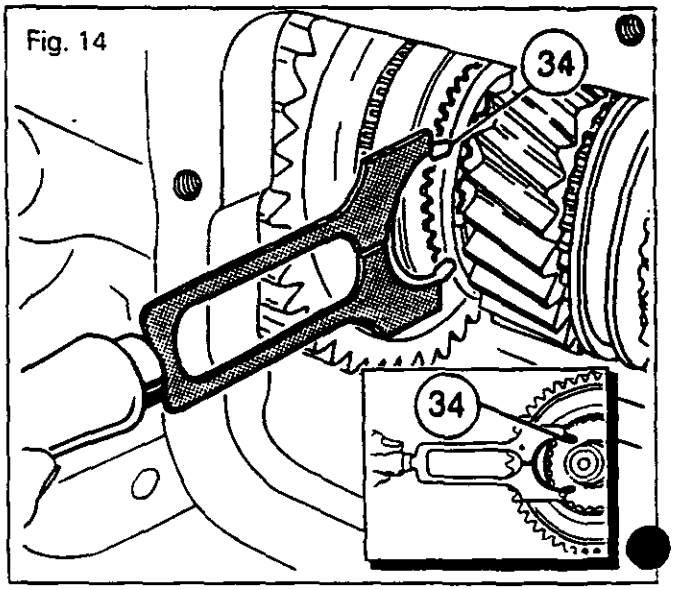


Fig. 14

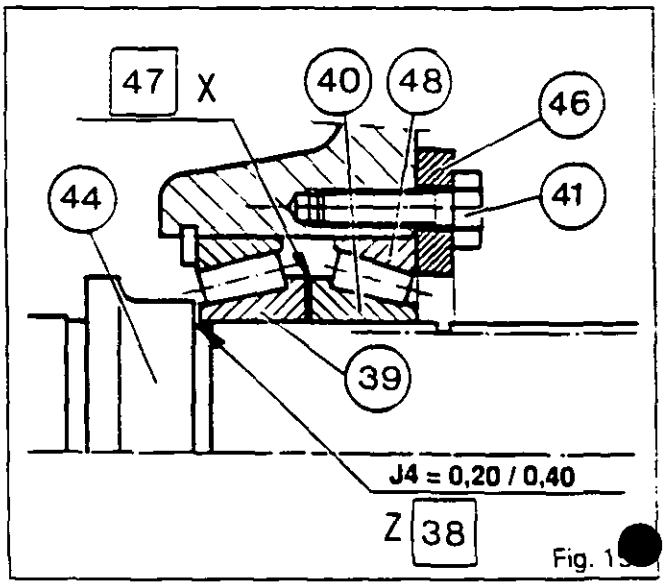


Fig. 15

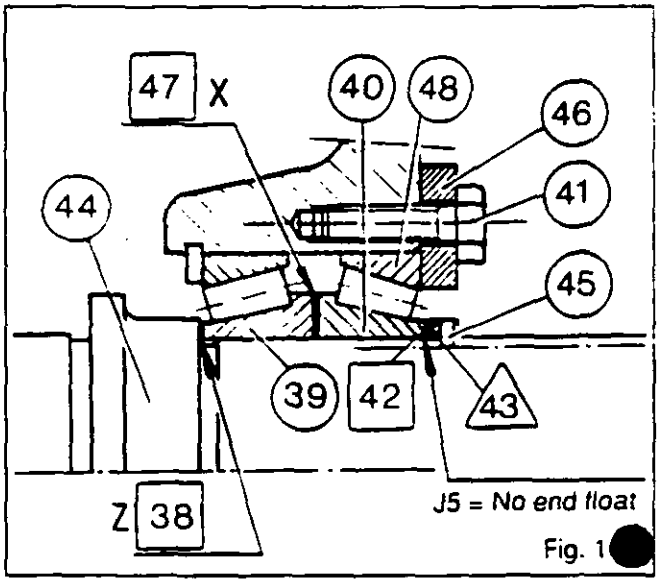


Fig. 16

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F : Reassembling the guide rail and forks (Fig. 17)

64. Check that the ports in the Hare/Tortoise cylinder **(10)** are not blocked.
65. Fit the cylinder **(10)** equipped with O-ring **(11)** in the housing.
66. Install the Hare/Tortoise fork **(20)** in the synchro-mesh.
67. Fit seals **(12)** and **(14)** onto the piston **(13)** and then insert it into the bore in the cylinder.
    Note : Line up the locations for the adjusting screws with the tapped holes in the fork. Immobilise the piston with a screw (19).
68. Clean and then assemble the mechanical locking device **(22)**, taper bearing **(23)**, cone **(24)** and castellated nut **(21)**.
69. Fit the 3rd and 4th speed fork **(6)** and the 1st and 2nd speed fork **(5)**, and the locking assembly **(25)**.
70. Insert the guide rail **(7)** from the rear of the housing and slide it through the piston, the locking assembly and the forks.
71. Fit the bearing **(15)** and tighten the bolts **(16)** to a torque of 27 - 32 Nm.
72. Clean the set screw **(8)** with a solvent. Coat it with Loctite 542 and tighten to a torque of 28 - 43 Nm.
73. Fit he locking plungers **(3)** and springs **(2)**, and tighten the plugs **(1)** to a torque of 50 - 70 Nm.
    Note : Gearboxes equipped with creeper gears (Fig. 3).
    - ***Fit sleeve (5), fork (4) and pin (1).***
    - ***Position the fork so that locking screw (3) is over the flat on the guide rail (6) (between the two locking recesses).***
    - ***Tighten the screw fully in so that the ball is compressed.***
    - ***Loosen the screw by one quarter turn.***
    - ***Apply Loctite 241 to nut (2) after cleaning it with solvent.***
    - ***Tighten to a torque of 15 - 20 Nm.***
    - ***Check that the fork locks correctly.***

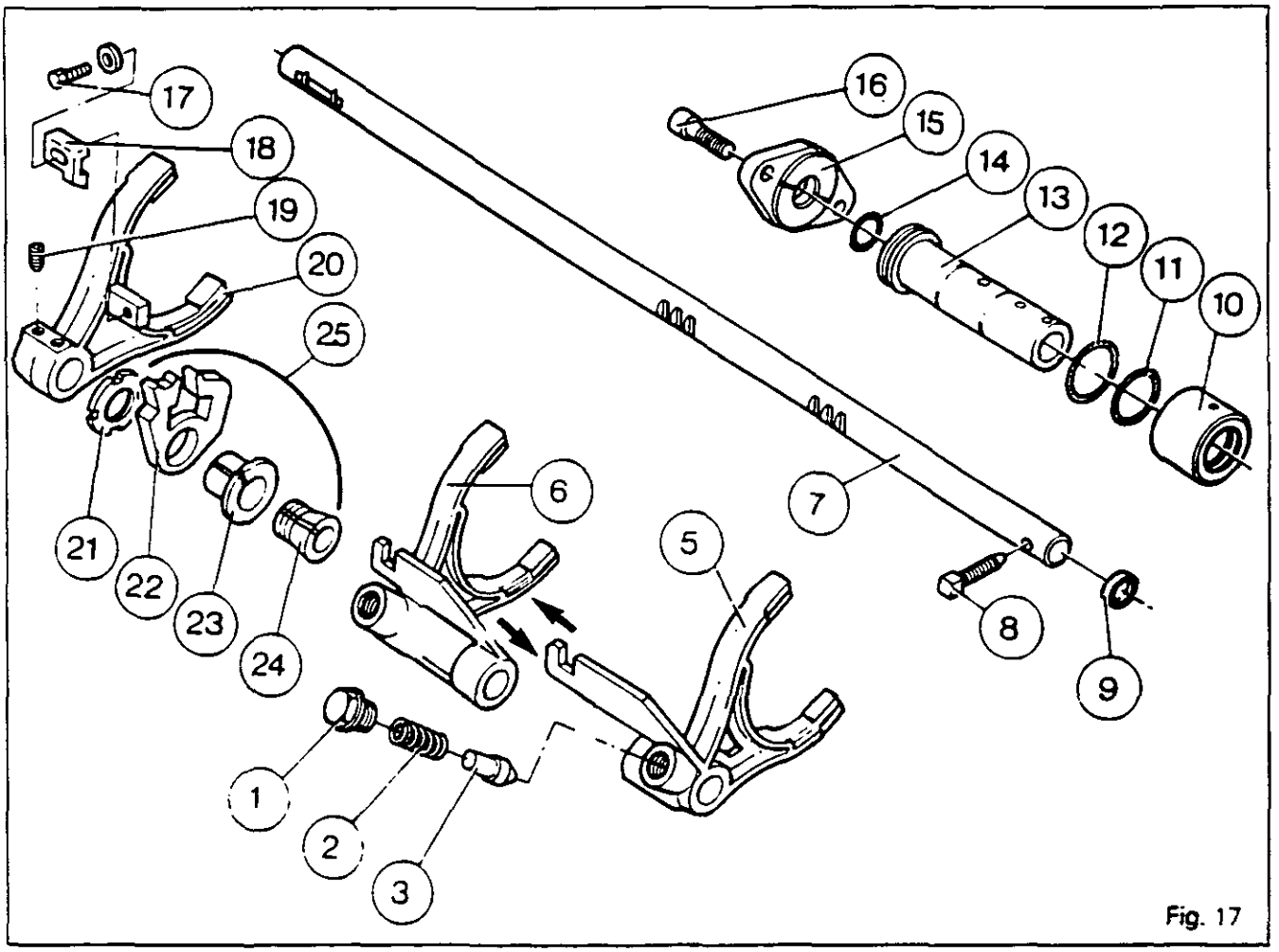


Fig. 17

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74. **Adjusting the Hare/Tortoise fork**
Principle: The fork **(20)** is positioned by means of the difference in the spacing between the tapped holes **Y** and the spacing **Z** of the spot-facing marks in the piston **(13)**. The fork can be adjusted to move to different positions by acting on either the front or rear screw, depending on the adjustment required (Fig. 18). Set the control piston **(13)** and synchromesh **(31)** to the high range (Hare).
76. Hold the synchromesh against the high range gear **(29)**. (See Fig. 19).
77. Adjust the position of the fork **(20)** by acting on the two adjusting screws **(19)** after cleaning them with solvent and coating them with Loctite 221, in order to obtain a play of **J1 = 0.3** mm between the rear face of the pad and the synchromesh slide rod (Figures 19 and 20).
Note: Perform the setting using a locally manufactured tool.
78. Set the control piston **(13)** and the synchromesh to the low range (Tortoise).
79. Check that there is a play of **J2 = 0.3** min. (value determined by setting J1) between the pad and the synchromesh slide rod, with the slide rod resting against the low range gear **(36)** (Fig. 21). Tighten the screws to a torque of 35 Nm without modifying the setting.
Note: In the Tortoise position, play J1 must be increased if face X of the pad on fork (20) is bearing against the synchromesh slide rod (Fig. 21).
80. Set the fork to the Tortoise position.
81. Slightly loosen the castellated nut **(21)**. Apply a moderate coat of Loctite 270 on the thread of cone **(24)**.
82. Place the forks in the neutral position.

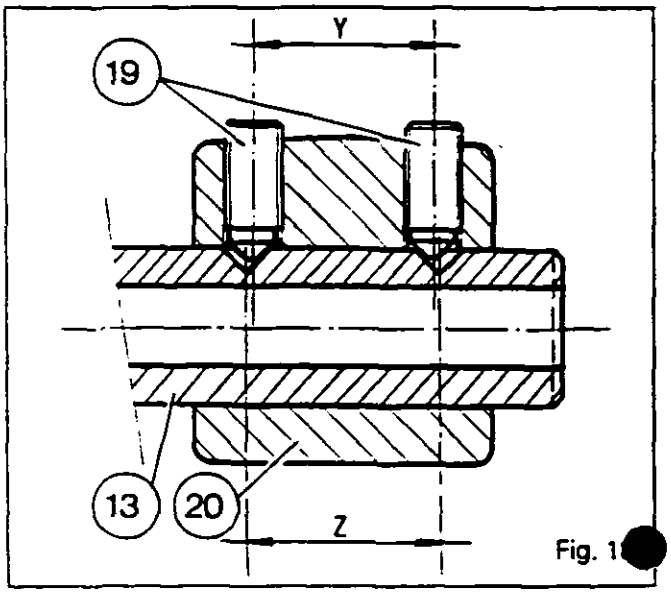


Fig. 1

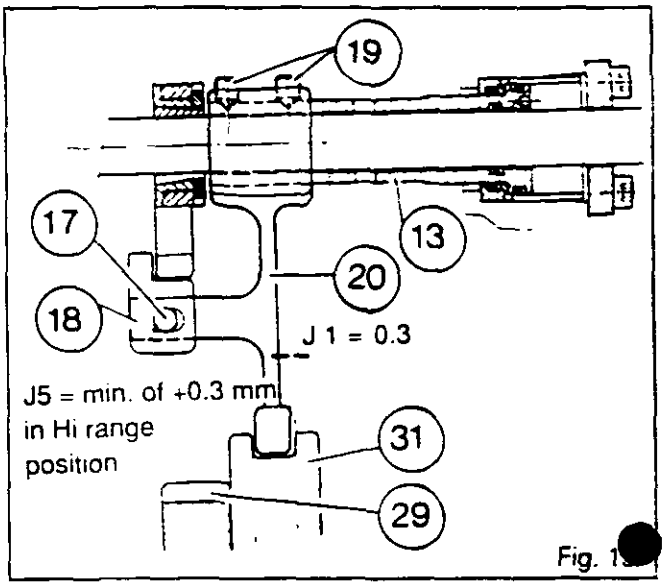
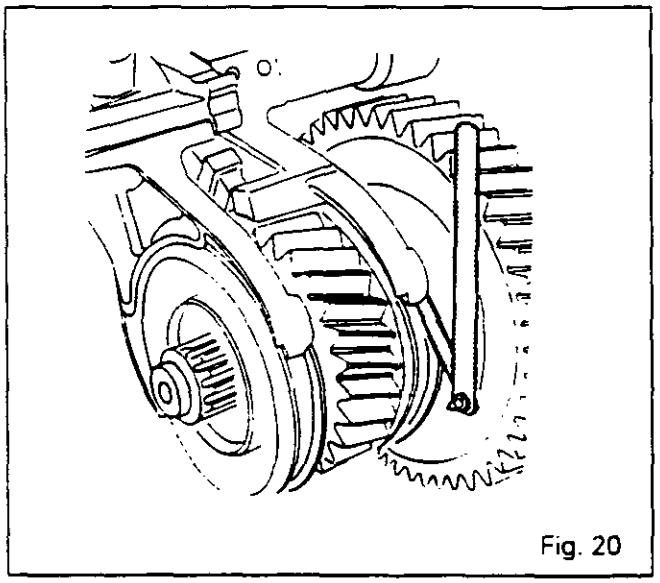


Fig. 1


Fig. 20

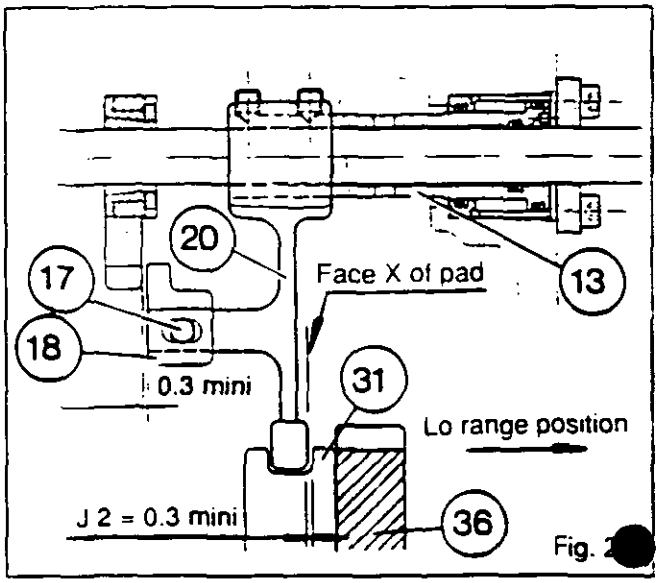


Fig. 2

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83. Adjust the plays J3 and J4 (min. = 0.3 mm) evenly so that the mechanical lock **(22)** operates freely (Figures 22 and 23).
84. Tighten the castellated nut **(21)** to a torque of 50 Nm using a spanner 3615334 M1 and a spring scale (Fig. 23).
85. Apply Loctite 648 on the tightening face of the slider **(18)** and Loctite 241 on bolt **(17)**. Fit the washer and the bolt.
86. Adjust plays J5 and J6 (min. = 0.3 mm) evenly between the slider and the lock in the Hare and Tortoise positions (Figures 19 to 21 and 24).
87. Tighten the bolt to a torque 36 - 46 Nm.
88. Check the operation of the Hare/Tortoise range and the lock.
89. Check the changing of the gears.

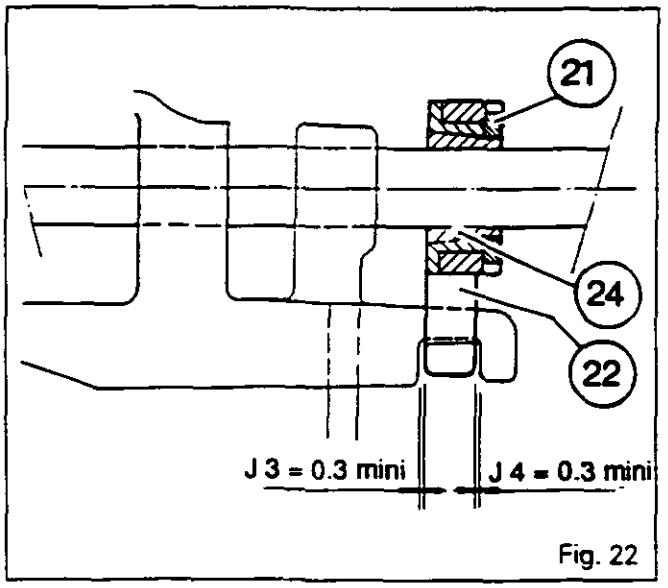


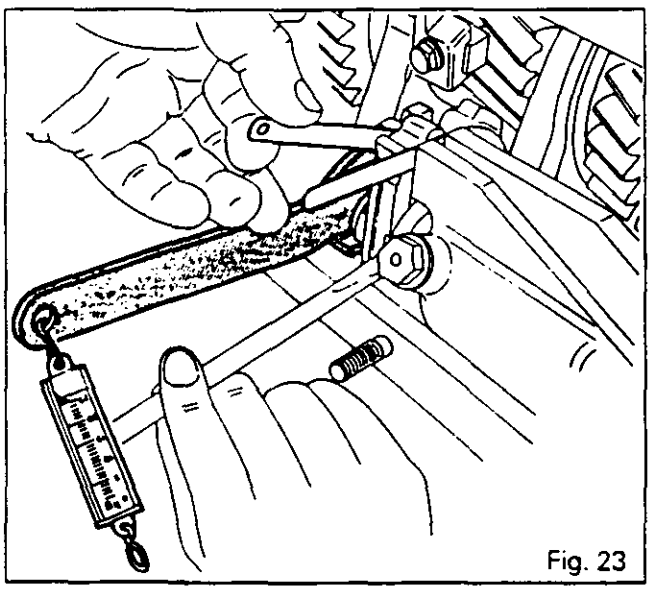
Fig. 22

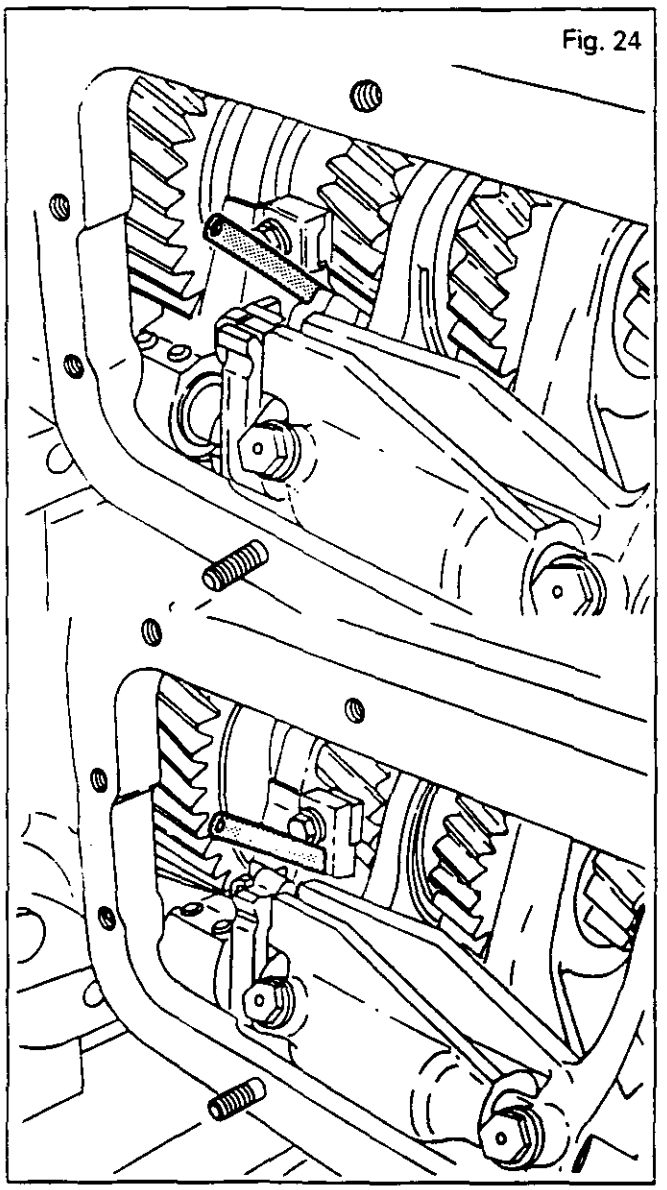
G. Refitting the selector cover

90. Fit the bolt **(1)** (Fig. 13), if fitted, and carry out procedures 33 to 38, in Section 5 X01.
Note: If the setting of the sleeves on the levers is required, repeat part E, Section 5 X01.

H . Final operations

91. Recouple the tractor between the gearbox and the rear axle, as per Section 3 B02.
92. Check :
- the systems for leaks,
- the operation of the electrical circuits.
93. Carry out a road test on the controls.
94. Check for leaks on the mating faces of the selector cover and of the gearbox on the rear axle.


Fig. 23

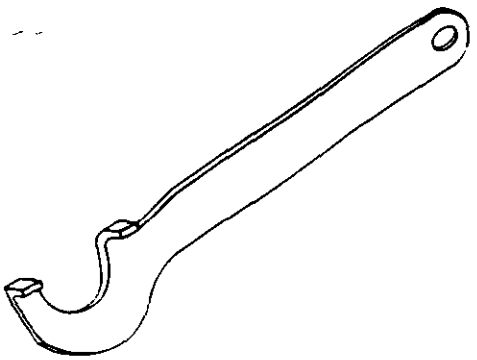

Fig. 24

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I. Service tools

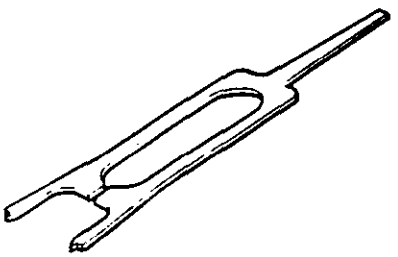
a) Tools available from the MF network

Slotted nut wrench 3615334 M1



3376805 M1

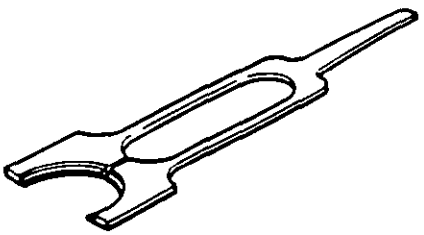
Snap ring remover tool MF 460

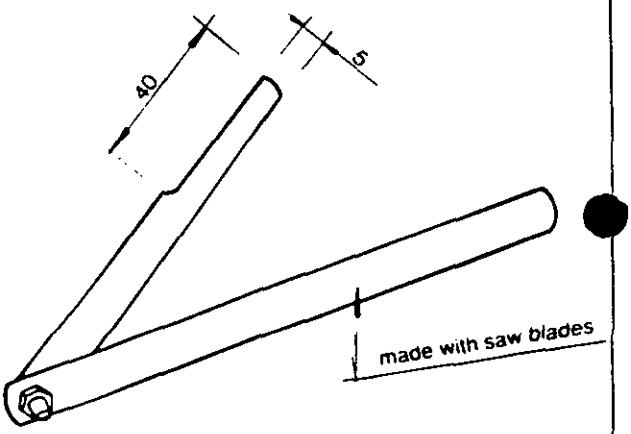


MF 458

b) Tool to be manufactured locally

Snap ring replacer tool MF 459





Set of shims

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5 X01 Selector cover

CONTENTS

- **General** ____ 2
- **Operation** ____ 2

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B. **Disassembly** ____ 5

C. **Reassembly** ____ 5

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E. **Adjustment of sleeves on levers** ____ 6

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Gearbox - Dynashift

General

The selector cover fitted on the right-hand side of the gearbox housing has two separate levers each of which performs one of two different functions :

- Front lever : This lever controls the reverse shuttle.
- Rear lever : This lever selects the four basic speeds and the two Hare/Tortoise (Hi-Lo) ratios.

Operation

Reversing lever

The reverse shuttle is operated when the lever **(23)** is pushed forwards (reverse) or backwards (forward motion).

When the lever **(23)** *is moved forwards or backwards,* it causes the shaft **(53)** which is secured to the U-arm **(54)** to turn. The index on the U-arm moves the selector **(S)**.

Gear lever

The arrangement of the 1st and 2nd speed gears is the reverse of the arrangement for the standard 8-speed gearbox (4 x 2).

Operation

Selecting 1st/2nd gears

When the lever **(12)** is pushed, the arm **(36)** is engaged in the 1st and 2nd speed fork,
moving lock **(V)** which prevents any movement of the 3rd and 4th speed fork.
1st gear is then obtained by moving the lever forwards and 2nd is obtained by moving it back.

Selecting 3rd/4th gears

In this configuration, the gear lever **(12)** is in the intermediate position. The arm **(36)**, which is secured to the lever **(12)**, is engaged in the 3rd and 4th speed fork and lock (V) prevents any movement of the 1st and 2nd speed fork.
3rd gear is then obtained by moving the lever forwards and 4th is obtained by moving it back.

Hare/Tortoise function

The Hare/Tortoise position (Hi-Lo) is obtained in the neutral position by pulling the lever **(12)**. The arm **(36)** moves the lock **(V)** which applies pressure on switch **(1)** controlling the Hare/Tortoise solenoid valve via the Autotronic system.

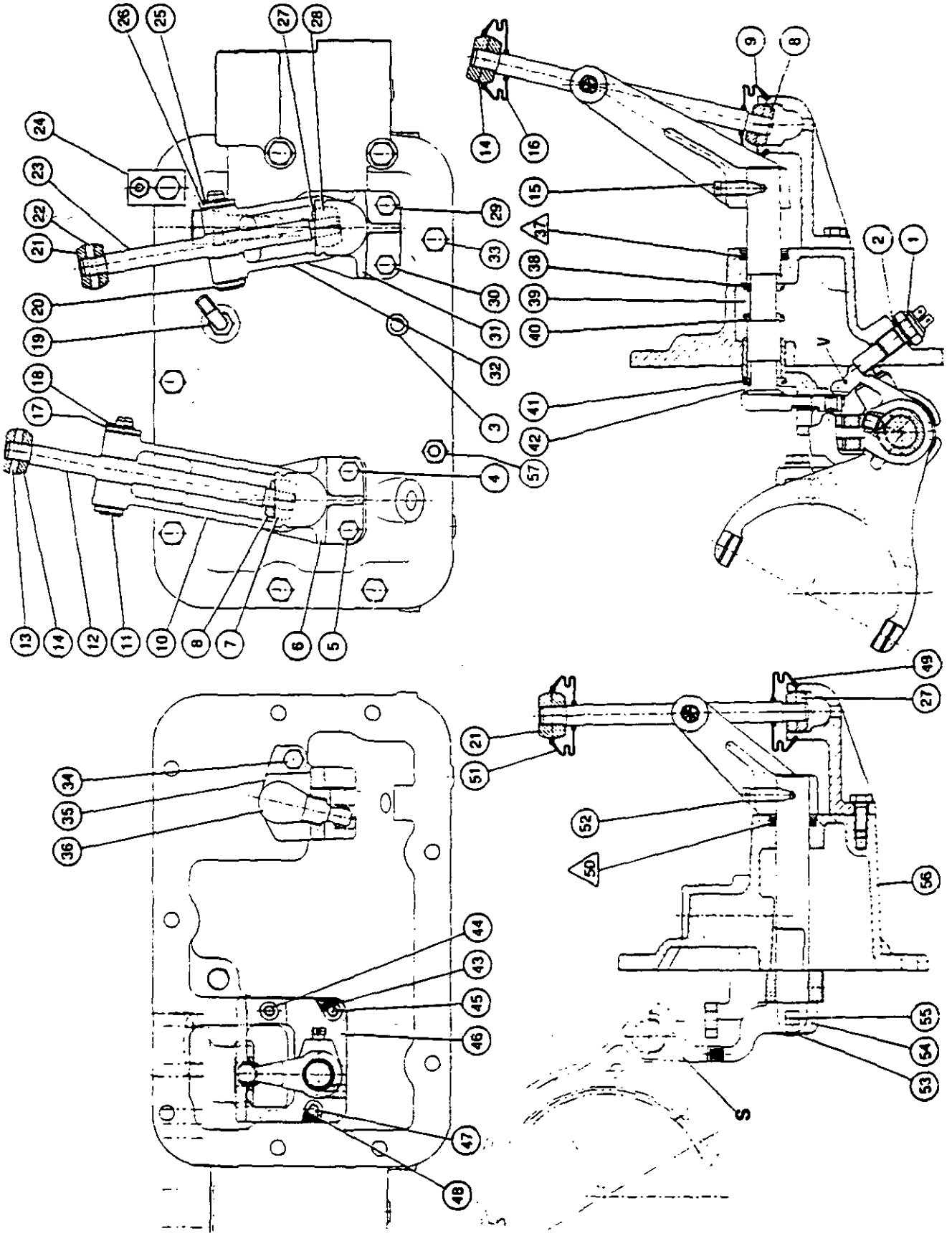
For the operation of the hydraulic system, see Section 5 K01, page 5.

List of parts

(1) Switch
(2) Seal
(3) Temperature probe
(4) Bolt
(5) Bolt
(6) Support bracket
(7) Pin
(8) Ball
(9) Dust cover
(10) Link
(11) Pin
(12) Gear lever
(13) Pin
(14) Ball
(15) Set screw
(16) Dust cover
(17) Washer
(18) Cotter pin
(19) Elbow union
(20) Pin
(21) Ball
(22) Pin
(23) Reversing lever
(24) Lug
(25) Cotter pin
(26) Washer
(27) Ball
(28) Pin
(29) Bolt
(30) Bolt
(31) Support bracket
(32) Link
(33) Bolt
(34) Bolt
(35) Rack
(36) Arm
/37 Seal
(38) Cup
(39) Spring
(40) Cup
(41) Cup
(42) Spring
(43) Dowel pin
(44) Bolt
(45) Bolt
(46) Bracket
(47) Bolt
(48) Dowel pin
(49) Dust cover
/50 Seal
(51) Dust cover
(52) Set screw
(53) Shaft
(54) Arm
(55) Set screw
(56) Cover
(57) Nut

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Gearbox - Dynashift



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Exploded view

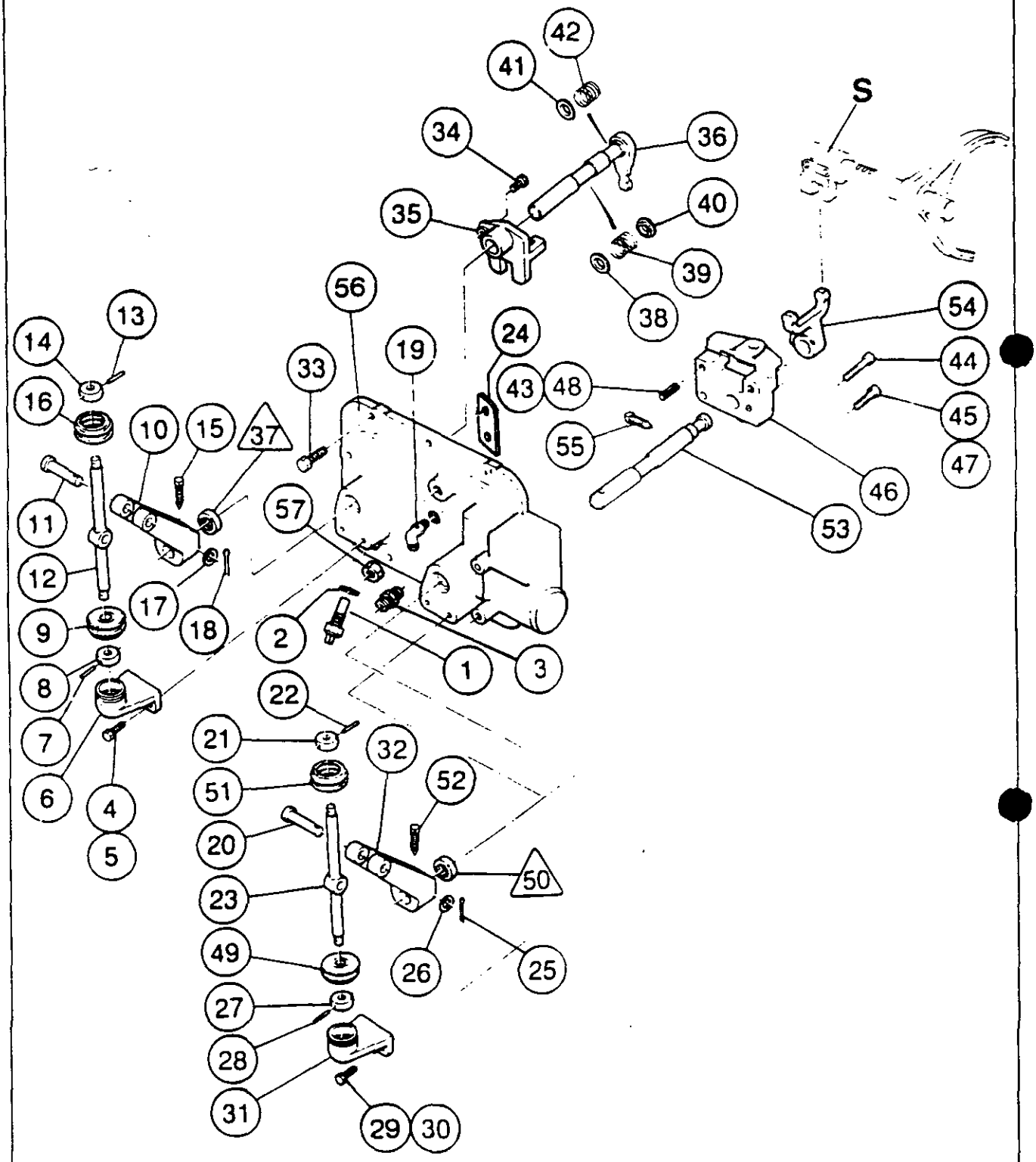


Fig.

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A . Removal

1. Immobilise the tractor. Fit wedging block under the left-hand rear wheel.
2. Apply the handbrake.
3. Fit chock between the frame and the front axle.
4. Drain the oil from the gearbox only.
5. Raise the rear right-hand side of the tractor with a trolley jack.
6. Install an axle stand and remove the wheel.
7. Remove the footstep (if necessary).
8. Take out the cotter pins **(18)** and **(25)**, washers **(17)** and **(26)**. Remove pins **(11)** and **(20)**. Lift the dust covers **(49)** **(51)** and **(9)** **(16)**. Remove the reversing lever **(23)** and gear lever **(12)** and mark their positions (Fig. 3).
9. Disconnect the wiring harnesses from the switch **(1)** and temperature probe **(3)** (Fig. 3).
10. Disconnect the control linkage on gearboxes equipped with creeper gears.
11. Remove the nut **(57)** and bolts **(33)** and mark the position of the earth wire lug **(24)**. On creeper-type gearboxes, remove the control cable support bracket **(1)** (Fig. 4).
12. Remove the cover **(56)**.

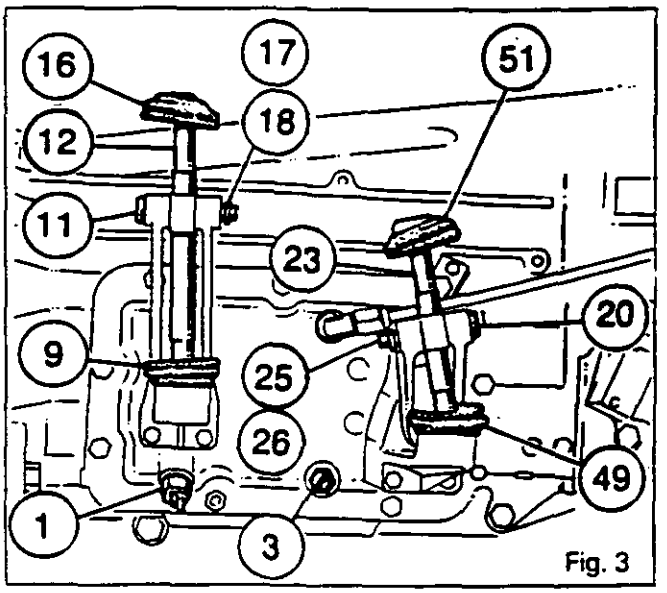


Fig. 3

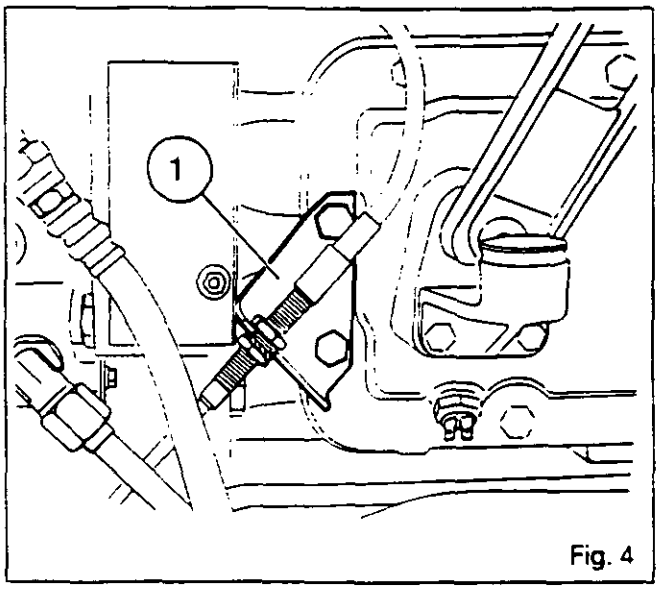


Fig. 4

B . Removal

13. Install the cover in a vice.
14. Take out bolts **(29)** **(30)** and **(4)** **(5)**. remove the supports **(6)** and **(31)**.
15. Remove set screws **(15)** and **(52)**. Remove the links **(10)** and **(32)**.
16. Remove bolt **(55)**. Withdraw shaft **(53)** and remove the reversing control U-arm **(54)**.
17. Remove bolts **(44)** **(45)** and **(47)**.
18. Remove the bracket **(46)**.
19. Extract the dowel pins **(43)** **(48)** from the cover.
20. Remove bolt **(34)**. Remove the gear control assembly.
21. Remove the cups **(38)** and **(40)**, and spring **(39)**.
22. Separate the arm **(36)** from rack **(35)**. Remove the cup **(41)** and spring **(42)** from the arm **(36)**.
23. Remove the Hare/Tortoise switch **(1)**, seal **(2)**, union **(19)** and temperature probe **(3)**.
24. Remove seals **/37** and **/50**.

C . Reassembly

25. Clean the mating face on the cover **(56)**. Apply Loctite 542 on the outer circumference of seals **/37** and **/50** and fit them fully home in the shoulder of the cover.
26. Fit the dowel pins **(43)** and **(58)** in the cover. Install the bracket **(46)**.
    Reinstall the bolts **(44)** **(45)** and **(47)**, and tighten them to a torque of 25 - 35 Nm.
    Refit the U-arm **(54)** and refit the shaft **(53)** from the inside of the cover. Be careful not to damage the lip of seal **/50**.
    Install the set screw **(55)** and tighten it to a torque of 28 - 43 Nm.
27. Refit the cup **(41)** and spring **(42)** on arm **(36)**. Assemble the arm with the rack **(35)**.

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28. Reinstall the spring **(39)** and cups **(38)** and **(40)**.
29. Refit the gear control assembly and bolt **(34)** after coating it with Loctite 270. Tighten to a torque of 25 - 35 Nm.
    Note : Be careful not to damage the lip of seal /37\.
30. Reinstall the union **(19)**, the temperature probe **(3)** fitted with its seal, the Hare/Tortoise switch **(1)** and its seal **(2)**.
31. Refit links **(10)** and **(32)**. Fit the set screws **(15)** and **(52)**.
32. Refit the support brackets **(6)** and **(31)**. Fit bolts **(29)** **(30)** and **(4)** **(5)**.

D . Refitting

33. Clean the mating face on the cover **(56)**.
34. Set the reversing selector, and the 1st, 2nd, 3rd and 4th gear forks to the neutral position. Move the lock **V** towards the opening of the selector cover (see Fig. 5).
35. Apply a sealing compound on the mating face of the gearbox housing.
36. Position the gear lever pointing towards the right. Set the reversing lever to the neutral position.
37. Position the cover on the gearbox, making sure that the levers are correctly positioned in the selector mechanisms.
38. Fit the earth wire lug **(24)**, bolts **(33)** and nut **(57)**. Tighten to a torque of 50 - 70 Nm.
    Note : For gearboxes equipped with creeper gears, fit the cable support (1) (Fig. 4).
39. Connect up the control linkage on gearboxes equipped with creeper gears.
40. Reconnect the wiring harnesses to the Hare/Tortoise switch **(1)** and on the temperature probe **(3)**.
41. Refit the reversing lever **(23)** and gear lever **(12)**.
42. Reinstall pins **(11)** and **(20)**. Reinstall the washers and pins. Position the dust covers (Fig. 3).
43. Refit the footstep (if it was removed).
44. Reinstall the wheel.
45. Remove the axle stand and the trolley jack. Tighten the wheel nuts to a torque of 400 - 450 Nm.
46. Carry out procedures 1 to 4 in reverse order.
47. Carry out a road test on the controls for :
    - the reverse shuttle, gears, Hare/Tortoise range, creeper gears (if fitted) and Dynashift speeds A, B, C, D.
    - Check the mating face on the cover and hydraulic unions for leaks.

E . Adjusting the sleeves on levers

Note: If an adjustment or replacement is necessary, lightly coat the inside of each sleeve with "Anti-Seize" grease or equivalent.

48. Set the reversing and gear levers to the neutral position.
49. Unlock nuts **(1)**. Adjust the sleeves **(2)** so as to obtain a dimension **X** between the base of the sleeve and shoulder **"E"** on each lever (see Fig. 6). Tighten the nuts to a torque of 50 Nm and position the dust cover **(3)**.
    X = 40 mm for all types
    = 70 mm on the gear lever only for 3125 as from serial number B064014.

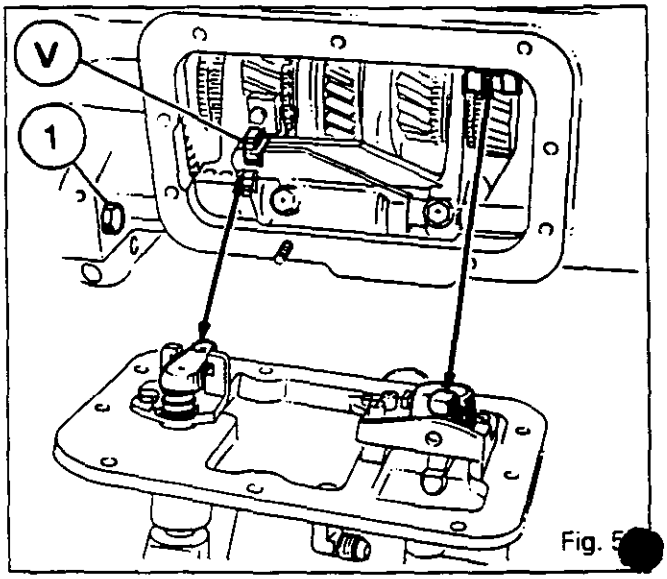


Fig. 5

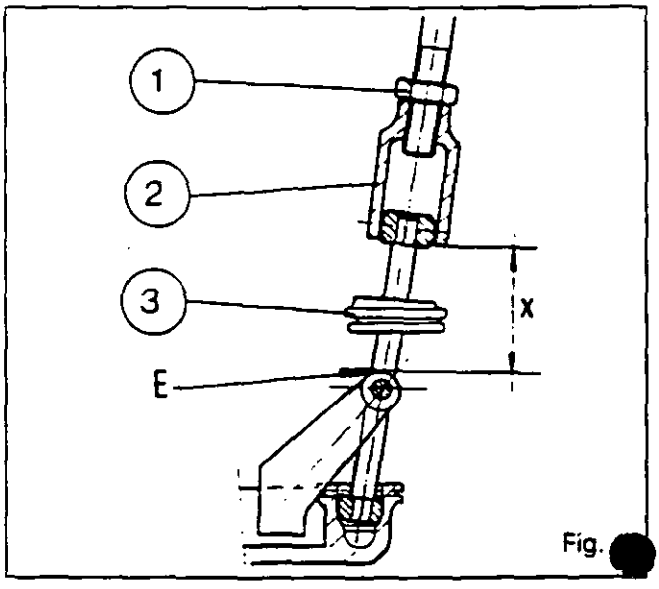


Fig. 6

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6 A01 Description of rear axle

CONTENTS

- **General** ____ 2

A. Centre housing assembly ____ 2

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6A01.2

Rear axle - Description

General

The rear axle comprises four main housings :

- The centre housing which houses the differential, the power take-off gear in all variants and the 4-wheel drive transmission, the handbrake and main brake control unit. It also supports the two axle housings (trumpets), the lift cover and the side covers (see chapters 8 I01-02).

- The right and left trumpets fixed to each side of the centre housing, serving as a rear wheel drive axle case (see chapters 6C01-02).

- The lift cover fitted to the top of the centre housing supporting the lift arms which are attached to the lower links (see chapter 6B01).

A. Centre housing assembly

Differential

The bevel gear is driven from the gearbox output shaft through a connecting shaft with splined couplers. The helical bevel crownwheel and pinion set transmits the drive through a differential to the final reduction units. A differential lock system actuated by hydraulic pressure is incorporated into the casing (see 6J01).
The differential lock is controlled by the Autotronic (if fitted).

4-wheel drive clutch

A gear splined to the drive bevel gear shaft drives the 4 WD clutch assembly.
Motion is then transmitted via Belleville washers to the clutch output shaft (see 7A01).
It is hydraulically actuated to disengage the 4 WD. There is therefore no possibility of accidental disengagement of 4 WD in the event of hydraulic failure.

Power take-off drive

The rotation of the shaft passing through the gearbox, proportional to the engine speed, is transmitted to the hydraulic clutch situated at the front of the centre housing (see 6G01).
In the engaged position drive is transmitted by a countershaft and a set of driving and driven gears to the 540 or 1000 rpm power take-off shaft. Speeds are selected by a system of interchangeable shafts (see 6 E01) or by coupler (see 6 E02).
A hydraulic braking device stops the rotation of the power take-off shaft in the disengaged position.
Two additional options are offered :
- (economy) 4 speed power take-off (see 6 D01).
- power take-off proportional to forward speed (GSPTO) (see 6 F01).

Handbrake assembly

A brake assembly comprising two plates and an expander mechanism is mounted on the bevel drive pinion (see 6I01).

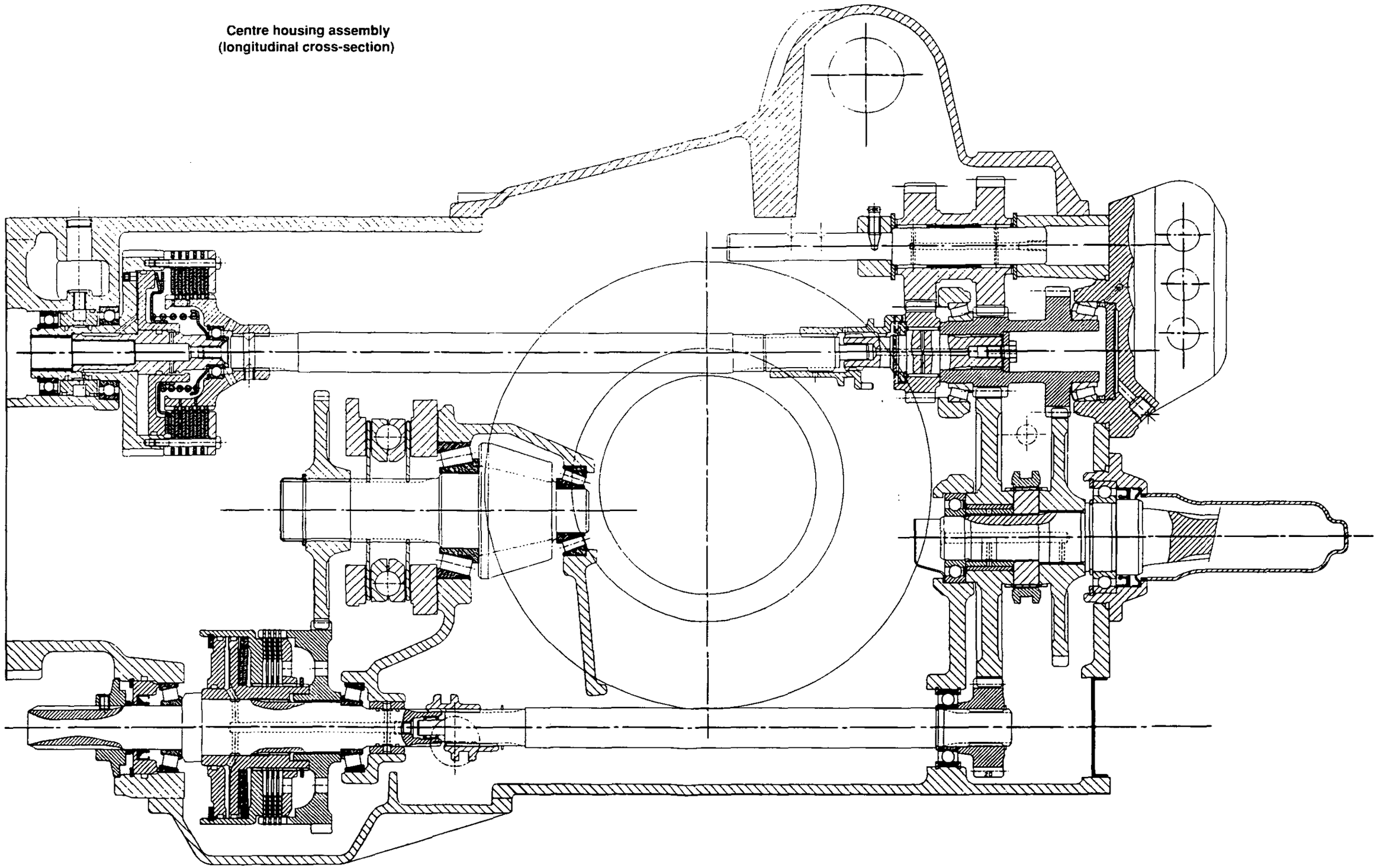
Main brakes

Two pistons mounted laterally in two cavities in the centre housing act on two discs splined onto the output shafts. The brake pistons are activated hydraulically (see 6 K01).

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Rear axle - Description

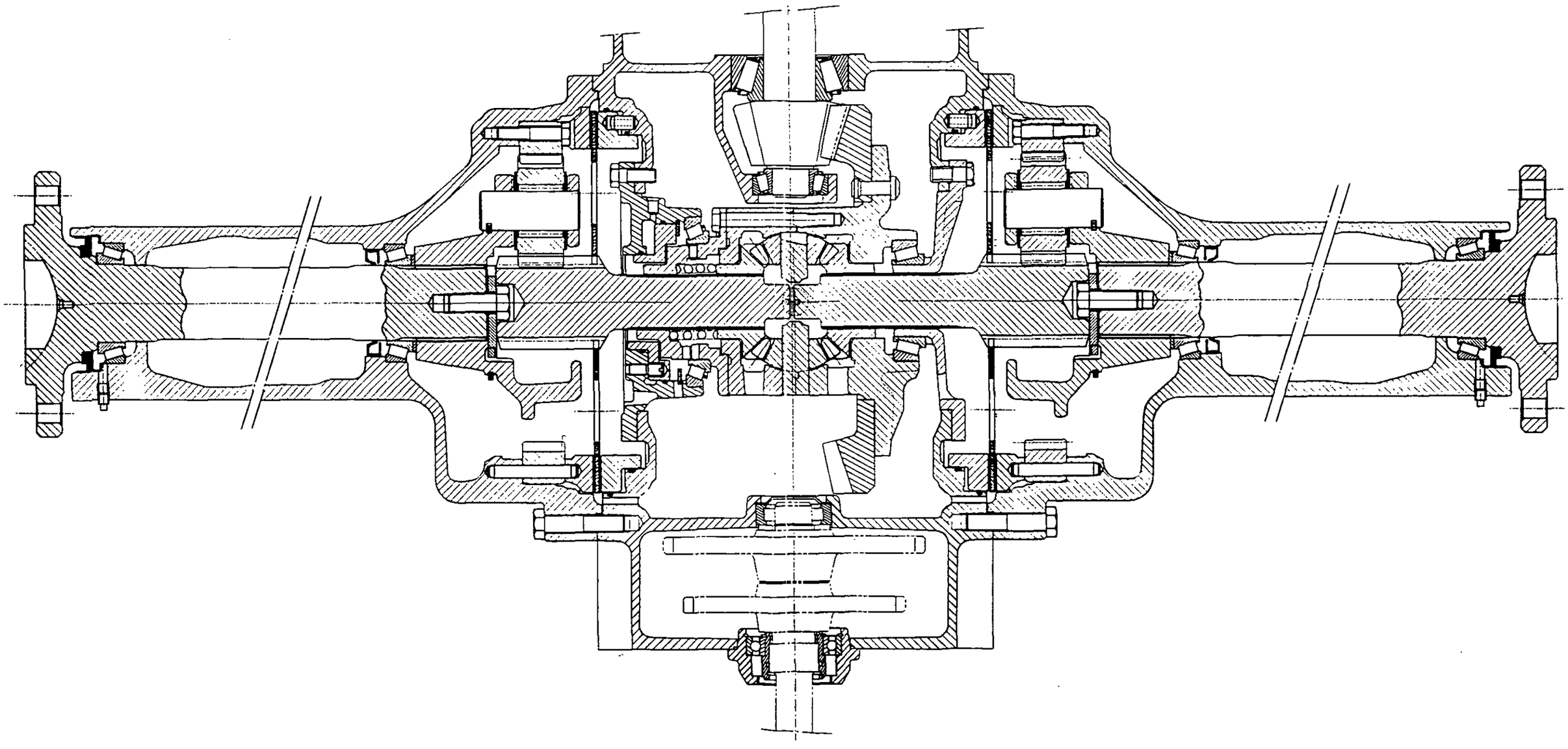
Centre housing assembly
(longitudinal cross-section)



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Rear axle - Description

Rear transmission assembly (cross section)



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6 B01 Lift cover

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6B01.2

Rear Axle - Lift cover

General

The lift cover is mounted on the upper face of the rear axle housing. The shaft **(4)** which has the two lift arms **(5)** and **(11)** splined to it, is supported by bushes **(8)**.

Cam **(9)** on the lift shaft **(4)** provides the means for sensor **(26)** to monitor position of lift arms. This information is transmitted to the Electronic Linkage Control (ELC) system.

To ensure correct play between the lift arms and the cover, shims **[12]** are fitted on the left hand end of the shaft.

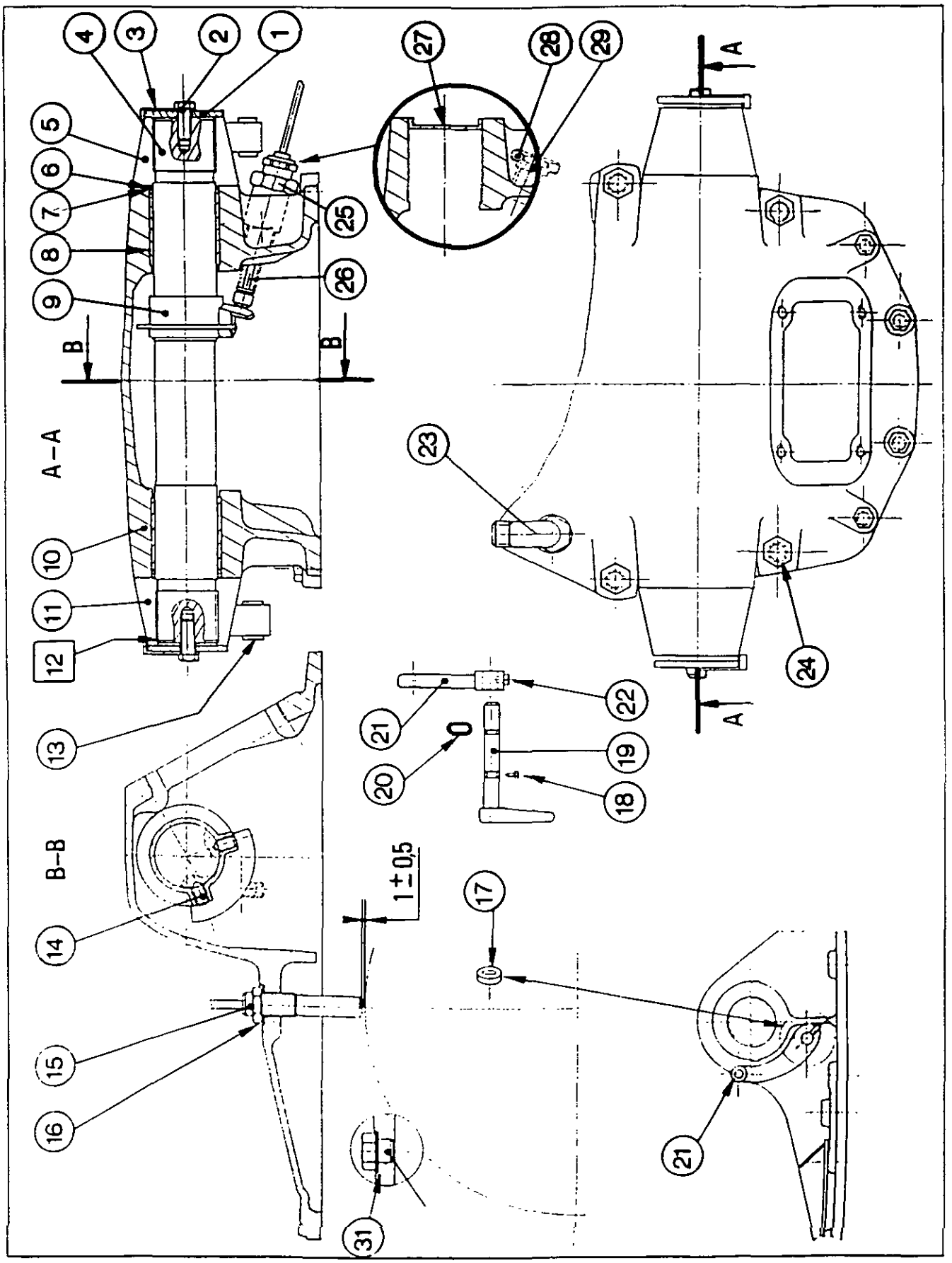
The rear face of the lift cover supports the auxiliary spool valves. The vehicle speed sensor **(15)** is screwed in the front of the cover. The cover also supports lever **(21)** for economy (4 speed) PTO, if fitted.

Parts list

(1) Washer
(2) Bolt
(3) Retainer
(4) Lift shaft
(5) Right-hand lift arm
(6) Nylon ring (2)
(7) O-ring (2)
(8) Bush (2)
(9) Cam
(10) Lift cover
(11) Left-hand lift arm
[12] Shim(s)
(13) Bush
(14) Set screw (2)
(15) Vehicle speed sensor
(16) Nut
(17) Cup plug (2-speed PTO)
(18) Screw (4-speed PTO)
(19) Control finger (4-speed PTO)
(20) O-ring (4-speed PTO)
(21) Lever (4-speed PTO)
(22) Screw (4-speed PTO)
(23) Elbow connector
(24) Bolt
(25) Nut
(26) Position sensor
(27) Cup plug
(28) Threaded plug
(29) Seal
(30) Threaded plug
(31) Seal

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Rear Axle - Lift cover



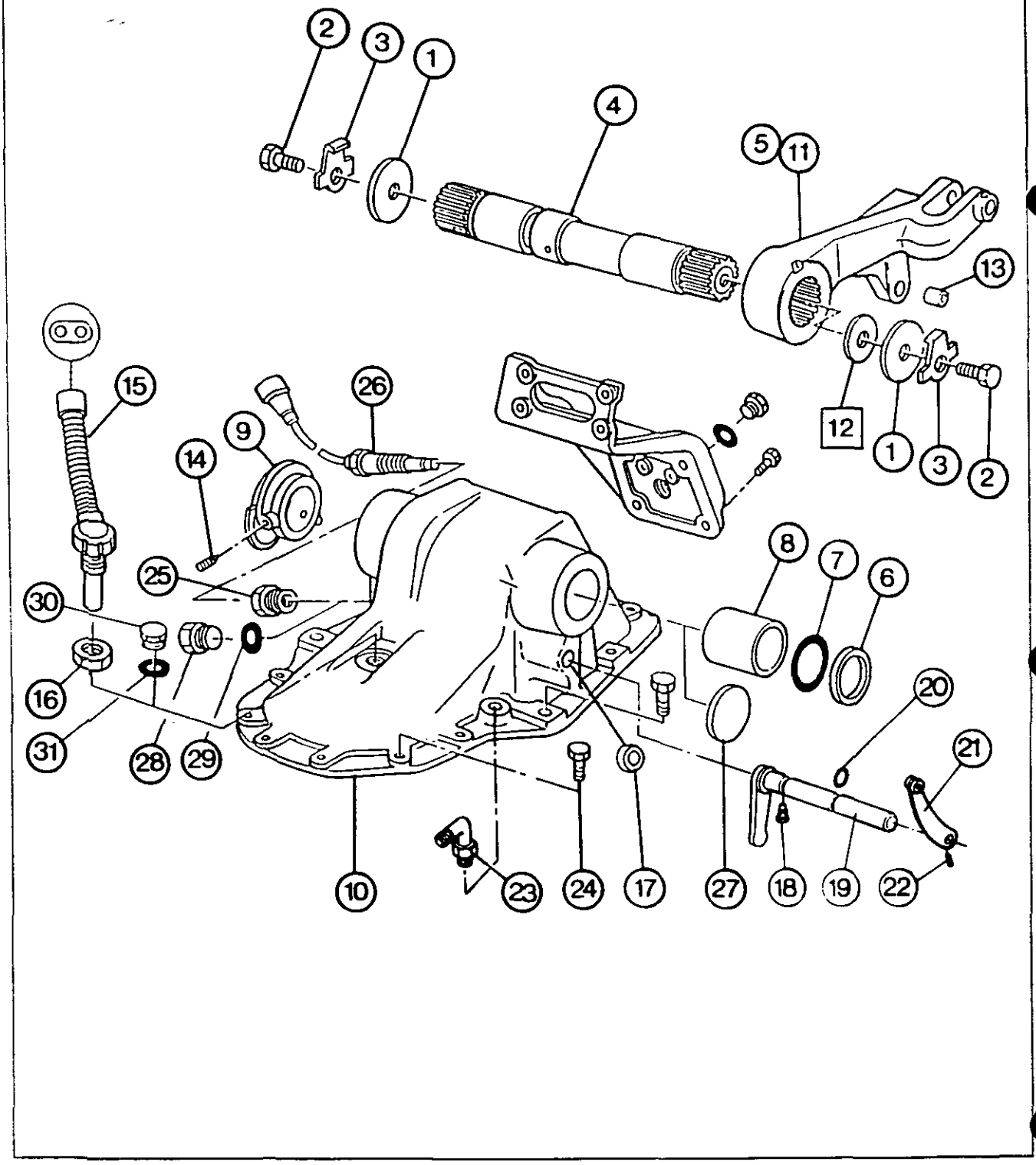
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Rear Axle - Lift cover

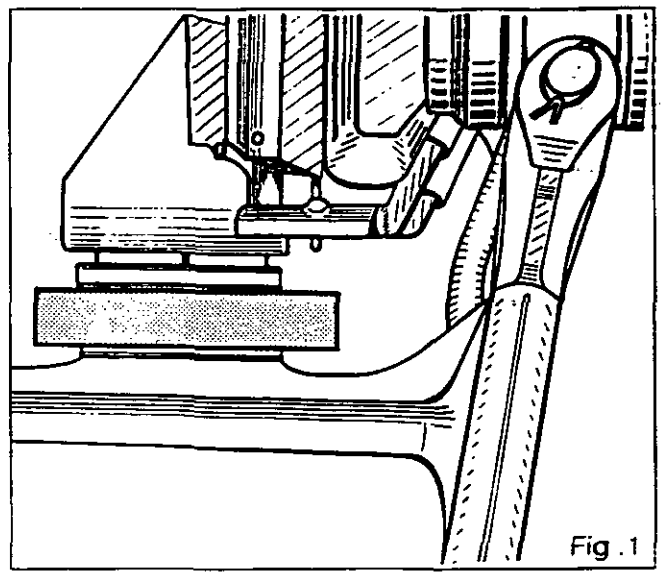
Exploded diagram



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A. Removal

1. Remove the sheetmetal.
2. Remove the rear fastening screws to the cab (remove only the central and lower screws to the guard plates to gain access to the cab fastening screws).
3. Raise the cab.
   Note: Place a block between the cab and the trumpets (Fig. 1).
4. Disconnect (Fig. 2) :
   - the supply hose **(1)** to the spool valve
   - the supply hose **(3)** to the lift valve
   - the return hose **(2).**
5. Remove the bolts **(4)** for the spool valve support **(5)** (Fig. 2).
6. Remove the support swinging the assembly out of the way, without disconnecting the controls **(1)** (Fig. 3).
7. Disconnect (Fig. 4):
   - the vehicle sensor wire assembly **(1)** (Autotronic, Datatronic)
   - the position sensor wire assembly **(2)**
   - the differential lock pipe **(3)**
   - the cable **(4)** (4-speed PTO, if fitted)
   - the cable **(5)** (shiftable PTO, if fitted).


Fig .1

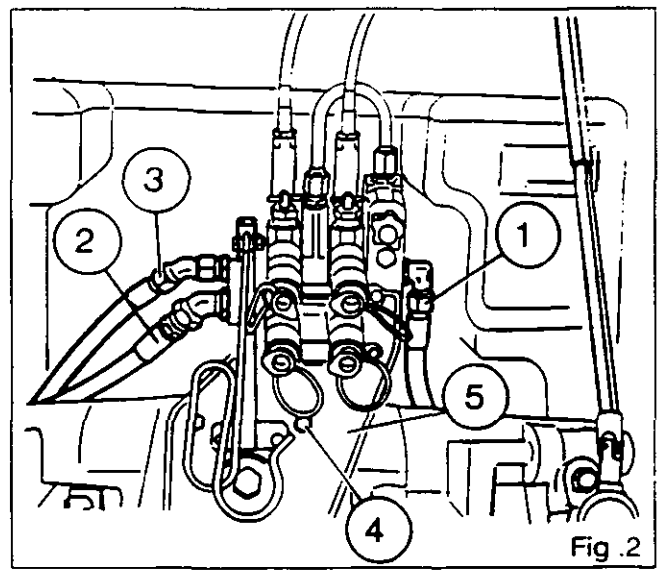


Fig .2

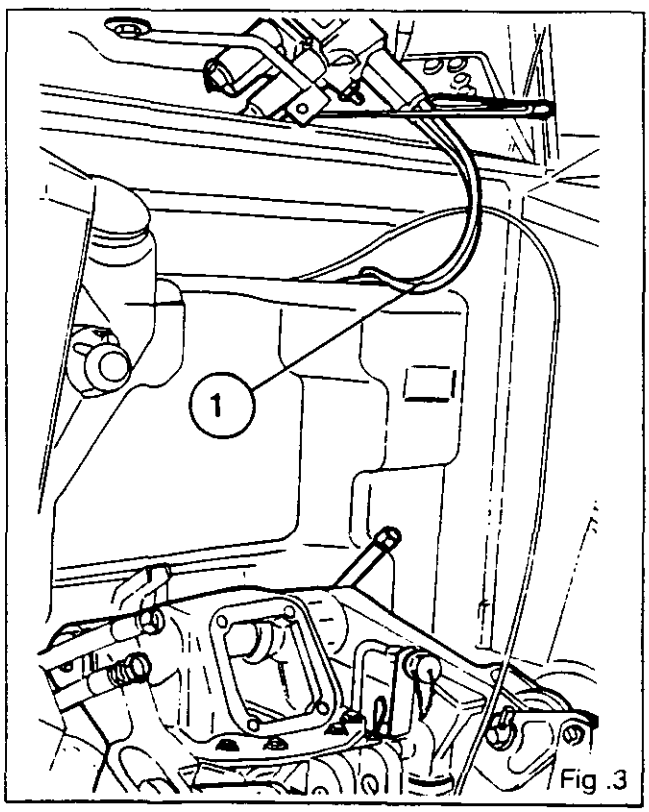


Fig .3

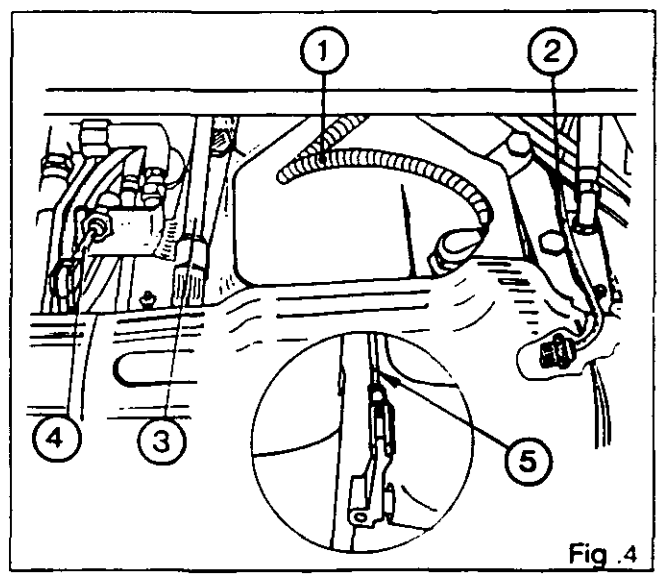


Fig .4

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Rear Axle - Lift cover

8. Unscrew the pipe **(1)** at both ends and remove the support **(2)** for the trailer brake connector if fitted (Fig. 5).
9. Remove the upper pins from the rams and lift rods.
10. Remove the fastening bolts **(24)** for the cover **(10)**.
    Note: The p.t.o. control cable supports (depending on the version) are fixed by the bolts for the cover.
11. Lift the cover and remove it.

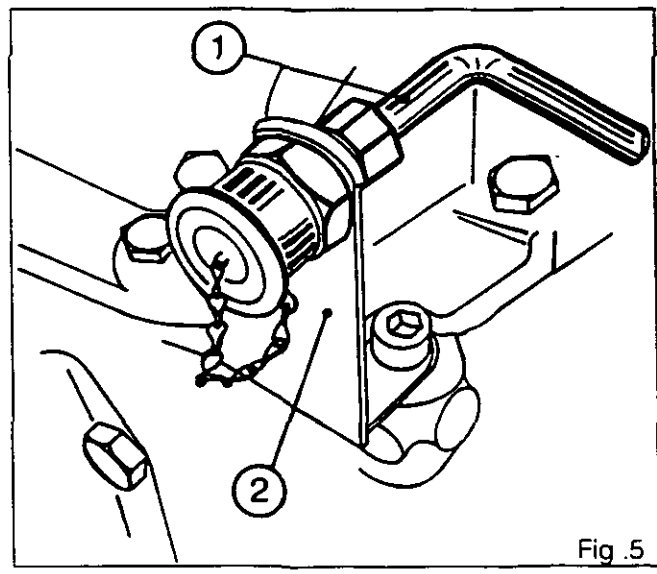


Fig .5

B. Disassembly

12. Place the cover on a work bench.
13. Remove the elbow connector **(23).**
14. Unscrew the nut **(16)** and remove the vehicle speed. sensor **(15)**.
15. Unscrew the nut **(25)** and remove the position sensor **(26)**.

For tractors equipped with economy 4-speed, carry out operations 16 to 19 (Fig. 6).

16. Undo the Allen screw **(22)** in the lever **(21)**.
17. Undo the screw **(18)**.
18. Remove the control finger **(19)**.
19. Remove the O-ring **(20)**.
20. Flatten tabs locking the bolts **(2)** retaining the lift arms..
21. Undo the screws.
22. Remove the washers **(1)**.
23. Remove the shim(s) **[12].**
24. Remove the lift arms **(5)** and **(11)**.
25. Remove the nylon rings **(6)** and the O-rings **(7).**
26. Remove the set screws **(14)** in the cam **(9)**.
27. Withdraw the lift shaft **(4)** from the cover.
28. Remove the cam **(9)**.
29. Withdraw the bushes **(8)** (Fig. 7).
30. Remove the cup plug **(17)** (2-speed PTO).

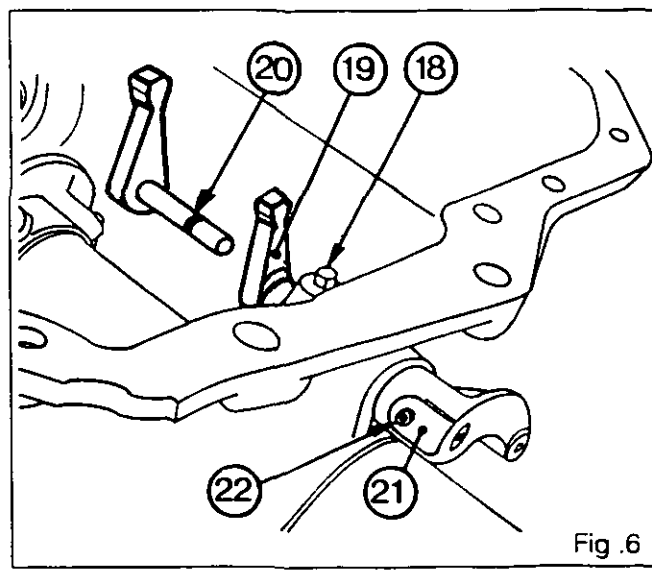


Fig .6

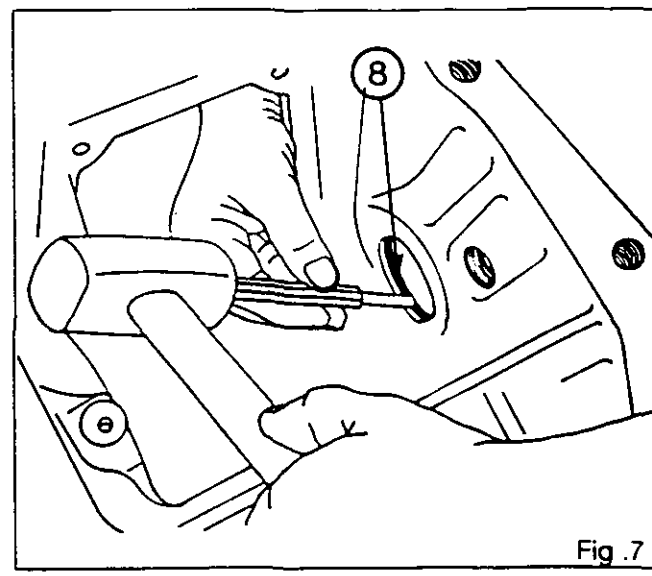


Fig .7

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C. Reassembly

Note: The bushes (13) are mounted with Loctite 648 at a distance of 40.50 mm from the face A (Fig. 8).

31. Clean and check the parts. Replace any which are defective.
32. Clean the joint faces of the lift cover and of the spool valve support.
33. Fit the bushes **(8)** in the cover.
34. Fit the cup plug **(17)** smeared with Loctite 542 flush with the cover (2- speed p.t.o.).
35. Mount the lift shaft **(4)** and the cam **(9)** in the cover (Fig. 9).
    Note: Ensure that the direction of the shaft and the position of the cam are correct.
36. Tighten the set screws **(14)** smeared with Loctite 241 to a torque of 5 Nm (Fig. 9).
    Note: Apply this torque so as not to deform the cam.
37. Position the O-rings **(7)** and the nylon rings **(6)**.
    Note: Protect the splines of the shaft. Lubricate the O-rings before mounting (Fig. 10).
38. Grease the splines of the shaft **(4)** (Anti-Seize Grease or equivalent).
39. Fit the lift arm **(5)** (sensor side), the washer **(1)**, the retainer **(3)** and the screw **(2).**
    Note: Grease the face of the cover (Anti-Seize Grease or equivalent) before fitting the arms.
40. Tighten the screw **(2)** so as to align two flat sides of the screw head with the two tabs of the retainer**(3)**. Bend back the tabs.

Note: If work has been done without the need to carry out shimming J1 (Fig. 12) (eg. replacement of seals) it is essential to place the shims [12] at the left end of the shaft (factory fitting) to preserve the correct positioning of the cam and avoid having to adjust the sensor (26).

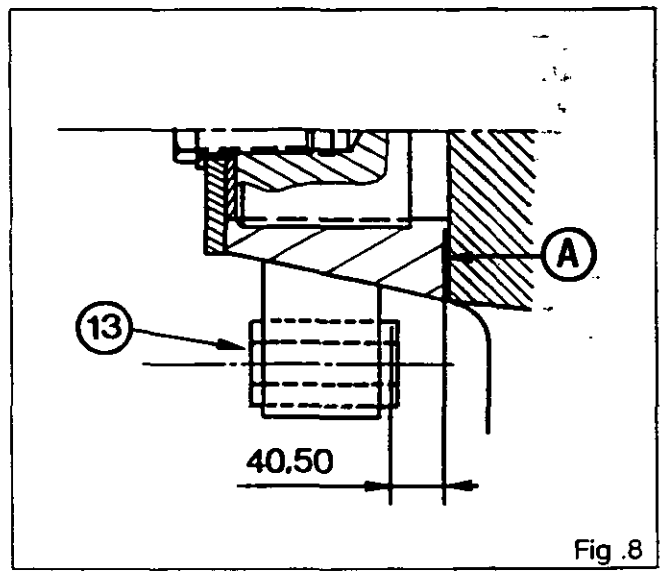


Fig .8

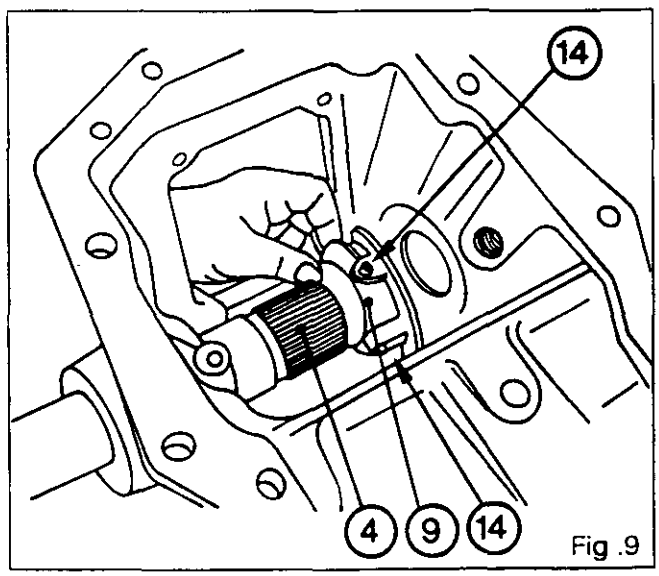


Fig .9

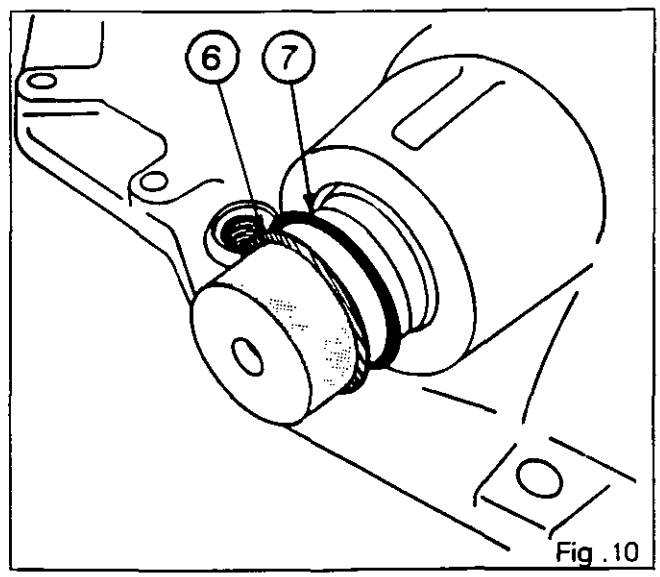


Fig .10

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Rear Axle - Lift cover

41. Carry out shimming of the shaft **(4)** (Fig. 12) to obtain:
    J1 = +0.05 to +0.20 maximum.
    Mount the arm **(11)**, the washer **(1)** and the bolt **(2)**.
    Note: Grease the face of the cover (Anti-Seize Grease or equivalent) before mounting the arm.
42. Tighten the bolt so as to position the lift arms **(5)** and **(11)** correctly on the shaft.
43. Remove the bolt **(2)** and the washer **(1)** at the left end of the shaft.
44. Measure the distance between face A of the shaft and face B of the arm using a depth gauge (Figs. 11 and 12).
45. By measuring dimension X, determine the thickness of spacers Y needed to obtain (Fig. 12):
    J1 = +0.05 to +0.20 maximum.
    J1 = X + Y
46. Mount the previously selected shims **[12]**, the washer **(1)**, the retainer **(3)** and the bolt **(2)**.
47. Tighten the bolt **(2)** so as to align two flat sides of the screw head with the two tabs of the retainer **(3)**. Bend back the tabs.

For tractors equipped with economy 4-speed PTO, carry out operations 48 to 51.

48. Refit the finger **(19)** (Fig. 13).
49. Mount the O-ring **(20)** from the exterior side of the cover (Fig. 13).
50. Smear the screws **(18)** and **(22)** with Loctite 241 and tighten.
51. Check that the control functions smoothly.
52. Fit the elbow connector **(23)**.

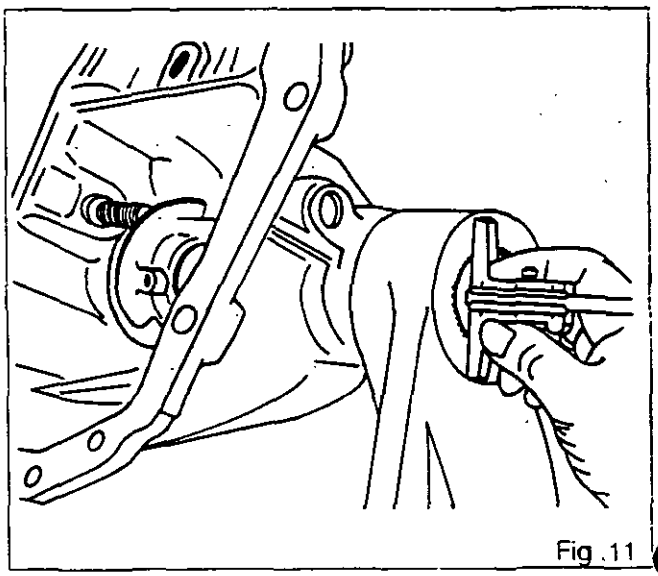


Fig .11

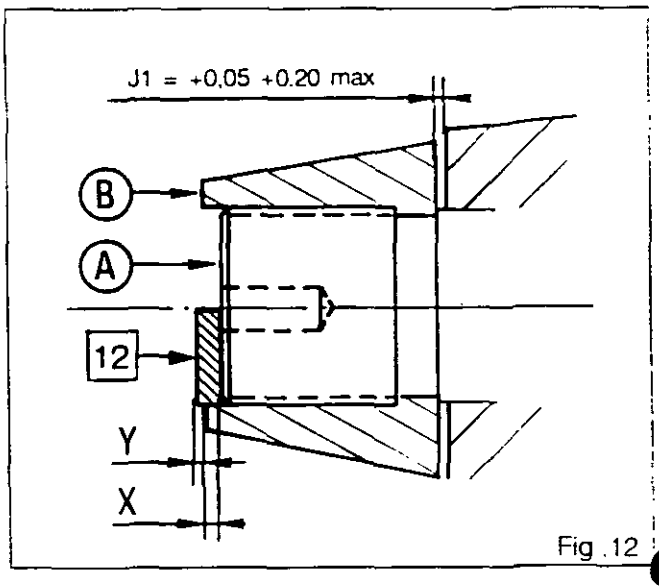


Fig .12

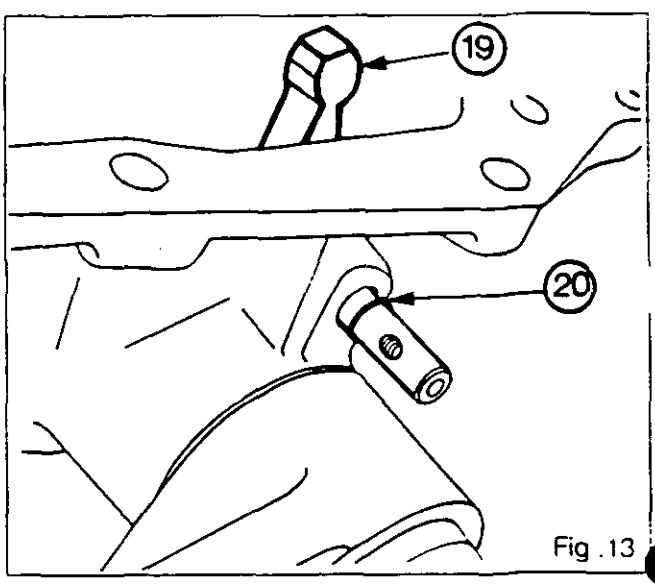
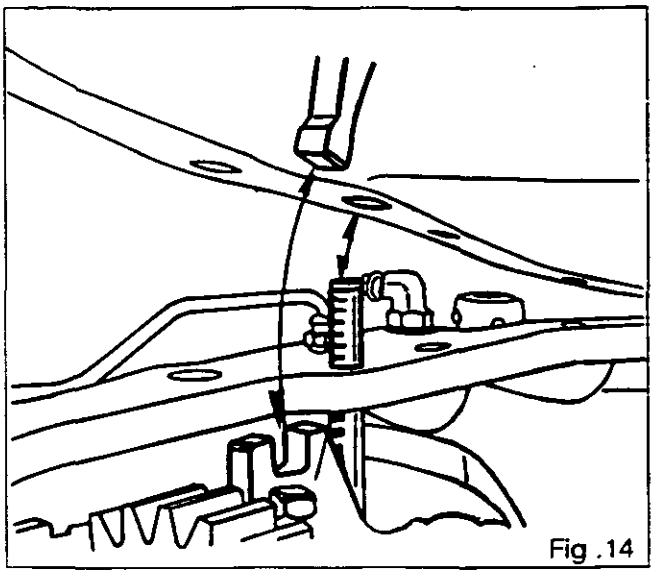


Fig .13

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D. Refitting

53. Clean the joint face of the cover on the rear axle housing.
54. Smear the joint face with a sealing compound (Master Joint 510 Loctite or equivalent).
55. Lift cover into position.
    Note: When refitting the cover, ensure that the supply pipe of the differential lock and the control finger (4-speed economy PTO) engage properly in their respective positions (Fig. 14).
56. Mount the supports for the PTO control cables (depending on the version) and fit the bolts **(24)** of the cover **(10)**. Tighten to the following torque :
    . 12mm diameter bolt = 72- 96 Nm
    . 16mm diameter bolt = 160-200 Nm
    A heavy-duty cover and five new bolts **(24)** has been released on 3125 tractor from SN : S067011. The tightening torque of 16 mm diam bolts is 240 - 320 Nm instead of 160 - 200 Nm.
57. Refit the upper pins to the rams and lift rods. Refit the trailer brake valve support if fitted. Retighten the pipe at both ends.
58. Refit (Fig. 4) :
    . the differential lock supply pipe **(3)**
    . the cable **(4)** (4-speed PTO, if fitted)
    . the cable **(5)** (shiftable PTO, if fitted)
59. Fit the vehicle speed sensor **(15)** with "Loctite 577 Sensor Sealing" or equivalent (Autotronic, Datatronic tractors) (Fig. 15).
60. Screw in the speed sensor into contact with the crownwheel, without forcing it.
61. Unscrew the sensor 3/4 of a turn so as to obtain a clearance of approx. 1 mm between the sensor and the crownwheel (Fig. 15).
62. Tighten the nut **(16)** moderately (Fig. 15).
63. Connect the sensor.
64. Fix the harness assembly with a clip.
65. Clean the joint face of the spool valve support .
66. Coat the joint face of the spool valve support with a sealing compound (Master Joint 510 Loctite or equivalent).
67. Refit the support and spool valve assembly **(1)** (Fig. 16).


Fig .14

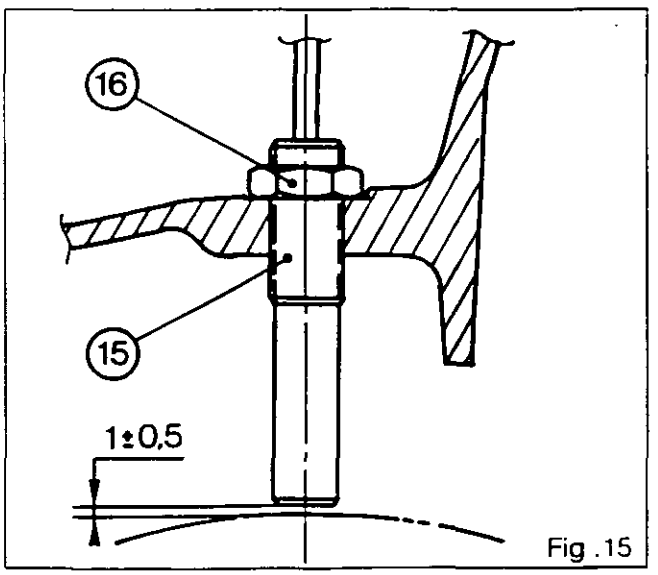


Fig .15

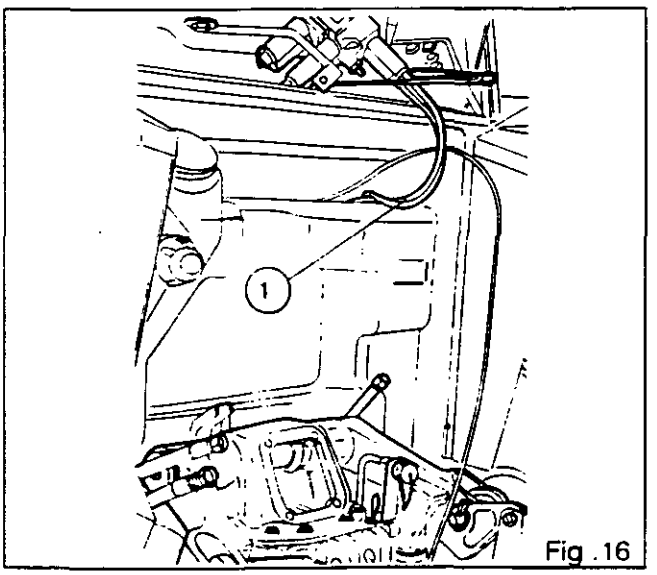


Fig .16

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Rear Axle - Lift cover

68. Smear the thread of the two lower screws **(4)** with Loctite 510. Fit and tighten the bolts **(4)** in the spool valve support to a torque of 50-70 Nm (Fig. 17).
69. Reconnect (Fig. 17):
    - the supply hose **(1)** to the spool valve
    - the supply hose **(3)** to the lift valve
    - the return hose **(2)**
70. Adjust the p.t.o. control (4-speed) (chapter 6D01, operations 127 and 132 to 137) and the p.t.o. control (shiftable) (chapter 6E02, operations 47 and 52 to 58).
71. Remove the blocks between the cab supports and the trumpets. Position the cab.
72. Refit the rear fastening screws of the cab. Tighten the nuts to 27-35 Nm and the lock-nuts smeared with Loctite 270 to 13-20 Nm. Refasten the guard plates.
73. Fit and adjust the position sensor.
74. Smear the thread of the sensor **(26)** with a sealing compound (Hylomar or equivalent), then screw in the sensor a few turns and connect the harness.
75. Start the engine.
76. Using the external control, make sure that the lift arms are in the fully raised position (relief valve blowing.
77. Stop the engine, then make a mark on the cover and on one arm. Screw in the sensor (without forcing it) until it meets the cam **(9)** and unscrew by approximately one turn (ie. 1.5 mm).
78. Fix the harness.
79. Start the engine.
80. Using the internal control, lower and raise the lift arms.
81. Check the position of the moving mark on the arm. The difference between the two marks should be approx. 3 mm.
    Note:
    a) If the difference is greater than 3 mm, unscrew the sensor slightly.
    b) If the difference is less than 3 mm, retighten the sensor slightly.
82. Tighten the nut **(25)** to a torque of 25 Nm using a suitable spanner (Fig. 18).
83. Check for leaks:
    - at the joint between the lift cover and the spool valve support
    - at the hydraulic connectors.
84. Refit the sheetmetal.

Version without lift

- The holes of the shaft **(4)** are plugged with caps **(27)** sealed with Loctite 542.
- The position sensor **(26)** is replaced with a threaded plug **(28)** equipped with a seal **(29)**.

Version without Autotronic

- The vehicle speed sensor **(15)** is replaced with a threaded plug **(30)** equipped with a seal **(31)**.

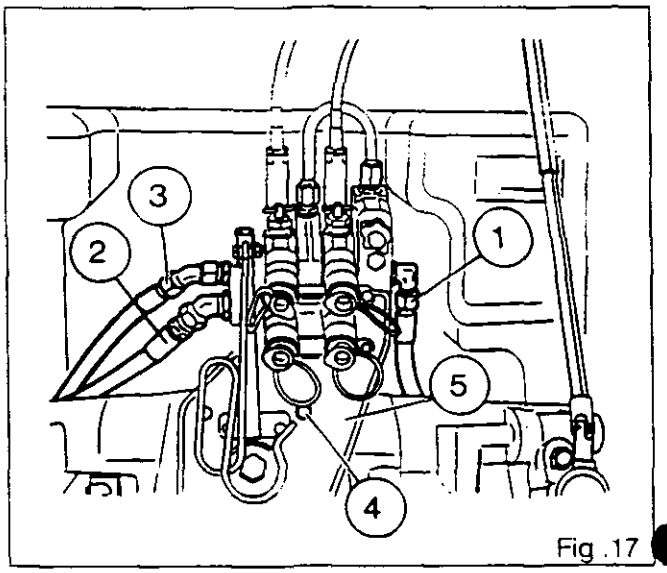


Fig .17

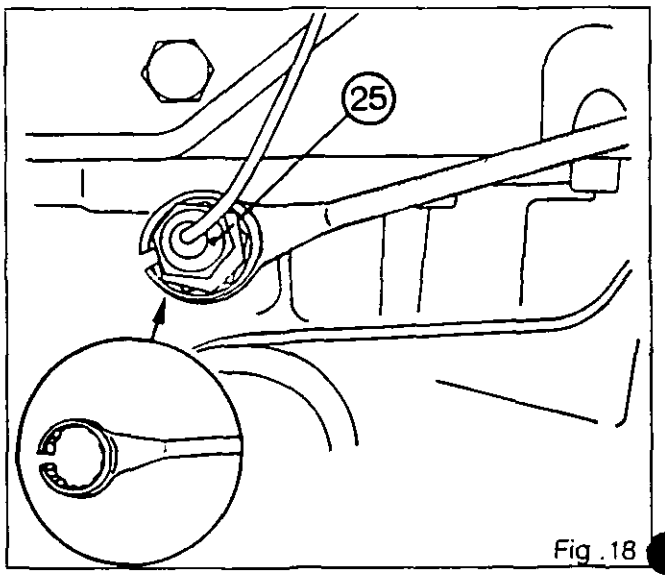


Fig .18

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6 C01 3000 Tractor Trumpet housings

CONTENTS

. **General** ____ 2

A. **Trumpet housing assembly** ____ 5

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D. **Axle shaft bearings preload** ____ 9

E. **Wheel stud replacement** ____ 10

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Rear axle - 3000 Tractor trumpet

General

Description

The trumpet housings support the RH and LH axle shafts and house the final reduction units which transmit the drive from the differential assembly.
There are two versions of the rear axle, normal and heavy duty, depending on the size of tractor: normal for the 3050, 3060 and 3065 tractors and heavy duty for the 3070, 3080 and 3095 tractors.

The two trumpet housings are identical and are fitted on either side of the centre housing.

Construction

The half shaft **(2)** is supported by two taper roller bearings **(5)** and **(8)** fitted opposite each other. The unit is sealed on the outside by a triple lip seal /**3**\ and on the inside by a single lip seal /**7**\. The final reduction planetary carrier assembly **(10)** fitted with three pinions **(14)** is splined onto the half shaft **(2)**.
The heavy duty planetary carrier assemblies comprise two rows of needle rollers **(16)** separated by a spacer **(15)**. The normal duty planetary carrier assemblies have only one row of needle rollers **(16)**. The recesses in carrier assemblies **(10)** are rough finished and as such planetary gears **(14)** end float is adjusted by fitting suitable thickness thrust washer **(13)**.

Shims **[26]** located at the end of the axle shaft allow the taper roller bearing preload to be adjusted. The half shaft **(2)** and the planetary carrier assembly **(10)** are held by the washer **(25)** and the bolt **(24)**. The ring gear **(22)** is a force fit in the trumpet housing and attached by three bolts **(17)**. It comprises three locating dowels **(21)** which centre the brake plate **(18)**.
Drive from the differential is transmitted to the final reduction planetary gears through a planetary shaft **(23)** on to which the brake disc **(19)** is splined.

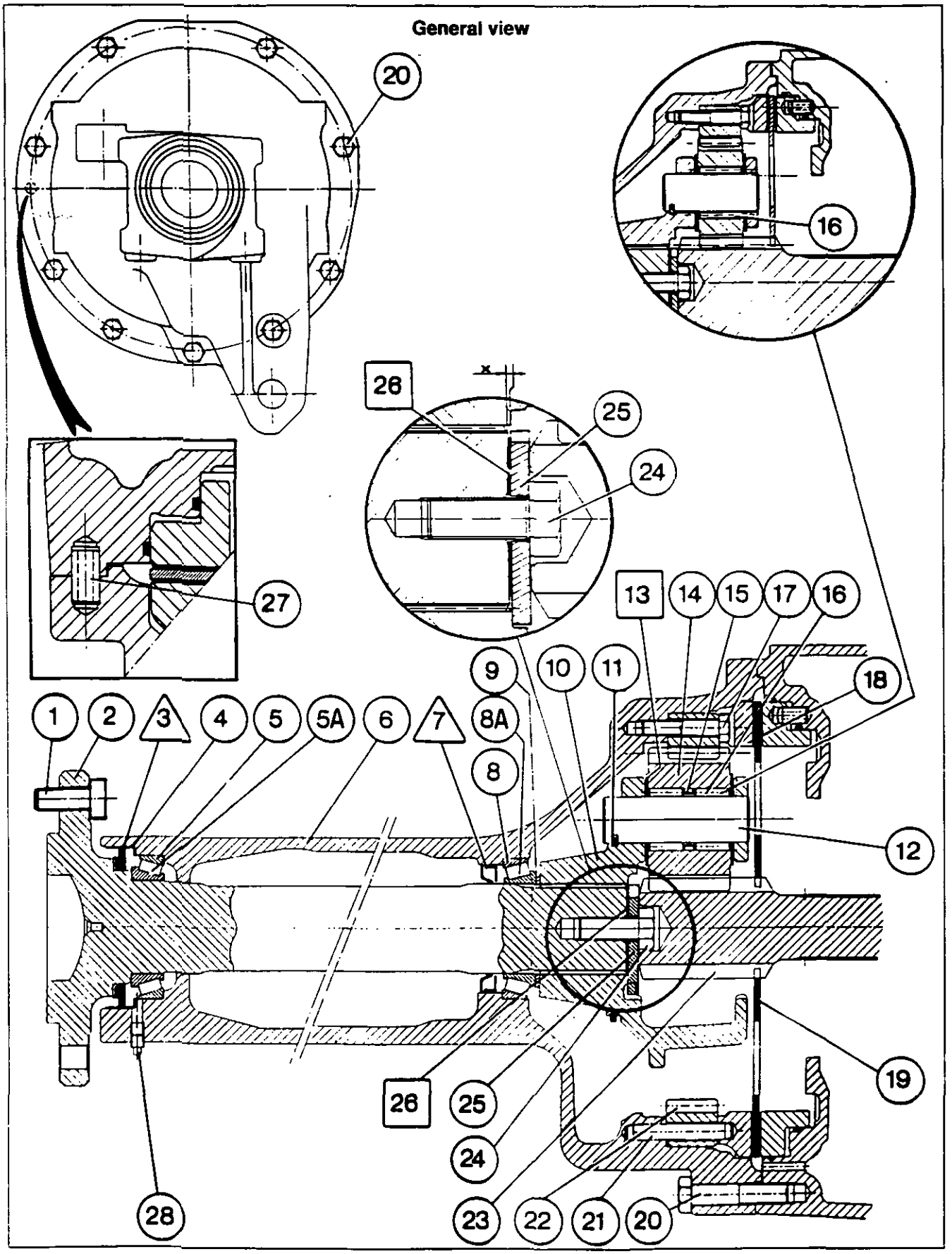
Key to illustrations

(1) Wheel stud
(2) Axle shaft
/**3**\ Triple lip seals
(4) Seal housing
(5) Bearing cup
(5A) Bearing cone
(6) Trumpet housing
/**7**\ Seal
(8) Bearing cup
(8A) Bearing cone
(9) Sour washer
(10) Planetary carrier assembly
(11) Circlip
(12) Planetary gear pin
[13] Thrust washer(s)
(14) Planetary gear
(15) Spacer (heavy duty planetary carrier assembly)
(16) Needle rollers
(17) Bolt
(18) Brake plate
(19) Brake disc
(20) Bolt
(21) Locating dowel
(22) Ring gear
(23) Planetary shaft
(24) Bolt
(25) Washer
[26] Shim(s)
(27) Locating dowel
(28) Plug

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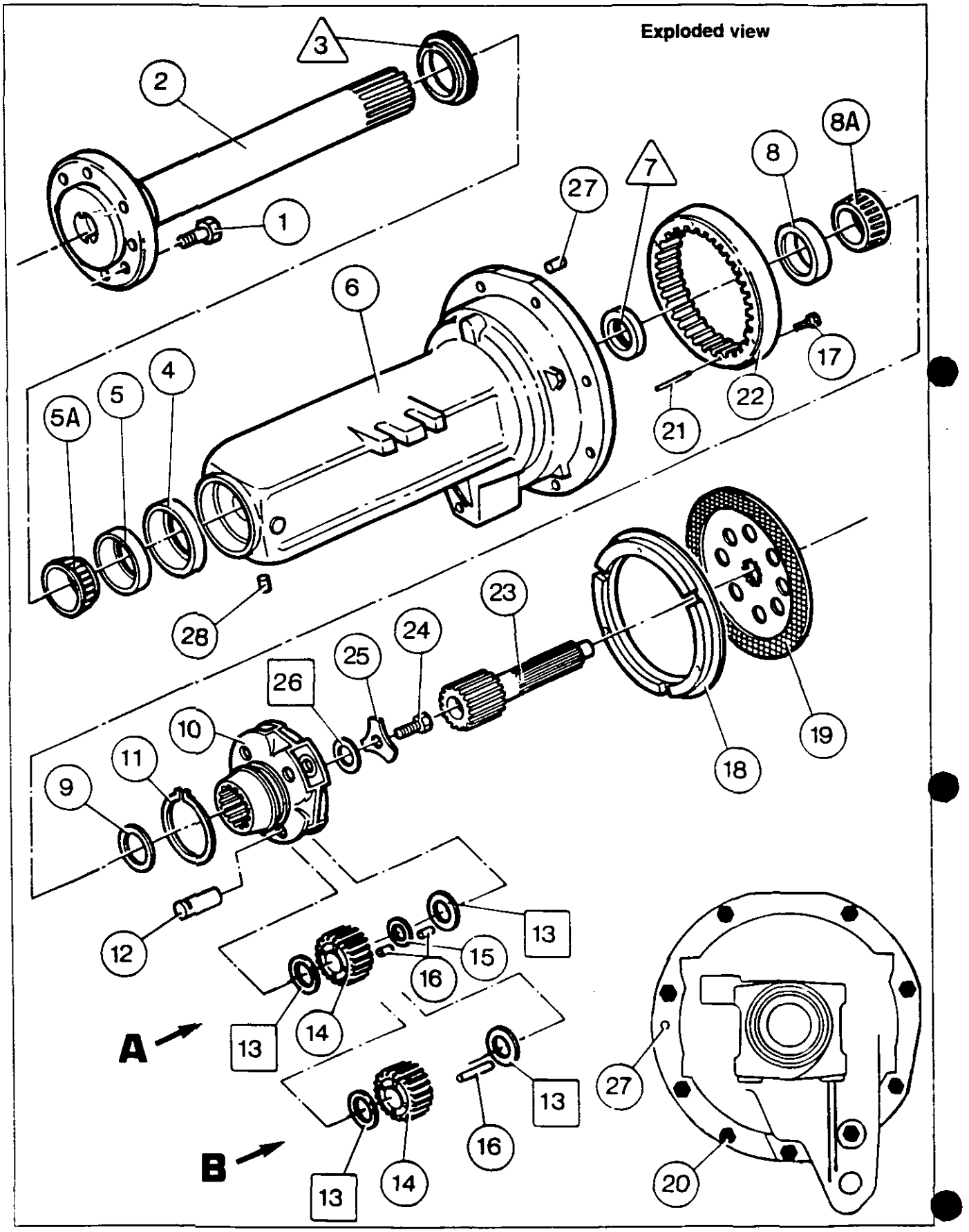
Rear axle - 3000 Tractor trumpet



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Rear axle - 3000 Tractor trumpet

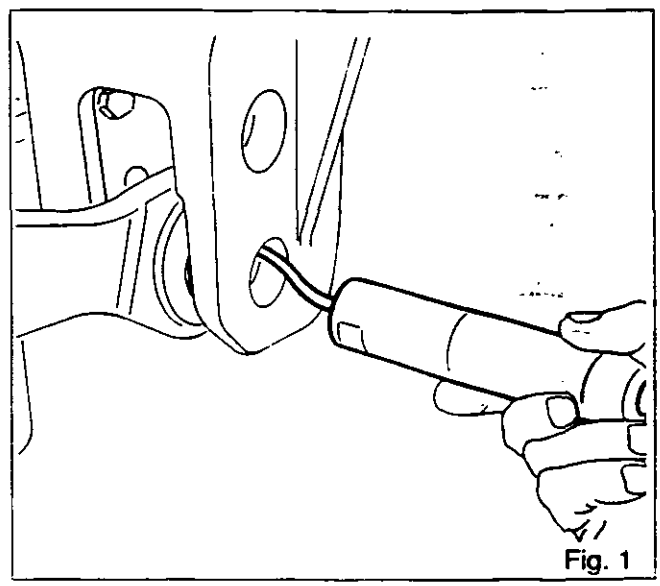


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A. Trumpet housing assembly

Removal

1. Immobilize the tractor. Apply the handbrake. Fit chocks between the frame and the front axle (see 3 A01 Fig 1).
2. Drain the rear axle only.
3. Using a trolley jack, raise the side of the tractor involved.
4. Support the tractor with an axle stand.
5. Remove the wheel.
6. Remove the stabilizer bracket
7. Disconnect the draft control sensor harness.
8. On tractors fitted with **an automatic hitch**, the sensor is removed outwards (Fig.1).
9. Remove the cab attaching bolts **(A)** (Low profile cab Fig.2) - (Hiline cab Fig.3).
10. Raise the cab sufficiently to prevent any fouling when the trumpet housing is removed (chock the cab).
    Important : Check the clearance between the hood and the windscreen (if insufficient remove the sheet metal).
11. Remove the spacer **(B)** (Fig.2 low profile cab).
    Note: Only for trumpet housing replacement on hiline cab tractors, remove bolts (A) and (C) and the spacer B (Fig.3).
12. Position a suitable support on a trolley jack under the trumpet housing.
13. For the LH trumpet housing disconnect the lift hydraulics valve supply hose (plug the ends).
14. Unscrew the attaching bolts **(20)**.
15. Pull the trumpet housing away from the rear axle housing.


Fig. 1

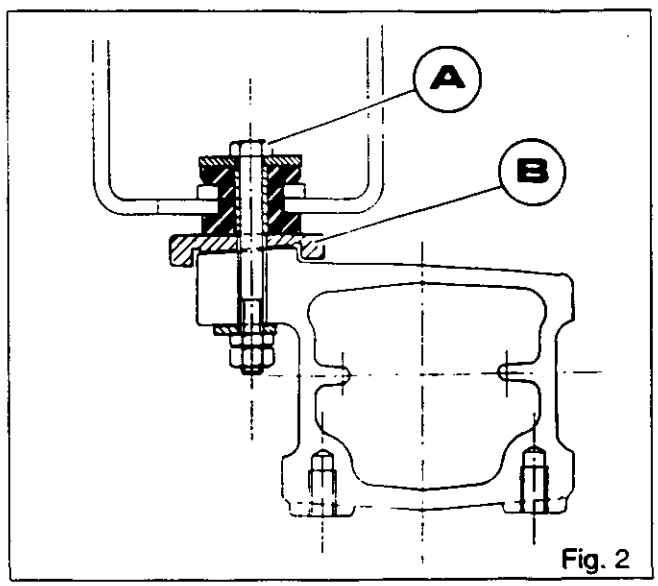


Fig. 2

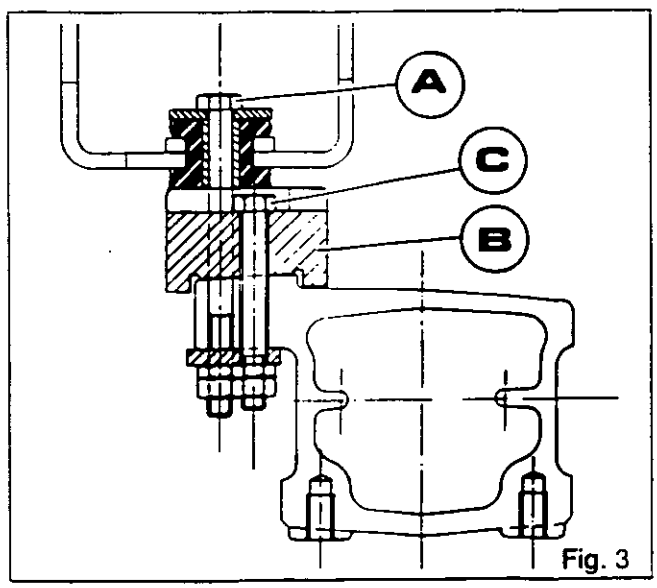


Fig. 3

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Rear axle - 3000 Tractor trumpet

16. Remove :
    . the brake disc **(19)**
    . the planetary shaft **(23)**
    . the locating dowel **(27)**
    Note : To prevent the brake piston (C) from coming out of the housing, it is recommended that two wide washers and two bolts be fitted diametrically opposite each other to hold it in place. (Fig.4)
17. Remove the brake plate **(18)**.

Refitment

18. Clean the mating faces of the centre housing and the trumpet housing with a non-greasy solvent.
19. Apply a bead of oil resistant (Silicomet type) silicone to the inner edge of the centre housing (Fig.5).
    Note: Do not block up the oil drain hole in the housing.
20. Check that the disk **(19)** slides freely on the planetary shaft **(23)** (Fig.6).
21. Refit the locating dowel **(27)**, the planetary shaft **(23)** and the brake disc **(19)**.
22. Screw two dowel pins into diametrically opposite positions on the centre housing.
23. Refit the brake plate **(18)** in the trumpet housing.
    Note: To retain the plate, apply three spots of "Amber Technical" grease or an equivalent product to the surface of the ring gear (22).
24. Fit the trumpet housing to the centre housing.
    Note: Turn the shaft (2) to engage the planetary shaft (23) in the planetary gears.
25. Clean the bolts **(20)** and coat them with Plastex, Hylomar or an equivalent gasket sealant.
26. Fit and tighten the bolts **(20)** to a torque of 170-210 Nm.
27. Carry out procedures 12 and 13 in reverse.
28. Carry out procedures 10 and 11 in reverse.
29. Refit the cab attaching bolts with the nuts and locknuts to a torque of :
    Nut : 27-35 Nm
    Locknut : 13-20 Nm (with Loctite 270)
30. Refit the draft control sensor.
    Note: Lightly coat the draft control sensor with Loctite Anti-seize or equivalent grease.
31. Reconnect the draft control sensor harness and refit the stabilizer bracket.
32. Replenish transmission oil.
33. Refit the wheel. Tighten to a torque of 400-450 Nm.
34. Remove the axle stand.
35. Test the hydraulic lift and brake circuits.

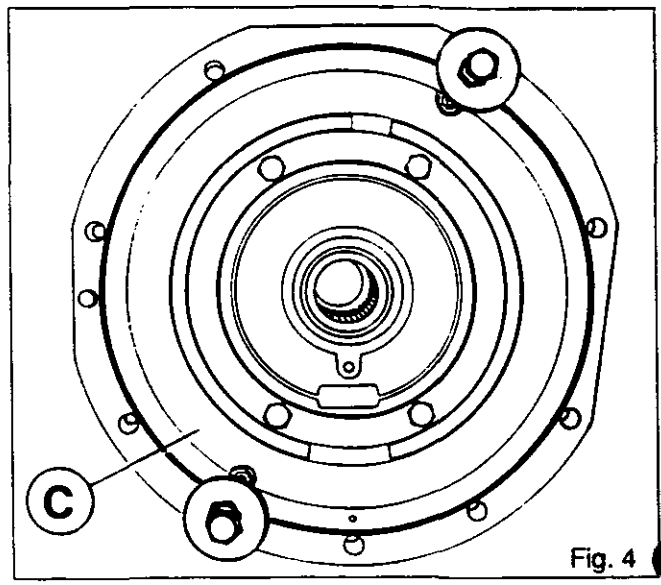
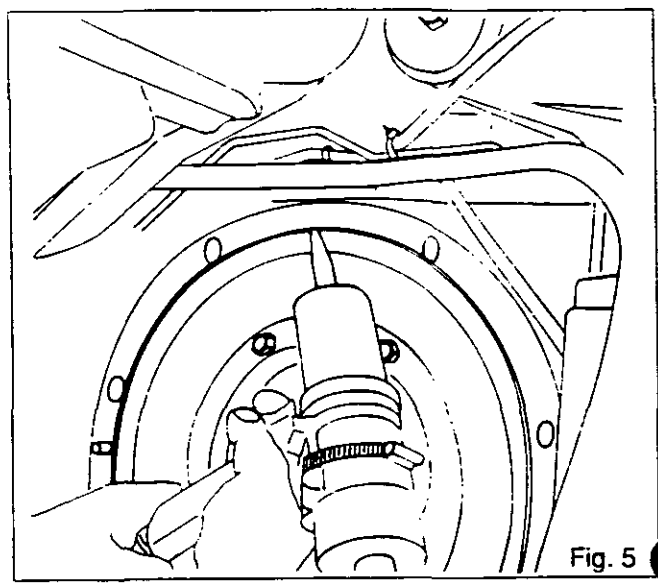


Fig. 4


Fig. 5

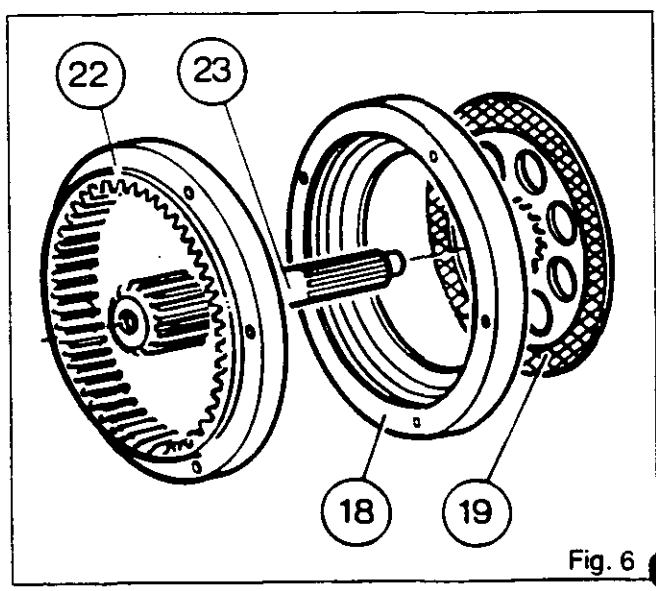


Fig. 6

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36. **Check for leaks** :
    - between the trumpet housing and the rear axle housing
    - from the lift system valve supply hose (LH trumpet housing)

B. Planetary carrier assembly

Disassembly

1. Remove the trumpet housing (see Section A).
2. Remove the bolt **(24)** (Fig. 7).
3. Remove the retaining washer **(25)** and the shim(s) **[26]** (Fig.7).
4. Remove the planetary carrier assembly **(10)**.
5. Open out the circlip **(11)** (Fig.8).
6. Using a copper tipped mallet, tap lightly on the three pins **(12)** (Fig.8).
7. Remove the three pins **(12)** and the circlip **(11)**.
8. Remove the three planetary gears **(14)**, the needle rollers **(16)**, the spacers **(15)** (heavy duty planetary gear **A**) and the thrust washers **[13]**.

Reassembly

9. Clean the planetary carrier **(10)**, the pins **(12)** and the planetary gears **(14)**. Check the condition of the parts.
10. Coat the needle rollers **(16)** with "Amber Technical" or an equivalent grease. Into each planetary gear **(14)** insert :
    - Heavy duty planetary carrier **(A)** : two rows of needle rollers separated by a spacer **(15)** (Fig.7).
    - Normal duty planetary carrier **(B)** : one row of needle rollers (Fig.7).

    Note: Each heavy duty planetary gear (A) has 42 needle rollers.
    Each normal duty planetary gear (B) has 21 needle rollers.
11. Shim the planetary gears.

    Note: Three thicknesses of thrust washer [13] are available :
    - 3382026 M2 = 1.60 / 1.50
    - 3382210 M1 = 2.37 / 2.27
    - 3580962 M1 = 2.10 / 2.00
12. Position the planetary gears **(14)** and the medium thickness washers **[13]** on each side of the planetary gear.
13. Fit the three pins **(12)**.

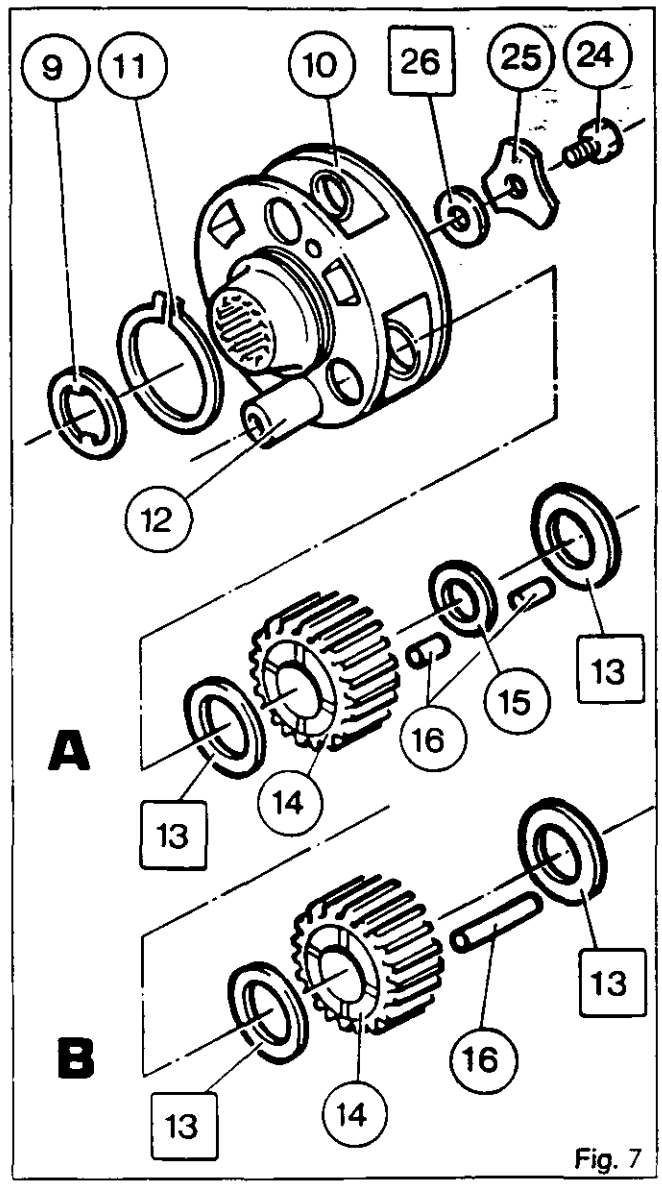


Fig. 7

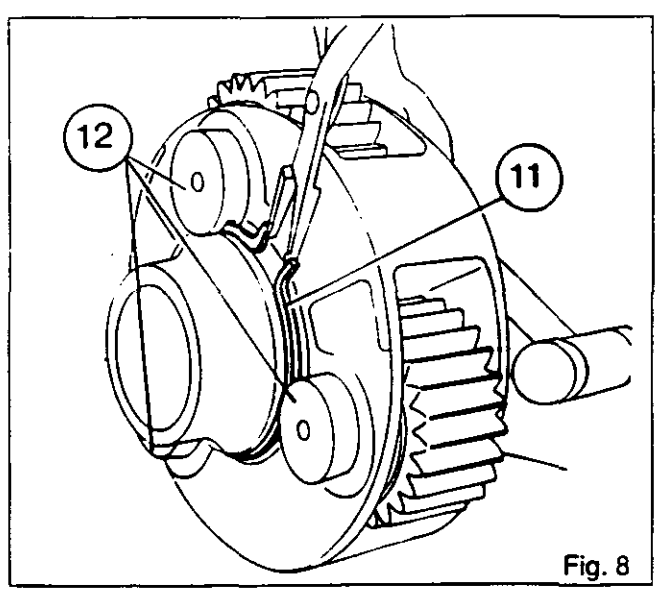
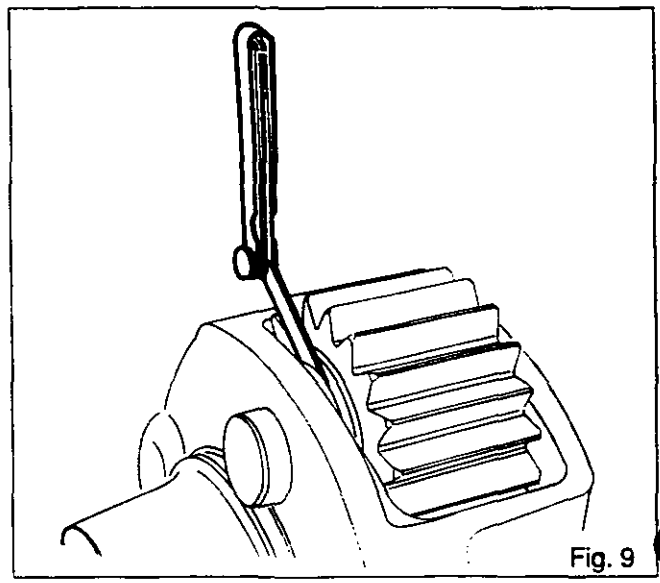


Fig. 8

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Rear axle - 3000 Tractor trumpet

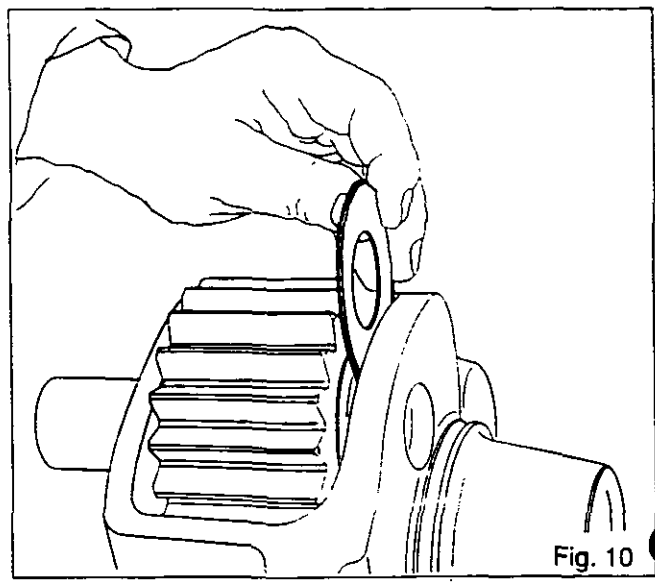
14. Using a set of feeler gauges, determine the thickness of washers **[13]** to be fitted to obtain an end play of between 0.15 and 0.55 on each planetary gear (Fig.9).
15. *Pull out the three pins slightly and fit the shims* **[13]** selected in procedure 14 (Fig.10).
16. Push in the three pins and fit the circlip **(11)**.
17. Open out the circlip **(11)** (Fig.8).
18. Tap lightly on the three pins to insert the circlip **(11)** into the groove in the planetary carrier (Fig.11).
19. Check that the spur washer **(9)** is fitted.
20. Refit the planetary carrier.
21. Fit shims to obtain the required preload (see Section D).
22. Refit the trumpet housing (see Section A).


Fig. 9

C. Bearings and Seals

Disassembly

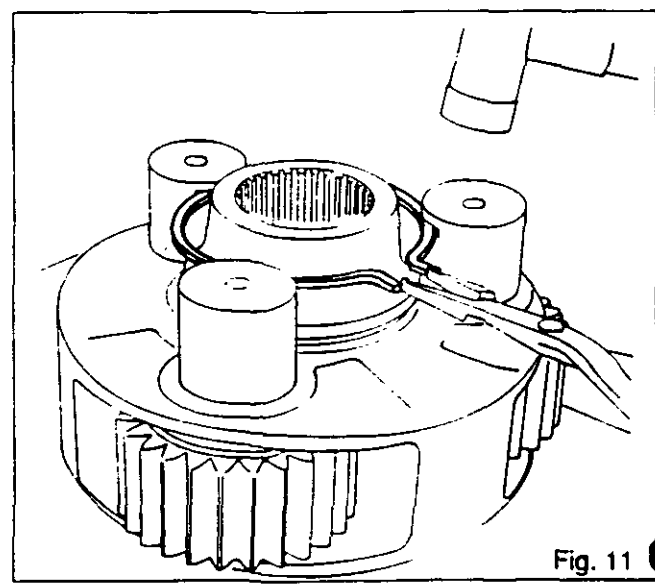
1. Separate the trumpet housing from the centre housing (see Section A).
2. Remove the planetary carrier (see Section B).
3. Remove :
   - the spur washer **(9)** (Fig. 12)
   - the bearing cone **(8A)** (runs free on shaft)
4. Withdraw the shaft **(2)** from the trumpet housing.
5. Extract the cone **(5A)**.
6. Drive out the triple lip seal /**3**\.
7. Using an extractor, remove:
   - the cup **(5)**
   - the housing **(4)** for seal /**3**\
   - the cup **(8)**
8. Drive out the seal /**7**\.


Fig. 10

Reassembly

Note: The planetary ring gear (22) is a tight fit in the trumpet housing (6) (page 3).
It is centred by the three locating dowels (21) (Loctite 638) and tightened by the three bolts (17) to a torque of 79-90 Nm (Loctite 242).

9. Clean the seal contact surfaces, the cup seats and the cones in the trumpet housing and on the shaft. The seal, cup and cone contact surfaces must be free from burrs and damage.
10. Coat the outside diameter of the seal /**7**\ with Loctite 542 (metal cage).
    Note: Fit the seal the correct way round.


Fig. 11

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11. **Replacement of seal /7\ :**
    a) Without replacing the shaft (2)
    So that the seal lip is not in the same place on the shaft, press on the seal until it is 4 mm from the shoulder of the cup **(8)** (Fig.12).
    b) Replacing the shaft (2)
    Position the seal 5 mm from the shoulder of the cup **(8)** (Fig.13).
12. Lubricate the cups **(8)** and **(5)** and press them fully on to the shoulder.
13. Press the housing **(4)** fully on to the shoulder (Fig.14).
14. Push the triple lip seal /3\ up against the shaft shoulder.
    Note : Ensure that the seal is fitted the correct way round (Fig.14).
15. Lubricate the shaft **(2)** and press the cone **(5A)** against the shoulder.
16. Lightly grease the cone **(5A)** and the lips of seals /3\ and /7\ (use BP Agricharge or an equivalent-grease).
17. Protect the splines of the shaft **(2)** and insert it into the trumpet housing.
    Note: The lips of seal /3\ must face outwards.
18. Remove the protection from the shaft and lightly lubricate the cone **(8A)**.
19. Refit the cone **(8A)**, the washer **(9)** and the planetary carrier **(10)**.
20. Fit shims to obtain the required preload (see D).
21. Replace the plug **(28)** by a grease nipple. Partly fill the cavity at the end of the trumpet housing between the cone **(5A)** and the seal /3\ with BP Agricharge or an equivalent grease. Remove the grease nipple and refit the plug (Fig.14).
22. Refit the trumpet housing (see Section A).

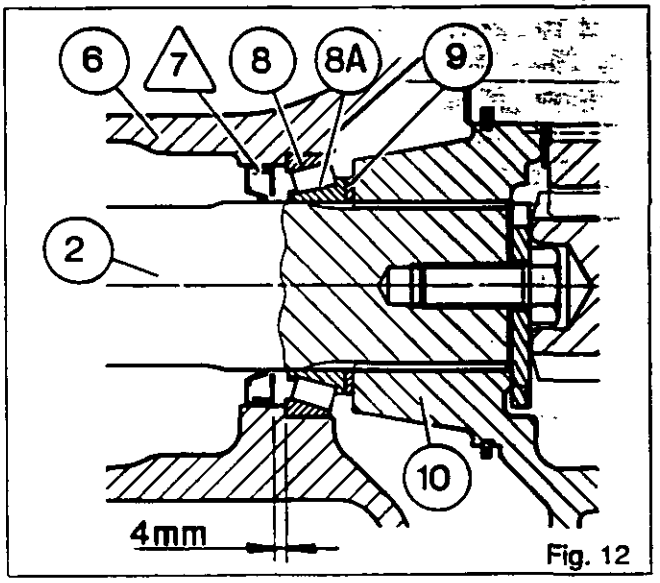


Fig. 12

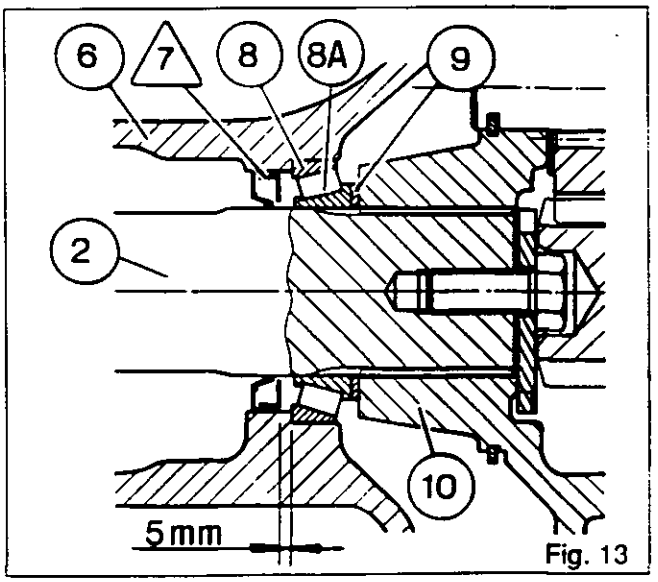


Fig. 13

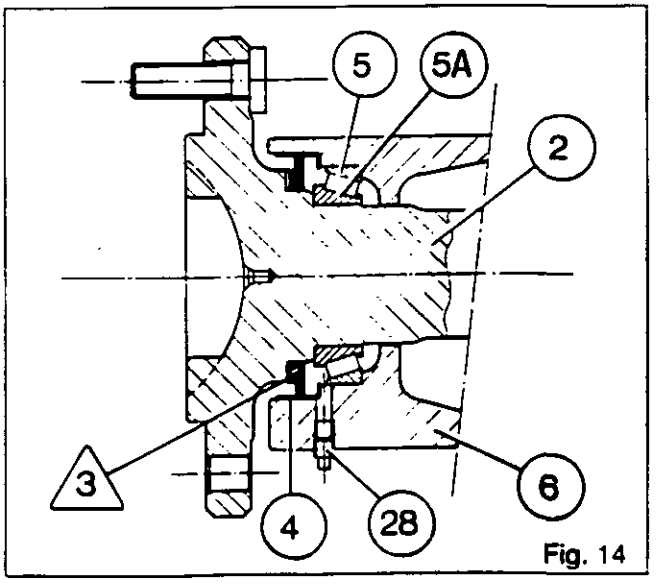


Fig. 14

D. Axle shaft bearings preload

1. Place the trumpet housing assembly in a vertical position.
2. Remove the bolt **(24)** and the washer **(25)**.
3. Seat the cones **(5A)** and **(8A)** in their cups by turning the trumpet housing on its shaft.

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Rear axle - 3000 Tractor trumpet

4. Fit shims **[26]** required to provide thickness greater than dimension **X** to obtain end play (Fig.15).
5. Fit the washer **(25)** and the bolt **(24)** and tighten to a torque of 270-440 Nm.
6. Using a dial gauge, check the end play by moving the planetary carrier laterally (Fig.16).
7. Remove the bolt (24) and the washer **(25)**.
   On the basis of the reading obtained, remove the number of shims [26] required to obtain a preload of : **P1 = 0.025 to 0.125**
8. *Clean the threads at the end of the shaft* **(2)**.
9. Refit the washer **(25)**.
10. Clean the bolt **(24)** and coat it with Loctite 241. Tighten to a torque of 270-440 Nm.

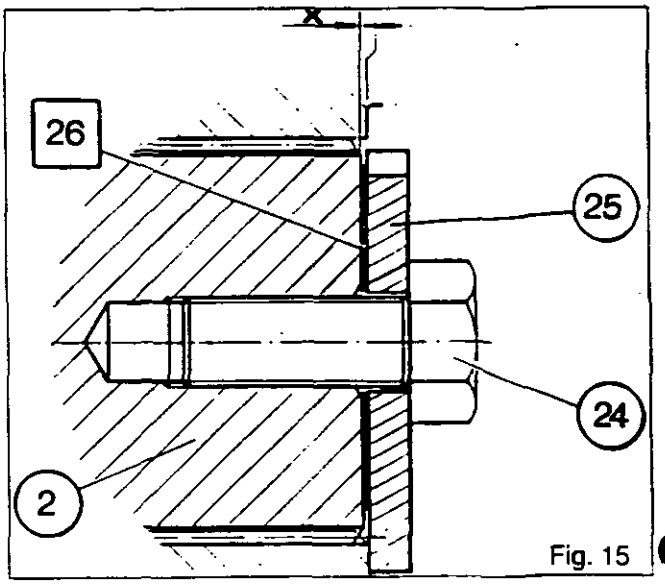
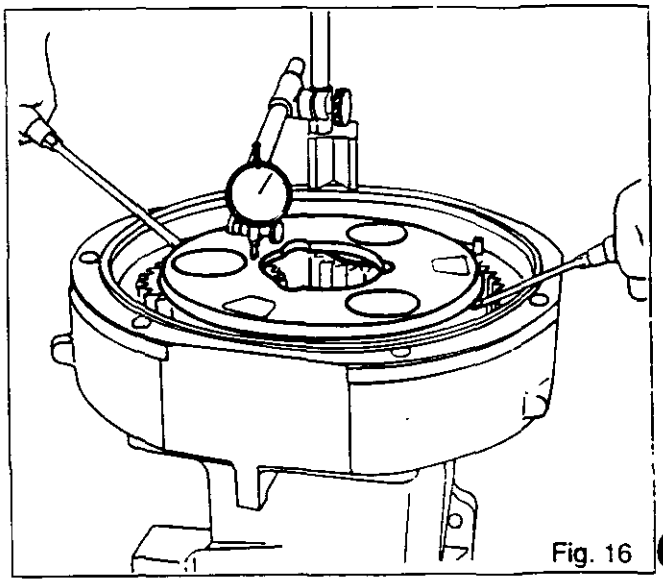


Fig. 15


Fig. 16

E. Rear wheel stud replacement

1. Drive out the damaged stud using a hammer and bronze drift.
2. Clean the marks left by the stud ridges with a paint brush dipped in solvent.
3. Dry with compressed air.
4. Apply a few drops of Loctite 270 to the new stud ridges.
5. Place the new stud in the ridge marks left by the old stud.
6. Make sure that the ridges are properly engaged and then knock the stud head up against the half shaft flange with a bronze mallet.

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6C02.2

Rear axle - 3100 Tractor trumpet

General

Description

The trumpet housings support the RH and LH axle shafts and house the final reduction units which transmit the drive from the differential assembly.
The two trumpet housings are identical and are fitted on either side of the centre housing.

Construction

The half shaft **(2)** is supported by two taper roller bearings **(5)** and **(8)** fitted opposite each other. The unit is sealed on the outside by a triple lip seal /**3**\ and on the inside by a single lip seal /**7**\. The final reduction planetary carrier assembly **(21)** fitted with three pinions **(18)** is splined onto the half shaft **(2)**.Shims **[22]** located at the end of the axle shaft allow the taper roller bearing preload to be adjusted. The half shaft **(2)** and the planetary carrier assembly **(21)** are held by the washer **(23)** and the bolt **(24)**. The ring gear **(10)** is a force fit in the trumpet housing. It comprises five locating dowels **(9)** which centre the brake plate **(26)**. Drive from the differential is transmitted to the final reduction planetary gears through a planetary shaft **(25)** on to which the brake disc **(27)** is splined.

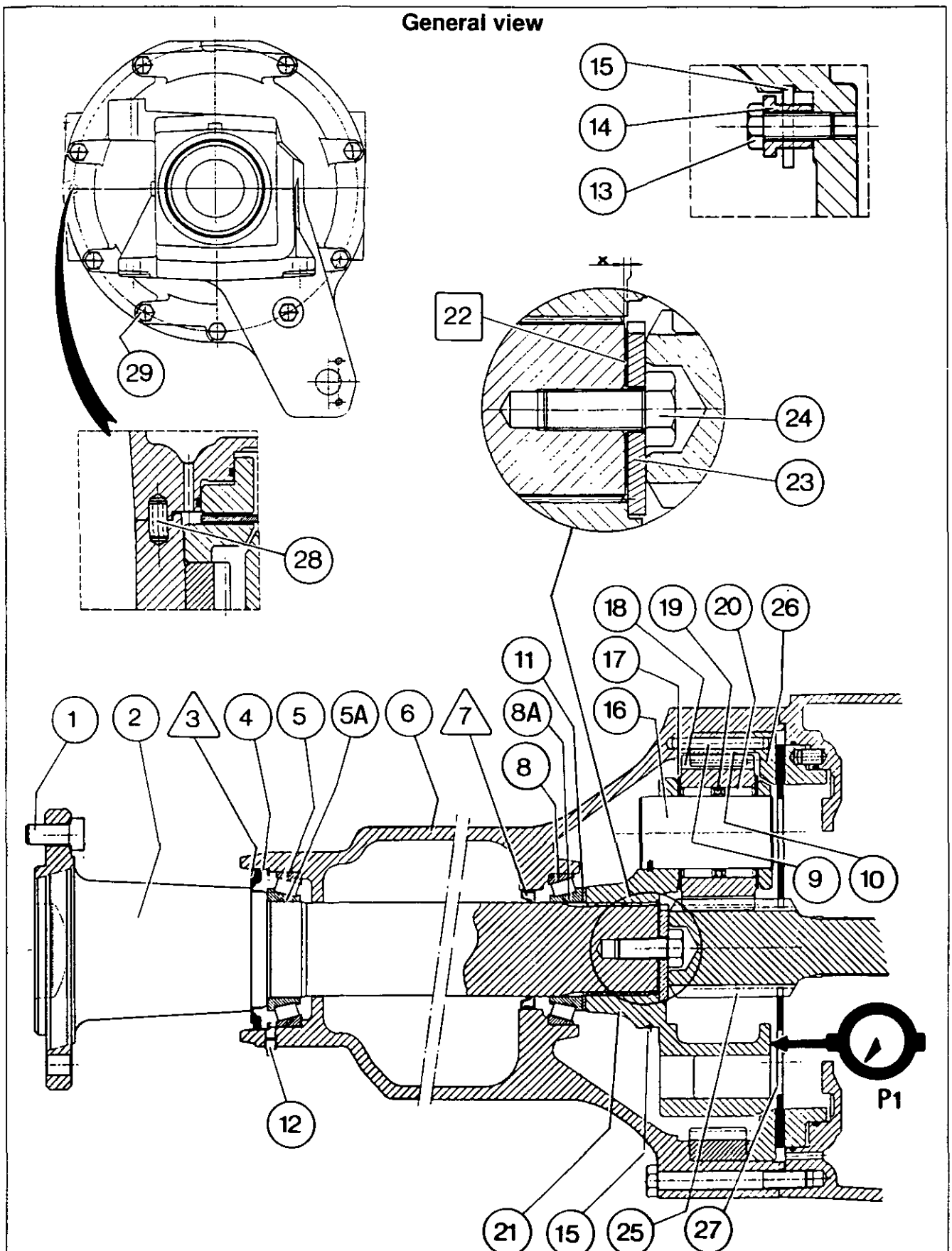
Key to illustrations

(1) Wheel stud
(2) Axle shaft
/**3**\ Triple lip seal
(4) Seal housing
(5) Bearing cup
(5A) Bearing cone
(6) Trumpet housing
/**7**\ Seal
(8) Bearing cup
(8A) Bearing cone
(9) Locating dowel
(10) Planetary ring gear
(11) Spur washer
(12) Plug
(13) Bolt
(14) Spacer
(15) Circlip
(16) Planetary gear pin
(17) Thrust washer
(18) Planetary gear
(19) Spacer
(20) Needle roller
(21) Planetary carrier
[22] Shim(s)
(23) Retaining washer
(24) Bolt
(25) Sun wheel
(26) Brake plate
(27) Brake disc
(28) Locating dowel
(29) Bolt

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Rear axle - 3100 Tractor trumpet

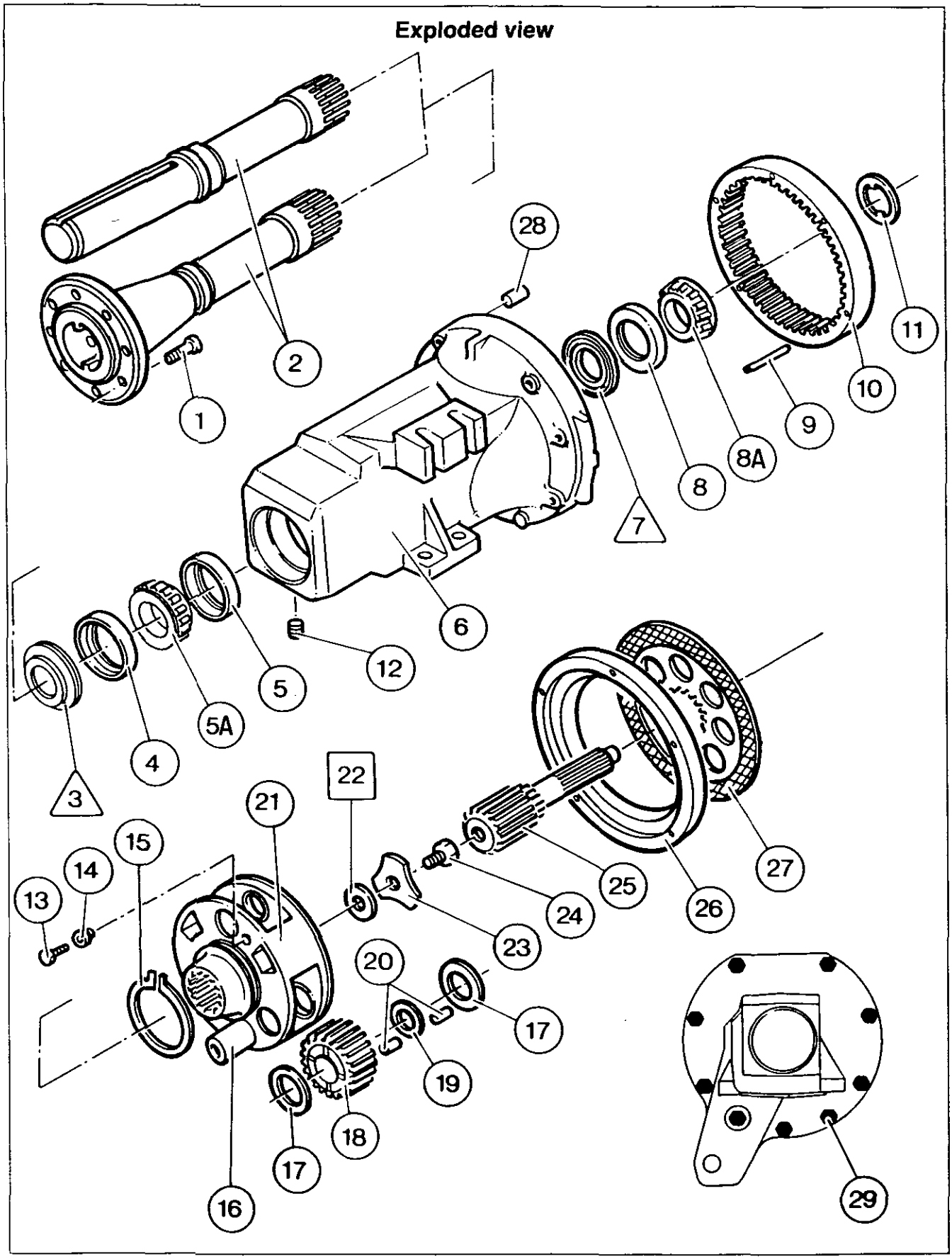


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Rear axle - 3100 Tractor trumpet



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Rear axle - 3100 Tractor trumpet

A. Trumpet housing assembly

Removal

1. Immobilize the tractor. Apply the handbrake. Fit chocks between the frame and the front axle (see 3 A02 Fig 2).
2. Drain the rear axle only.
3. Using a trolley jack, raise the side of the tractor involved.
4. Support the tractor with an axle stand.
5. Remove the wheel.
6. Remove the stabilizer bracket
7. Disconnect the draft control sensor harness (without disconnecting the harness).
8. Remove the cab attaching bolts **(A)** with the nuts (Fig.1).
9. Raise the cab sufficiently to lift the support spacer **(B)** clear (Fig.1).
   Note : Check the clearance between the hood and the windscreen (if insufficient remove the sheet metal).
10. Position a suitable support on a trolley jack under the trumpet housing.
11. For the LH trumpet housing disconnect the lift hydraulics valve supply hose (plug the ends).
12. Unscrew the attaching bolts **(29)**.
13. Separate the trumpet housing from the rear axle housing.
14. Remove :
    . the brake disc **(27)**
    . the planetary shaft **(25)**
    . the locating dowel **(28)**
    Note: To prevent the brake piston (C) from coming out of the housing, it is recommended that two wide washers and two bolts be fitted diametrically opposite each other to hold it in place. (Fig.2)
15. Remove the brake plate **(26)**.

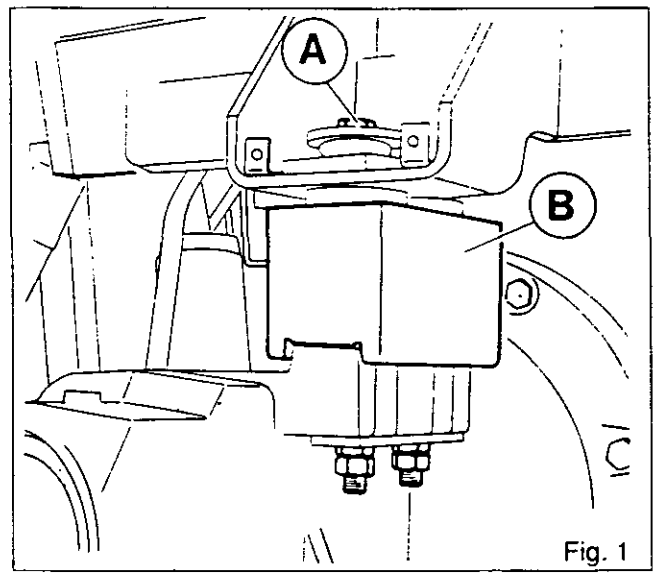


Fig. 1

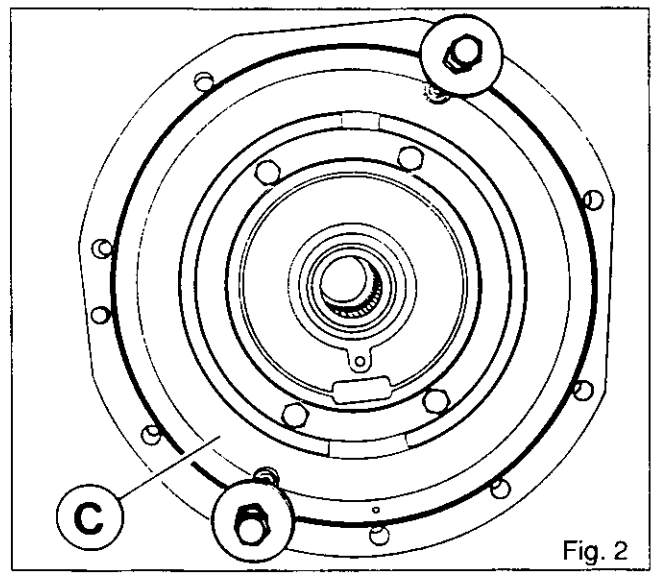


Fig. 2

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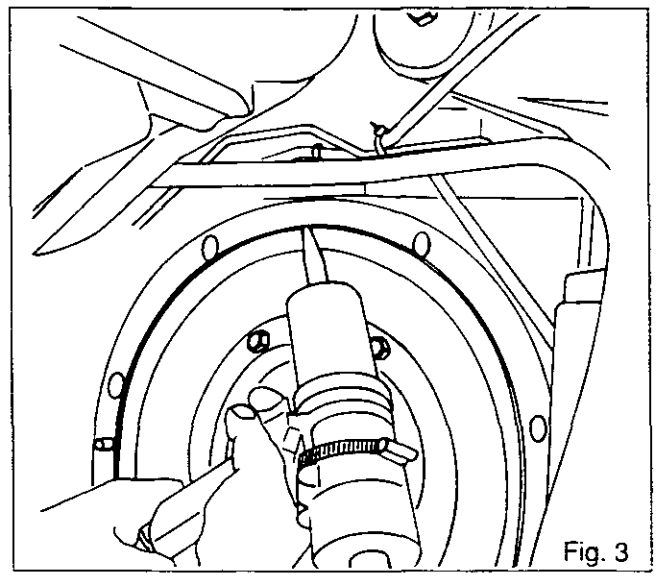
Refitment

16. Clean the mating faces of the centre housing and the trumpet housing with a non-greasy solvent.
17. Apply a bead of oil resistant silicone (Silicomet type) to the inner edge of the centre housing (Fig.3).
    Note: Do not block up the oil drain hole in the housing.
18. Check that the disk **(27)** slides freely on the planetary shaft **(25)** (Fig.4).
19. Refit the locating dowel **(28)**, the planetary shaft **(25)** and the brake disc **(27)**.
20. Screw two dowel pins into diametrically opposite positions on the centre housing.
21. Refit the brake plate **(26)** in the trumpet housing.
    NOTE: To retain the plate, apply three spots of "Amber Technical" or equivalent grease to the surface of the ring gear (10).
22. Fit the trumpet housing to the centre housing.
    Note: Turn the shaft (2) to engage the planetary shaft (25) in the planetary gears (18)
23. Clean the bolts **(32)** and coat them with Plastex, Hylomar or an equivalent gasket sealant.
24. Fit and tighten the bolts **(29)** to a torque of 170 - 210 Nm.
25. Carry out procedures 9 to 11 in reverse.
26. Refit the cab attaching bolts with the nuts and locknuts to a torque of:
    Nut : 27-35 Nm
    Locknut : 13-20 Nm (with Loctite 270)
27. Refit the draft control sensor.
    Note: Lightly coat the draft control sensor with Loctite Anti-seize or equivalent grease.
28. Carry out procedures 6 and 3 in reverse
29. Refit the wheel. Tighten to a torque of 400 - 450 Nm.
30. Remove the axle stand.
31. Carry out procedures 1 and 2 in reverse.
32. Test the hydraulic lift and brake circuits.
33. **Check for leaks** :
    - between the trumpet housing and the centre housing
    - from the lift system valve supply hose (LH trumpet housing)

B. Planetary carrier assembly

Disassembly

1. Remove the trumpet housing (see Section A).
2. Remove the bolt **(24)**.
3. Remove the retaining washer **(23)** and the shim(s) **[22]** (Fig.5).


Fig. 3

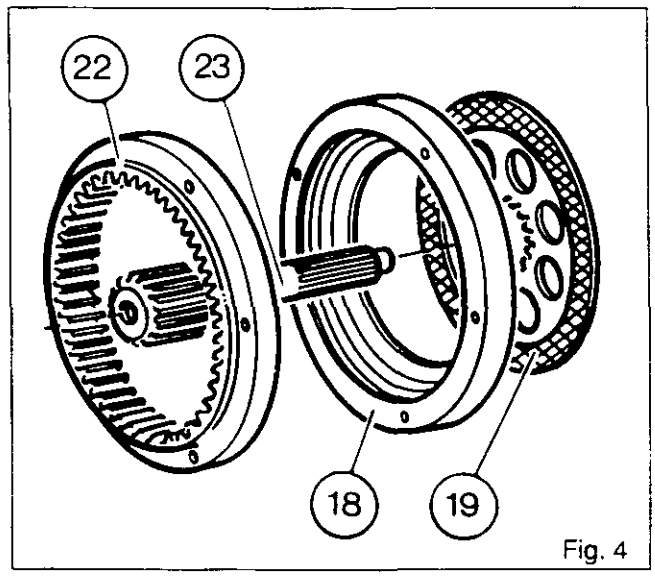


Fig. 4

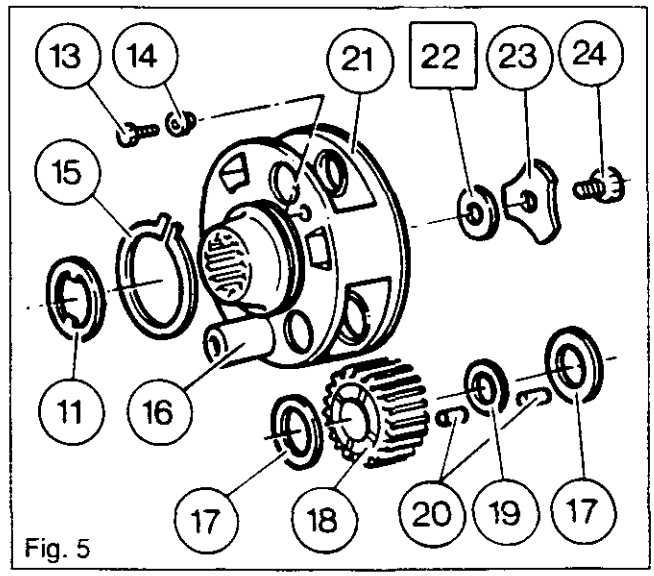


Fig. 5

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Rear axle - 3100 Tractor trumpet

4. Remove the planetary carrier assembly **(21)**.
5. Remove the bolt **(13)** and the spacer **(14)**.
6. Open out the circlip **(15)** (Fig.6).
7. Using a copper tipped mallet, tap lightly on the three pins **(16)** (Fig.6).
8. Remove the three pins **(16)** and the circlip **(15)**.
9. Remove the three planetary gears **(18)**, the needle rollers **(20)**, the spacers **(19)** and the thrust washers **(17)**.

Reassembly

10. Clean the planetary carrier **(21)**, the pins **(16)** and the planetary gears **(18)**. Check the condition of the parts.
11. Coat the needle rollers **(20)** with "Amber Technical" or an equivalent grease. Into each planetary gear **(18)** insert two rows of needle rollers separated by a spacer **(19)**.
    Note: Each planetary gear has 56 needle rollers.
12. Fit the planetary gears **(18)** and the thrust washers **(17)**.
13. Fit three pins **(16)** with the circlip **(15)** (Fig.7).
14. Open out the circlip **(15)** (Fig.6).
15. Tap lightly on the three pins to insert the circlip **(15)** into the planetary carrier groove (Fig.7).
16. Position one end of the circlip in contact with the pin **(16)** (Fig.8)
17. Clean the threads of the bolt **(13)**. Fit the spacer **(14)**. Coat the bolt **(13)** with Loctite 270 before fitting. Tighten to a torque of 34 - 50 Nm (Fig.8).
18. Check that the spur washer **(11)** is fitted.
19. Refit the planetary carrier.
20. Fit shims to obtain the required preload (see Section D).
21. Refit the trumpet housing (see Section A).

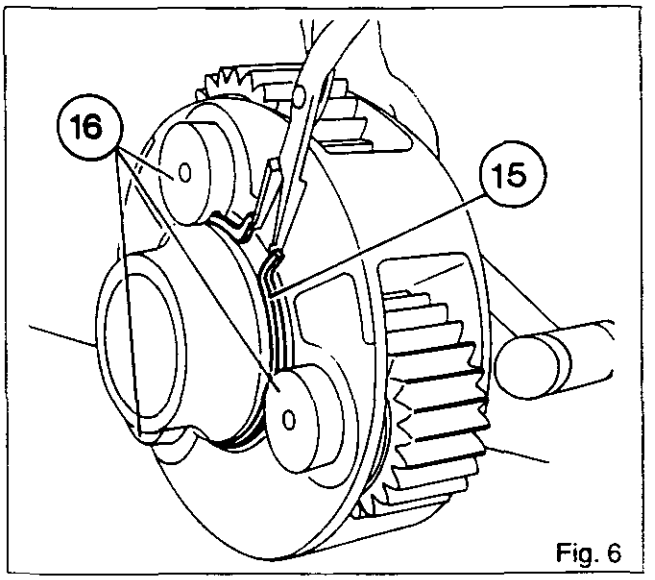
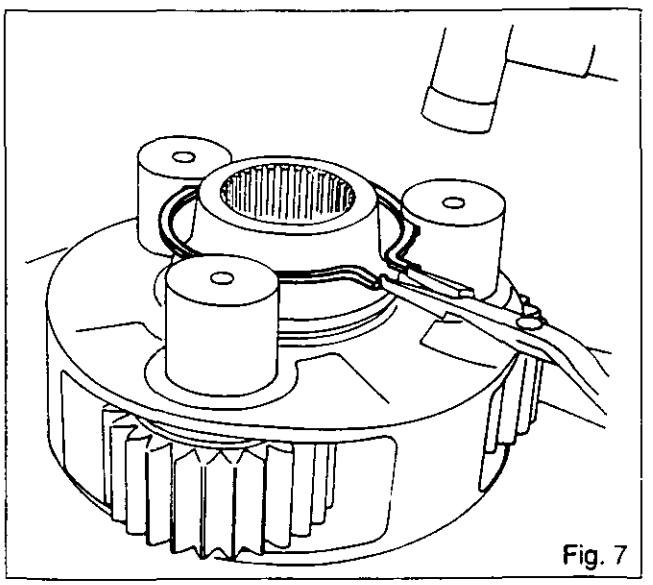


Fig. 6


Fig. 7

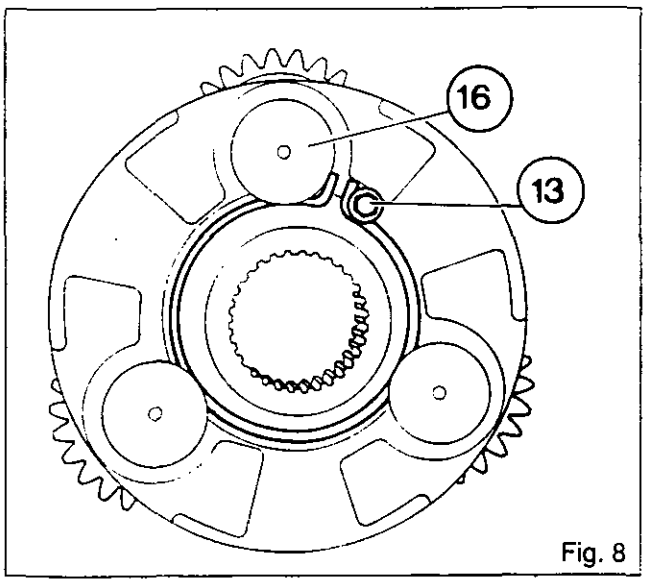


Fig. 8

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Rear axle - 3100 Tractor trumpet

C. Bearings and Seals

Disassembly

1. Separate the trumpet housing from the centre housing (see Section A).
2. Remove the planetary carrier (see Section B).
3. Remove :
   - the spur washer **(11)** (Fig. 9)
   - the bearing cone **(8A)** (runs free on shaft)
4. Withdraw the shaft **(2)** from the trumpet housing.
5. Extract the cone **(5A)**.
6. Drive out the triple lip seal /3\.
7. Using an extractor, remove:
   - the cup **(5)**
   - the housing **(4)** for seal /3\
   - the cup **(8)**
8. Drive out the seal /7\.

Reassembly

9. Clean the seal contact surfaces, the cup seats and the cones in the trumpet housing and on the shaft. The seal, cup and cone contact surfaces must be free from burrs and damage.
10. Coat the outside diameter of the seal /7\ with Loctite 542.
    Note: Fit the seal the correct way round.
11. Replacement of seal /7\ :
    a) Without replacing the shaft **(2)**
    So that the seal lip is not in the same place on the shaft, press on the seal until it is 9 mm from the shoulder of the cup (Fig 9).
    b) Replacing the shaft **(2)**
    Position the seal 8 mm from the shoulder of the cup (Fig.10).
12. Lubricate the cups **(8)** and **(5)** and press them fully on to the shoulder.
13. Press the housing **(4)** to within 20 mm of the trumpet housing (Fig.11).
14. Push the triple lip seal /3\ up against the shaft shoulder.
    Note: Ensure that the seal is fitted the correct way round (Fig.11).
15. Lubricate the shaft **(2)** and press the cone **(5A)** against the shoulder.
16. Lightly grease the cone **(5A)**, the lips of seals /3\ and /7\ (use BP Agricharge or an equivalent grease).

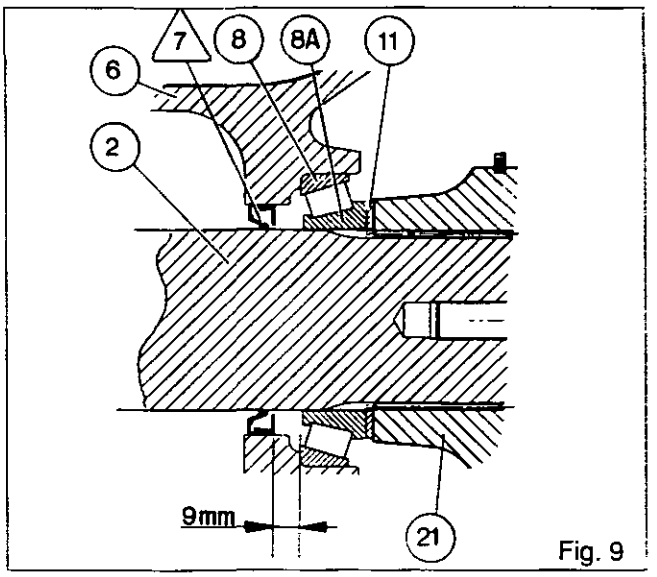


Fig. 9

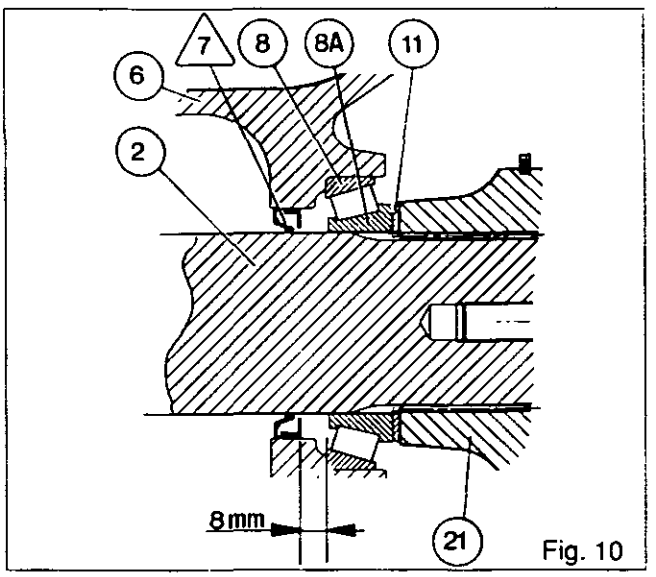


Fig. 10

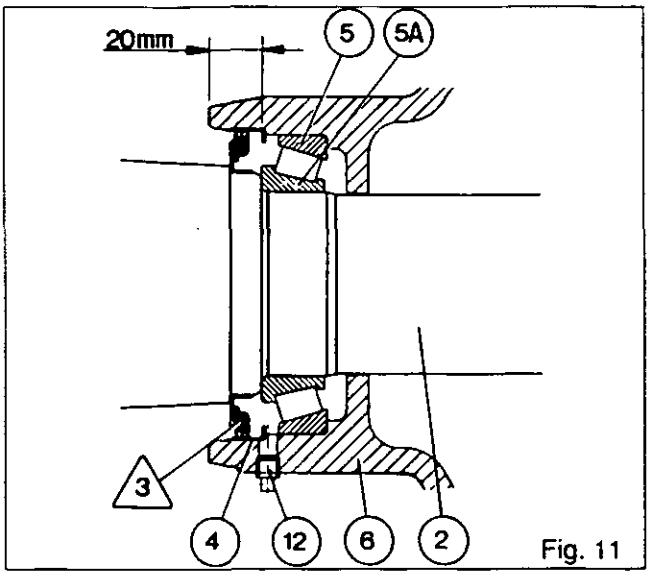


Fig. 11

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17. Protect the splines of the shaft **(2)** and insert it into the trumpet housing.
Note: The lips of the seal /3\ must face outwards.
18. Remove the protection from the shaft and lightly lubricate the cone **(8A)**.
19. Carry out procedures 2 and 3 in reverse.
20. Fit shims to obtain the required preload (see D).
21. Replace the plug **(12)** by a grease nipple. Partly fill the cavity at the end of the trumpet housing between the cone **(5A)** and the seal /3\ with BP Agricharge or an equivalent grease. Remove the grease nipple and refit the plug (Fig.11).
22. Refit the trumpet housing (see Section A).

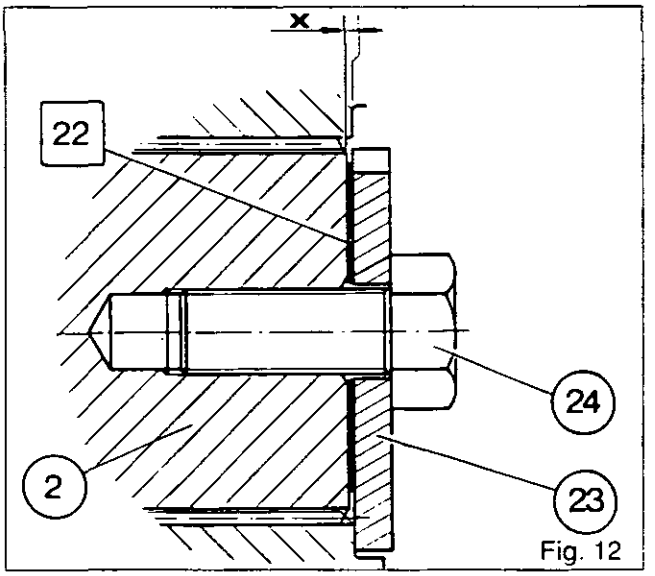
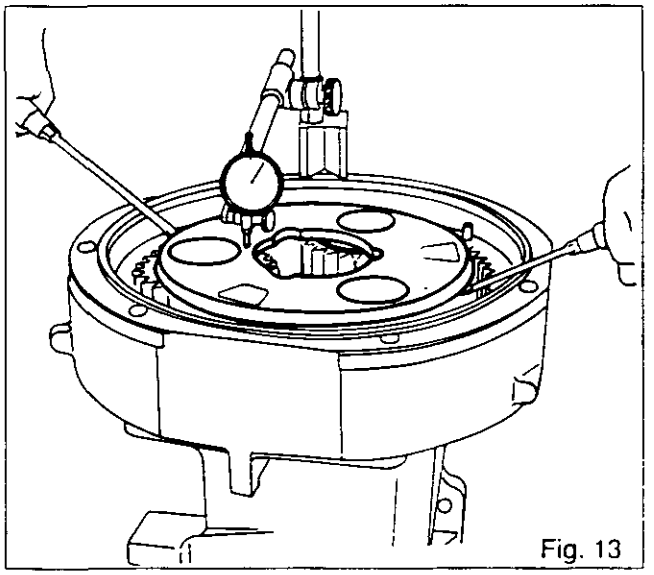


Fig. 12

D. Axle shaft bearings preload

1. Place the trumpet housing assembly in a vertical position.
2. Remove the bolt **(24)** and the washer **(23)**.
3. Seat the cones **(5A)** and **(8A)** in their cups by turning the trumpet housing on its shaft.
4. Fit shims **[22]** required to provide thickness greater than dimension **X** to obtain end play (Fig.12).
5. Fit the washer **(23)** and the bolt **(24)** and tighten to a torque of 270 - 440 Nm.
6. Using a dial gauge, check the end play by moving the planetary carrier laterally (Fig.13).
7. Remove the bolt **(24)** and the washer **(23)**.
On the basis of the reading obtained, remove the number of shims **[22]** required to obtain a preload of : **P1 = 0.025 to 0.125**
8. Clean the threads at the end of the shaft **(2)**.
9. Refit the washer **(23)**.
10. Clean the bolt **(24)** and coat it with Loctite 241. Tighten to a torque of 270 - 440 Nm.


Fig. 13

E. Rear wheel stud replacement

1. Drive out the damaged stud using a hammer and bronze drift.
2. Clean the marks left by the stud ridges with a paint brush dipped in solvent.
3. Dry with compressed air.
4. Apply a few drops of Loctite 270 to the new stud ridges.
5. Place the new stud in the ridge marks left by the old stud.
6. Make sure that the ridges are properly engaged and then knock the stud head up against the half shaft flange with a bronze mallet.

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6 D01 Intermediate shaft - Driving pinion - Power-take-off brake

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- **Operation** ____ 2

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B. **2-speed PTO (with shimming)** ____ 6

C. **4-speed economy PTO (without shimming)** ____ 8

D. **4-speed economy PTO (with shimming)** ____ 10

E. **Adjustment of PTO control 4-speed economy** ____ 12

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6D01.2

Rear axle - Intermediate shaft - Driving pinion - PTO brake

General

The drive from the engine is transmitted to the power-take-off clutch mounted at the front of the centre housing.
The intermediate shaft **(2)** is connected by splines at one end to the clutch and at the other end either to the double pinion **(13)** in the 2-speed PTO version or to the coupler **(31)** in the 4-speed economy PTO version.
The compound pinion **(13)** turns on two taper roller bearings **(3)** **(4)** and **(7)** **(8)**, mounted in the bore of the centre housing and the top link support **(10)** respectively.
A piston **(9)** housed in the 3rd point support and controlled by the 17 bar hydraulic circuit enables the compound pinion **(13)** to be braked when the control lever is moved to the PTO braking position.

Operation

2-speed PTO
When the PTO solenoid valve feeds the clutch, the intermediate shaft **(2)** is driven. This in turn drives the compound driving pinion **(13)** which engages constantly with the 540 rpm and 1000 rpm pinions of the lower line.

4-speed PTO
This feature enables speeds of 540 rpm or 1000 rpm to be obtained with an engine speed of 1550 rpm.

Standard position (engine speed 2000 rpm)
When the coupler **(31)** is moved forwards, the intermediate shaft **(2)** turns with the shaft **(35)** which drives the compound driving pinion **(13)**. This configuration is identical to the 2-speed PTO version.

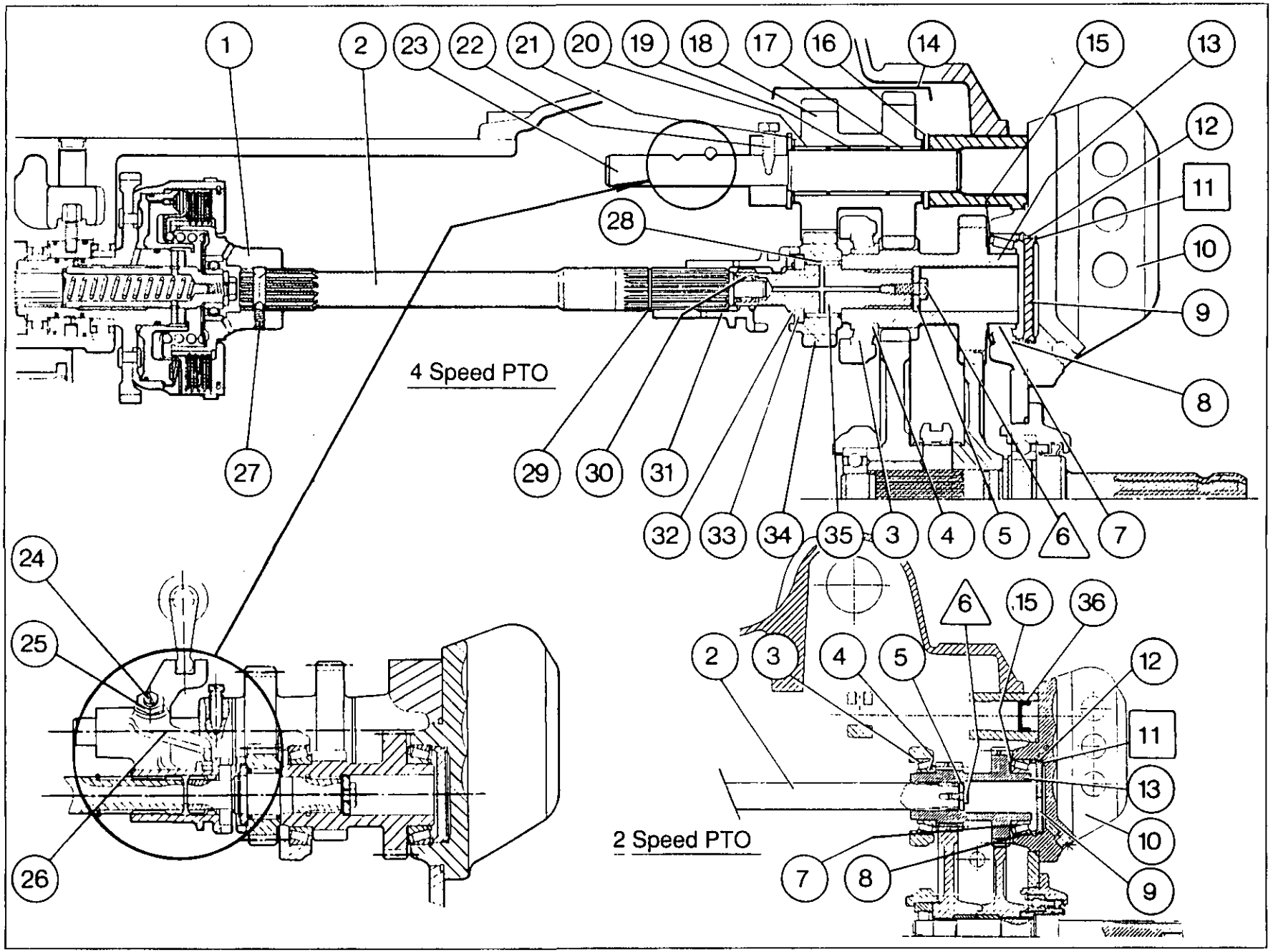
Economy position (engine speed 1550 rpm)
When the coupler **(31)** is moved backwards, the drive is transmitted to the coupler **(34)** (fitted loose on the shaft **(35)**) and to the compound pinion **(18)** which drives the driving pinion **(13)**. The ratio of the compound pinion **(18)** is 1.292.

Power-take-off brake
The movement of the control lever in the cab acts on an electrical contactor which enables the solenoid valve of the PTO brake mounted on the right cover to open. Oil is supplied to the chamber situated behind the piston **(9)**. The piston moves and presses the bearing cup **(8)** against the bearing cone **(7)**, progressively immobilising the driving pinion **(13)** which constantly engages with the 540 and 1000 rpm pinions.

		Power-take-off 4-speed	Power-take-off 2-speed
(1)	Clutch	•	•
(2)	Intermediate shaft	•	•
(3)	Bearing cup	•	•
(4)	Bearing cone	•	•
(5)	Washer	•	•
/6	Bolt	•	•
(7)	Bearing cone	•	•
(8)	Bearing cup	•	•
(9)	Brake piston	•	•
(10)	Top link support	•	•
[11]	Shims	•	•
(12)	O-ring	•	•
(13)	Driving pinion	•	•
(14)	Compound pinion assembly	•	
(15)	Deflector	•	•
(16)	Washer	•	
(17)	Needle roller bearing	•	
(18)	Compound pinion	•	
(19)	Spacer	•	
(20)	Needle roller bearing	•	
(21)	Washer	•	
(22)	Set screw	•	
(23)	Shaft	•	
(24)	Locking screw	•	
(25)	Nut		•
(26)	Fork	•	
(27)	Screw	•	
(28)	Needle roller bearing	•	
(29)	Circlip	•	
(30)	Ring	•	
(31)	Dog tooth coupler	•	
(32)	Circlip	•	
(33)	Washer	•	
(34)	Dog tooth pinion	•	
(35)	Shaft	•	
(36)	Cup plug		•

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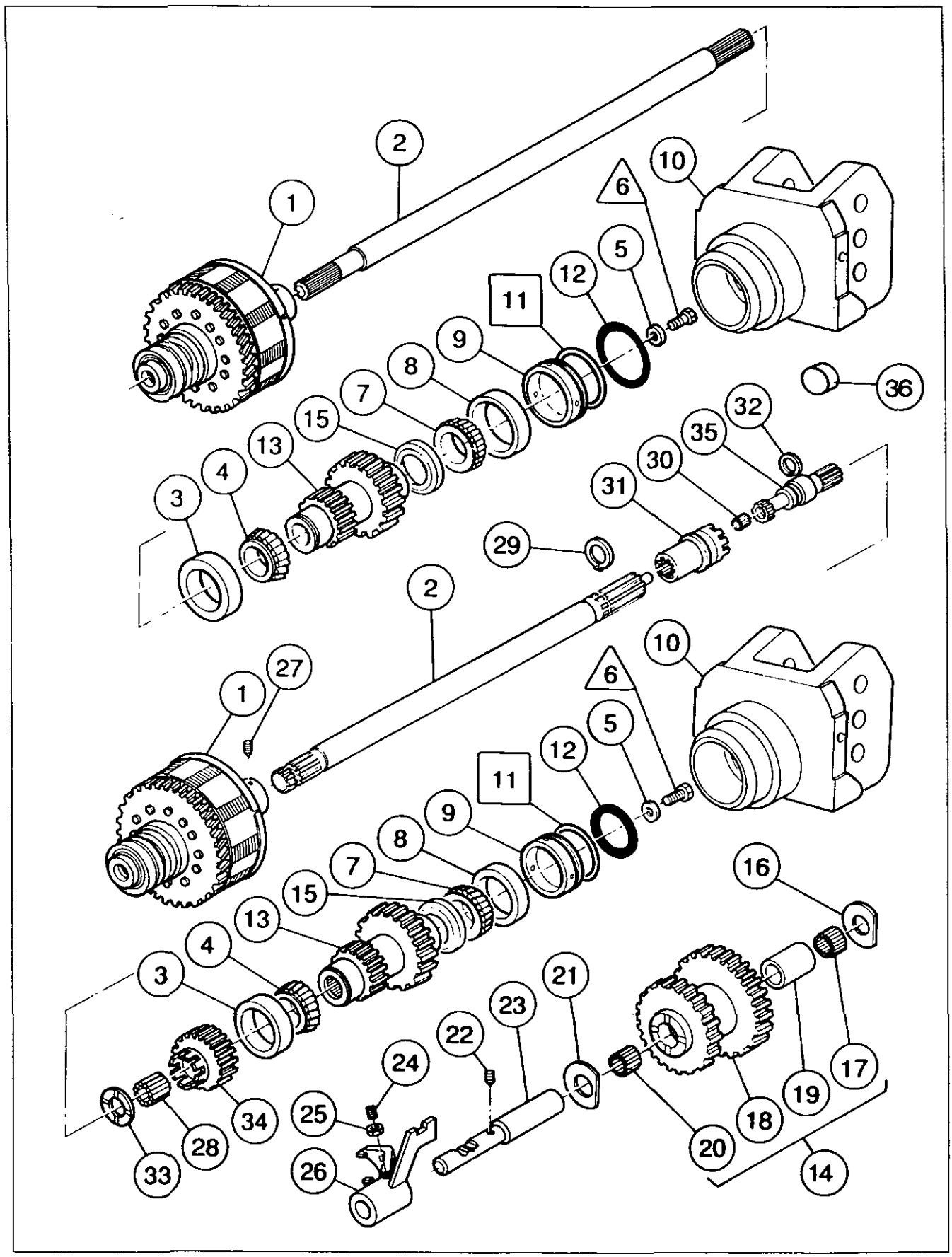


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6D01.4

Rear axle - Interᵗᵉ shaft - Drivⁱⁿᵍ pinion - PTO brake



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A. 2-speed PTO (without shimming)

Disassembly

1. Disconnect (Fig. 1) :
   - the auxiliary spool valve supply hose **(1)**
   - the supply hose of the lift valve **(3)**
   - the return hose **(2)**
2. Remove the bolts **(4)** of the auxiliary spool valve support **(5)** (Fig. 1).
3. Detach the auxiliary spool valve support.
   Note: Tilt the support and auxiliary spool valve assembly without detaching the control cables (1) (Fig. 2).
4. Disconnect the supply tube **(1)** of the PTO brake (Fig. 3).
5. Disconnect the lubrication tube **(4)** (Fig. 3).
6. Remove the bolts **(3)** and the top link support **(10)** (Fig. 3).
7. Withdraw the pinion **(13)** and shaft **(2)** assembly held by the washer **(5)** and screw /**6**\. Remove the bearing cone **(4)**.
   Note: The shaft (2) is mounted in the clutch (1) without locking screw.

Reassembly

8. Check and clean the parts. Replace those which are defective.
9. Refit the bearing cone **(4).** Fit the pinion **(13)** and shaft **(2)** assembly held by the washer **(5)** and screw /**6**\.
10. Clean the joint face of the top link support.
11. Smear the joint face of the housing with a sealing compound (Loctite 510 or equivalent).
    Note: To ensure the lubrication of the bearing cone (7), a cup plug (36) is fitted without Loctite, recessed into the face of the housing.
12. Refit the top link support **(10)**. Fit and tighten the bolts **(3)** to a torque of 130-170 Nm (Fig. 3).
    Note: Ensure that the cup (8) is present.
13. Reconnect the supply tube of the PTO brake **(1)** and the lubrication tube **(4)** (Fig. 3).
14. Clean the joint face of the spool valve support.
15. Smear the joint face of the support cover with a sealing compound (Loctite 510 or equivalent).
16. Refit the support, tilting it, with the control cables **(1)** (Fig. 2).
17. Smear the threads of the two lower bolts **(4)** with Loctite 510. Fit and tighten the bolts **(4)** to a torque of 50-70 Nm (Fig. 1).

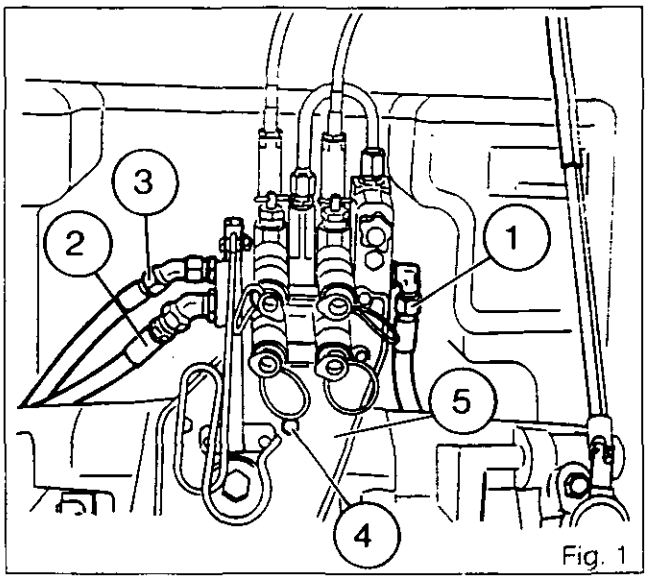


Fig. 1

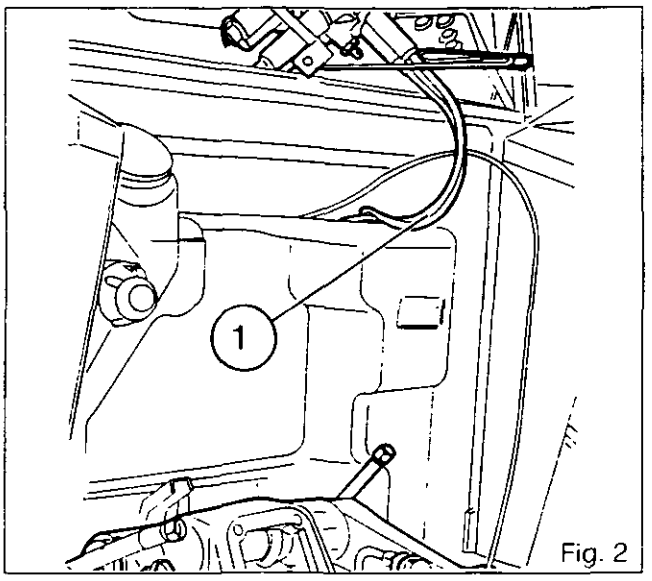


Fig. 2

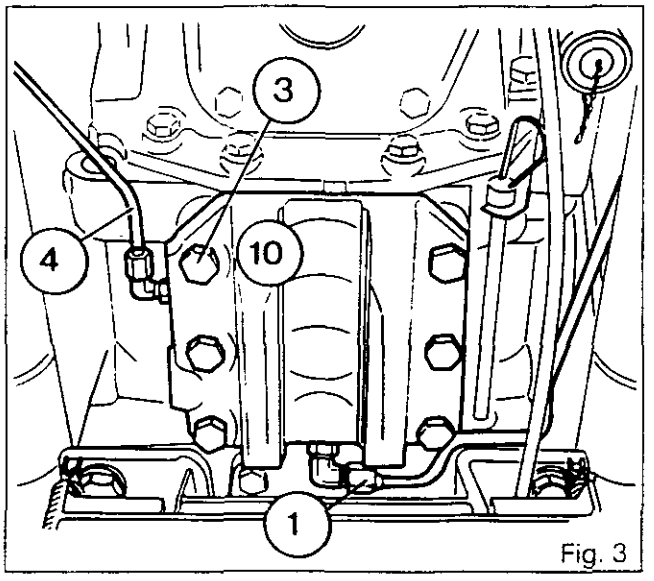


Fig. 3

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18. Reconnect (Fig. 1):
    - the spool valve supply hose **(1)**
    - the supply hose of the lift valve **(3)**
    - the return hose **(2).**
19. Check the operation of the PTO and its brake.
20. Check for leaks
    - at the joint faces (spool valve support, top link support)
    - at the hydraulic connectors.

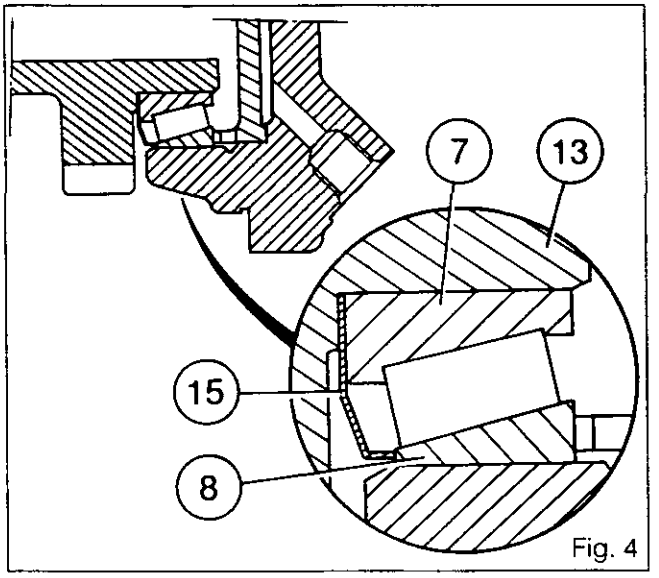


Fig. 4

B. 2-speed PTO (with shimming)

Note: Shimming J1 must be carried out when working on the following parts: Pinion (13), deflector (15), bearing cones (4) (7), cups (3) (8), piston (9), support (10).
For correct shimming of the bearing cones (4) (7) and of the cups (3) (8), it is necessary to remove the lift cover.

Disassembly

21. Remove the lift cover. Carry out operations 1 to 11, chapter 6B01.
22. Disconnect the supply tube **(1)** from the PTO brake (Fig. 3).
23. Disconnect the lubrication tube **(4)** (Fig. 3).
24. Remove the bolts **(3)** of the top link support (Fig. 3) and detach it.
25. Withdraw the pinion **(13)** and shaft **(2)** assembly held by the washer **(5)** and bolt /**6**\.
    Note: The shaft (2) is mounted in the clutch (1) without locking screw.
26. Remove the screw /**6**\ and the washer **(5)**.
27. Separate the pinion **(13)** from the shaft **(2)**.
    Note: A deflector (15) mounted between the pinion (13) and the bearing cone (7), in contact with the cup (8) (Fig.4), has been introduced on 3000 tractors from serial number N120009 onwards.
28. Extract the bearing cone **(7)** and the deflector **(15)** (Fig. 5), then remove the bearing cone **(4)**.
    Note: To extract the cup (3) it is necessary to remove the 540/1000 rpm pinions. Partly drain the rear axle housing. Carry out operations 29, 8 to 11 and 31, chapter 6E01.

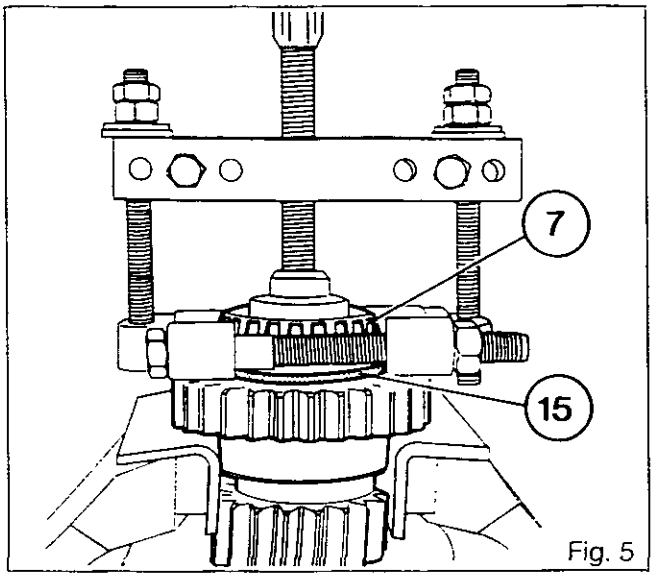


Fig. 5

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Reassembly

29. Check and clean the parts. Replace those which are defective.
30. Place the deflector **(15)** on the pinion **(13)**. Push the bearing cone **(7)** on as far as the shoulder with the aid of a press (Fig. 6).
    Lubricate the bearing cone **(4)** and place it in the cup **(3)**.
    Note: If replacing the cup (3), refit the 540/1000 rpm pinions. Carry out operations 33, 36 and 37, 12 to 15, chapter 6E01. Top up the oil of the rear axle housing.
31. Withdraw the piston **(9)** from the top link support **(10)**.
32. Remove the shims **[11]** and the O-ring **(12)** in order to prepare for shimmng J1.
33. Fit the piston **(9)** (without O-ring) and the cup **(8)** in the support **(10)**.
34. Lubricate the cup and the bearing cone **(7)**.
35. Fit the pinion **(13)** in the housing.
36. Refit the top link support.
    Tighten the bolts to a torque of 130 - 170 Nm.
37. Carry out shimming (Fig. 7) to obtain:
    J1 = -0.05 to +0.05.
38. Place the tip of the dial gauge against the end of the pinion **(13)** (Fig. 8).
39. Pull on the pinion, turning it alternately from right to left, so as to compress the deflector **(15)**, to seat the bearing cone **(7)** correctly in the cup **(8)**.
40. Set the dial gauge to zero.
41. Push the pinion, turning it alternately from right to left, to seat the bearing cone **(4)** correctly in the cup **(3)**.
42. Select shims of the correct thickness as a function of the dial gauge reading so as to obtain clearance of J1.
43. Remove the support **(10)** and withdraw the cup **(8)** and piston **(9)**.
44. Place the shims **[11]** selected in operation 42 in the support **(10)**.

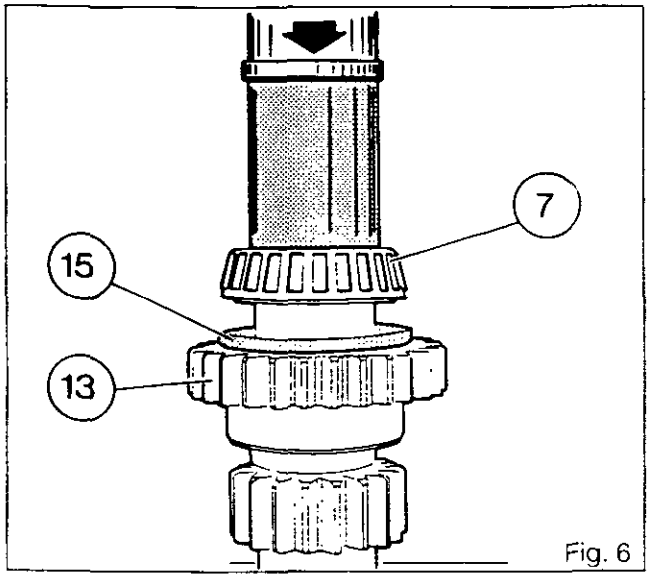


Fig. 6

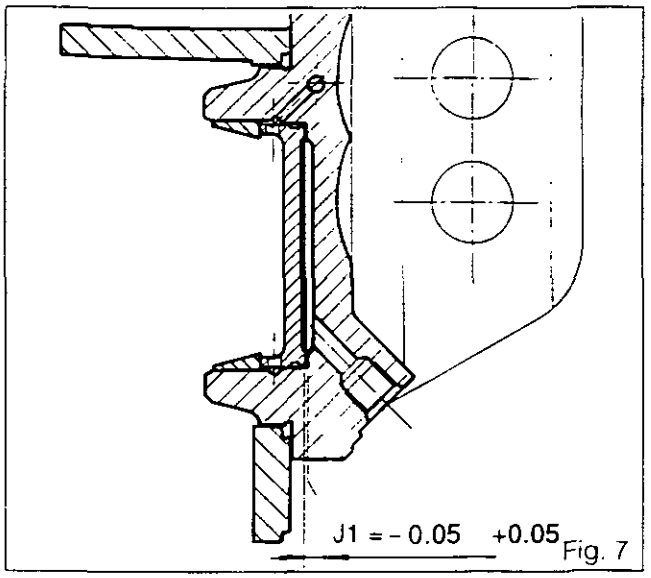


Fig. 7

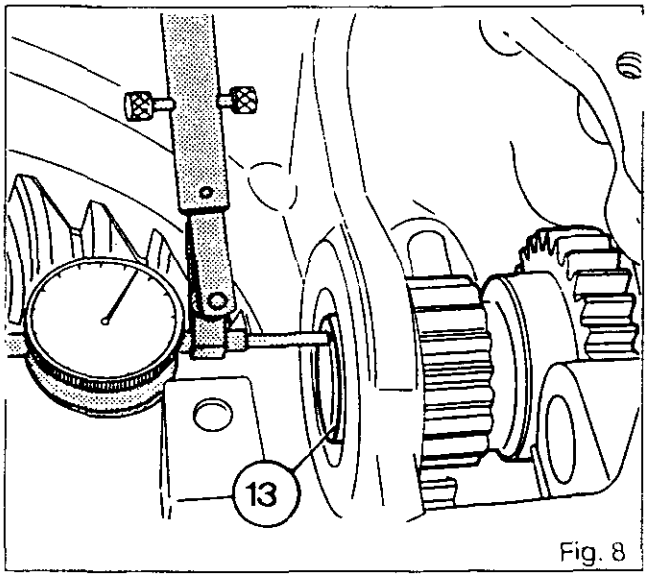


Fig. 8

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45. Fit the piston **(9)** with a new O-ring **(12)**.
Note: Position the lubrication holes of the piston toward the bearing cone (Fig. 9).
46. Fit the cup **(8)** in the support.
47. Withdraw the pinion **(13)** and assemble on the shaft **(2)** with the washer **(5)** and bolt /**6**\. Tighten to a torque of 50 Nm.
48. Refit the bearing cone **(4)**. Fit the pinion **(13)** and shaft **(2)** assembly.
49. Smear the face supporting the top link support on the rear axle housing with a sealing compound (Masterjoint 510 or equivalent).
50. Refit the top link support **(10)**. Fit and tighten the boltss **(3)** to a torque of 130-170 Nm (Fig. 3).
Note: Ensure that the cup (8) is present.
51. Reconnect the supply tube **(1)** of the PTO brake and the lubrication tube **(4)** (Fig. 3).
52. Refit the lift cover.
53. Carry out operations 53 to 57, chapter 6B01.
54. Reverse operation 7, chapter 6B01.
55. Carry out operations 64 to 69, chapter 6B01.
56. Carry out operations 71, 72 and 84, chapter 6B01.
57. Check the operation of the PTO and its brake.
58. Check for leaks:
. at the joint faces (spool valve support, top link support, lift cover)
. at the hydraulic connectors.

C. 4-speed economy PTO (without shimming)

Disassembly

59. Remove the left side cover.
If removing the screw **(27)** and the intermediate shaft **(2)**, carry out operations 1 to 6, chapter 8I02.
Note: A new assembly without coupling between the clutch and the intermediate shaft has been introduced on 3000 tractors from serial number N342012 onwards.
For earlier tractors and certain tractors equipped with the old assembly following the introduction: N342017 - N342018 - N342022 - N342026 - N348029 refer to workshop manual 1646640 M1.
60. Disconnect (Fig. 1):
. the spool valve supply hose **(1)**
. the supply hose of the lift valve **(3)**
. the return hose **(2)**.

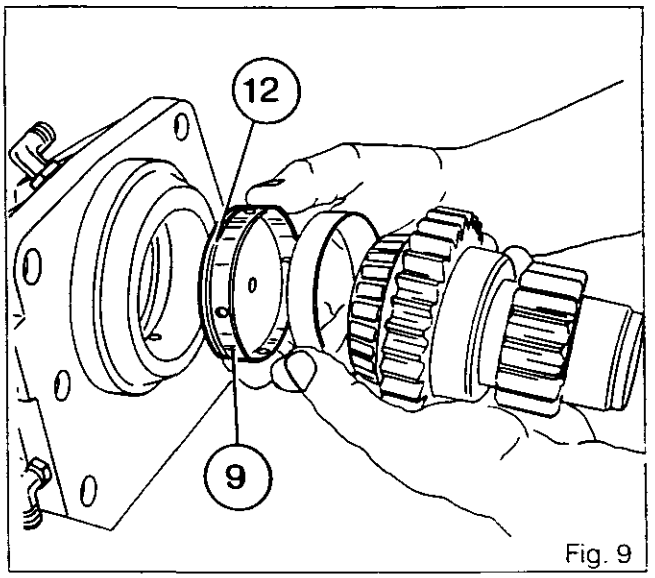


Fig. 9

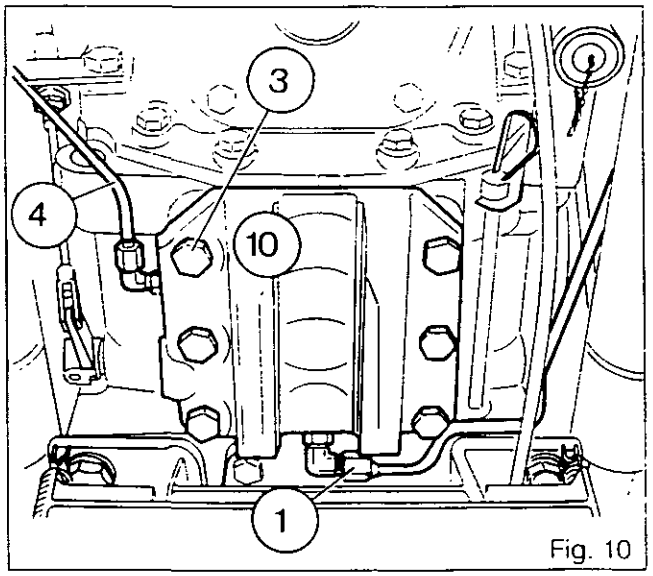


Fig. 10

61. Remove the bolts **(4)** fastening the support **(5)** to the lift cover (Fig. 1).
62. Remove the support.
Note: Tilt the support and spool valve assembly without detaching the cables (1) (Fig. 2).
63. Disconnect the supply tube **(1)** of the PTO brake (Fig. 10).
64. Disconnect the lubrication tube **(4)** (Fig. 10).
65. Remove the bolts **(3)** of the top link support **(10)** and detach it (Fig. 10).

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66. Remove the nut **(25)** and the locking screw **(24)** of the fork **(26)**.
67. Remove the screw **(22)** (Fig. 11).
68. Withdraw the shaft **(23)** from the compound pinion assembly **(14)** in order to disengage the fork **(26)**.
Note: To disengage the fork alone, gently pull the shaft (23) towards the rear.
69. Remove the friction washers **(16)** and **(21)**.
Note: Take care not to drop the washers in the housing.
70. Withdraw the compound pinion assembly **(14)** (through the aperture of the spool valve support for version without shimming only) (Fig. 12).
71. Remove the needle roller bearings **(17)** and **(20)** and the spacer **(19)** of the pinion **(18)**.
Note: A new coupler and a new pinion have been introduced on 3000 tractors from serial number P181042 onwards.
72. Remove the circlip **(32)** (Fig. 13).
Note: Use short-handled pliers to facilitate access to the circlip.
73. Withdraw the pinion **(13)** and shaft **(35)** assembly held by the washer **(5)** and bolt /**6**\.
74. Remove the flat washer **(33)**.
Note: Take care not to drop the circlip and the washer in the housing.
Hold the pinion (34) and the needle roller bearing (28).
The bearing cone (4) remains in the cup (3) during removal of the pinion (13).
75. Remove the pinion **(34)** and the needle roller bearing **(28)**.
76. Remove the bearing cone **(4)**.
77. Remove the hexagon socket setscrew **(27)** (if necessary).
78. Withdraw the shaft **(2)** and the coupler **(31)** (if necessary).
Note: The circlip (29) remains on the shaft (2).

Reassembly

79. Clean and check the parts. Replace those which are defective.
80. Refit the shaft **(2)** and the coupler **(31)** (if removed).
81. Smear the screw **(27)** with Loctite 221 and tighten (if removed).
82. Refit the bearing cone **(4)**. Advance the pinion **(13)** prepared with the shaft **(35)**. Fit the coupler **(34)**, the needle roller bearing **(28)**, the washer **(33)** and the circlip **(32)**. Push on to the pinion **(13)**. Position the washer **(33)**. Fit the circlip **(32)**.

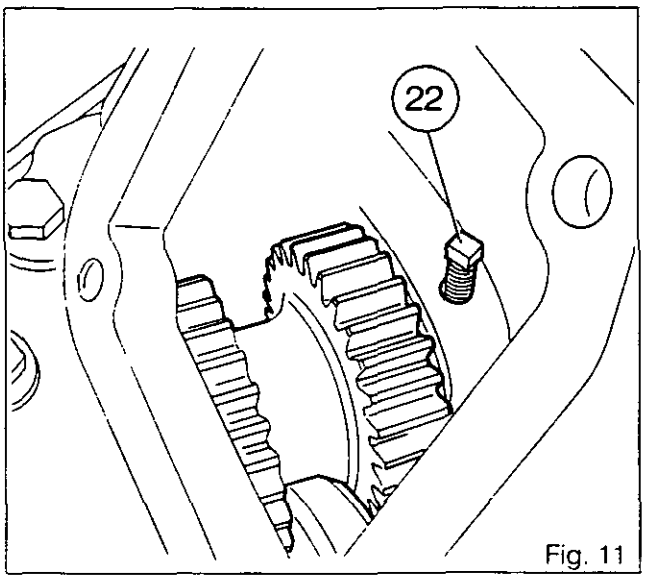


Fig. 11

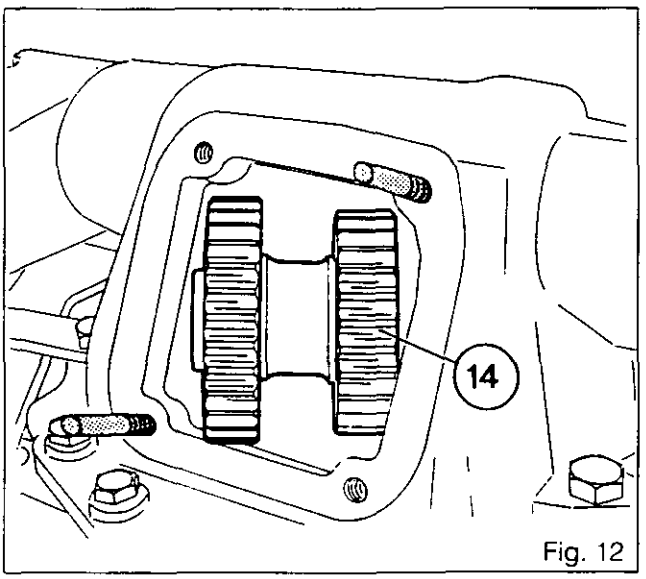


Fig. 12

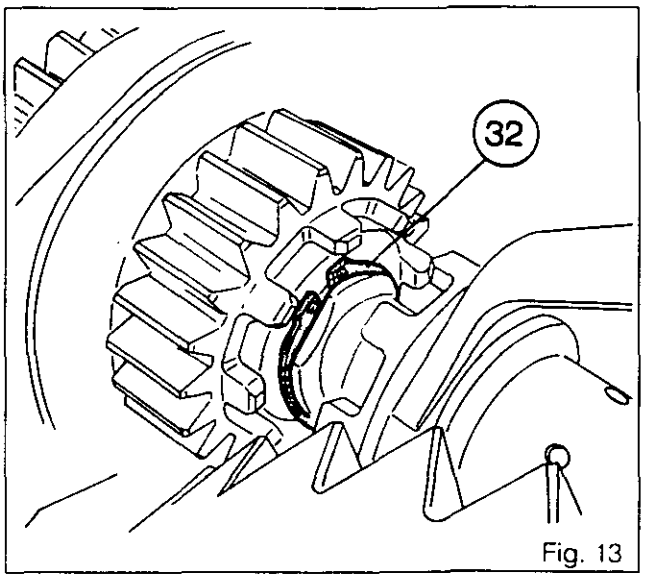


Fig. 13

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83. In the pinion **(18)**, place the spacer **(19)** and the needle roller bearings **(17)** and **(20)**. Position the compound pinion assembly **(14)**. Fit the washer **(16)** smeared with miscible grease (Amber Technical or equivalent).
84. Lightly engage the shaft **(23)** to hold the washer **(16)** in place. Fit the washer **(21)** smeared with miscible grease. Centre the compound pinion assembly **(14)**.
85. Mount the shaft **(23)** finally in the pinion assembly **(14)** and in the fork **(26)**, ensuring that the hole of the screw **(22)** is properly positioned.
86. Smear the screw **(22)** with Loctite 542. Fit and tighten to a torque of 28-43 Nm.
87. Clean the joint face of the top link support.
88. Smear the joint face of the housing with a sealing compound (Loctite 510 or equivalent).
89. Ensure that the cup **(8)** is present. Fit and tighten the bolts **(3)** to a torque of 130-170 Nm (Fig. 10).
90. Reconnect the tubes **(1)** and **(4)** (Fig. 10).
91. Refit the screw **(24)** and the nut **(25)** on the fork **(26)**.
92. **Adjustment of locking of fork (26) (Fig. 14):**
    - Position the fork **(26)** and the locking screw **(24)** on the flat part M of the shaft **(23)** (between the two locking notches). Tighten the screw as far as it will go so as to compress the ball.
    - Loosen the screw by 1/4 of a turn. Smear the nut **(25)** with Loctite 241. Tighten to a torque of 15-20 Nm.
    - Check that the fork is locked correctly.
93. Adjust the control.
    Carry out operations 127 and 132 to 137 .
94. Clean the joint face of the spool valve support.
95. Smear the joint face of the support with a sealing compound (Loctite 510 or equivalent).
96. Refit the support, tilting it, with the control cables **(1)** (Fig. 2).
97. Smear the threads of the two lower bolts **(4)** with Loctite 510. Tighten the four screws to a torque of 50-70 Nm (Fig. 1).
98. Reconnect the hoses **(1) (2) (3)** (Fig. 1).
99. If the screw **(27)** and intermediate shaft **(2)** have been removed, refit the left side cover. Carry out operations 7 to 20, chapter 8I02.
100. Check the operation of the PTO and its brake.

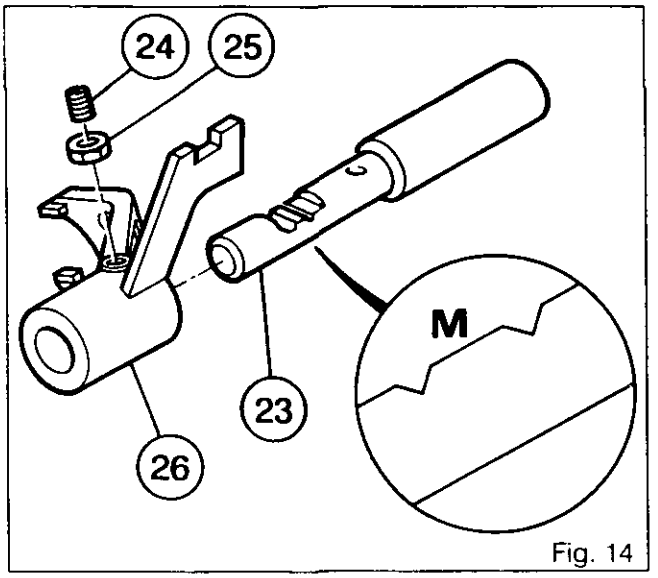


Fig. 14

101. Check for leaks
    - at the joint faces (spool valve support, top link support, left side cover)
    - at the hydraulic connectors.

D. 4-speed economy PTO (with shimming)

Note: Shimming J1 must be carried out when working on the following parts: Pinion (13), deflector (15), bearing cones (4) (7), cups (3) (8), piston (9), top link support (10).
For correct shimming of the bearing cones (4) (7) and of the cups (3) (8), it is necessary to remove the lift cover.

Disassembly

102. Remove the lift cover. Carry out operations 1 to 11, chapter 6B01.
103. Carry out operations 63 to 76.
    Note: A strengthened shaft (35) has been introduced on 3000 tractors. The old needle cage has been replaced with a friction ring (30) having an external diameter of 14 mm.
    The modified shaft has been introduced:
    - ***On tractors MF 3050 - 3060 - 3065 - 3070 and 3090 from serial number N287019 onwards.***
    - ***On tractors MF 3080 from serial number N288017 onwards.***

    For tractors prior to these numbers, refer to workshop manual 1646640 M1.

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104. Separate the pinion **(13)** from the shaft **(35)** with the aid of a press and a suitable tool (Fig. 15).
Note: The friction ring (30) is force-fitted in the shaft (35).

105. Extract the bearing cone **(7)** and the deflector **(15)** (Fig. 5).
Note: To extract the cup (3) it is necessary to remove the 540/1000 rpm pinions.
Partly drain the axle housing.
Carry out operations 21 to 24, 2 to 6 and 26 of chapter 6E02.

Reassembly

106. Check and clean the parts. Replace those which are defective.
Note: To obtain correct lubrication of the friction ring (30), a deflector (15) (mounted between the pinion (13) and the bearing cone (7) in contact with the cup (8) (Fig. 16)) has been introduced on 3000 tractors from serial number N120009 onwards.

107. Place the deflector **(15)** on the pinion **(13)**. Push the bearing cone **(7)** on as far as the shoulder with the aid of a press (Fig. 6). Place the bearing cone **(4)** in the cup **(3)**.
Note: If replacing the cup (3), refit the 540/1000 rpm pinions. Carry out operations 31 and 32, 7 to 10 and 34 to 37, chapter 6E02.
Top up the oil of the rear axle housing.

108. Carry out operations 31 to 46.

109. Withdraw the pinion **(13)** and assemble on the shaft **(35)** (Fig. 17). Mount the washer **(5)** and bolt **(6)**.
Tighten to a torque of 50 Nm.

110. Refit the bearing cone **(4)**, the coupler **(34)** and the needle roller bearing **(28)**.

111. Fit the pinion **(13)** and shaft **(35)** assembly.
Note: Ensure that the coupler (31) is present.

112. Position the washer **(33)**. Fit the circlip **(32)**.

113. In the pinion **(18)**, place the spacer **(19)** and the needle roller bearings **(17)** and **(20)**. Position the compound pinion assembly **(14)**. Fit the washer **(16)** smeared with miscible grease (Amber Technical or equivalent).

114. Lightly engage the shaft **(23)** to hold the washer **(16)** in place. Fit the washer **(21)** smeared with miscible grease. Centre the compound pinion assembly **(14)**.

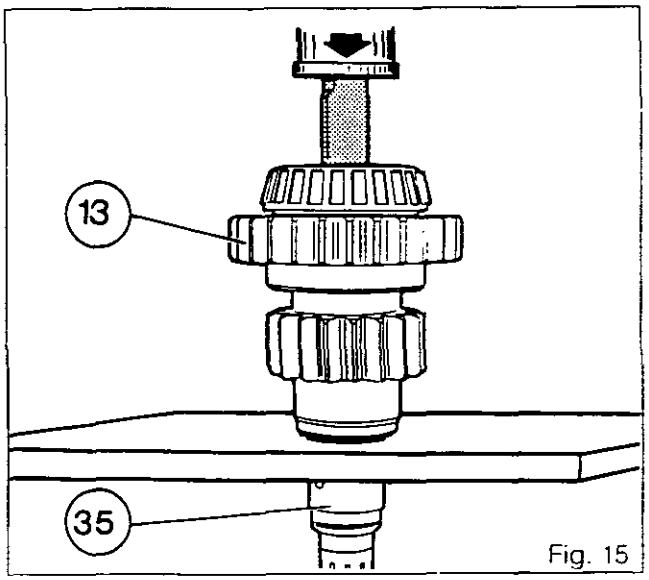


Fig. 15

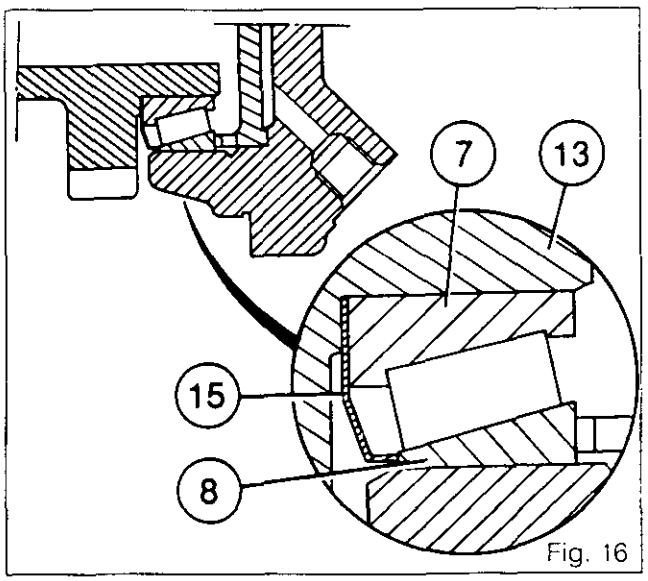


Fig. 16

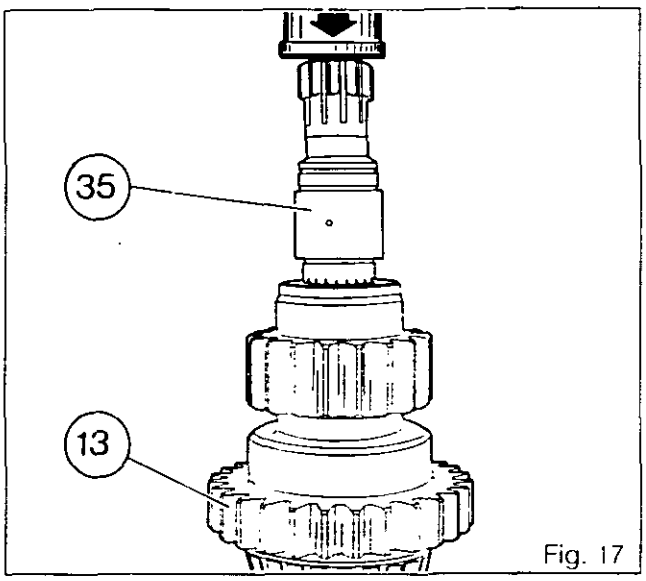


Fig. 17

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115. Fit the shaft **(23)** finally in the pinion assembly **(14)** and in the fork **(26)**, ensuring that the hole of the screw **(22)** is properly positioned.
116. Smear the screw **(22)** with Loctite 542. Fit and tighten to a torque of 28-43 Nm.
117. Clean the joint face of the top link support.
118. Smear the joint face of the housing with a sealing compound (Loctite 510 or equivalent).
119. Ensure that the cup **(8)** is present. Fit the top link support with the bolts **(3)** and tighten to a torque of 130-170 Nm (Fig. 10).
120. Reconnect the tubes **(1)** and **(4)** (Fig. 10).
121. Fit the locking screw **(24)** and the nut **(25)**. Adjust the fork **(26)**, carry out operation 92.
122. Refit the lift cover.
Carry out operations 53 to 57, chapter 6B01. Reverse operation 7, chapter 6B01. Carry out operations 64 to 69, 71, 72 and 84, chapter 6B01.
123. Adjust the economy PTO control.
Carry out operations 127 and 132 to 137.
124. Adjust the shiftable PTO control.
Carry out operations 47 and 52 to 58, chapter 6E02.
125. Check the operation of the PTO and its brake.
126. Check for leaks:
.at the joint faces (spool valve support, top link support)
.at the hydraulic connectors.

E. Adjustment of PTO control 4 speed economy

Note: Operations 128 to 131 must be carried out when replacing the control cable.

127. Set the control lever L to the «Economy 1550 rpm» position.
128. Screw the clevis **(1)** until it reaches the end of the threaded part of the cable **(6)** (Fig. 18).
129. Mount the clevis **(1)** on the lever with the clip **(7)**. Tighten the nut **(2)**.
130. Adjust the outer cable stop **(5)**, with the nut **(3)** reaching the end of the threaded part.
131. Tighten the nut **(4)**.
Note: Check that the cable is not constrained.
132. Set the lever M to the «Economy 1550 rpm» position (Fig. 19) (coupler engaged towards the rear, fork locked).

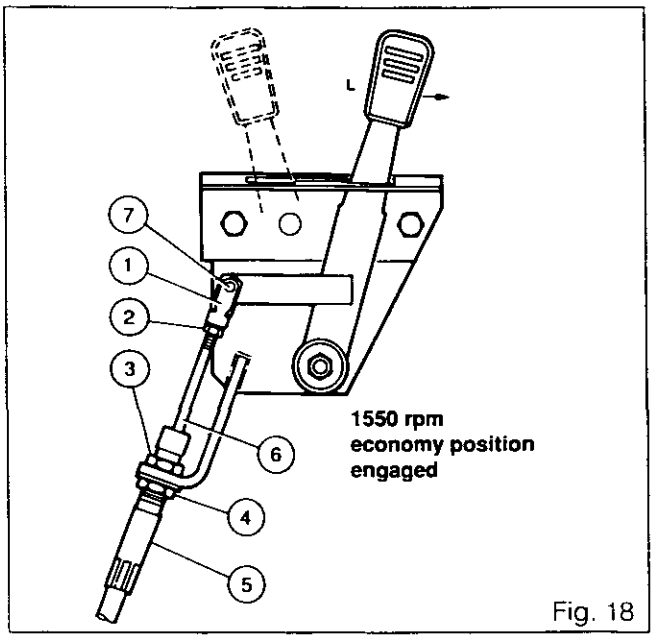


Fig. 18

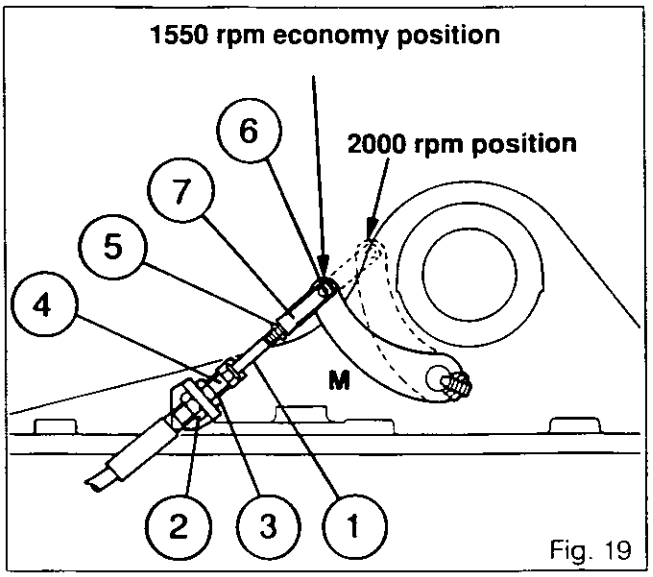


Fig. 19

133. Screw the clevis **(7)** until it reaches the threaded part of the cable **(1)**.
134. Fit the clevis **(7)** on the lever M with the clip **(6)**. Tighten the nut **(5)**.
135. Adjust the outer cable stop **(4)**, ensuring that the lever M is still locked.
136. Tighten the nuts **(2)** and **(3)**.
Note: After tightening, check that the cable is not subject to any constraint.
137. Check the locking of the control in the «2000 rpm» position.

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6 E01 Removable PTO shaft

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6E01.2

Rear Axle - Removable PTO shaft

General

The driven gears **(5)** and **(6)** are fitted on the PTO shaft situated in the lower rear part of the axle housing. These gears constantly engage with the driving compound gear which is driven by the upper shaft whose movement is transmitted by the PTO clutch.
The PTO shaft **(10)** is fitted at the front on a roller bearing **(1)** force-fitted in the axle housing and at the rear on a hub **(9)** turning on a roller bearing **(15)**.
It has 6 splines in the 540 rpm version and 21 splines in the 1000 rpm version.
In the 540 rpm configuration, the gear **(5)** is driven through the splines of shaft **(10)**. The gear **(6)** and bush **(4)** assembly runs idle on the shaft **(10)**.
In the 1000 rpm configuration, the gear **(6)** is driven via the splines of shaft **(10)**. The gear **(5)** and shaft **(3)** assembly runs idle on the shaft **(10)**.
The snap ring **(20)** holds the shaft in place.
Sealing is provided by the seal /**14**\ or /**14A**\ and the O-rings **(11)** and **(19)**. The deflector **(13)** ensures protection against foreign material.

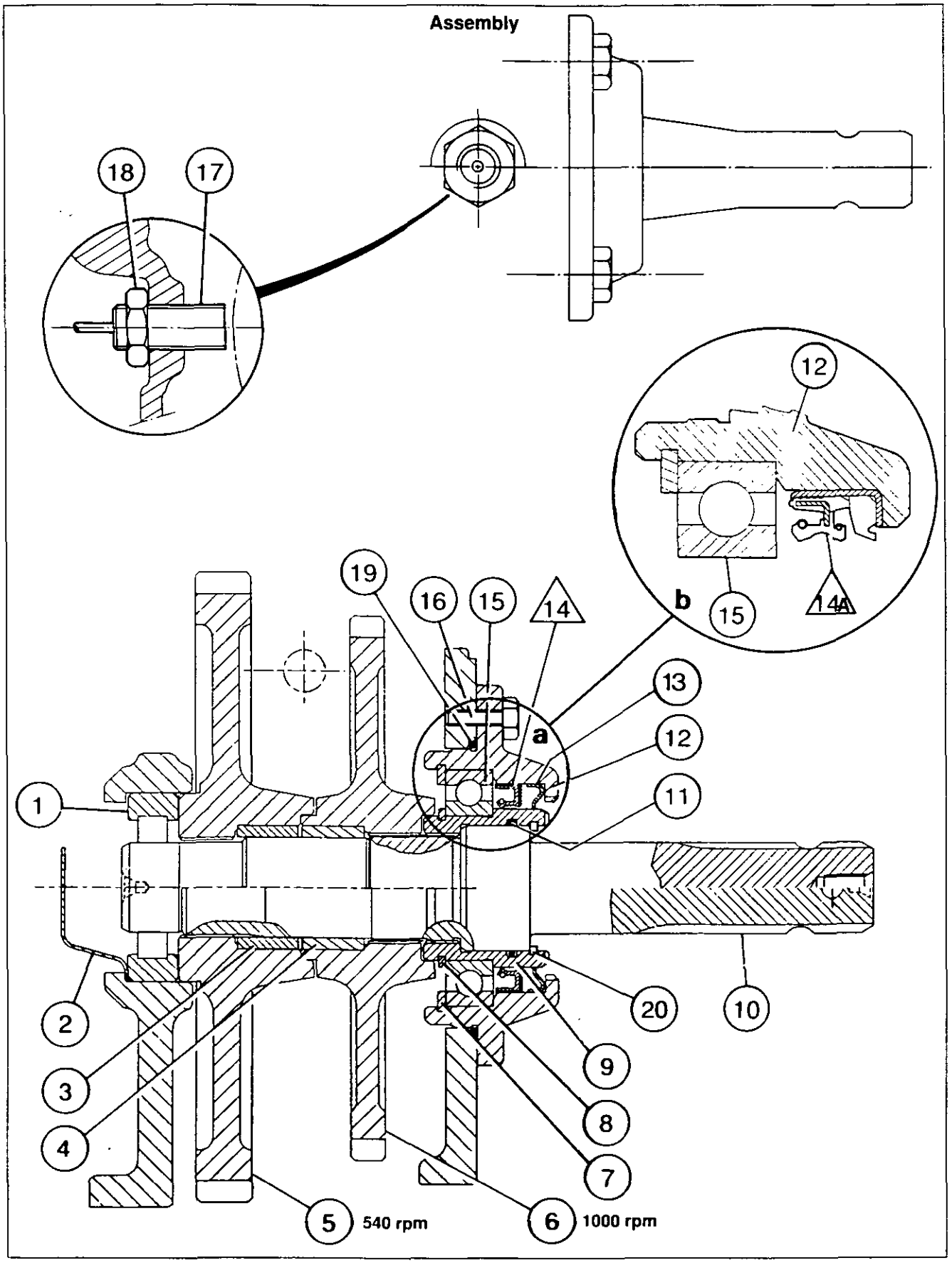
Parts list

(1) Roller bearing
(2) Deflector
(3) Bush
(4) Bush
(5) 540 rpm gear
(6) 1000 rpm gear
(7) Circlip
(8) Snap ring
(9) Hub
(10) 540 or 1000 rpm p.t.o. shaft
(11) O-ring
(12) Cover
(13) Deflector
/**14**\ Sealing ring
/**14A**\ Reinforced sealing ring
(15) Roller bearing
(16) Bolt
(17) PTO speed sensor
(18) Nut
(19) O-ring
(20) Snap ring

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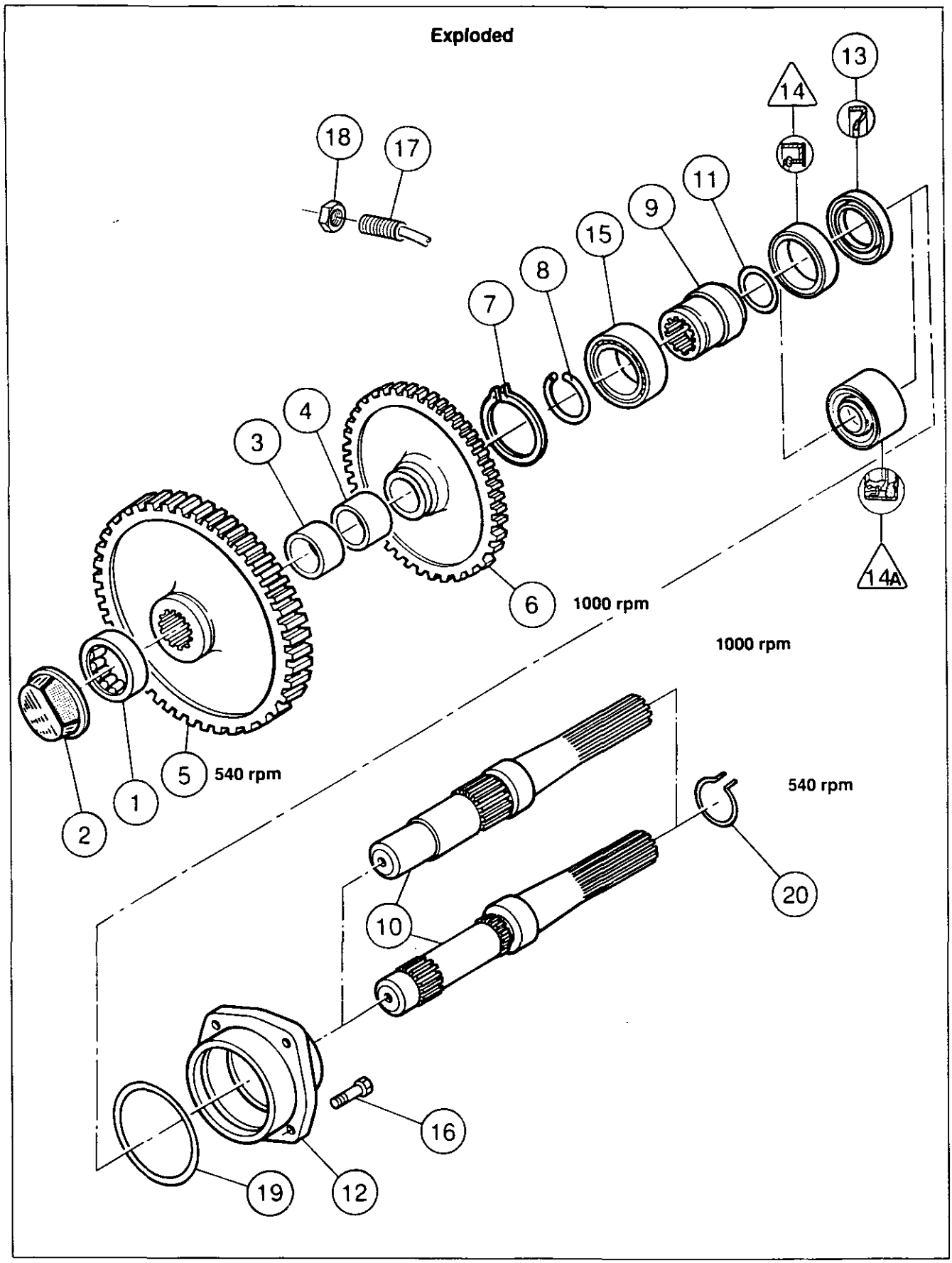
Rear Axle - Removable PTO shaft



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Rear Axle - Removable PTO shaft



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Rear Axle - Removable PTO shaft

A. Replacement of 540 or 1000 rpm shaft

Disassembly (Fig. 1)

1. Raise rear of tractor to avoid oil spillage.
2. Remove snap ring **(20)**.
3. Withdraw shaft **(10)**.
4. Remove O-ring **(11)** and discard it.

Reassembly

5. Fit a new O-ring **(11)**.
6. Clean and refit shaft **(10)**.
7. Refit snap ring **(20)** and lower rear of tractor.

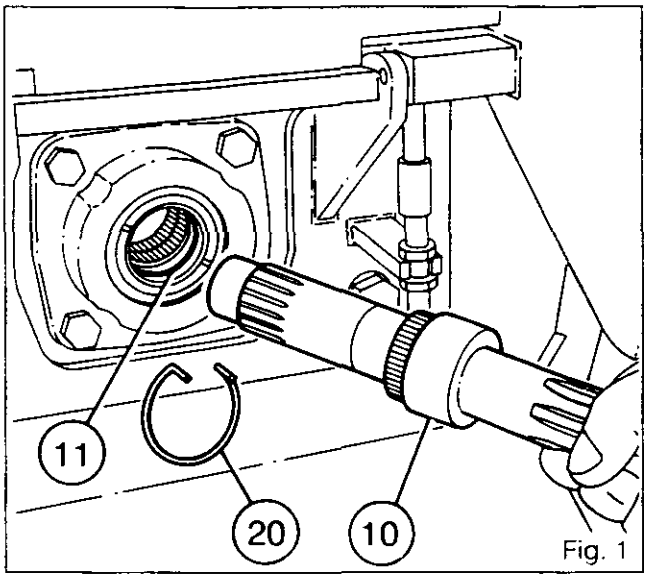


Fig. 1

B. Removal and refitting of rear cover

Removal

8. Partially drain the rear axle housing. Remove two diametrally opposed bolts **(16)** (Fig. 2).
9. Screw two guide studs (Fig. 2) against the gear **(6)**. The purpose of this is to hold the gears **(5)** and **(6)** in line when removing the shaft **(10)** and the rear cover assembly (Fig. 3).
10. Remove the other two bolts **(16)** (Fig. 2).
11. Withdraw the shaft and bearing assembly (Fig. 4).

Refitting

12. Mount the shaft and rear bearing assembly (Fig. 4).

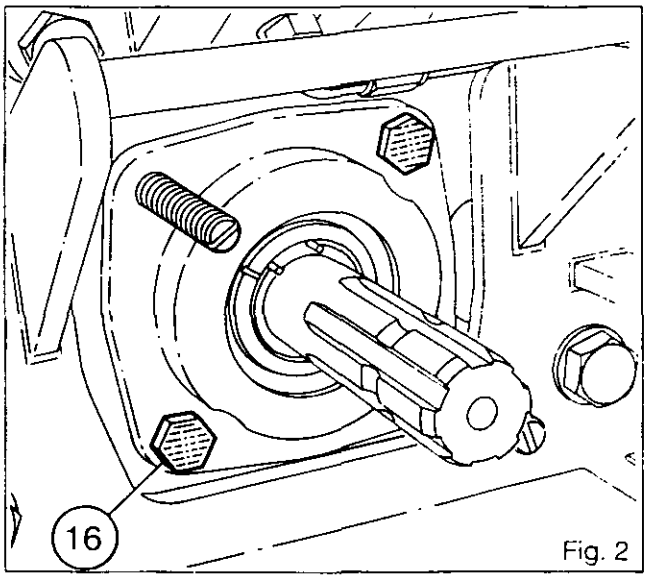


Fig. 2

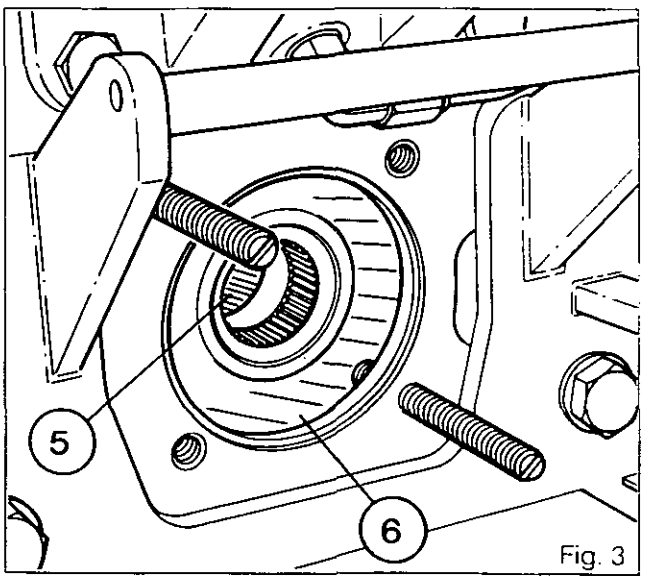
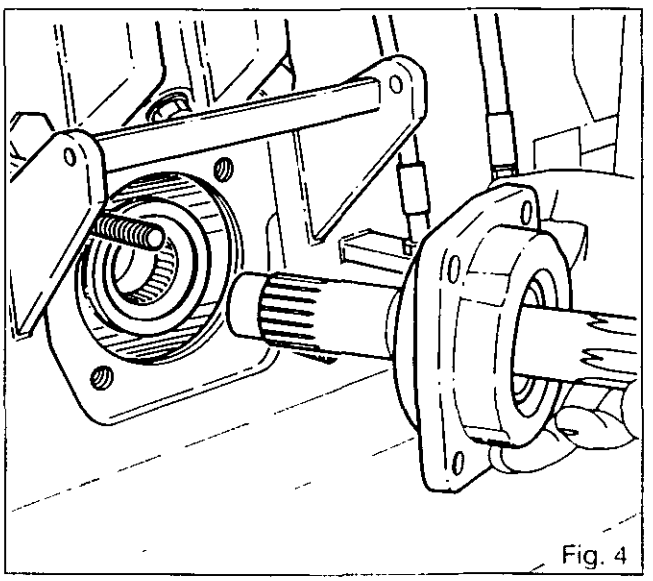


Fig. 3


Fig. 4

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13. Smear Loctite 542 on two bolts **(16)** then tighten to a torque of 105 - 120 Nm.
14. Remove the two guide studs.
15. Smear Loctite 542 on the other two bolts **(16)** then tighten to a torque of 105 - 120 Nm.
16. Top up the oil level of the rear axle housing.

C. Disassembly and reassembly of rear cover

Remove the rear bearing by carrying out operations 8 to 11.

Disassembly

17. Remove O-ring **(19)**.
18. Remove snap ring **(20)**.
19. Separate the shaft **(10)** from the bearing assembly.
20. Remove O-ring **(11)**.
21. Remove circlip **(7)**.
22. Separate the cover **(12)** from the roller bearing **(15)**.
23. Remove snap ring **(8)**.
24. Extract the roller bearing **(15)** from the hub **(9)**.
25. Dismantle :
    - version a : the sealing ring /**14**\ and the deflector **(13)**.
    - version b : the reinforced sealing ring /**14A**\.

Reassembly

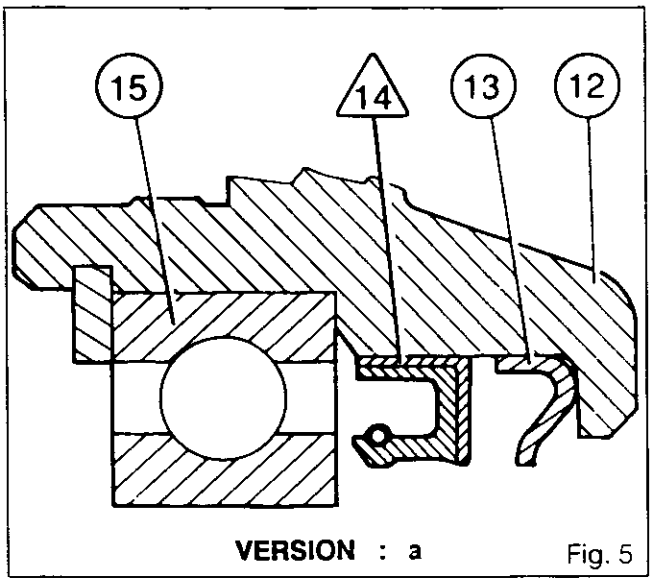
Version a (Fig. 5)

26. Using a press and a suitable device, fit the deflector **(13)** against the shoulder of the cover **(12)**.
    Note: Assemble in the correct way.
27. Using a press and a suitable device, fit the sealing seal ring /**14**\ flush with the chamfer of the cover **(12)** with the lip facing towards the bearing **(15)**.

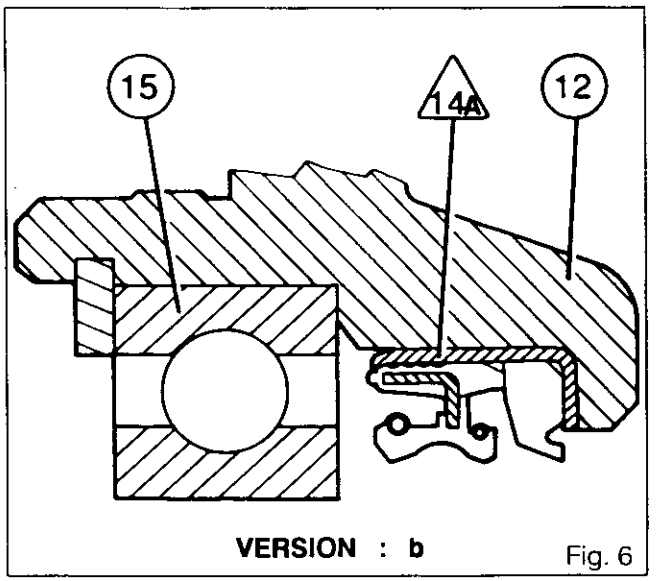
Version b (Fig. 6)

Depending on the option, a reinforced sealing ring /**14A**\ is fitted in place of the seal /**14**\ and deflector **(13)**. Smear Loctite 542 on the exterior of the sealing ring and using a suitable device, fit it against the shoulder of the cover **(12)**. The double lip should face towards the bearing **(15)**.

28. Reverse operations 17 to 24 and refit the rear bearing assembly by carrying out operations 12 to 15.



VERSION : a Fig. 5



VERSION : b Fig. 6

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D. Disassembly and reassembly of 540 or 1000 rpm gear and of front bearing

Disassembly

To disassemble gears **(5)** and **(6)** it is necessary to remove :

- The lift cover by carrying out operations 1 to 11, chapter 6 B01.
- The top link support, the driving gear and the intermediate shaft by carrying out operations 4 to 7, chapter 6 D01.A.

29. In order to gain access to the sensor, remove the left cylinder by dismantling the lower fastening and disconnecting the supply hose.
    Remove the PTO sensor (Autotronic - Datatronic).
30. Remove the rear cover assembly by carrying out operations 8 to 11.
31. Remove the gears **(5)** and **(6)**.
32. Extract the bearing **(1)** and the deflector **(2)**.

Reassembly

33. Clean and check the parts. Replace those which are defective.
34. Smear Loctite 648 on the face of the deflector **(2)** which meets the housing and place it in its hole. Position so that the aperture faces upward (Fig. 7).
35. Fit the roller bearing **(1)** in the housing abutting on the deflector **(2)**.
36. Lubricate the bushes **(3)** and **(4)**.
37. Refit the gears **(5)** and **(6)** and screw two guide studs against the gear **(6)**. The purpose of this is to hold the gears in line (Fig. 3) when refitting the rear cover assembly.
    Note: If the bushes (3) and (4) are damaged, replace the gears (5) and (6).
38. Refit the rear cover assembly by carrying out operations 12 to 15.
39. Smear Loctite «Form A gasket 2» (sensor sealing or equivalent) on the thread of the PTO sensor. Fit and adjust the sensor:
    a) Screw the sensor fully in, without forcing it, so that it is in contact with the gear **(6)**.
    b) Unscrew the sensor 3/4 of a turn.
    c) Tighten the nut **(18)** moderately and connect the harness.
    Refit the LH cylinder, reassemble the lower fastening and reconnect the supply hose.
    Refit the driving gear with the intermediate shaft and the top link support.

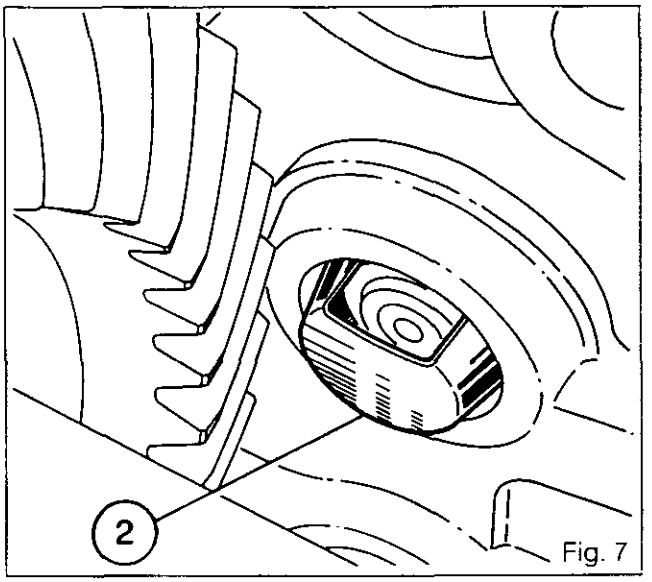


Fig. 7

40. Carry out operations 9 to 13, chapter 6 D01 (2 speeds).
    Refit the lift cover.
41. Carry out operations 53 to 57, chapter 6 B01.
42. Reverse operation 7, chapter 6 B01.
43. Carry out operations 64 to 69, chapter 6 B01.
44. Carry out operations 71, 72 and 84, chapter 6 B01.
45. Top up the oil level of the rear axle housing.
46. Check the operation of the p.t.o. and its brake.
47. Check for leaks:
    - of the joint faces (Auxiliary spool valve support, top link support, PTO rear cover assembly, lift cover)
    - of the hydraulic fittings.

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6 E02 Shiftable PTO shaft

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- General ____ 2

A. Removal and refitting rear cover ____ 5

B. Disassembly and reassembly of rear cover ____ 5

C. Disassembly and reassembly of 540 and 1000 rpm gear and of the front roller bearing of the shaft ____ 7

D. Adjustment of control cable ____ 9

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Rear Axle - Shiftable PTO shaft

General

The driven gears **(4)** and **(7)** are fitted on the p.t.o. shaft **(13)** situated in the lower rear part of the axle housing. These gears constantly engage with the driving compound gear which is driven by the upper shaft whose movement is transmitted by the p.t.o. clutch.
The p.t.o. shaft is fitted free in the roller bearing /**2**\ and is force-fitted in the roller bearing **(10)** which are fitted in the axle housing and in the cover **(14)** respectively.
The hub coupler **(6)** is driven by the splined shaft **(13)**.
The gears **(4)** and **(7)** drive the shaft when the coupler **(5)** is moved towards the front (540 rpm) or the rear (1000 rpm). When one of the gear **(4)** or **(7)**, equipped with bushes **(19)** and **(20)** respectively, is passive, it rotates either on the bush /**3**\ or on the shaft **(13)**.
A fork **(25)** fitted on a selector rail **(22)** enables speed selection (540 or 1000 rpm).
Sealing is by means of a seal /**11**\ or /**11A**\ and the O-ring **(18)**. The deflector **(12)** ensures protection against foreign materiel.

Lubrication of gears (4) and (7)

The two gears are lubricated by the transmission oil.
The roller bearing /**2**\ has a sealed face oriented towards the 540 rpm gear. The gears are lubricated via the deflector **(1)** and the shaft **(13)** which has an axial channel and radial holes.

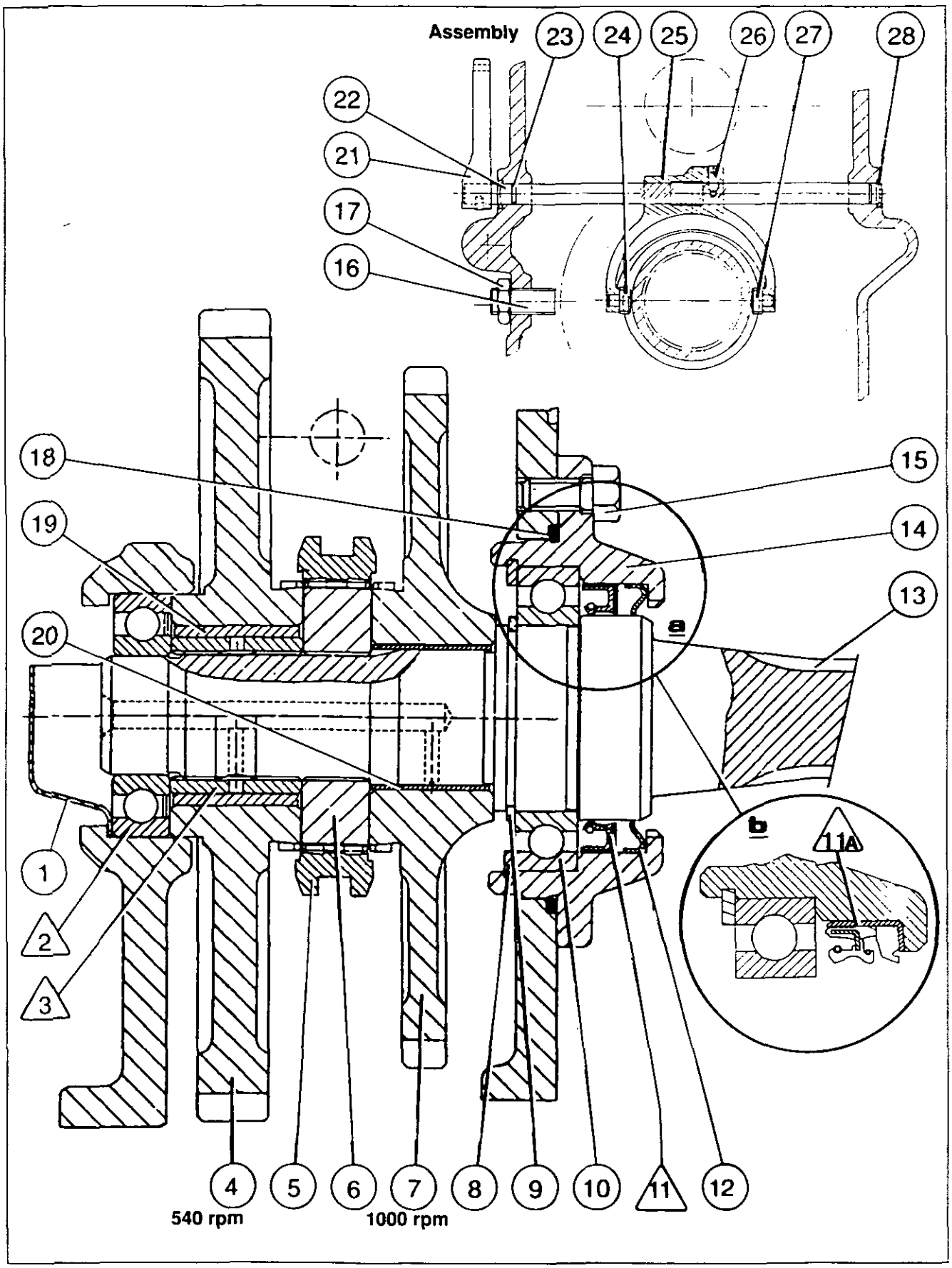
Parts list

(1) Deflector
/**2**\ Roller bearing
/**3**\ Bush
(4) 540 rpm gear
(5) Coupler
(6) Hub
(7) 1000 rpm gear
(8) Circlip
(9) Retainer ring
(10) Roller bearing
/**11**\ Seal
/**11A**\ Reinforced seal
(12) Deflector
(13) PTO shaft
(14) Cover
(15) Screw
(16) Sensor
(17) Nut
(18) O-ring
(19) Bush
(20) Bush
(21) Lever
(22) Selector rail
(23) O-ring
(24) Pad
(25) Fork
(26) Set screw
(27) Pad
(28) Plug

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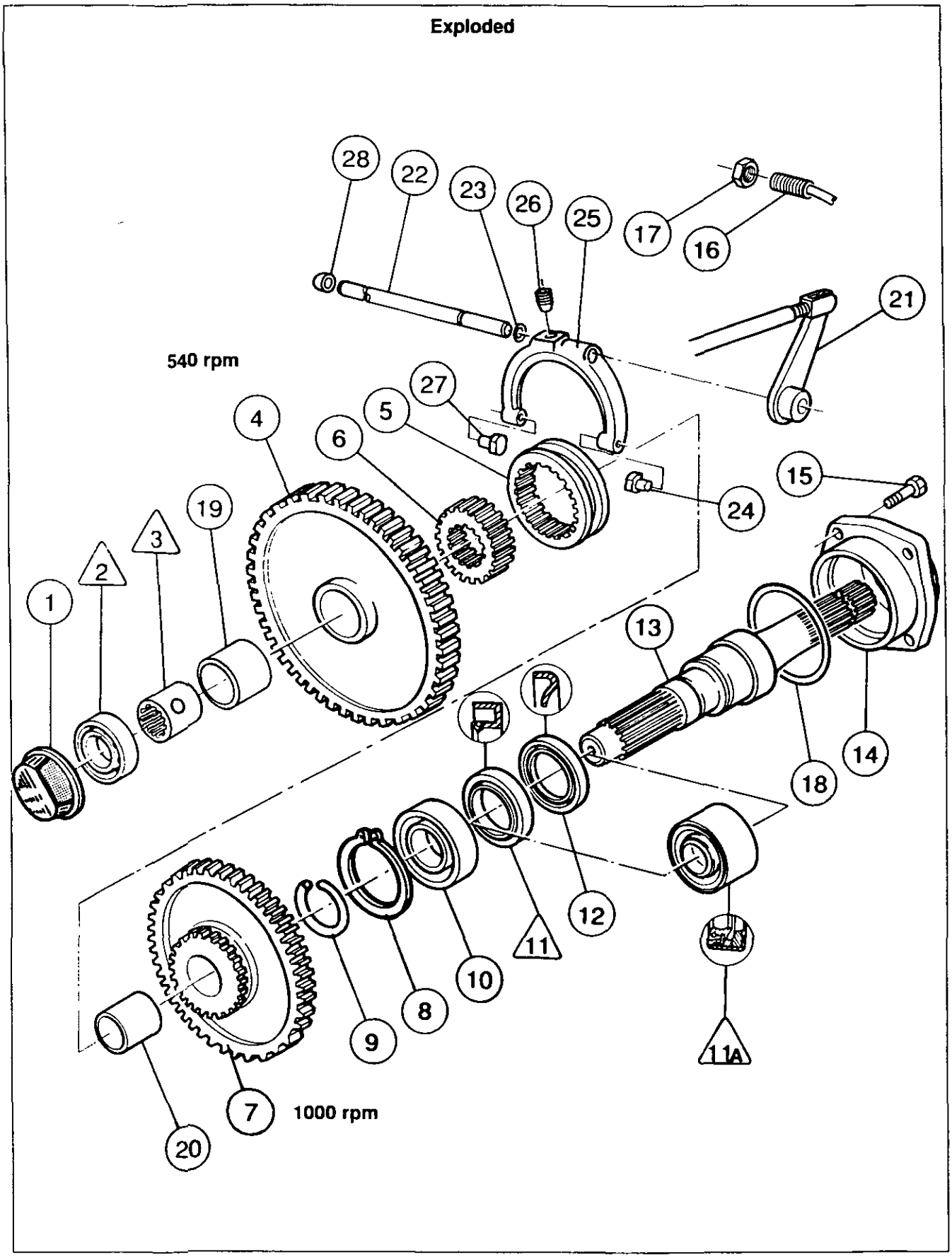
Rear Axle - Shiftable PTO shaft



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Rear Axle - Shiftable PTO shaft



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Rear Axle - Shiftable PTO shaft

A. Removal and refitting of rear cover

Disassembly

1. Partially drain the rear axle housing.
2. Place the coupler **(5)** on the gear **(7)**.
3. Remove two diametrically opposed screws **(15)** (Fig. 1).
4. Screw two guide studs against the gear **(7)**. The purpose of this is to hold the gear **(4)** and **(7)** (Fig. 2), the hub and the coupler in line when removing the shaft **(13)** and the cover assembly.
5. Remove the other two bolts **(15)**.
6. Withdraw the shaft and cover assembly (Fig. 3). Discard the O-ring **(18)**.

Refitting

7. Replace the O-ring **(18)**. Fit the shaft and cover assembly (Fig. 3).
8. Smear Loctite 542 on two screws **(15)** then tighten to a torque of 105 - 120 Nm.
9. Remove the two guide studs.
10. Smear Loctite 542 on the other two screws **(15)** then tighten to a torque of 105 - 120 Nm.
11. Top up the oil level of the rear axle housing.

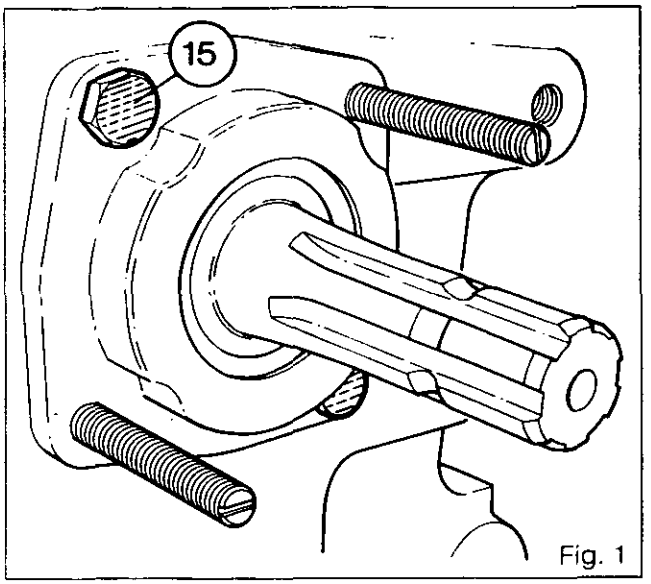


Fig. 1

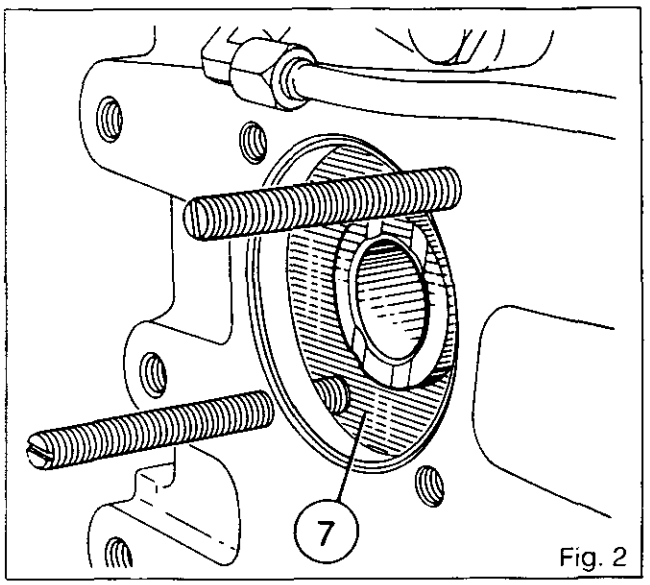


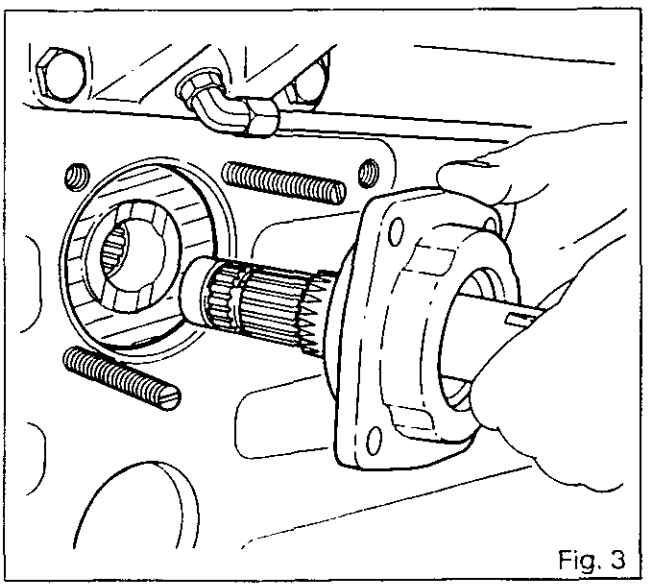
Fig. 2

B. Disassembly and reassembly of rear cover

Remove the rear cover by carrying out operations 1 to 6.

Disassembly

12. Remove O-ring **(18)**.
13. Remove circlip **(8)**.
14. Separate the cover **(14)** from the roller bearing **(10)**.
15. Remove the retainer ring **(9)**.
16. Extract the roller bearing **(10)** from the shaft **(13)**.
17. Remove :
    - Version a : the seal /**11**\ and the deflector **(12)**.
    - Version b : the reinforced seal /**11A**\.


Fig. 3

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Reassembly

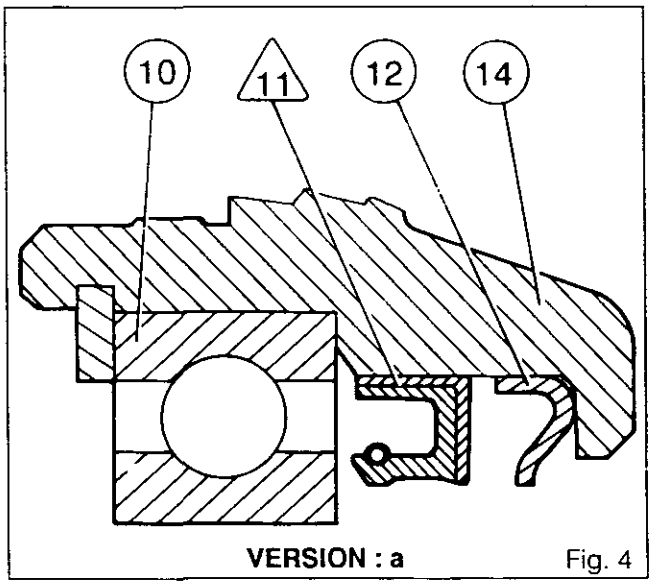
Version a (Fig. 4)

18. Using a press and a suitable device, fit the deflector **(12)** against the shoulder of the cover **(14)**.
Note: Assemble in the correct direction.
19. Using a press and a suitable device, fit the seal /**11**\ flush with the chamfer of the cover **(14)** with the lip facing towards the roller bearing **(10)**.

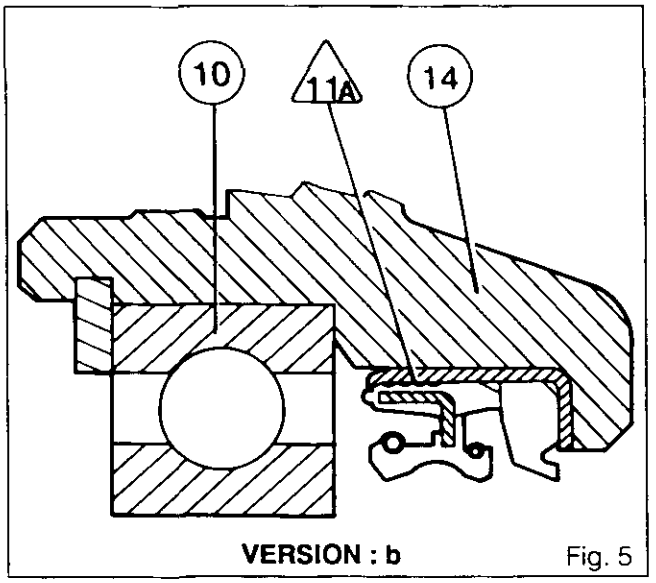
Version b (Fig. 5)

Depending on the option, a reinforced seal /**11A**\ is fitted in place of the seal /**11**\ and deflector **(12)**.
Smear Loctite 542 on the exterior of the seal and using a suitable device, fit it against the shoulder of the cover **(14)** (Fig. 12). The double lip should face towards the roller cover **(10)**.

20. Reverse operations 12 to 16 and refit the rear cover by carrying out operations 7 to 10.



VERSION : a Fig. 4



VERSION : b Fig. 5

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C. Disassembly and reassembly of 540 and 1000 rpm gears and of the front roller bearing of the shaft

Disassembly

To disassemble gears **(4)** and **(7)** it is necessary to remove:

- the lift cover by carrying out operations 1 to 11, chapter 6 B01.
- the top link support and the driving gear by carrying out operations 63 to 76, chapter 6 D01.

21. In order to gain access to the sensor, remove the left-hand lift cylinder by removing the lower fastening and disconnecting the supply hose. Remove the sensor (Autotronic - Datatronic).
22. Unscrew the set screw **(26)**.
23. Remove the selector rail **(22)** with the lever **(21)** towards the left-hand side of the tractor. Discard the O-ring **(23)**.
    Note: The plug (28) remains in the housing.
24. Withdraw the fork **(25)** with the pads **(24)** and **(27)**, taking care not to drop them into the housing.
25. Remove the rear cover assembly by carrying out operations 1 to 6.
26. Remove the hub (6) with the coupler **(5)**, the gears **(4)** and **(7)** and the bush /3\.
27. Extract the roller bearing /2\ and the deflector **(1)**.

Reassembly

28. Clean and check the parts. Replace those which are defective.
29. Smear Loctite 648 on the face of the deflector **(1)** which meets the housing and place it in its hole. Position the aperture upwards (Fig. 6).
30. Fit the roller bearing /2\ in the housing against deflector **(1)** (Fig. 6).
    Note: Place the sealed part of the roller bearing towards the gear (4).
31. Using a jet of compressed air, ensure that the channel of the shaft **(13)** is not obstructed. Lubricate bushes **(19)** and **(20)**. Refit the gears **(4)** and **(7)**, the coupler **(5)** with the hub **(6)**, the bush /3\ with the toothed opening facing towards the rear of the tractor (Fig. 7).
    Note: If the bushes (19) and (20) are damaged, replace the gears (4) and (7).
32. Engage the coupler **(5)** with the gear **(7)**. Screw two guide studs against the gear **(7)**. The purpose of this is to hold the gears in line (Fig. 2), when refitting the rear bearing assembly.

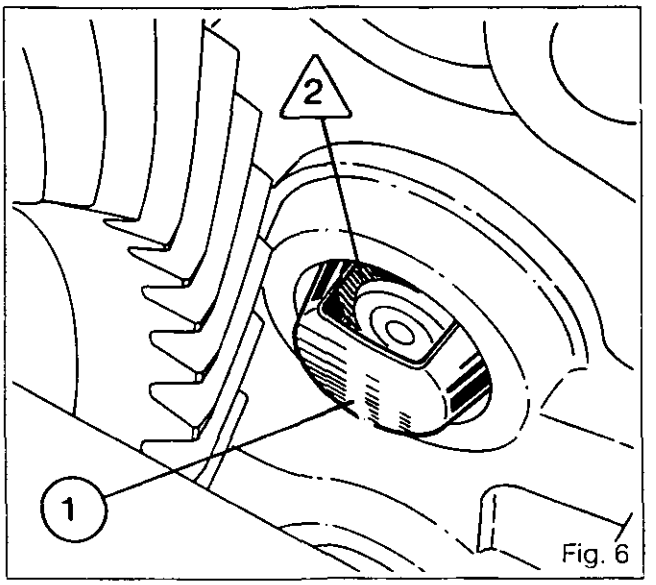


Fig. 6

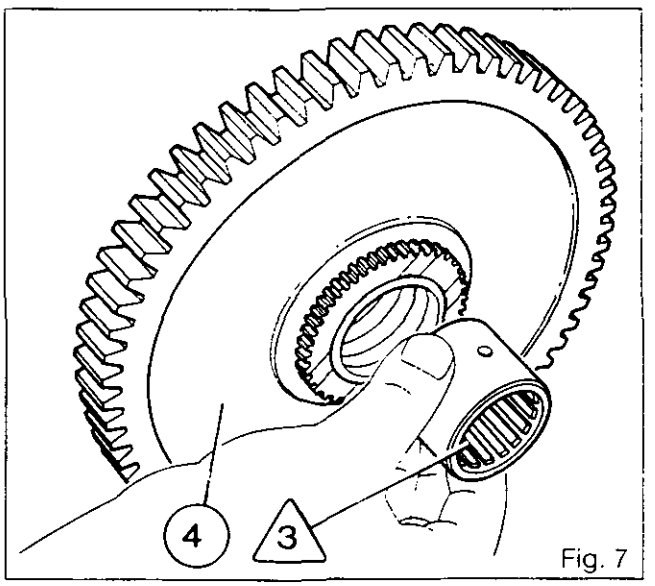


Fig. 7

33. Refit the rear cover assembly by carrying out operations 7 to 10.
34. Smear Loctite 577 (sensor sealing or equivalent) on the thread of the PTO sensor **(16)**. Fit and adjust the sensor:
    a) Without forcing screw the sensor in contact with the gear **(7)**.
    b) Unscrew the sensor 3/4 of a turn.
    c) Tighten the nut **(17)** moderately and connect the harness.
35. Refit the fork **(25)** with the pads **(24)** and **(27)**, held on the fork by two spots of miscible grease (Amber Technical or equivalent).
36. Fit a new O-ring **(23)**. Fit the selector rail **(22)** with lever **(21)**.

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Rear Axle - Shiftable PTO shaft

37. Smear Loctite 221 on the screw **(26)**. Fit and tighten. Manually check the operation of the fork. Refit the left-hand lift cylinder. Reassemble the lower fastening and reconnect the supply hose.
38. Refit the driving gear and the top link support. Carry out operations 82 to 92, chapter 6 D01.
39. Refit the lift cover. Carry out operations 53 to 57, chapter 6 B01.
40. Reverse operation 7, chapter 6 B01.
41. Carry out operations 64 to 69, 71, 72 and 84, chapter 6 B01.
42. Adjust the p.t.o. control (4 speeds), carry out operations 127 and 132 to 137, chapter 6D01.
43. Adjust the shiftable p.t.o. control, carry out operations 47 and 52 to 58, section D.
44. Top up the oil level of the rear axle housing.
45. Check the operation of the PTO and its brake.
46. Check for leaks:
    - of the joint faces (spool valve support, 3rd point support, PTO rear cover assembly, lift cover)
    - of the hydraulic fittings.

Note: On tractors equipped with a shiftable PTO, there are two types of control:
a) internal control via cable (Figs. 8 and 9).
b) external control (depending on option) (Figs. 10 and 11).

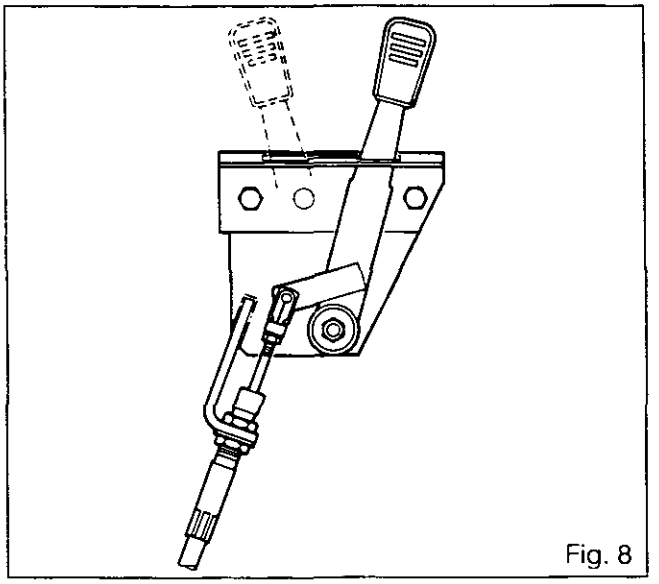


Fig. 8

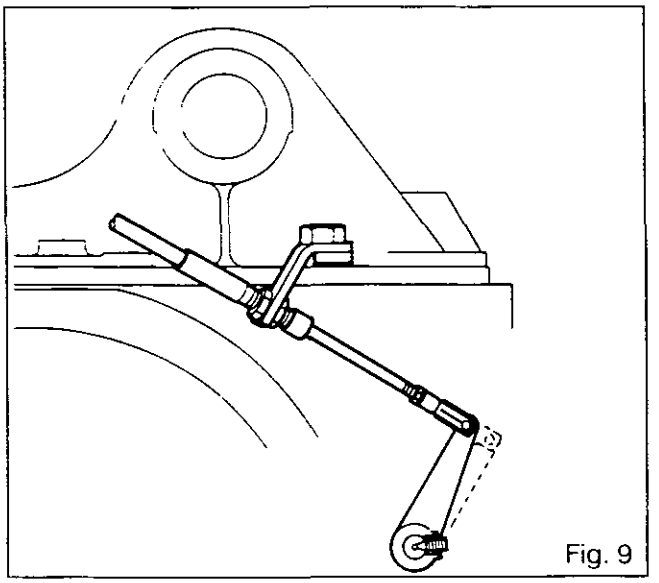


Fig. 9

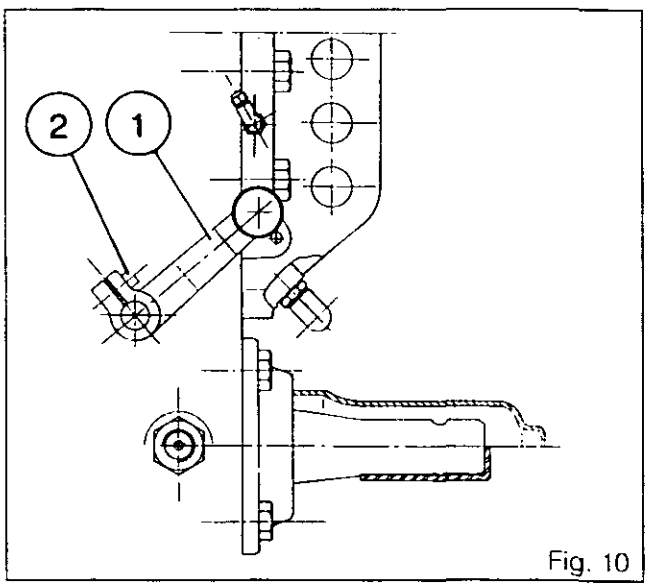


Fig. 10

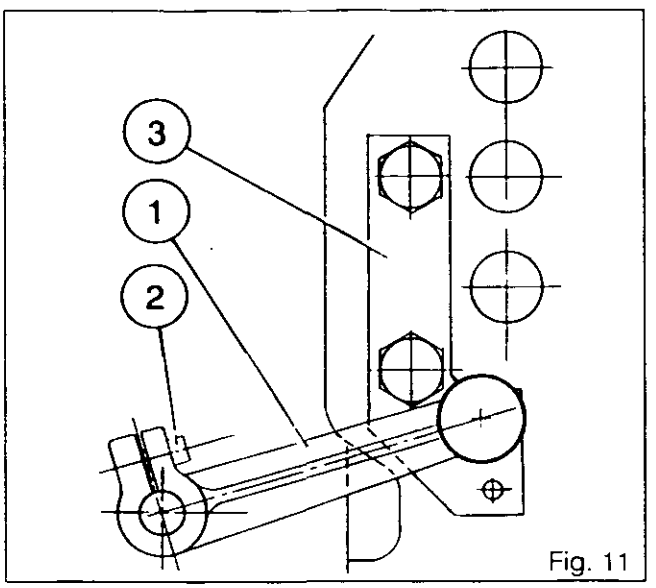


Fig. 11

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D. Adjustment of control cable

Note: Operations 48 to 51 must be carried out when replacing the control cable.

47. Set the U-lever to the «1000 rpm» position.
48. Screw the clevis **(1)** until it reaches the end of the threaded part of the cable **(6)** (Fig. 12).
49. Fit the clevis **(1)** on the U-rod with the clip **(7)**. Tighten the nut **(2)**.
50. Adjust the outer cable stop **(5)**, with the nut **(3)** reaching the end of the threaded part.
51. Tighten the nut **(4)**.
    Note: Check that the cable is not constrained.
52. Set the lever V to the «1000 rpm» position (Fig. 13).
53. Screw the clevis **(6)** until it reaches the threaded part of the cable **(4)**.
54. Temporarily fit the clevis **(6)** on the lever V with the clip **(7)**.
55. Adjust the outer cable stop **(1)**, ensuring that the lever V is still in the «1000 rpm» position.
56. Tighten the nuts **(2)** and **(3)**.
57. Set the adjustment with the clevis **(6)**, tighten the nut **(5)**.
    Note: After tightening, check that the cable is not subject to any constraint in the 1000 rpm and 540 rpm positions.
58. Check the operation of the control in the «540 rpm» position.

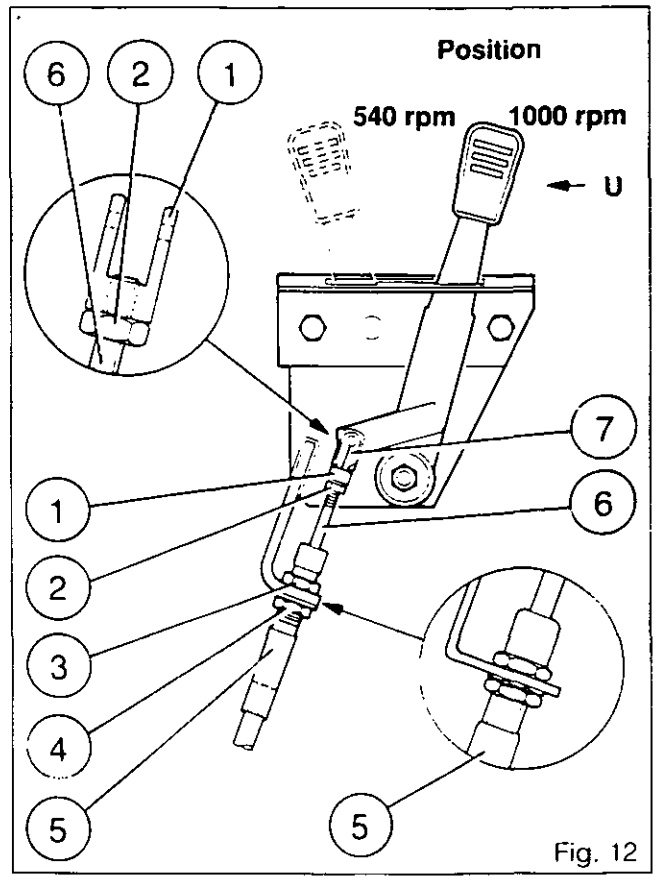


Fig. 12

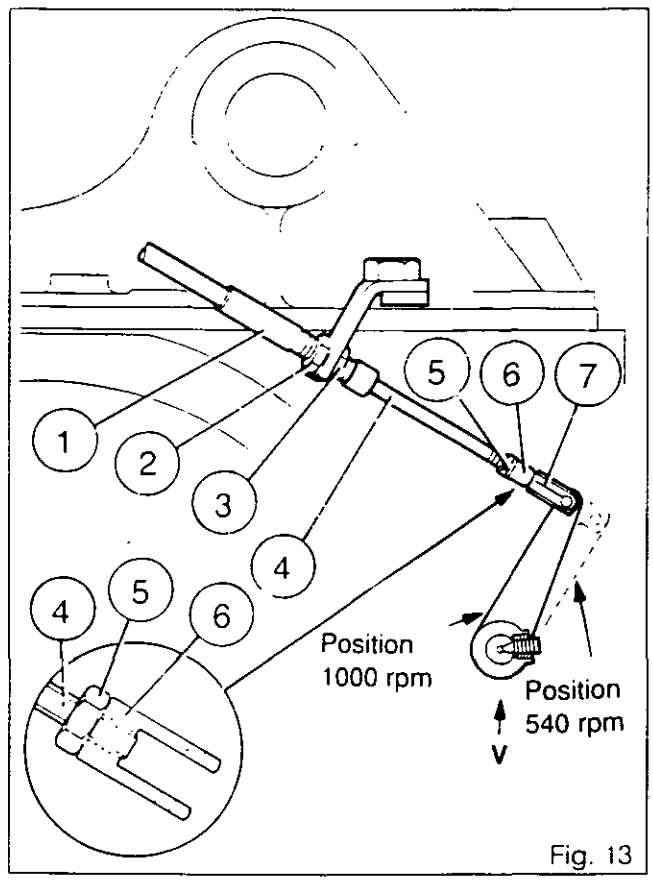


Fig. 13

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6 F01 Ground speed Power take-off

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D. Reassembly of power take-off (4WD version) ____ 12

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6F01.2

Rear Axle - GSPTO

General

3000/3100 series tractors can be equipped with a ground speed power take-off .

Unlike the independent p.t.o. system or the p.t.o. system which depends on the engine speed, the ground speed p.t.o. is driven by the driving pinion, and the speed of the p.t.o. shaft is proportional to the speed of the tractor.

Operation

The bevel drive pinion comprises a gear **(31)** which constantly engages either with the pinion **(16)** (2WD - page 4) or with the transfer gear **(33)** (4WD - page 3). The shaft **(18)** (2WD) or the shaft **(32)** (4WD) can be made to rotate with the shaft **(8)** by means of the coupler **(10).** The pinion **(3)** mounted at the end of the shaft **(8)** drives the 540 rpm gear of the rear power take-off shaft.

The coupler **(10)** is moved by a finger fixed on a pin mounted at the bottom left of the rear axle housing and controlled by a connecting rod and a cable activated by a lever in the cab.

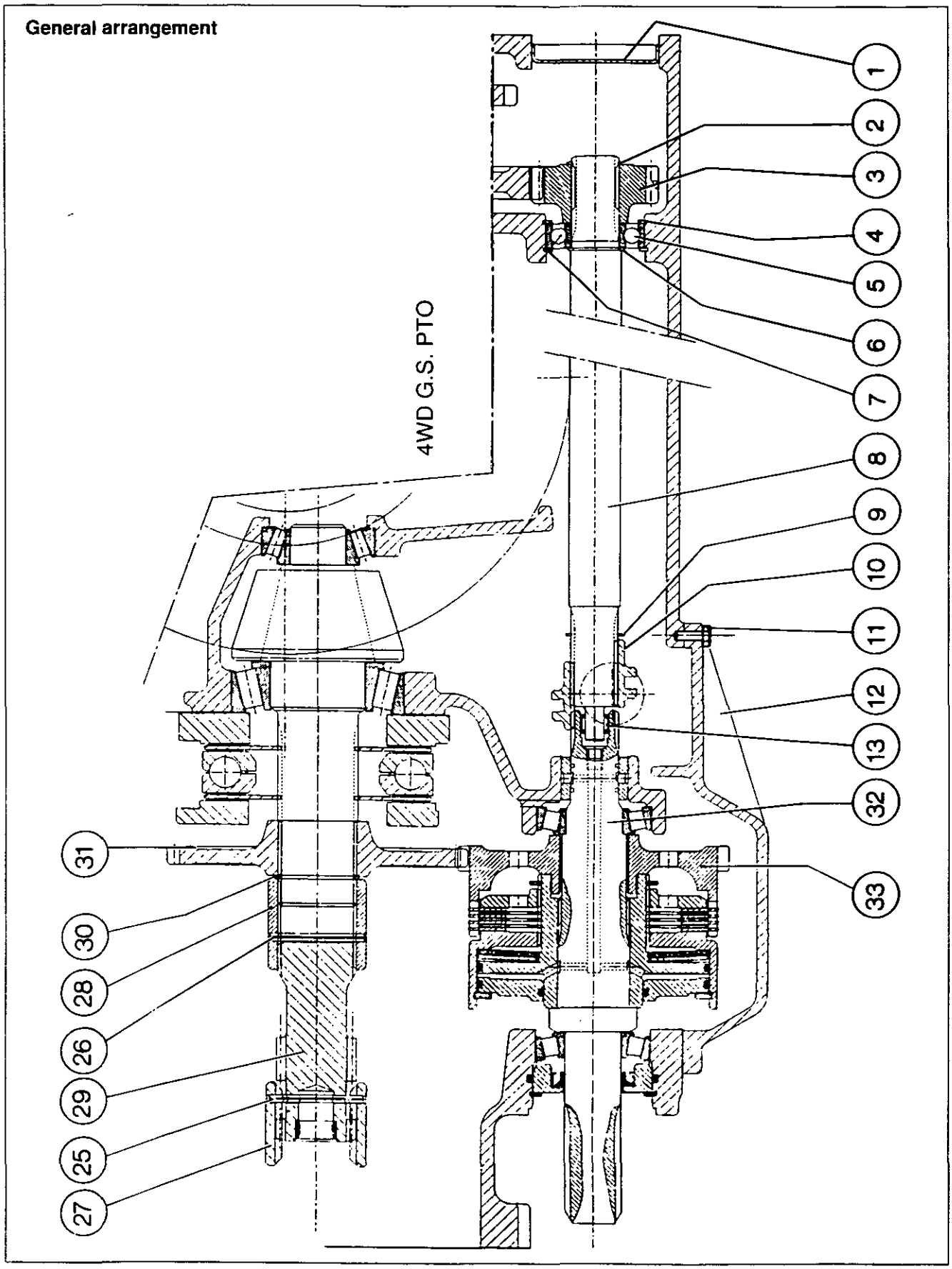
Parts list

		2WD	4WD
(1)	Plug	•	•
(2)	Circlip	•	•
(3)	Pinion	•	•
(4)	Circlip	•	•
(5)	Ball bearing	•	•
(6)	Circlip	•	•
(7)	Circlip	•	•
(8)	Shaft	•	•
(9)	Circlip	•	•
(10)	Coupler	•	•
(11)	Screw	•	•
(12)	Cover	•	•
(13)	Needle roller bearing	•	•
(14)	Bearing cup	•	
(15)	Bearingcone	•	
(16)	Gear	•	
(17)	Circlip	•	
(18)	2WD shaft	•	
(19)	Bearing cone	•	
(20)	Bearing cup	•	
[21]	Shim(s)	•	
(22)	Spacer	•	
(23)	Circlip	•	
(24)	Plug	•	
(25)	Double pin	•	•
(26)	Double pin	•	•
(27)	Sleeve	•	•
(28)	Sleeve	•	•
(29)	Shaft	•	•
(30)	Circlip	•	•
(31)	Gear	•	•
(32)	4WD shaft		•
(33)	Transfer gear		•

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Rear Axle - GSPTO

General arrangement



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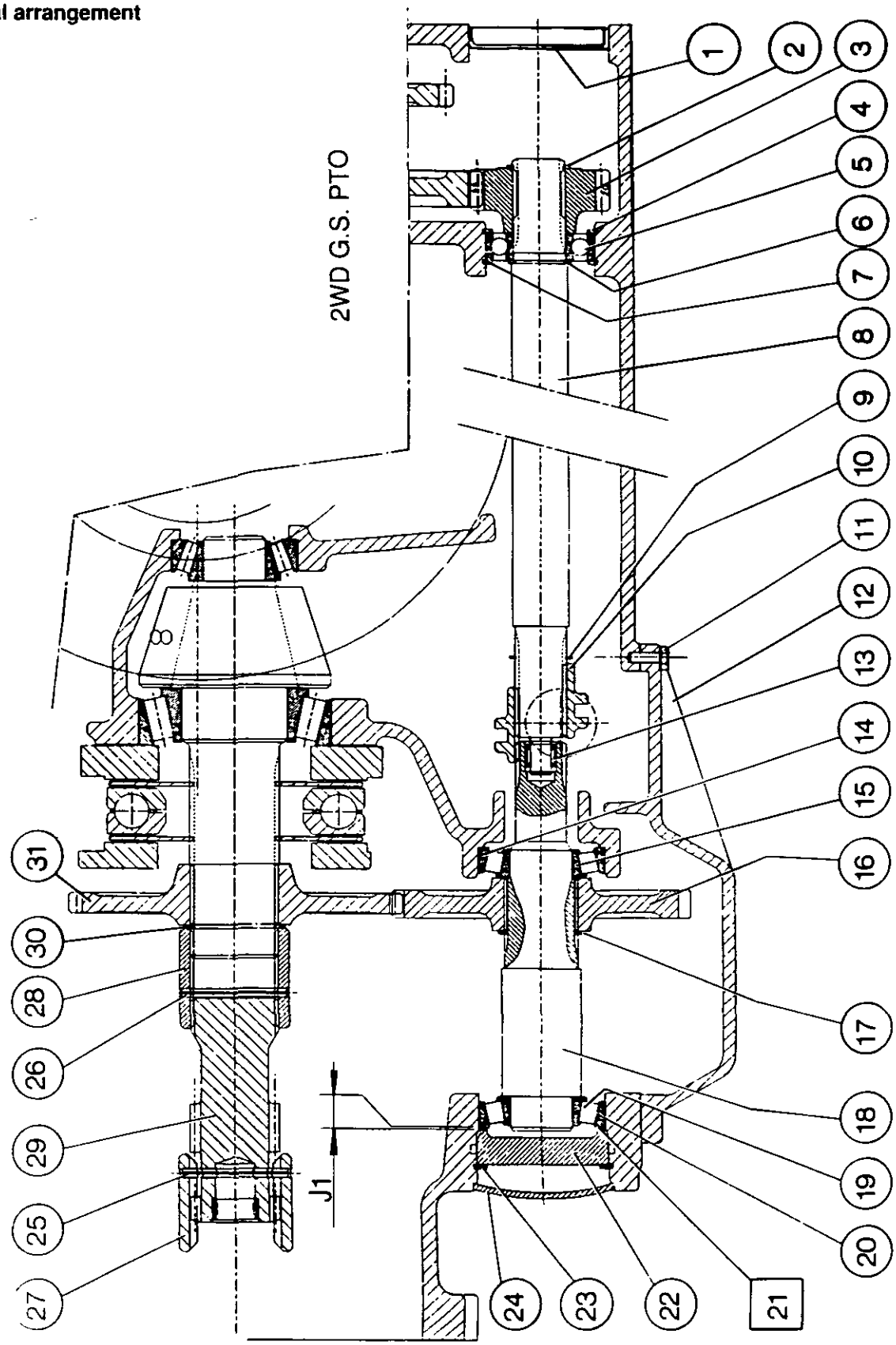
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Rear Axle - GSPTO

General arrangement

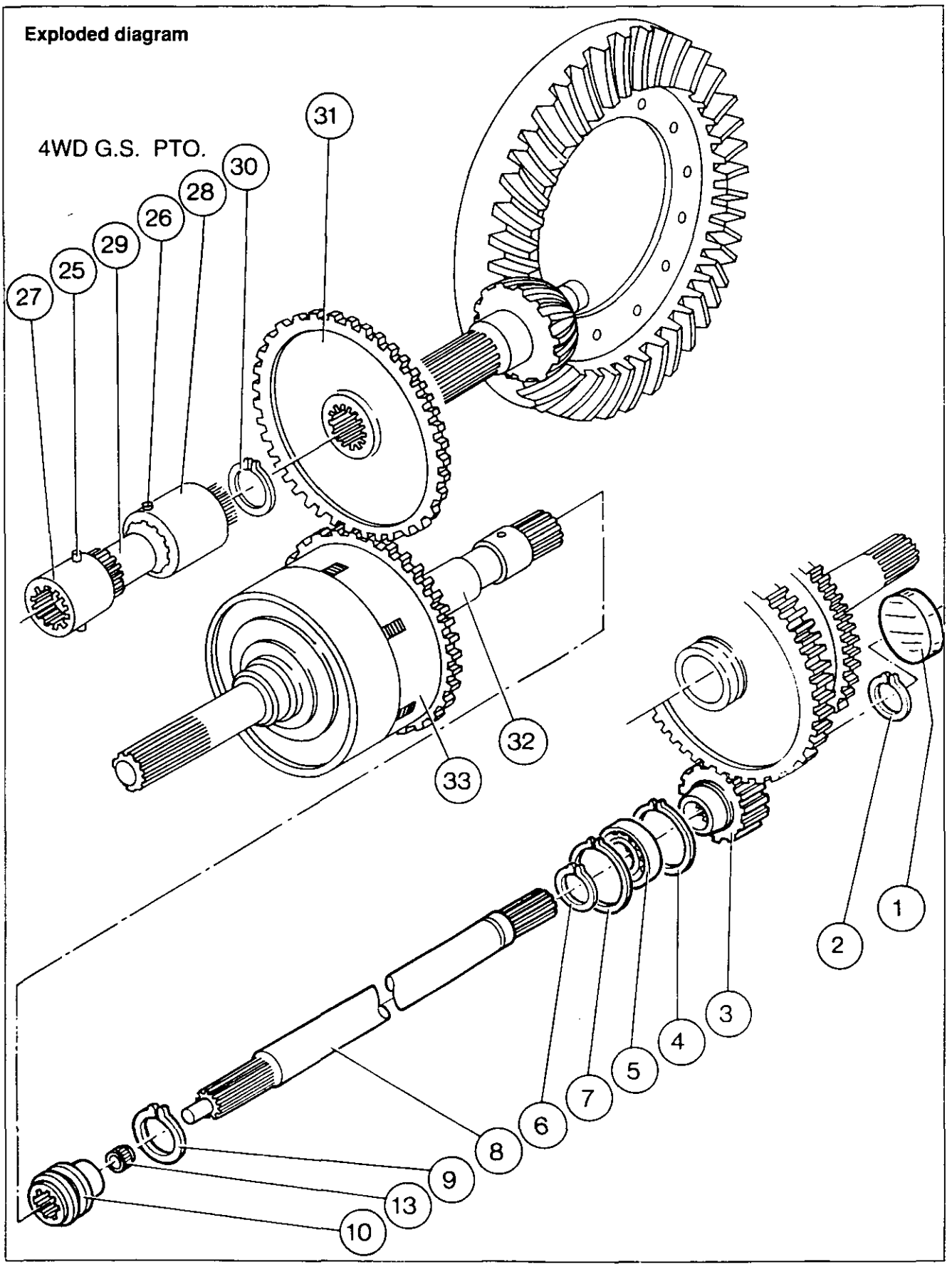


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Rear Axle - GSPTO

Exploded diagram

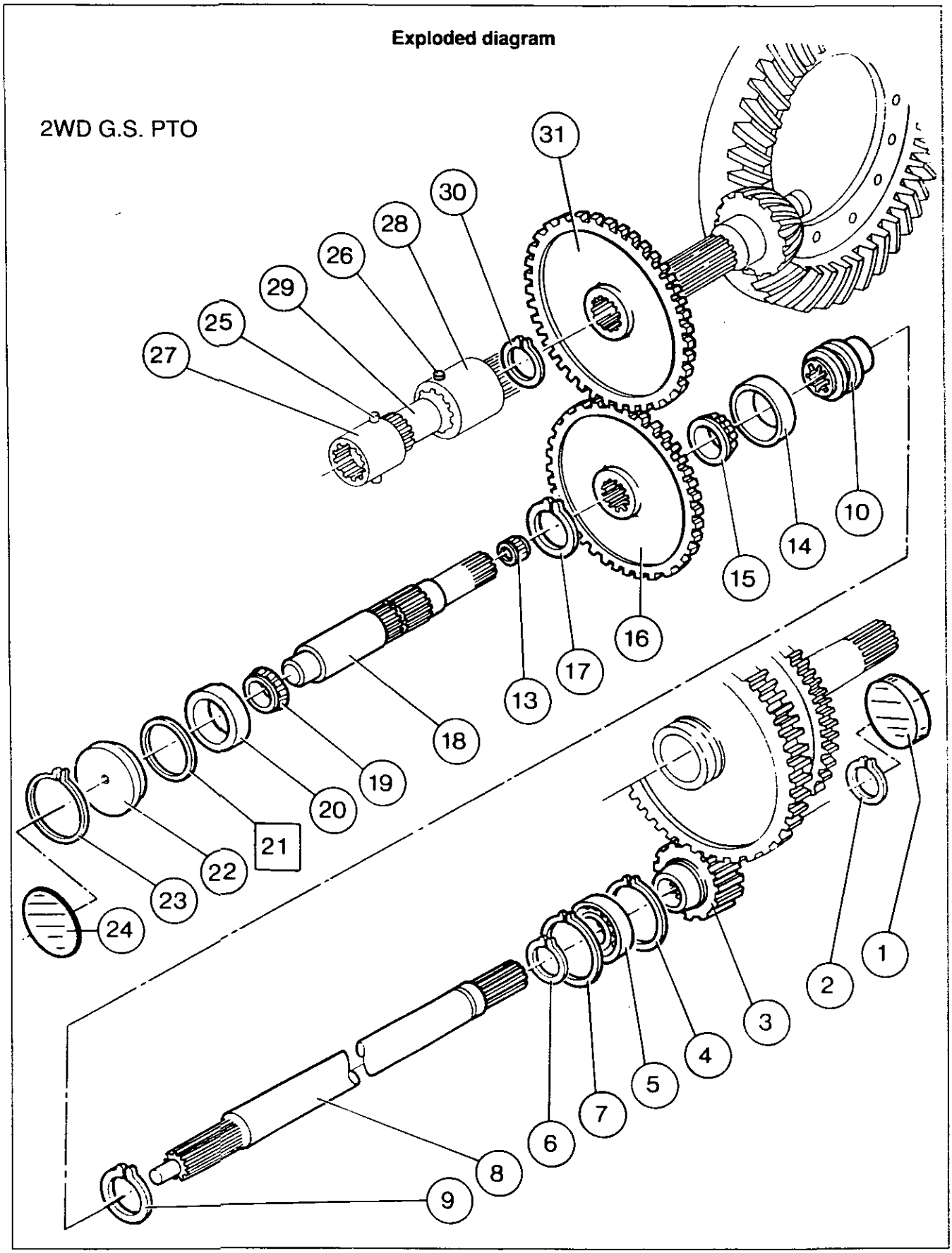


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Rear Axle - GSPTO

Exploded diagram



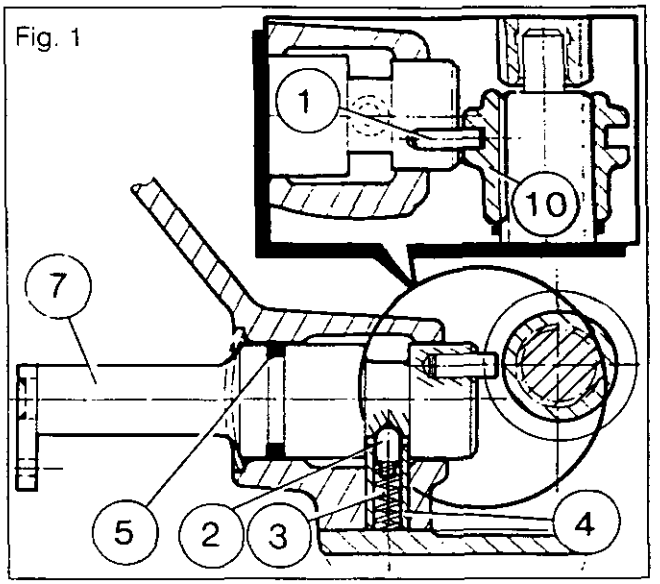
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A. Disassembly of power take-off (2WD version)

1. Immobilise the tractor. Drain the transmission oil.
2. Remove the screws **(11)**.
3. Remove the cover **(12)**.
   Note: Save the spring (3) (Fig. 1).
4. Remove the retaining tube **(4)** for the control pivot **(7)** and the locking plunger **(2)** (Fig. 1).
5. Disconnect the control cable **(1)** and remove the control pivot **(7)** (Fig. 2).
   Note: The finger (1) is force-fitted in the control pivot (Fig. 1).
6. Remove the O-ring **(5)** (Fig. 1).
7. Remove the drawbar.
8. Extract the plug **(1)** (Fig. 3).
9. Remove the circlip **(2)**.
10. Withdraw the pinion **(3)** (Fig. 4).

Fig. 1



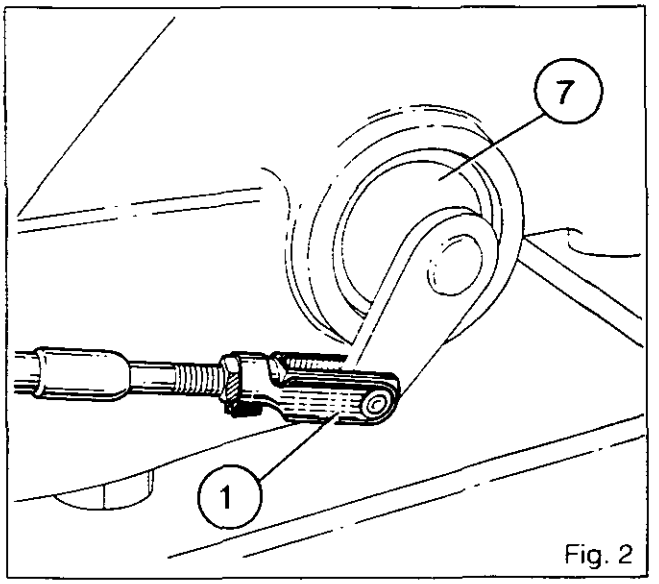


Fig. 2

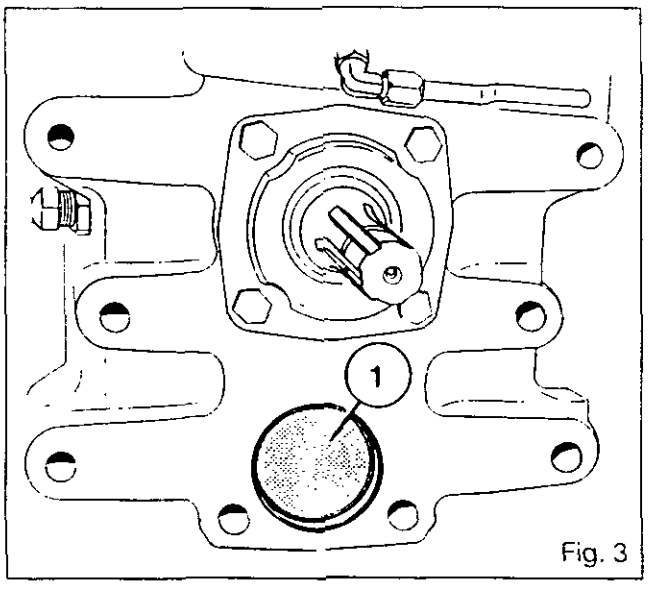


Fig. 3

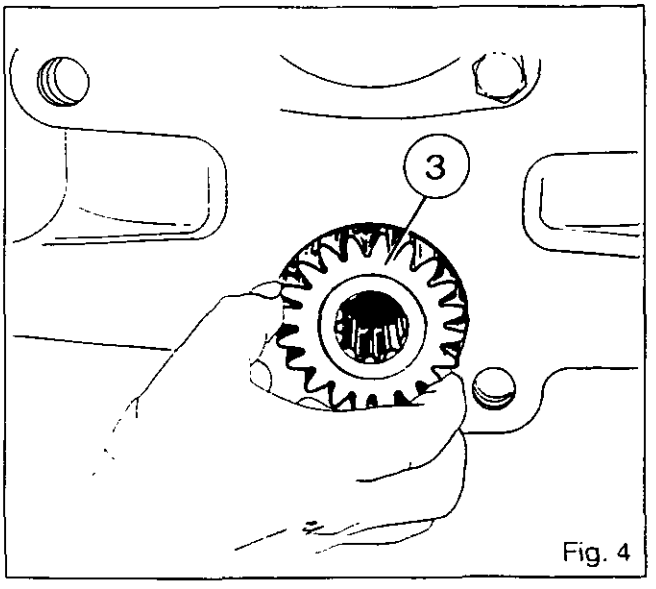


Fig. 4

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11. Remove the circlip **(4)** with long-nose pliers (Fig. 5).
12. Withdraw the shaft **(8)** with the ball bearing **(5)**, then remove the coupler **(10)**.
    Note: If it is unnecessary to remove the circlip (7), leave it in the housing.
13. Remove the circlips **(6)** and **(9)**.
14. Extract the ball bearing **(5)** with a press.
15. Extract the plug **(24)**.
16. Remove the circlip **(23)** and the spacer **(22)**.
17. Remove the shims **[21]**.
18. Remove the cup**(20)**.
19. Withdraw the shaft **(18)** assembled with the bearing cone **(19)** and the circlip **(17)**, while holding the gear **(16)**.
20. Remove the gear **(16)** and the bearing cone **(15)**.
21. Extract the cone**(19)** and remove the circlip **(17)** from the shaft **(18)**.
    Note: Keep the cones and the cups paired if they are to be reused.
    The roller bearing (13) is pressed in to the shaft (18).
22. Extract the cup **(14)** with a suitable extractor.

If removing the gear (31) it is necessary to remove the right-hand hydraulic cover.

23. Immobilise the tractor.
24. Apply the handbrake.
25. Lift the tractor with a jack.
26. Put a prop in position.
27. Remove the wheel.
28. Remove the right hydraulic cover.
    Carry out operations 2 to 14, chapter 8I01.

Tractors without creeper gears

29. Drive the double pins **(25)** and **(26)** from the sleeves **(27)** and **(28)**.
30. Slide the sleeves towards one another on the shaft **(29)**.
31. Detach the shaft and sleeve assembly.
32. Remove the circlip **(30)**.
33. Detach the gear **(31)**.
    Note: On 2WD tractors (without G.S. PTO) the gear (31) is omitted but the circlip (30) must remain in place.

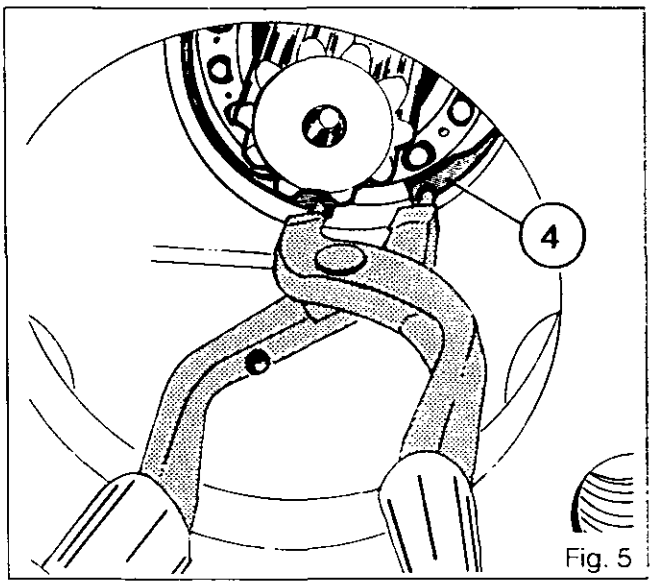


Fig. 5

Tractors with creeper gears

34. Remove the fork, the sleeve assembly, the connecting shaft and the coupler. Carry out operations 3 to 8 in chapter 5D01.A.
35. Carry out operations 13 to 16 in chapter 5D01.A.
36. Remove the circlip **(30)**.
37. Remove the gear **(31)**.

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B. Reassembly of power take-off (2WD version)

38. Clean and check the parts, replacing any which are defective.

If carrying out work on the gears (31).

Tractors with creeper gears

39. Refit the gear **(31)**.
40. Refit the circlip **(30)**.
41. Reattach the fork, the sleeve assembly, the connecting shaft and the coupler. Carry out operations 22 to 31 in chapter 5D01.A.

Tractors without creeper gears

42. Refit the gear **(31)**.
43. Refit the circlip **(30)**.
44. Refit the assembly (connecting shaft and sleeves), then position the sleeves **(27)** and **(28)** on the shaft **(29)**.
45. Mount the double pins **(26)** and **(25)** on the sleeves.
Note: Position the grooved end of the sleeve (28) towards the rear of the tractor (Fig. 6). Replace the pins. The long pin is fitted into the sleeve (27).

Tractors with or without creeper gears

46. If necessary, refit the right hydraulic cover. Carry out operations 15 to 27, chapter 8I01.
47. Push the cup **(14)** as far as it will go against the shoulder of the housing.
48. Push the bearing cone **(19)** on the shaft **(18)** as far as it will go against the shoulder using a press and a suitable device, then position the circlip **(17)**.
49. Check that the needle roller bearing **(13)** is present.

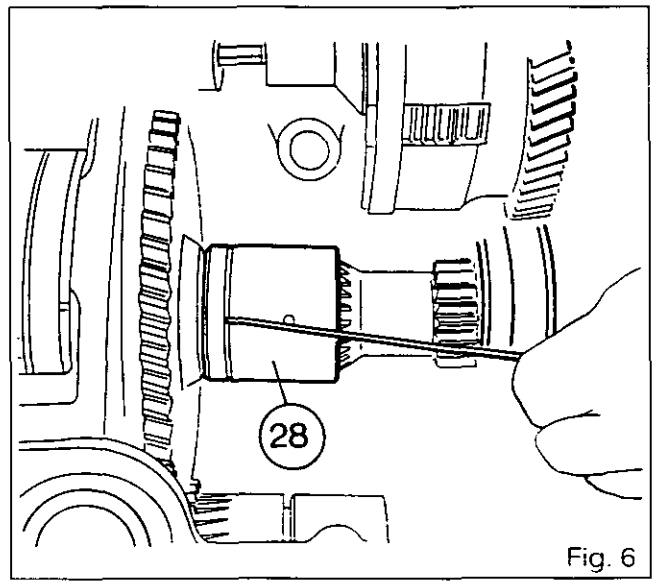


Fig. 6

50. In order to be able to turn the shaft to carry out spacing J1, do not mount the gear **(16)**. Position the cone **(15)**. Fit the shaft **(18)** assembled with the cone **(19)** and the circlip **(17)**.
51. Refit the cup **(20)**, the spacer **(22)** and the circlip **(23)**.
Note: To obtain correct shimming, ensure that the spacer moves freely in the bore of the housing.
52. Carry out shimming on the shaft **(18)** so as to obtain:
J1 = 0 to +0.10
53. Place the tip of the dial gauge against the spacer **(22)** (Fig. 7).

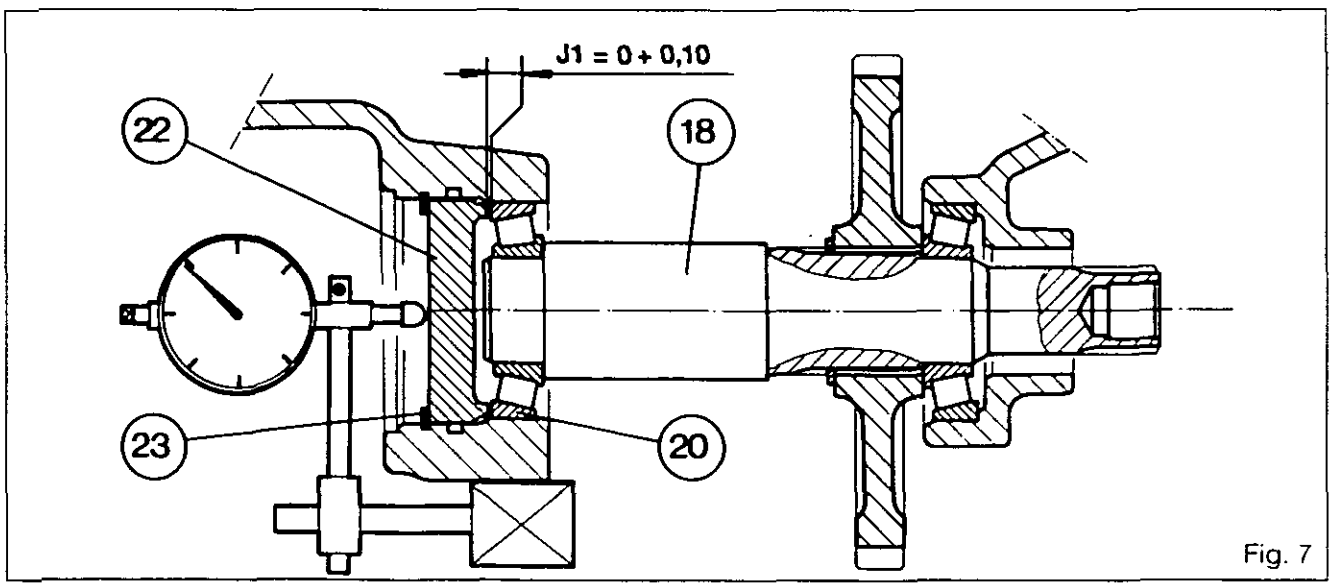


Fig. 7

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54. Through the opening in the cover **(12)**, pull on the shaft, turning it back and forth, in order to seat the bearing cones correctly in the cups.
55. Set the dial gauge to zero.
56. Repeat the operation while pushing the shaft.
57. Select the necessary thickness of shims to provide J1.
58. Remove the circlip **(23)** and the spacer **(22)**. Withdraw the shaft **(18)** assembled with the bearing cone **(19)** and the circlip **(17)** while holding the bearing cone **(15)**. Refit the gear **(16)** the shaft **(18)** and the cup **(20)**.
59. Apply two spots of grease to the shims **[21]** selected in operation 57 and place them against the cup **(20)**.
60. Fit the spacer **(22)** and the circlip **(23)**.
61. Clean the plug **(24)** and its recess in the housing.
62. Smear the edge of the plug with Loctite 542, then push it in.
63. Place the coupler **(10)** on the shaft **(18)**.
    Note: Position the small shoulder E towards the shaft (18) (Fig. 8).
64. Fit the circlips **(6)** and **(9)** on the shaft **(8)**.
65. Using suitable equipment, press the ball bearing **(5)** on to the shaft **(8)**, until it contacts the circlip **(6)**.
66. Check that the circlip **(7)** is present.
67. Mount the assembled shaft **(8)** in the housing (Fig. 9).
68. Mount the circlip **(4)**.
69. Fit the pinion **(3)**.
70. Mount the circlip **(2)** (Fig. 10).
71. Check the movement of the coupler **(10)** through the opening in the cover **(12)**.
72. Clean the plug **(1)** and the bore in the housing.
73. Smear the plug with Loctite 542, then push it in so that it is slightly recessed from the face of the housing.
74. Mount the control pivot **(7)** (equipped with a new O-ring **(5)**, placing the finger **(1)** in the groove of the coupler **(10)** (Fig. 1).
75. Clean and degrease the joint faces (cover and housing).
76. Smear the joint face of the cover with a sealing compound (Master Joint 510 or equivalent).
77. Screw two guide studs in opposite positions into the housing.
78. Mount the retaining tube **(4)** for the control pivot, the locking plunger **(2)** and the spring **(3)** (Fig. 1).
79. Refit the cover **(12)**.

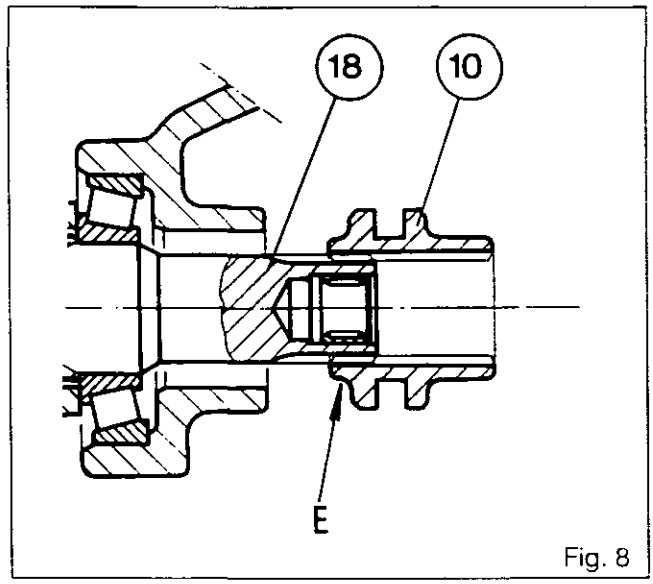


Fig. 8

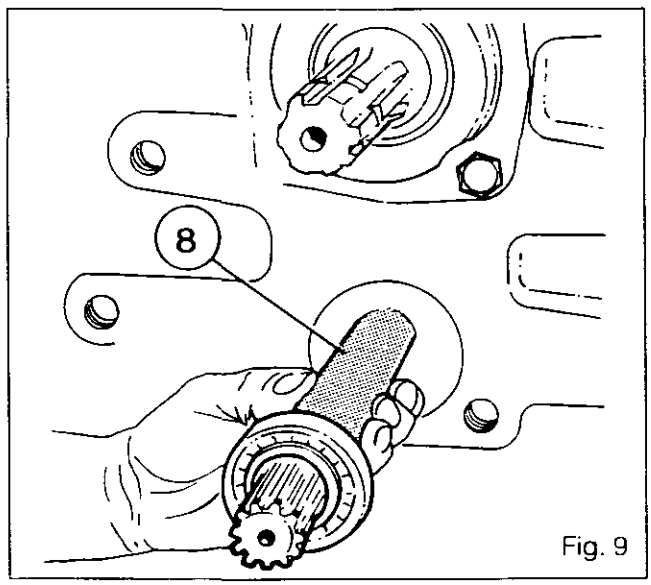


Fig. 9

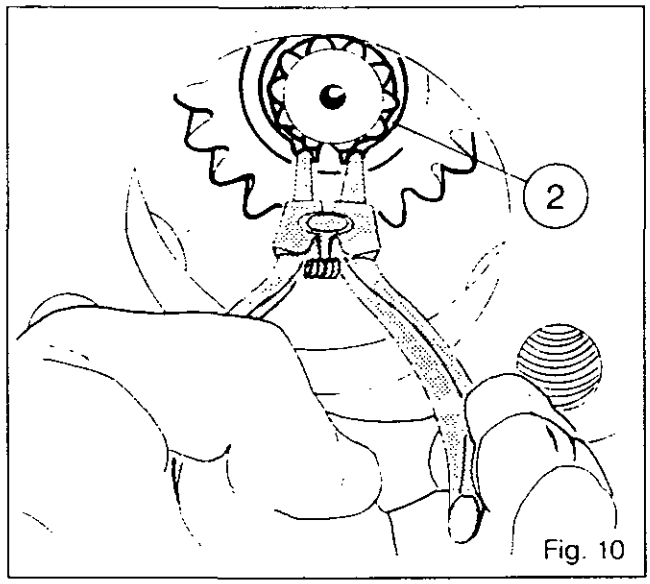


Fig. 10

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80. Remove the guide studs. Fit and tighten the screws to a torque of 130 - 170 Nm.
81. Reconnect the G.S. PTO control cable **(1)** (Fig. 2).
82. Adjust the control.
    Carry out operations 114 to 120.

If the right hand hydraulic cover has been removed, carry out operations 83 to 85.

83. Lift the tractor with a trolley jack.
84. Refit the wheel. Remove the prop and the jack.
85. Tighten the wheel nuts to a torque of 400 - 450 Nm.
86. Replenish transmission oil.
87. Refit the drawbar. (For tractors equipped with an automatic hook, check its operation. If adjustment should prove to be necessary, carry out operations 1 and 6 to 19, chapter 6M01.).
88. Check the operation of the GSPTO.
89. **Check for leaks:**
    - at the joint faces
    - at the cover under the rear axle housing.
    - at the right hydraulic cover (if removed)
    - at the hydraulic connectors

C. Disassembly of power take-off (4WD version)

90. Carry out operations 1 to 14.

Should it prove necessary to carry out work on the 4WD clutch assembly, on the bearing cones and cups, on the shaft and the needle roller bearing, refer to chapter 7A01.

If removing the gear (31) it is necessary to remove the right hand hydraulic cover.

91. Lift the tractor with a jack. Put a prop in position. Remove the wheel. Remove the right hydraulic cover.
92. Carry out operations 2 to 14, chapter 8I01.

Tractors without creeper gears

93. Drive the double pins **(25)** and **(26)** from the sleeves **(27)** and **(28)**.
    Note: If the double pins are not accessible, carry out operations 9 to 12, chapter 5D01.A.
94. Slide the sleeves towards one another on the shaft **(29)**.
95. Remove the assembly (shaft and sleeves).
96. Remove the circlip **(30)** and the gear **(31)**.

Tractors with creeper gears

97. Remove the fork, the sleeve assembly, the connecting shaft and the coupler. Carry out operations 3 to 8 and 13 to 16, chapter 5D01.A.
98. Remove the circlip **(30)** and the gear **(31)**.

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D. Reassembly of power take-off (4WD version)

99. Clean and check the parts, replacing any which are defective.

If carrying out work on the gear (31).
Tractors with creeper gears

100. Refit the gear **(31)** and refit the circlip **(30)**.

101. Refit the fork, the sleeve assembly, the connecting shaft and the coupler. Carry out operations 22 to 31 in chapter 5D01.A.

Tractors without creeper gears

102. Refit the gear **(31)** and refit the circlip **(30)**.

103. Refit the assembly (connecting shaft and sleeves), then position the sleeves **(27)** and **(28)** on the shaft **(29)**.

104. Fit two new double pins **(25)** and **(26)** on the sleeves.
Note : Position the grooved end of the sleeve (28) towards the rear of the tractor (Fig. 11). The long double pin is fitted in to the sleeve (27).

Tractors with or without creeper gears

105. If necessary, refit the right hand hydraulic cover. Carry out operations 15 to 27, chapter 8I01.
If the 4WD clutch assembly, the bearing cones and cups, the shaft and the needle roller bearing have been disassembled, refer to chapter 7A01 for reassembly.
If necessary, carry out operations 9 to 12, chapter 5D01.A in reverse.

106. Place the coupler **(10)** on the shaft **(32)**.
Note : Position the small shoulder E towards the shaft (32) (Fig. 12).

107. Carry out operations 64 to 82.

If the right hand hydraulic cover has been removed, carry out operations 83 to 85.

108. Carry out operations 86 to 88.

109. **Check for leaks:**
. at the joint face of the cover under the rear axle housing
. at the right hydraulic cover (if removed)
. at the hydraulic connectors.

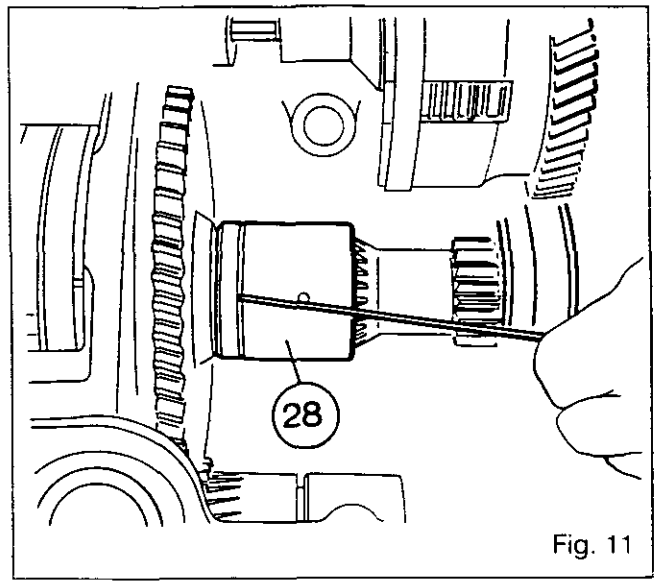


Fig. 11

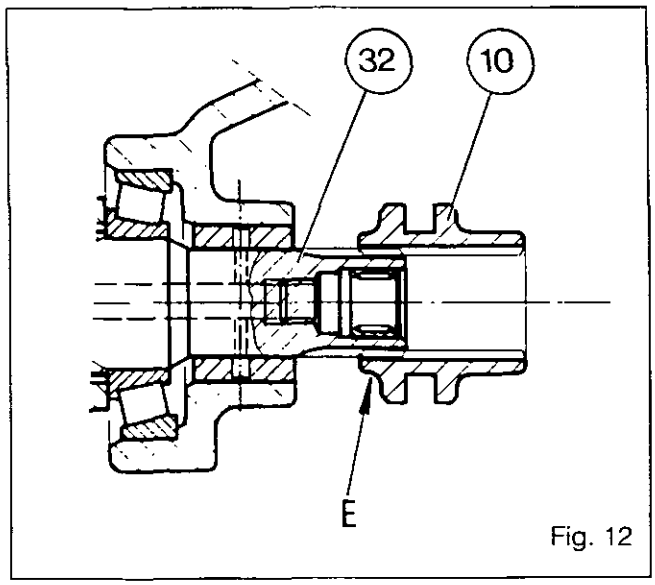


Fig. 12

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E. Adjustments of control

Note: Carry out operations 110 to 113 when replacing the control cable.

110. Screw the clevis **(1)** on to the end of the threaded part of the cable **(7)** (Fig. 13).
111. Mount the clevis **(1)** on the selector lever U with the clip **(8)**. Tighten the nut **(2)** (Fig. 13).
112. With the inner cable **(7)** extended the outer cable end **(5)** (Fig. 13) is to be positionned in support **(6)** so that selector lever U has a neutral dimension of 105 mm between the clevis hole **(1)** and the support **(6)**.
113. Tighten the nut **(4)**.
Note: Check that the cable is not restricted.
114. Place the selector lever U in the «engaged» position (Fig. 14).
115. Place the control pivot V in the «engaged» position (Fig. 15).
Note: Make sure that the control pivot V is fully engaged.
116. Screw the clevis **(6)** on to the threaded part of the cable **(4)** (Fig. 15).
117. Fit the clevis **(6)** on control pivot V with the clip **(5)**. Tighten the nut **(7)**.
118. Adjust the outer cable stop **(1)** with the nut **(3)**, ensuring that the control pivot V is still in the «engaged» position.
119. Tighten the nut **(2)**.
Note: After tightening, make sure that the cable operates freely to the «disengaged» and «engaged» positions (Fig. 15).
120. Check the operation of the control in the «disengaged» position.

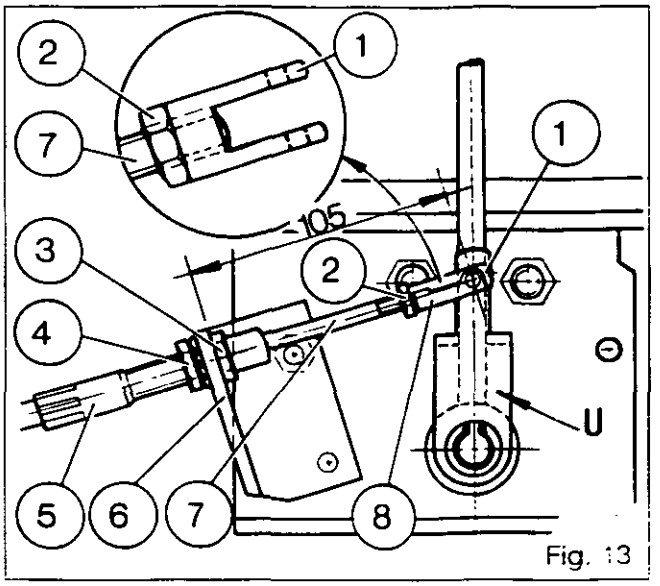


Fig. 13

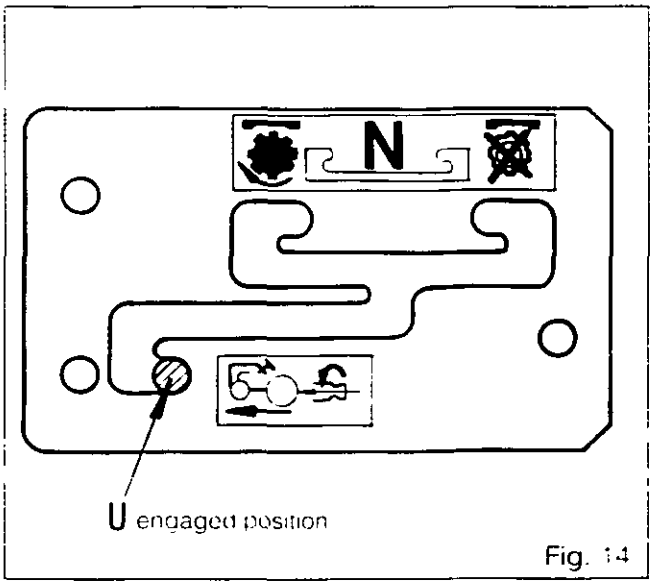


Fig. 14

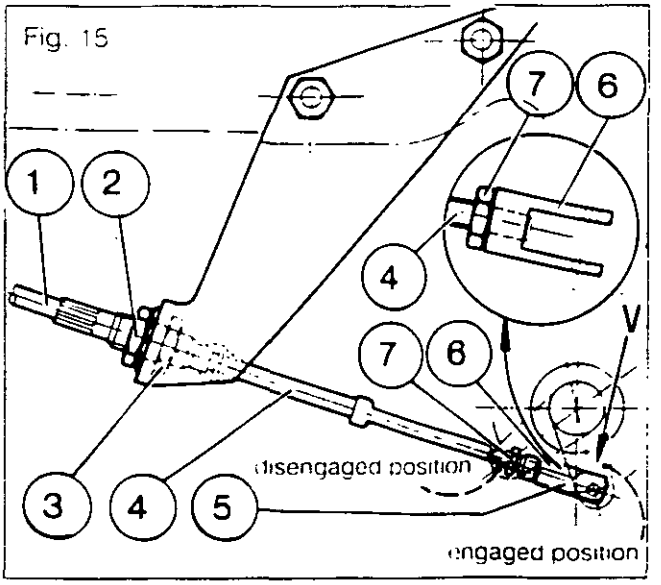


Fig. 15

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6 G01 Power take-off clutch

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Rear axle - PTO clutch

General

The power-take-off clutch, fitted at the front of the rear axle housing, is driven by a shaft traversing the primary shaft of the gearbox, the speedshift, the reverse shuttle and the layshaft. This shaft is connected via splines to a sleeve fixed on the engine flywheel.

The clutch assembly, Valeo version, is composed of the following principal components :
- A housing **(9)** supported by two ball bearings **(2)** and **(7)** separated by a sleeve **(4)** centred in a hole in the centre housing. The housing contains a shaft supported by the ball bearing **(23)** in the hub **(24)**.
- A piston **(11)** sliding inside the housing.
- A set of inner plates **(16)** and outer plates **(15)**.
- A driving hub **(24)**.
- A cover **(20)**.

The housing has exterior helical teeth which drive the gear of the hydraulic pump. The roller bearings and the plates are lubricated.

A new clutch made by MF operating in an identical manner is now fitted on 3000 and 3100 tractors.
The clutch has 3, 4 or 5 plates, depending on the version.

Version without PTO (Fig. 1)

On tractors without PTO, an assembly comprising a driving gear **(1)** and sleeve **(2)** (see diagram) replaces the PTO clutch. The sleeve is smeared with Loctite 648 and is inserted in the gear by a press.

On the right cover, the solenoid valves of the PTO and of the PTO brake are replaced with plugs.

The PTO brake feeder tube is absent.

The PTO speed sensor is replaced with a plug.

The top link support has 2 plugs mounted on the lubrication and brake ducts of the PTO

A cover plate (fitted using Loctite 510 or equivalent) replaces the rear cover assembly.

The lubrication tube of the gear driving the PTO is absent. A right-angled connector replaces the T-connector.

Operation

PTO engagement

The clutch is fed by the 17 bar hydraulic circuit through the PTO solenoid valve situated on the right side cover. The oil enters the support housing **(9)** through channels a, b and c. It pushes the piston **(11)** which presses the outer plates **(15)** against the inner plates **(16)**. The outer plates **(15)** have lugs which are driven by the clutch housing **(17)** and the inner plates **(16)** drive the hub **(24)**, which is splined to the intermediate shaft which is in turn splined to the PTO compound gear. At the same time the pressure which was acting on the PTO brake piston is cut off, enabling the 540 and 1000 rpm gears to turn freely. When the clutch is engaged, the plates are cooled and lubricated.

PTO braking

When the supply is cut off, the spring pushes the piston against the housing **(9)**.
At the same time, the solenoid valve for the PTO brake directs the oil to the PTO brake situated in the top link support. The pressure acts on a piston which supports the cup on the rear taper roller bearing, progressively stopping the driving gear.

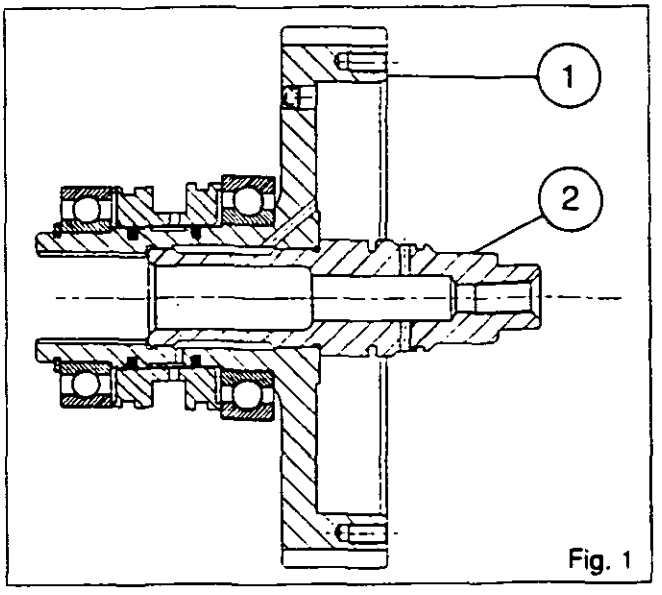
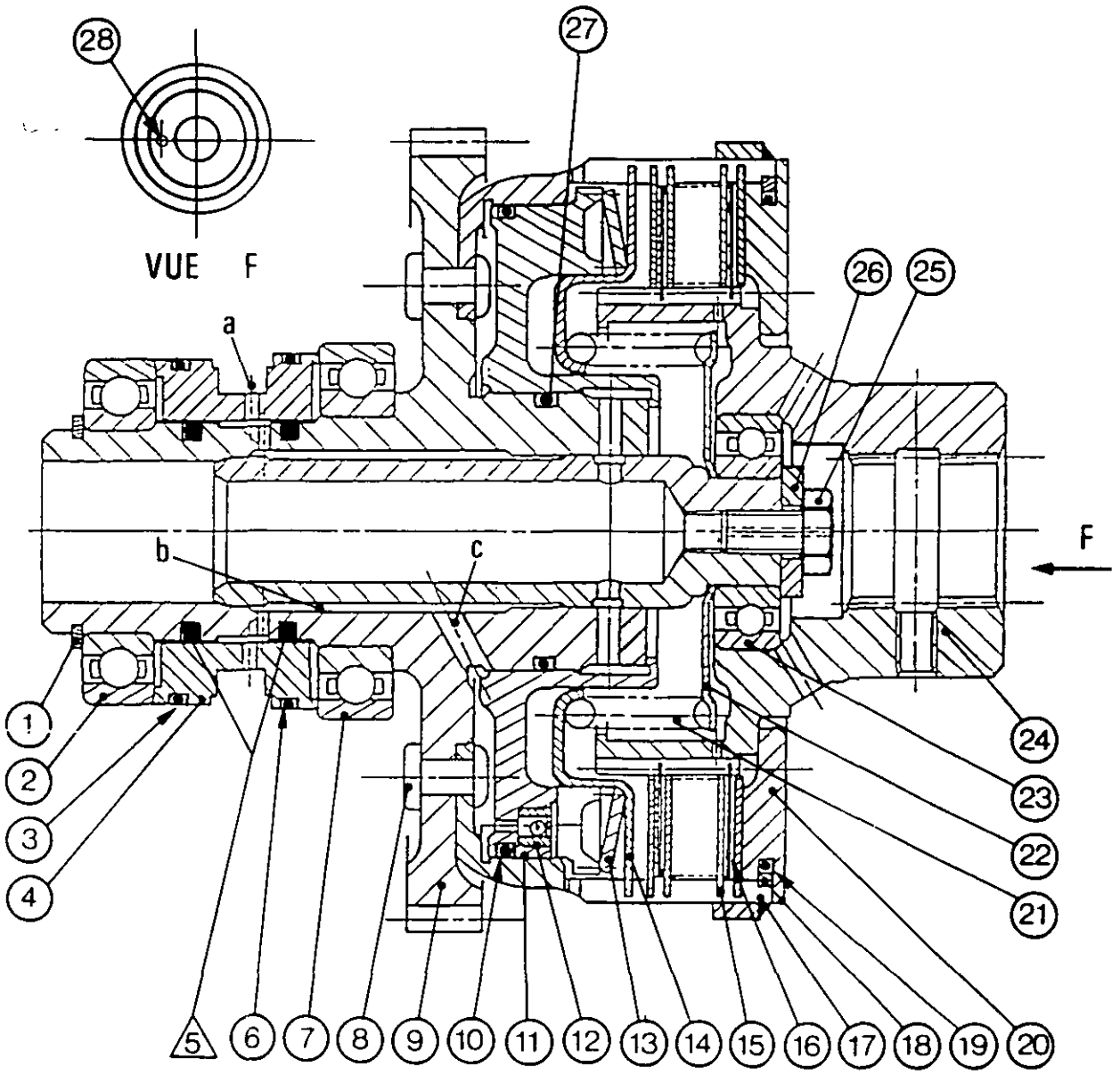


Fig. 1

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General arrangement of Valeo clutch



(1)	Circlip	**(11)**	Piston	**(21)**	Spring
(2)	Ball bearing	**(12)**	Valve	**(22)**	Spring seat
(3)	O-ring	**(13)**	Belleville washer	**(23)**	Ball bearing
(4)	Sleeve	**(14)**	Retainer	**(24)**	Hub
(5)	Seal rings	**(15)**	Outer drive plate	**(25)**	Screw
(6)	O-ring	**(16)**	Inner driven plate	**(26)**	Washer
(7)	Ball bearing	**(17)**	Clutch housing	**(27)**	O-ring
(8)	Rivet	**(18)**	Circlip	**(28)**	Ball
(9)	Clutch housing	**(19)**	Retaining ring		
(10)	O-ring	**(20)**	Cover		

Fig. 2

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Rear axle - PTO clutch

Exploded view - Valeo clutch

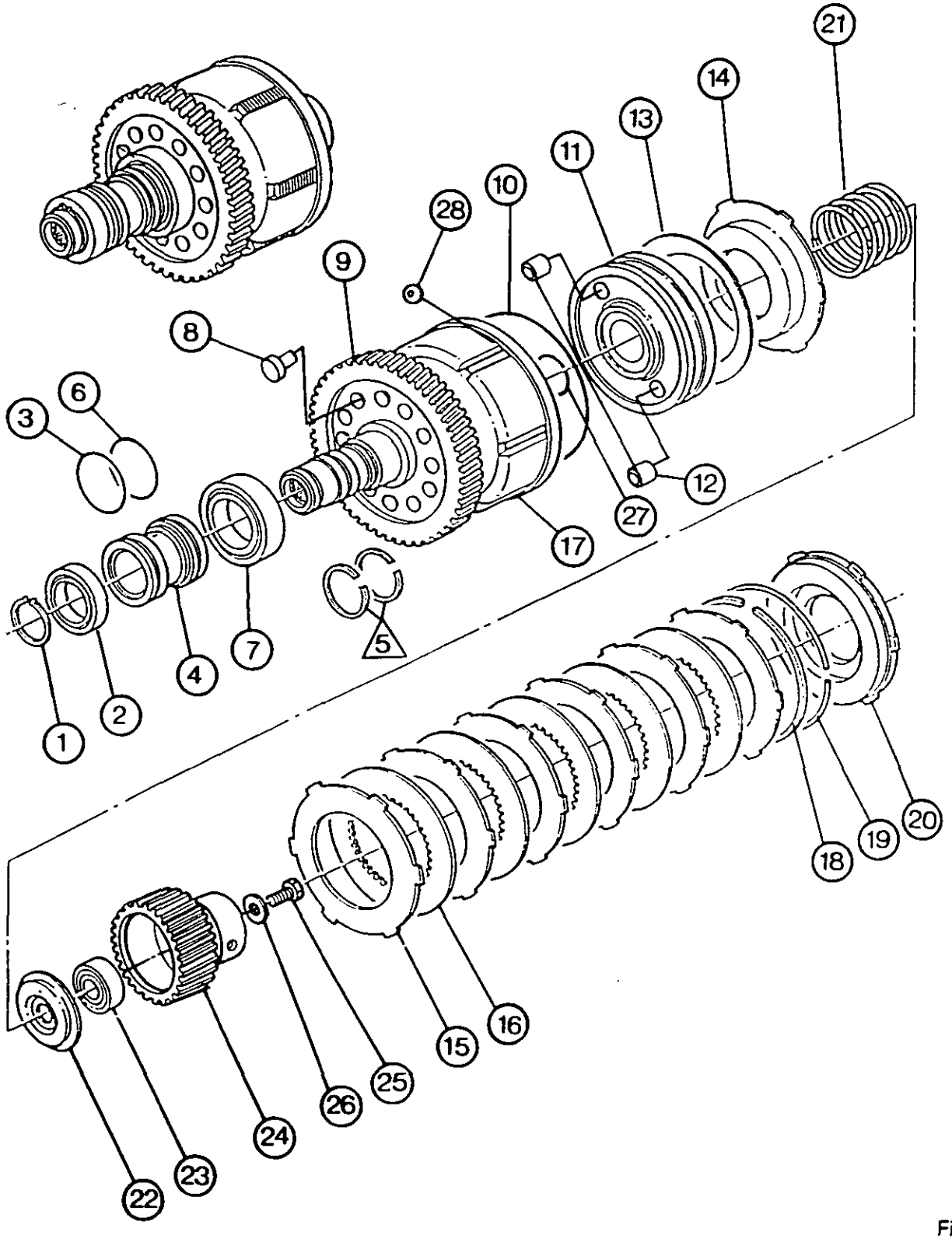
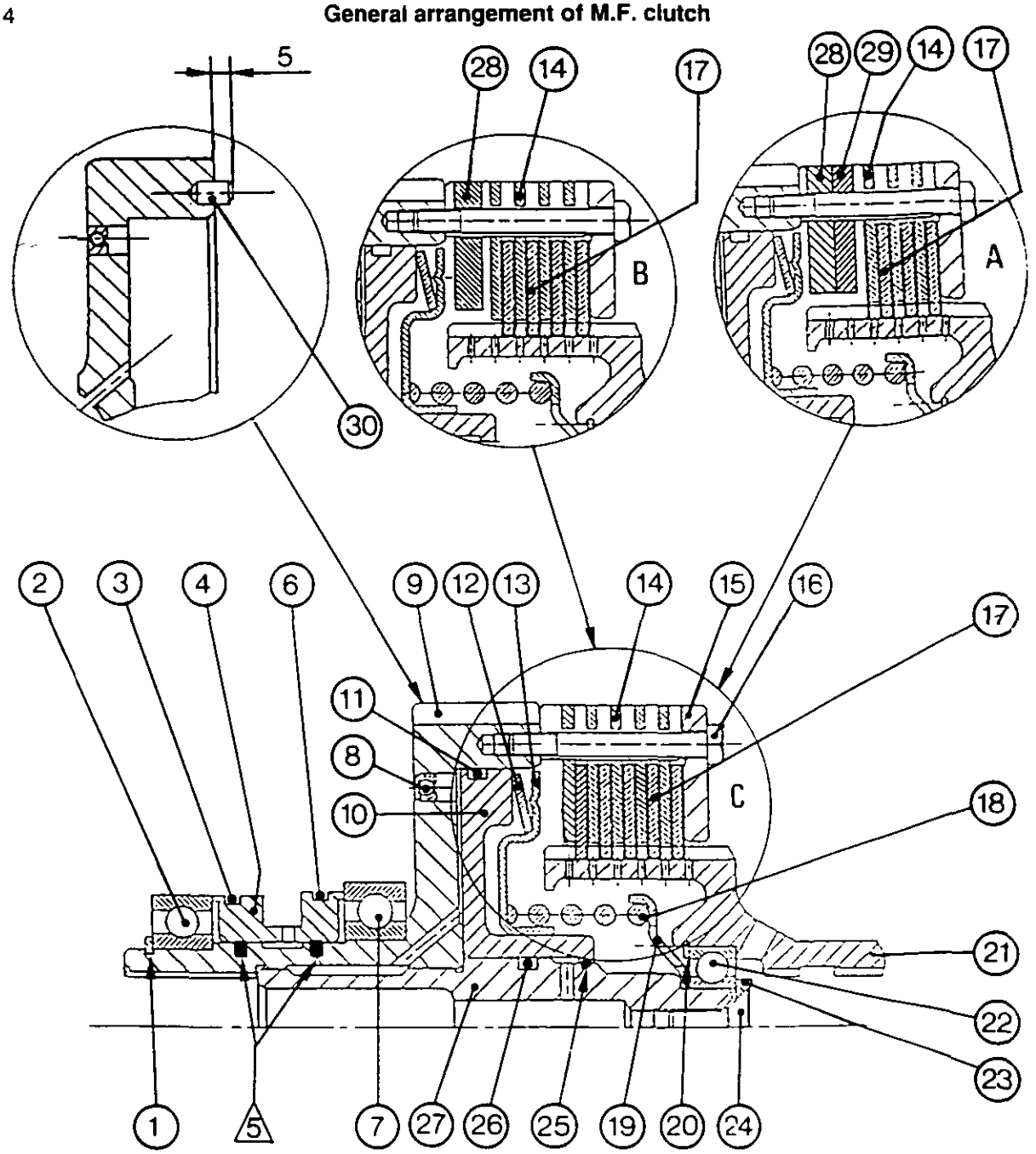


Fig. 3

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Fig. 4 **General arrangement of M.F. clutch**



(1)	Circlip	**(13)**	Retainer	**(19)**	Spring seat
(2)	Ball bearing	**(14)**	Outer plate	**(20)**	Securing ring
(3)	O-ring		A : 3-plate clutch	**(21)**	Hub
(4)	Sleeve		B : 4-plate clutch	**(22)**	Ball bearing
/5	Seal rings		C : 5-plate clutch	**(23)**	Washer
(6)	O-ring	**(15)**	Clutch housing	**(24)**	Screw
(7)	Ball bearing	**(16)**	Bolt	**(25)**	O-ring
(8)	Valve	**(17)**	Inner plate	**(26)**	O-ring
(9)	Support housing		A : 3-plate clutch	**(27)**	Sleeve
(10)	Piston		B : 4-plate clutch	**(28)**	Spacer, 3- and 4-plate type
(11)	O-ring		C : 5-plate clutch	**(29)**	Spacer, 3-plate type
(12)	Belleville washer	**(18)**	Spring	**(30)**	Pins

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Rear axle - PTO clutch

Exploded view - M.F. clutch

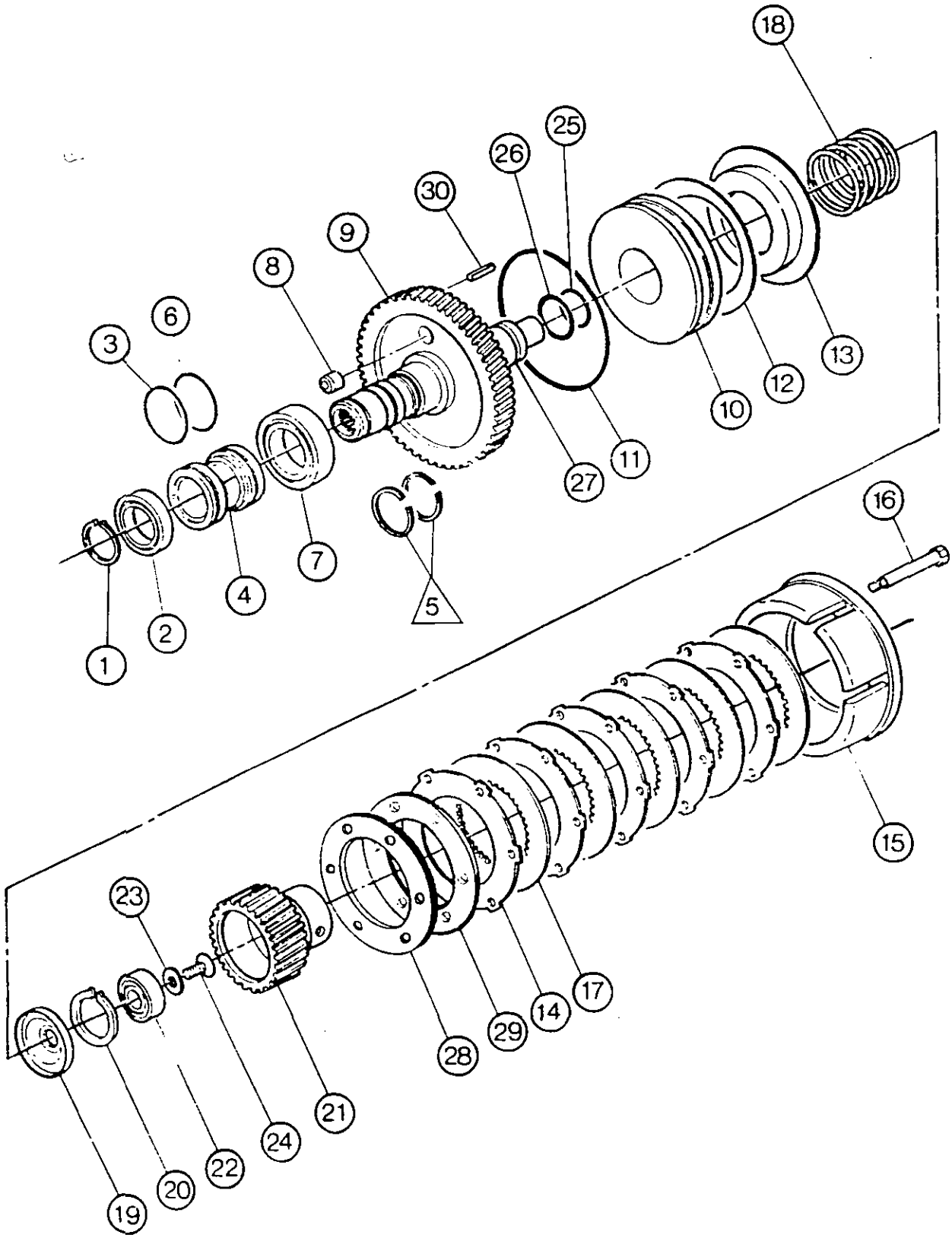


Fig. 5

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A . Removal and refitting of PTO clutch (2-speed version)

Removal

1. Remove the left side cover. Carry out operations 1 to 6, chapter 8 I02.
2. Remove the top link support, the compound gear and the intermediate shaft. Carry out operations 1 to 7, chapter 6 D01.
3. Remove the retaining screw **(3)** of the clutch **(1)**. Remove the clutch and the spring **(5)** (Fig. 6).

Refitting

4. Clean and check the parts. Replace those which are defective.
5. Check that the O-rings **(2)** and **(4)** (Fig. 6) have not deteriorated.
6. Place the spring **(5)** (Fig. 6) in the hollow clutch shaft and refit the clutch, pushing it as far as possible with a lever (Fig. 7) so as to compress the spring in order to fit the screw **(3)** (Fig. 6).
7. Clean the screw and smear it with Loctite 221 and tighten it with a ring spanner (Fig. 6).
8. Refit the intermediate shaft, the compound gear and the top link support. Carry out operations 9 to 18, chapter 6 D01.
9. Replace the left cover. Carry out operations 7 to 19, chapter 8 I02.
10. Check the operation of the PTO clutch, the PTO brake and of the lift.
11. Check for leaks:
    - at the joint faces (spool valve support, top link support, left side cover)
    - at the hydraulic connectors.

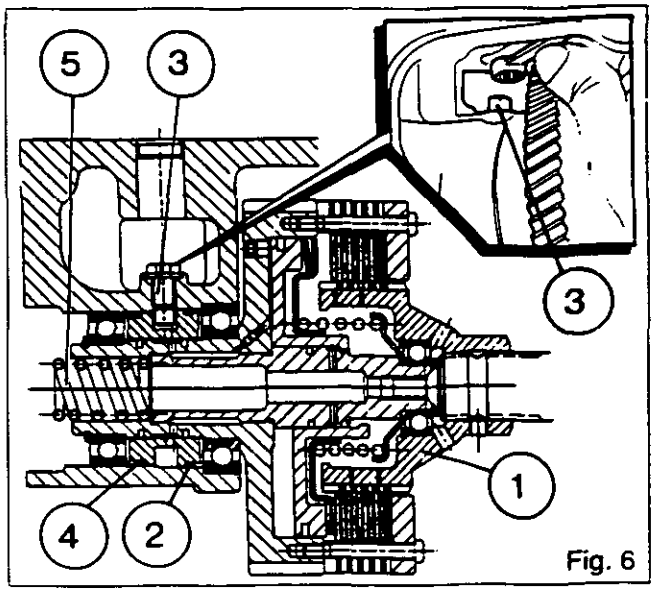
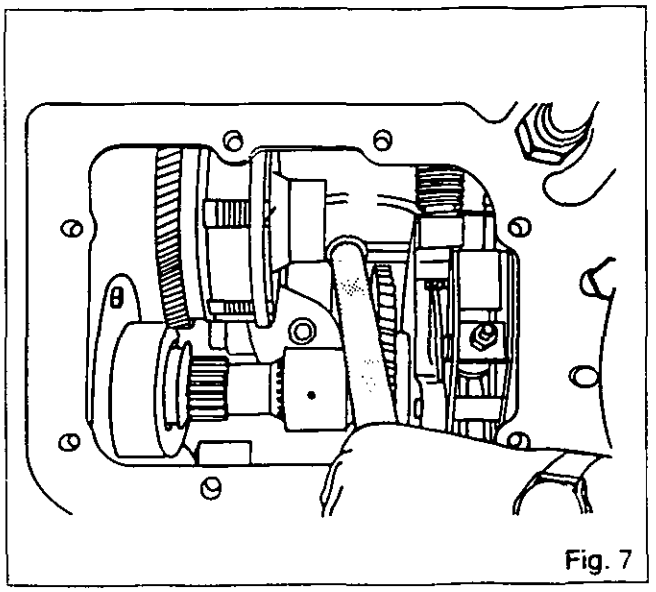


Fig. 6


Fig. 7

B. Removal and refitting of PTO clutch (4-speed version)

Removal

12. Remove the left side cover.
    Carry out operations 1 to 6, chapter 8 I02.
    Note: A new assembly has been introduced without intermediate shaft sleeve (clutch outlet) on 3000 tractors as of serial number N342012.
    Serial numbers of tractors equipped with old assembly after introduction: N342017, N342018, N342022, N342026, N348023.
    For tractors equipped with old assembly, refer to workshop manual 1646640M1
13. Remove the top link support, the compound gear and the intermediate shaft. Carry out operations 60 to 68 and 72 to 78, chapter 6 D01.
14. Remove the retaining screw **(3)** of the clutch **(1)**. Remove the clutch and the spring **(5)** (Fig. 6).

Refitting

15. Clean and check the parts. Replace those which are defective.
16. Check that the O-rings **(2)** and **(4)** (Fig. 6) have not deteriorated.
17. Place the spring **(5)** (Fig.6) in hollow clutch shaft and refit the clutch, pushing it as far as possible with a lever (Fig. 7) so as to compress the spring in order to fit the screw **(3)** (Fig. 6).

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18. Clean the screw and smear it with Loctite 221 and tighten it with a ring spanner (Fig. 6).
19. Refit the intermediate shaft, the compound gear and the top link support. Carry out operations 80 to 82 and 85 to 98, chapter 6 D01.
20. Replace the left cover. Carry out operations 7 to 19, chapter 8 I02.
21. Check the operation of the clutch, the PTO brake and of the hydraulic lift.
22. Check for leaks :
    - at the joint faces (spool valve support, top link support, left side cover)
    - at the hydraulic connectors.

C. Disassembly and reassembly of clutch (Valeo make)

Disassembly

23. Place the clutch housing **(9)** in a vice (Fig. 8).
24. Remove the retaining ring **(19)** (Fig. 8) with vice grips.
25. Remove the cover **(20)** with the circlip **(18)**, the outer plates **(15)** and the inner plates **(16)** (page 4).
26. Remove the O-rings **(3)** and **(6)**.
27. Remove the circlip **(1)**.
28. Extract the ball bearings **(2)** and **(7)** with the sleeve **(4)** (Fig. 9). Remove the sealing rings **(5)**.
29. Hold the spring **(21)** with a locally manufactured tool (Fig. 10). For tool see page 12.
30. Remove the screw **(25)** and the washer **(26)**.
31. Remove the hub **(24)**, the spring seat **(22)**, the spring **(21)**, the retainer **(14)** and the Belleville washer **(13)**.
32. Extract the ball bearing **(23)**.
33. Take out the piston **(11)**.
34. Remove the O-rings **(10)** and **(27)**.

Reassembly

Note: The valves (12) are fitted in the piston (11) and the ball (28) in the support housing (9).
The support and clutch (17) are fastened together by rivets (8).

35. Clean and check the parts. Replace those which are defective.

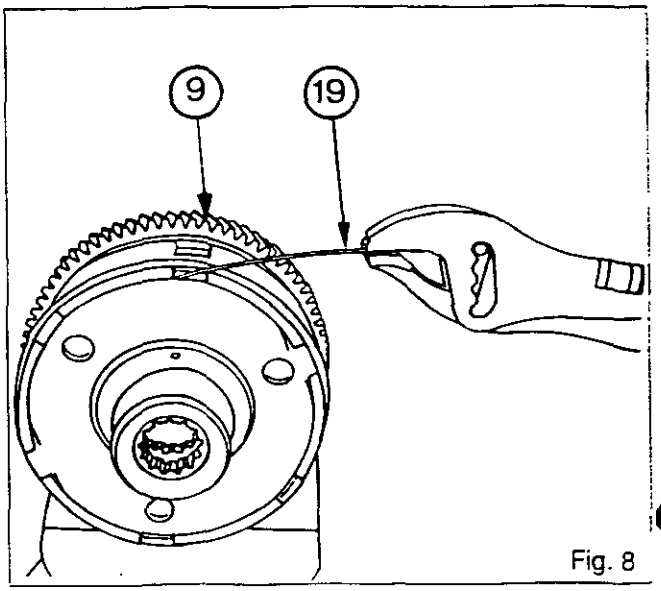


Fig. 8

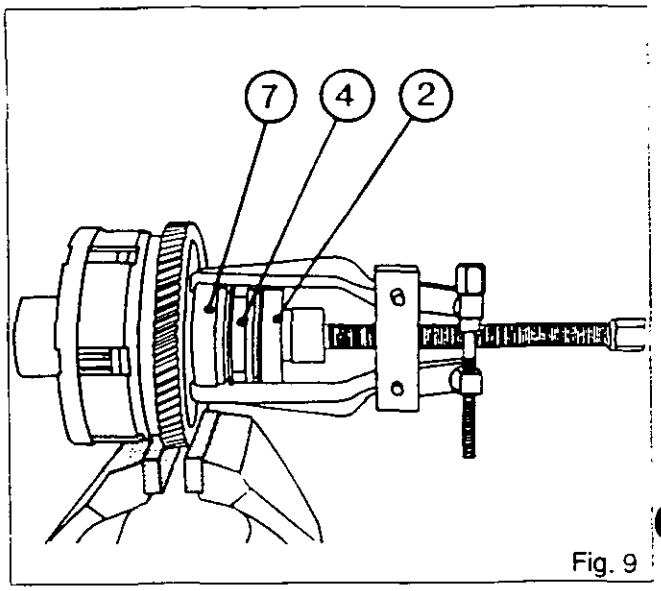
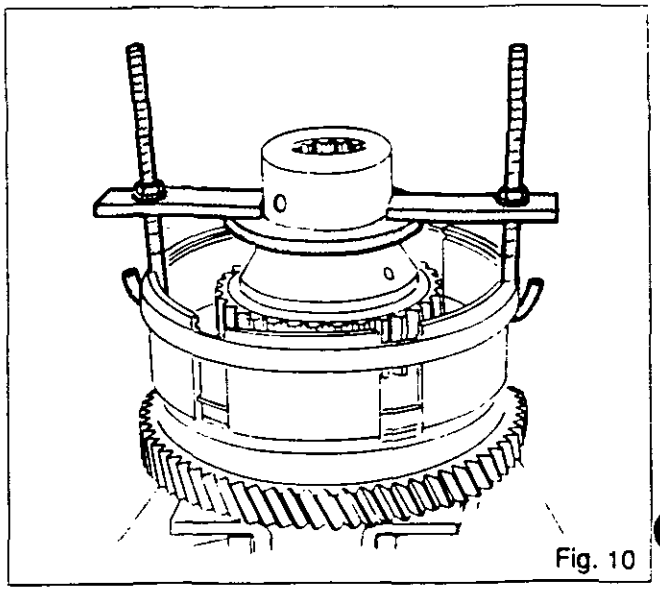


Fig. 9


Fig. 10

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36. Using a suitable device and a press, push the ball bearing **(7)** in as far as the shoulder (Fig. 11).
37. Place the seal rings **(5)** in their grooves. Ensure that they turn freely.
38. Slide the sleeve **(4)** over the rings, taking care not to damage them.
    Note: Position the larger diameter end of the sleeve towards the ball bearing (7).
39. Using a suitable device and a press, push the ball bearing **(2)** in until it meets the shoulder of the support **(9)** (Fig. 12).
40. Fit the circlip **(1)**.
41. Replace and lubricate the O-rings **(10)** and **(27)**.
42. Lubricate the hole of the support housing **(9)** and the piston **(11)** and insert into the housing with a plastic mallet.
43. Fit the ball bearing **(23)** in the hub **(24)**.
44. Refit the Belleville washer **(13)**, the retainer **(14)**, the spring **(21)**, the spring seat **(22)** and the hub **(24)**.
45. Compress the spring **(21)** with the tool (Fig. 10) (see section E). Fit the washer **(26)** and tighten the screw **(25)** smeared with Loctite 242 to a torque of 24 - 28 Nm.
    Note : Take care not to obstruct the lubricating hole with Loctite.
46. Place the outer plates and the inner plates on the hub **(24)**.
    Note: The clutch is equipped with 5 inner plates and 6 outer plates. Check that the plates slide freely on the hub.
47. Fit the cover **(20)** with the circlip **(18)**.

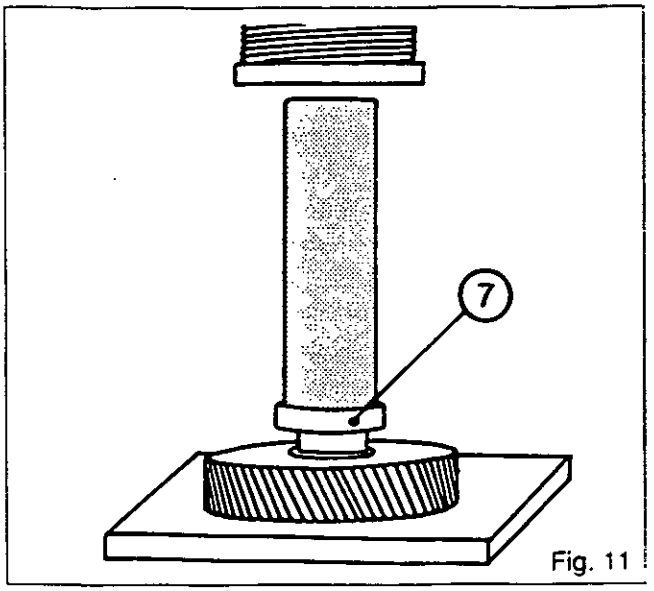


Fig. 11

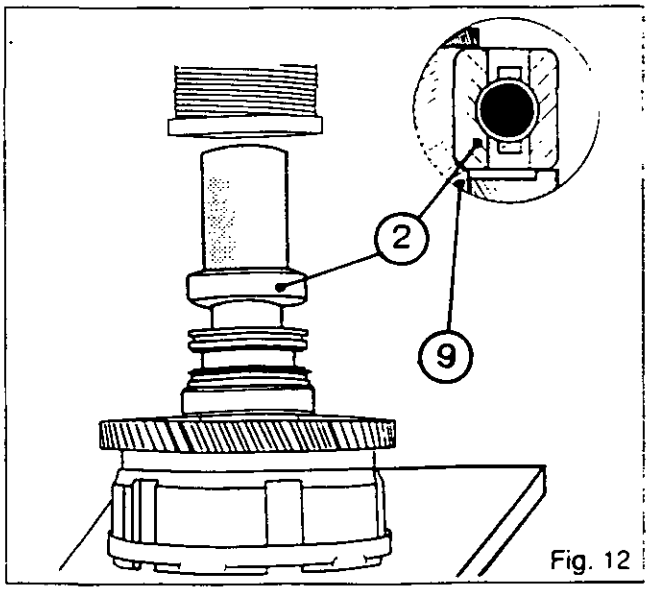


Fig. 12

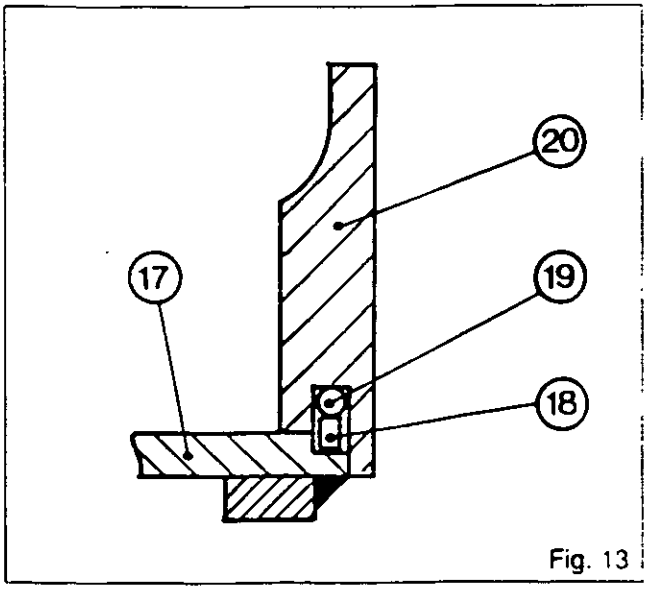


Fig. 13

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48. Fit the retaining ring **(19)**.
Note : The retaining ring must be fitted between the cover (20) and the circlip (18) (Fig. 13). After fitting, bend back the end of the retaining ring (19) (Fig. 14).
49. Manually check that the inner plates and outer plates do not bind together.
50. Lubricate and fit the O-rings **(3)** and **(6)**.
Note : The O-rings have different diameters.

D. Disassembly and reassembly of clutch (M.F. make)

Disassembly

51. Remove the bolts **(16)**.
52. Remove the clutch housing **(15)**, the inner plates **(17)** and the outer plates **(14)**.
Note: The number of inner plates and outer plates varies according to the type of tractor.
Assembly A : 3 inner plates, 3 outer plates and 2 spacers (28) and (29) for 3050 - 3060 - 3065 tractors.
Assembly B : 4 inner plates, 4 outer plates and 1 spacer (28) for 3070, 3080-3095.
Assembly C : 5 inner plates, 5 outer plates for 3115, 3125, 3120, 3140 tractors.
53. Place the support housing **(9)** in a vice.
54. Remove the O-rings **(3)** and **(6)**.
55. Remove the circlip **(1)**.
56. Extract the ball bearing **(2)** with the sleeve **(4)** (Fig. 15).
57. Remove the seal rings **(5)** (Fig. 20). Extract the ball bearing **(7)** (Fig. 16).
58. Hold the spring **(18)** with the aid of a locally made tool (Fig. 17). For tool see page 12.
59. Remove the screws **(24)** and take off the washer **(23)** (Fig. 17). Gradually decompress the spring with the tool.
60. Remove the hub **(21)**, the spring seat **(19)**, the spring **(18)**, the retainer **(13)** and the Belleville washer **(12)**.
61. Remove the securing ring **(20)**.
62. Extract the ball bearing **(22)**.
63. Take out the piston **(10)**.
64. Remove the O-rings **(11)**, **(25)** and **(26)**.

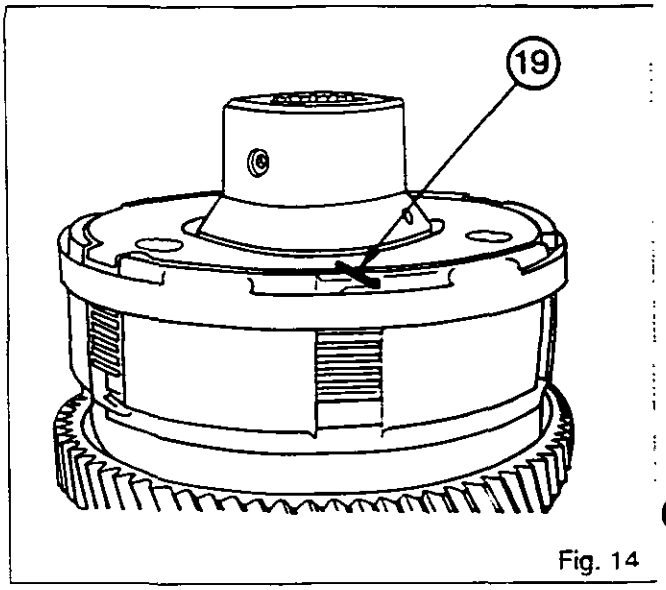


Fig. 14

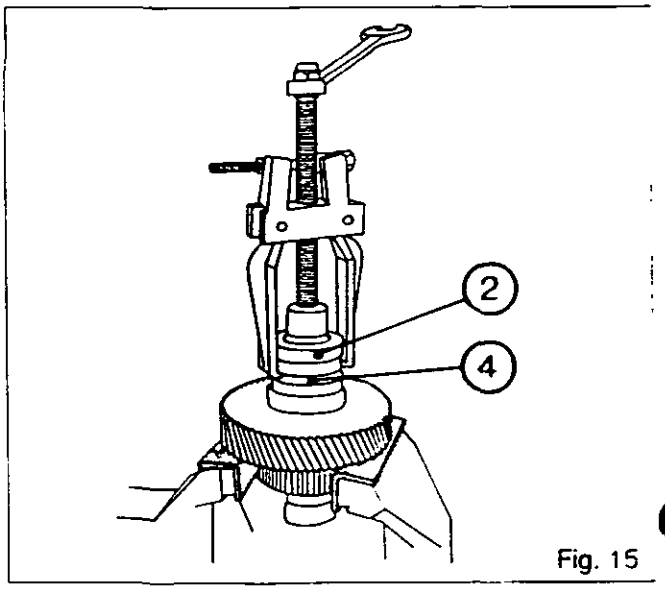


Fig. 15

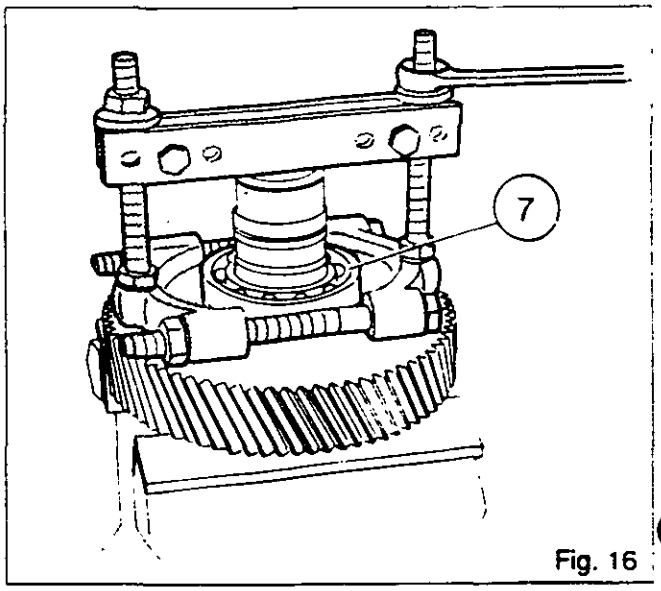


Fig. 16

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Reassembly

Note: The valve (8) is fitted in the support housing (9).

The sleeve (27), smeared with Loctite 648 (Fig. 18) is fitted with a press. If disassembly proves necessary, check when reassembling that the channel is not obstructed with Loctite.

Two pins (30) are fitted in the support housing (9) 5 mm from the face (Fig. 19).

65. Clean and check the parts. Replace those which are defective.
66. Using a suitable device and a press, push the ball bearing **(7)** in until it meets the shoulder.
67. Place the seal rings **/5** in their grooves and join up the ends (Fig. 20). Ensure that they turn freely.
68. Slide the sleeve **(4)** on to the seal rings, taking care not to damage them.
    Note: Position the larger diameter end of the sleeve towards the ball bearing (7).

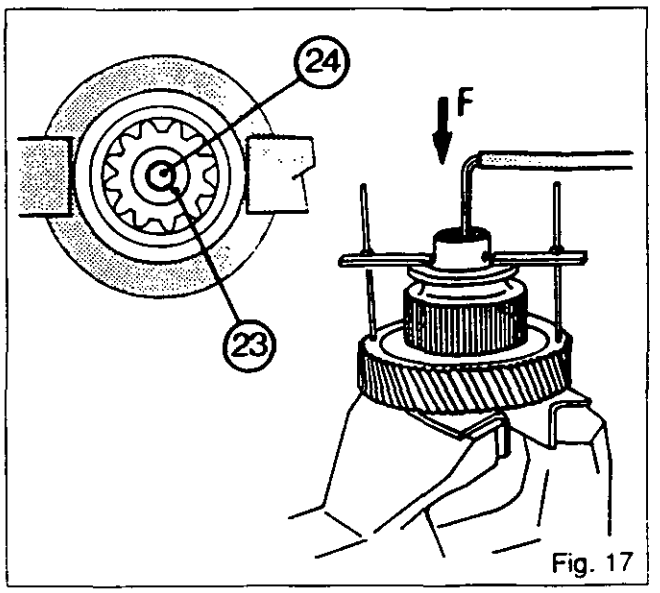


Fig. 17

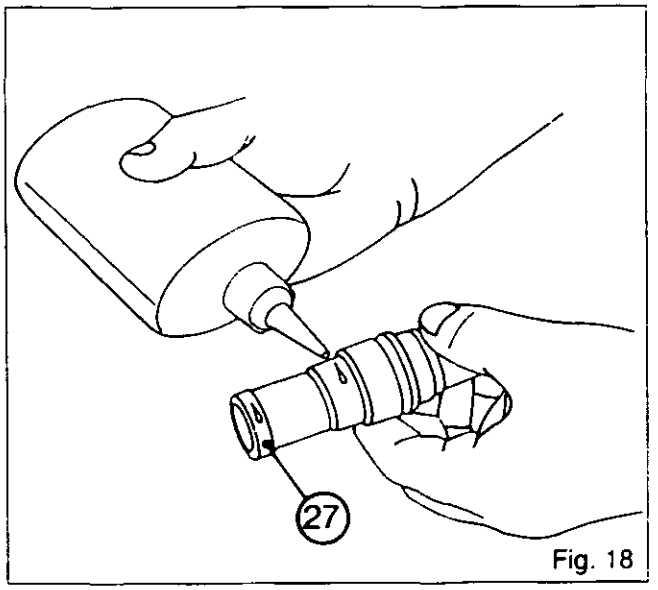


Fig. 18

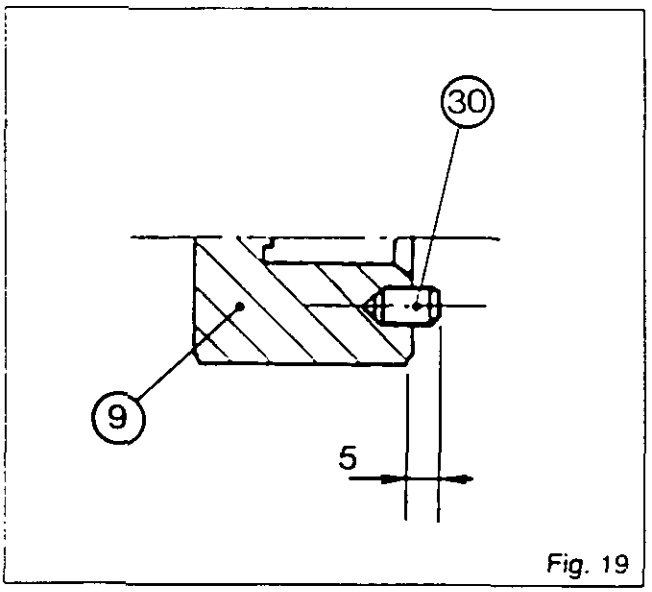


Fig. 19

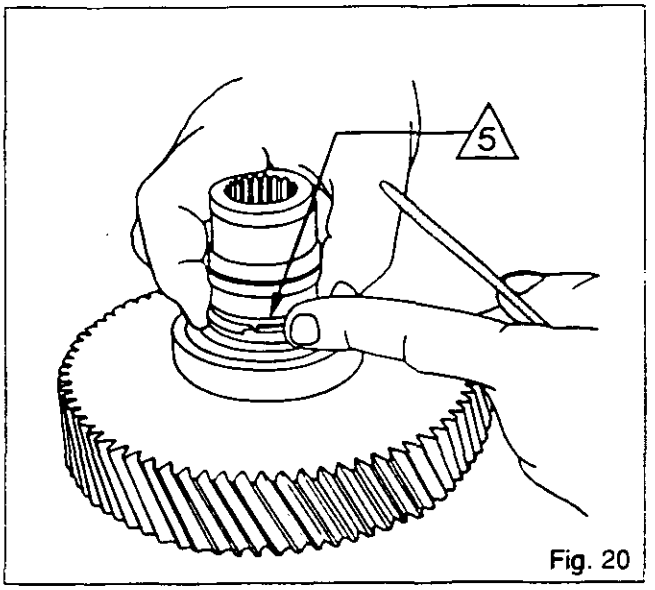


Fig. 20

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69. Using a suitable device and a press, push the ball bearing **(2)** in until it meets the shoulder of the support housing **(9)** (Fig. 21).
70. Fit the circlip **(1)**.
71. Replace and lubricate the O-rings **(11)**, **(25)** and **(26)**.
72. Lubricate the sleeve **(27)** and the piston **(10)** and insert into the housing with a plastic mallet (Fig. 22).
73. Using a suitable device and a press, insert the ball bearing **(22)** into the hub **(21)**. Fit the securing ring **(20)**.
74. Refit the Belleville washer **(12)**, the support **(13)**, the spring **(18)**, the spring seat **(19)** and the hub **(21)**.
75. Compress the spring **(18)** with the tool (Fig. 17). Mount the washer **(23)** and tighten the screw **(24)** smeared with Loctite 242 to a torque of 24 - 28 Nm.
76. Place the spacers, the outer plates and the inner plates (according to the type) on the hub **(21)**.
77. Position the clutch housing **(15)** on the two pins **(30)**. Fit the bolts **(16)** lightly smeared with Loctite 542 and tighten them to a torque of 24 - 28 Nm.
78. Manually check that the inner plates and outer plates do not bind together.
79. Lubricate and fit the O-rings **(3)** and **(6)**.
Note : The O-rings have different diameters.

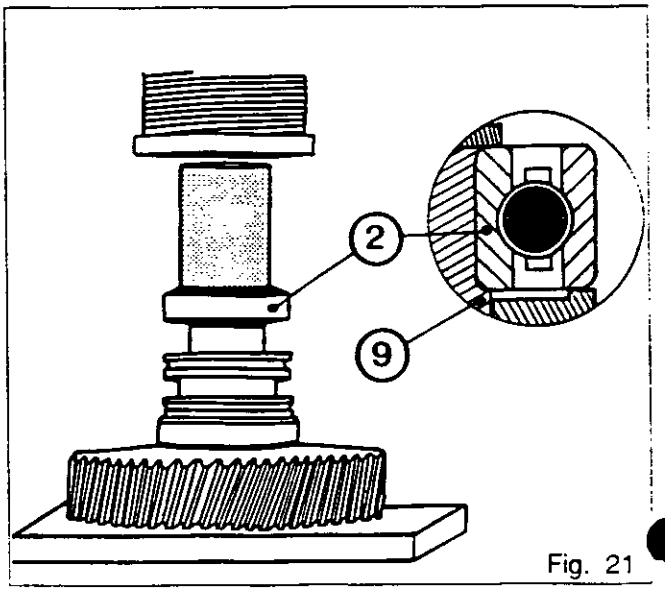


Fig. 21

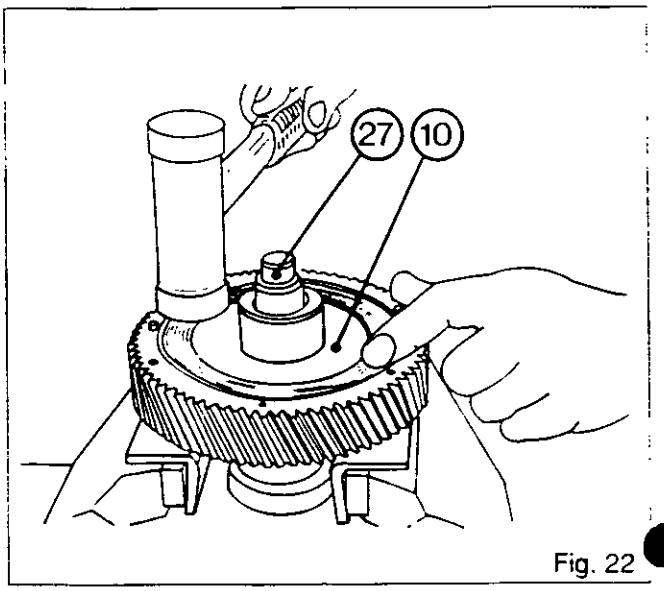
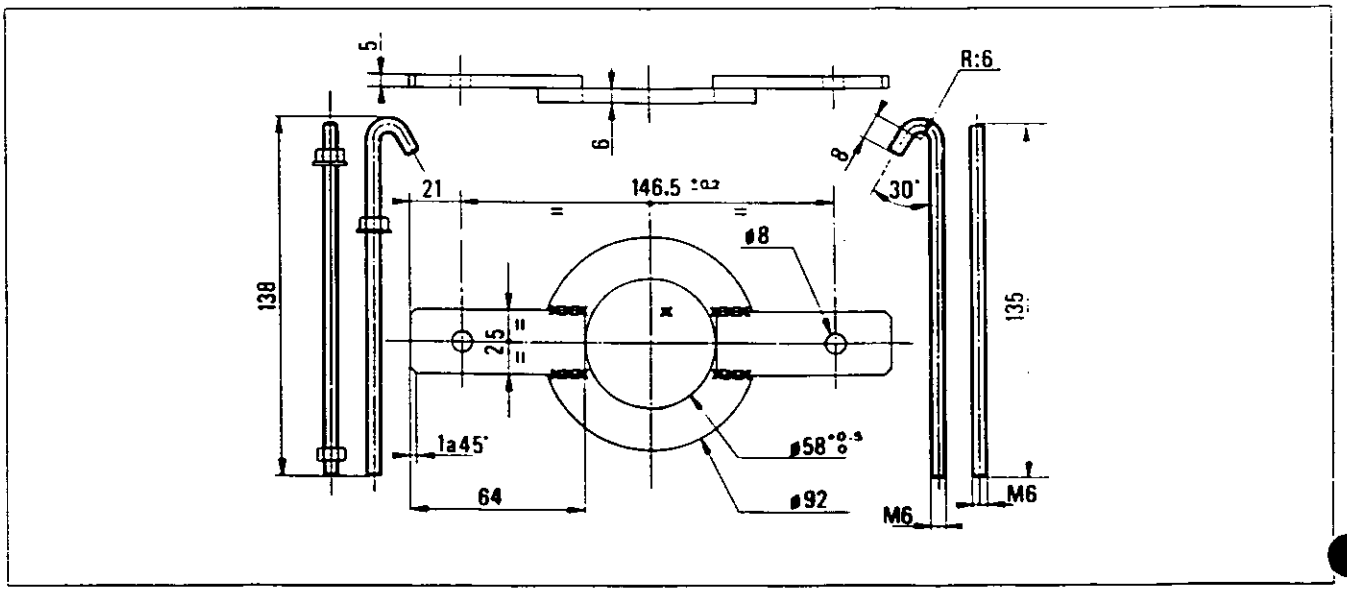


Fig. 22

E. Service tool

Tool to be made locally.



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6 I01 Handbrake

CONTENTS

- **General** ____ 2

- **Operation** ____ 2

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B. **Reassembly** ____ 7

C. **Fitting and adjustment of control** ____ 9

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6I01.2

Rear Axle - Handbrake

General

The handbrake assembly is fitted on the bevel drive pinion. It consists of a mechanism placed between two friction discs which are driven by the bevel drive pinion via splines.

The mechanism comprises two cast iron plates held by springs and separated by balls housed in cams.

Operation

When the handbrake lever in the cab is pulled, the cam **(14)** is moved via the pin **(20)**. The cam pushes the actuator lever **(13)** which causes the plates of the mechanism **(31)** to rotate and move apart. The discs **(30)** are thus compressed between the moving plates, the closing plate **(24)** and the supporting plate **(29)**, preventing the bevel drive pinion from rotating.

When the handbrake lever is released, the spring **(17)** moves the cam **(14)** to the rest position and the mechanism is closed by its springs.

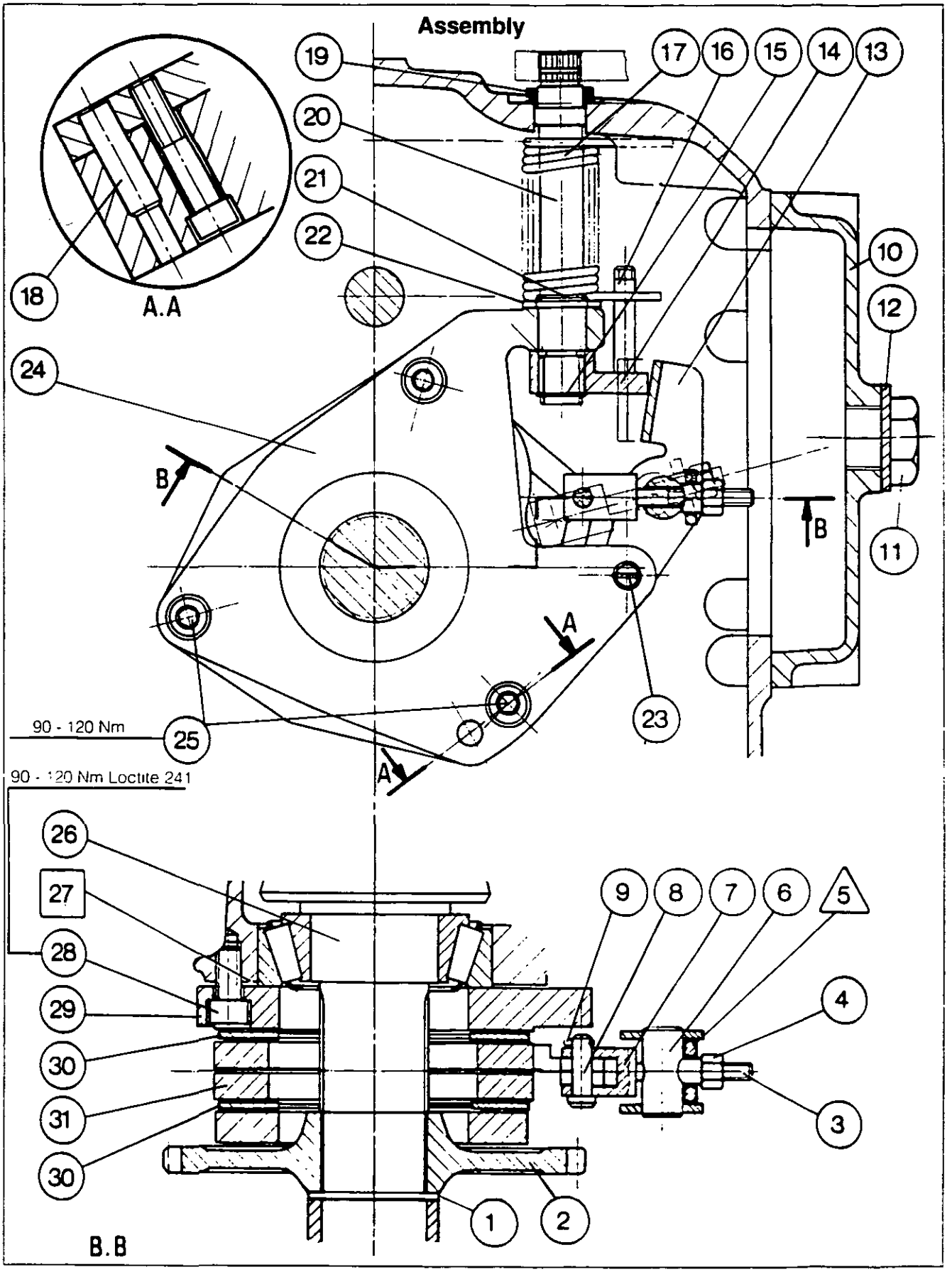
Parts list

(1) Circlip
(2) Pinion
(3) Stud
(4) Nut
/5 Plate
(6) Pin
(7) Clevis
(8) Pin
(9) Cotter pin
(10) Left cover
(11) Plug
(12) Seal Ring
(13) Actuator lever
(14) Cam
(15) Circlip
(16) Finger
(17) Spring
(18) Dowel
(19) Seal ring
(20) Control shaft
(21) Retainer ring
(22) Washer
(23) Finger
(24) Closing plate
(25) Screw
(26) Bevel drive pinion
[27] Shim(s)
(28) Screw
(29) Supporting plate
(30) Discs
(31) Mechanism

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Rear Axle - Handbrake

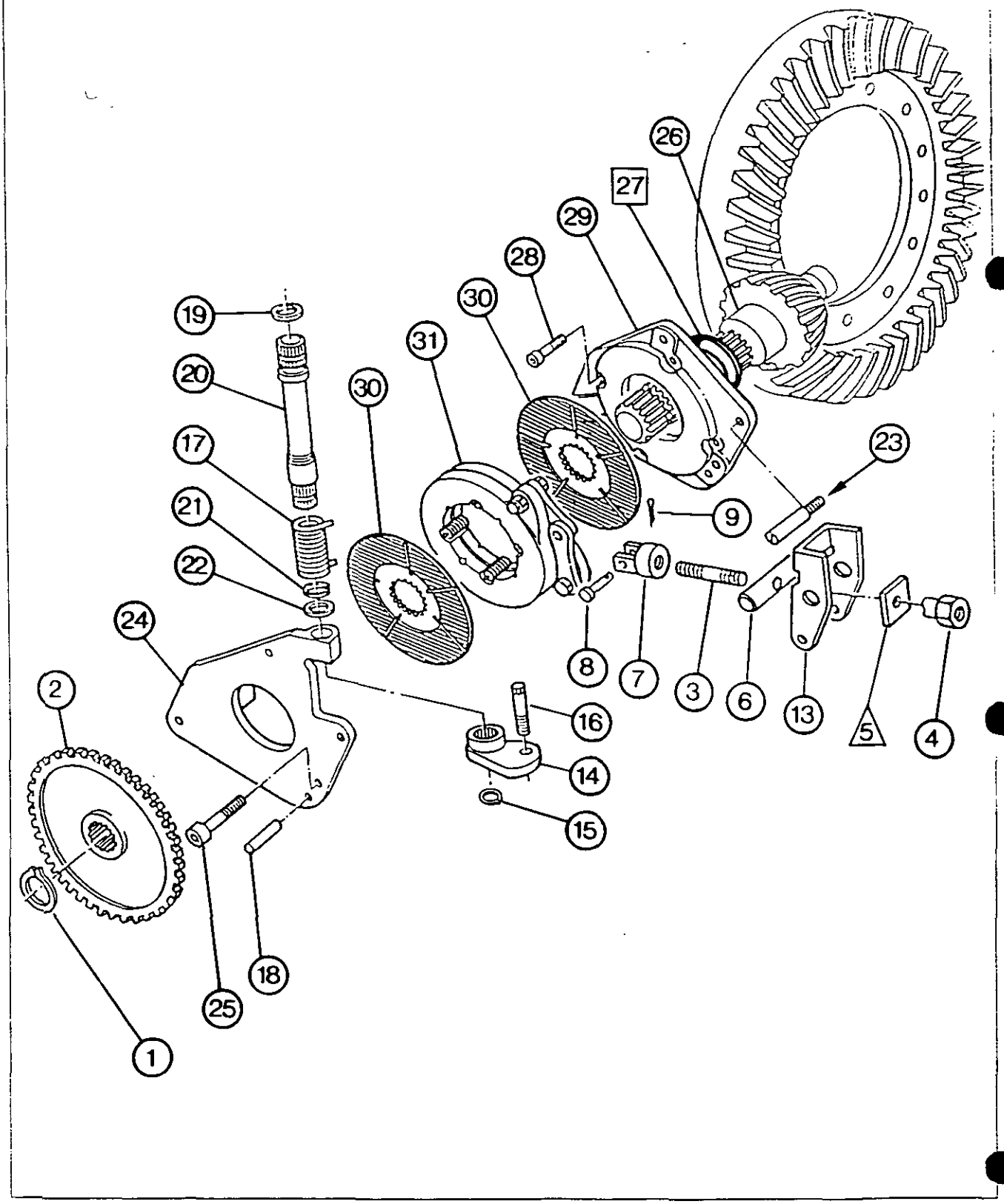


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Rear Axle - Handbrake

Exploded



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Rear Axle - Handbrake

A. Disassembly

1. Drain the rear axle housing.
2. Block:
   - the front wheels of the tractor
   - between the engine frame and the front axle (Fig. 1).
3. Raise the tractor with a jack.
4. Place props in position.
5. Remove the rear wheels.
6. Remove the right-hand hydraulic cover. Carry out operations 2 to 14, chapter 8 I01.
7. Remove the left-hand cover. Carry out operations 2 to 6, chapter 8 I02.

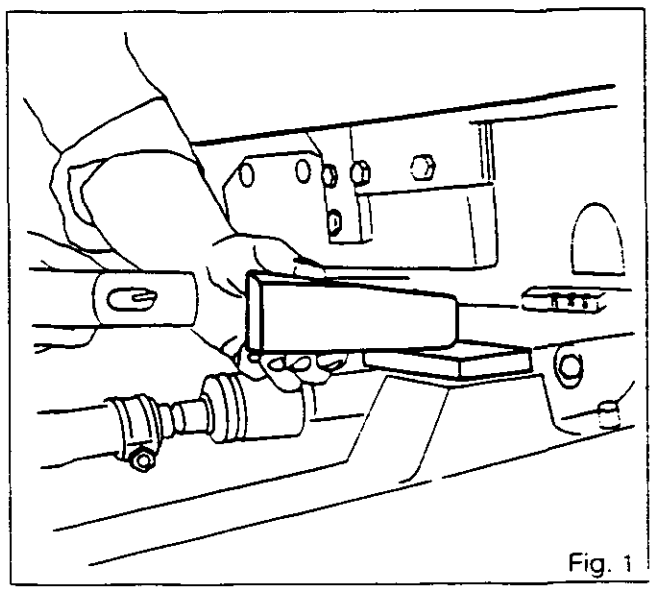


Fig. 1

Tractors without creeper gears

8. Drive out the double pins **(2)** and **(4)** of the coupling sleeves **(1)** and **(5)**. Slide the sleeves towards each other on the pin **(3)**.
   Remove the pin and sleeve assembly (Fig. 2).
   On 4RM tractors
   If the double pins are not accessible, carry out operations 9 to 12, chapter 5 D01.A.
9. Remove the circlip **(1)**.
10. Remove the pinion **(2)** (if fitted).

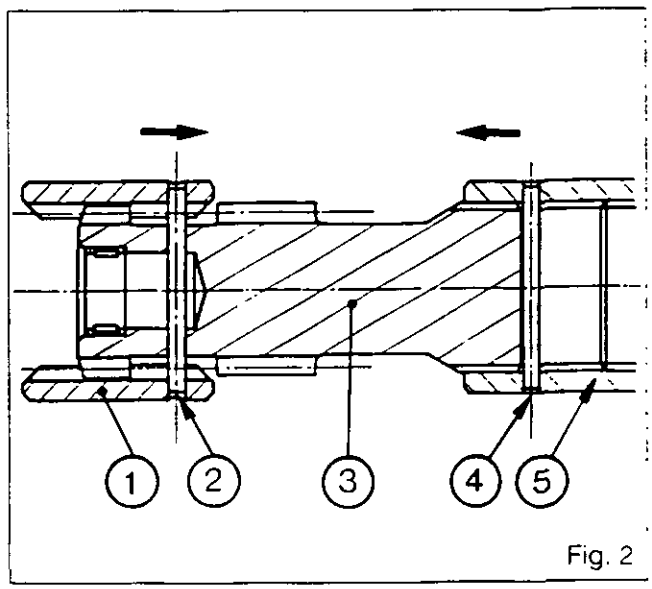


Fig. 2

Tractors with creeper gears

11. Remove the creeper gears control fork and the sleeve assembly (linking pin and coupler).
    Carry out operations 3 to 8, chapter 5 D01.A.
12. Carry out operations 13 to 16, chapter 5 D01.A.
13. Remove the circlip **(1)**.
14. Remove the pinion **(2)** (if fitted).

Tractors with or without creeper gears

Note: Lift the cab, carry out operations 2 and 3, chapter 6 B01. Examine the space between the hood and the windscreen (if the space is inadequate, remove the sheetmetal).

15. Disconnect the cable **(3)**. Take out the split pin **(1)** and remove the control arm **(2)** (Fig. 3).
16. Remove the seal **(19)**.
17. Release the spring **(17)** using pliers.
18. Undo the nut to release the actuator lever **(13)** of the cam **(14)**.
19. Remove the circlip **(15)**.
20. Remove the cam **(14)** with the finger **(16)**.
21. Remove the screws **(25)**.

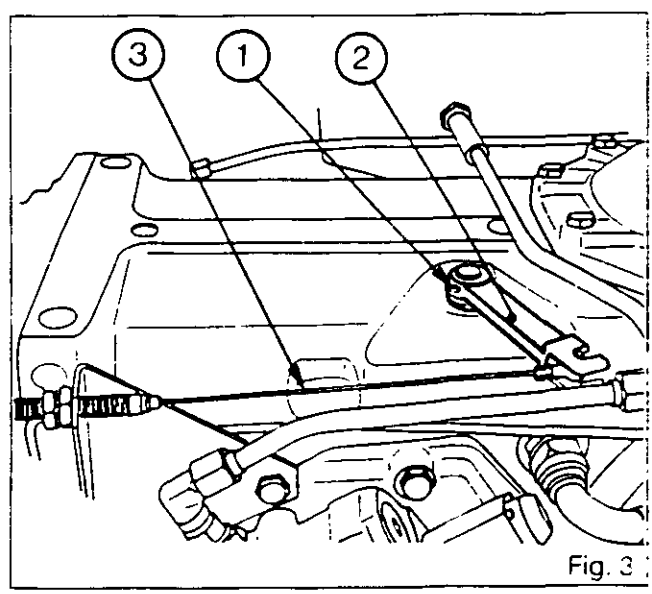


Fig. 3

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Rear Axle - Handbrake

22. Remove the closing plate **(24)** and the control shaft **(20)**.
Note: Keep the mechanism (31) and the brake discs (30) towards the rear. Withdraw the closing plate (24) (Fig. 4), inclining it in order to disengage it from the dowel (18), the finger (23) and the bevel drive pinion (26) and to release the shaft (20) from the housing.
23. Remove the spring **(17)** and the washer **(22)**.
24. Remove the retainer ring **(21)** (if necessary) on the control shaft **(20)**.
25. Remove the discs **(30)** and the mechanism **(31)**.

In case of replacement of mechanism

26. Undo the nut **(4)**, remove the plate **(5)** and the pin **(6)**.
27. Remove the split pin **(9)**, take out the pin **(8)** and the clevis **(7)**.
Note: The stud (3) is smeared with Loctite 270 and locked in the clevis (7).

If replacement of the supporting plate (29) is unavoidable

28. Remove two diametrically opposed screws **(28)** and screw in two guide studs **(A)** (Fig. 5). The purpose of this is to hold the shims **[27]** (Fig. 6).
29. Unscrew the two remaining screws.
30. Remove the supporting plate.
Note: Check that the shims have all remained on the housing.
The finger (16) smeared with Loctite 241 is screwed into the cam (14). The finger (23) smeared with Loctite 241 is screwed into the supporting plate (29).
The dowel (18) is pushed fully home on the shoulder of the closing plate (24).

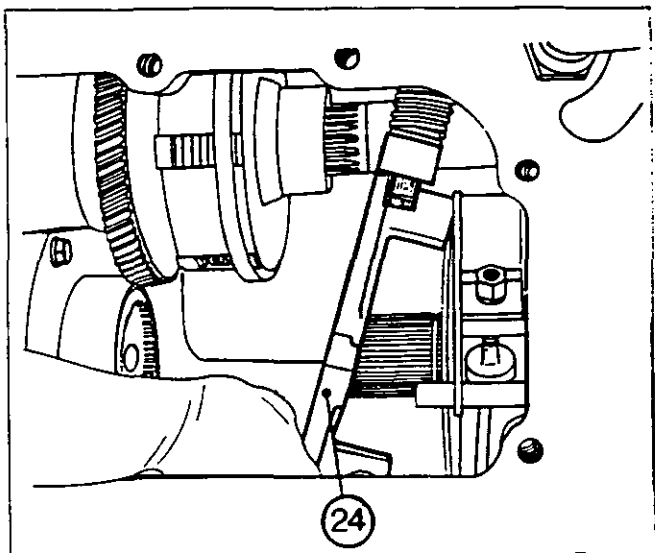


Fig. 4

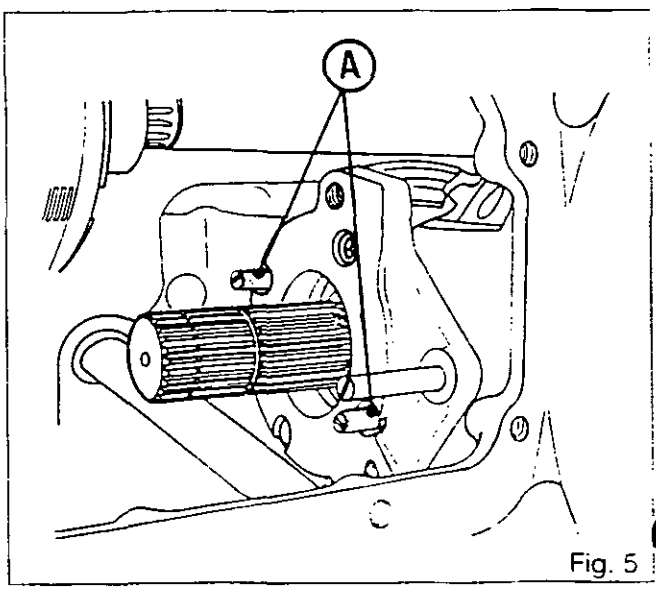


Fig. 5

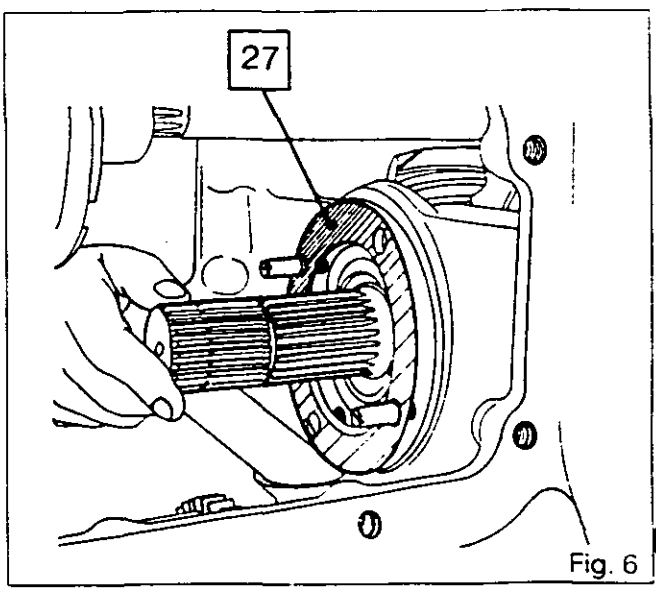


Fig. 6

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B. Reassembly

31. Clean and check the parts. Replace any which are defective.

In case of replacement of supporting plate (29)

32. Refit the plate.
33. Smear two screws **(28)** with Loctite 241 then tighten to a torque of 90 - 120 Nm.
34. Remove the two guide studs.
35. Smear the other two screws **(28)** with Loctite 241 then tighten to a torque of 90 - 120 Nm.

In case of replacement of mechanism

36. Refit the clevis **(7)** prepared with the stud **(3)** and the pin **(8)**. Replace the split pin **(9)**.
37. Fit the lever **(13)** with its pin **(6)** on the stud **(3)** of the clevis.
38. Refit the plate /5\, tighten the nut **(4)**.
    Note: The plate /5\ is rectangular. It must be positioned horizontally, lengthwise, on the pin (6) in the lever (13) to be correct (Fig. 7).
39. Replace the discs **(30)**, placing the mechanism **(31)** between them.
    Note: Fit the lever (13) on the finger (23). Check that the discs slide freely on the bevel drive pinion (26).
40. Place the retainer ring **(21)** (if removed) on the shaft **(20)**.
41. Fit the shaft **(20)** in the closing plate **(24)** with the washer **(22)** and the spring **(17)**.
42. Reverse operation 22.
43. Check that the discs **(30)** and the mechanism **(31)** are correctly positioned.
44. Fit and tighten the screws **(25)** to a torque of 90 - 120 Nm.
45. Fit the cam **(14)** with its finger **(16)**.
46. Fit the circlip **(15)**. Replace the spring **(17)**, positioning its ends E as indicated in Fig. 8.
47. Fit the seal **(19)** supported by the housing (Fig. 9).

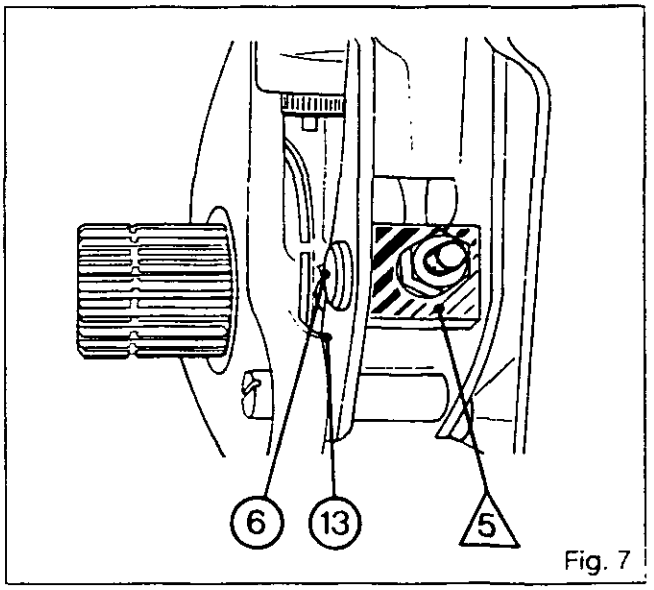


Fig. 7

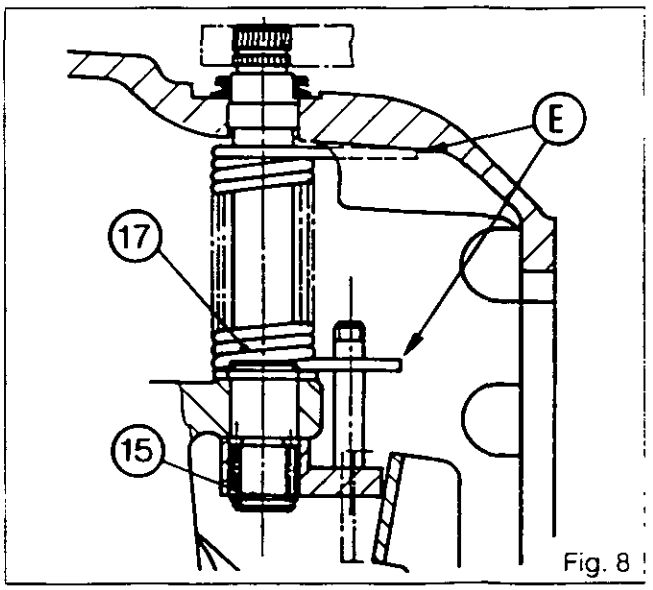


Fig. 8

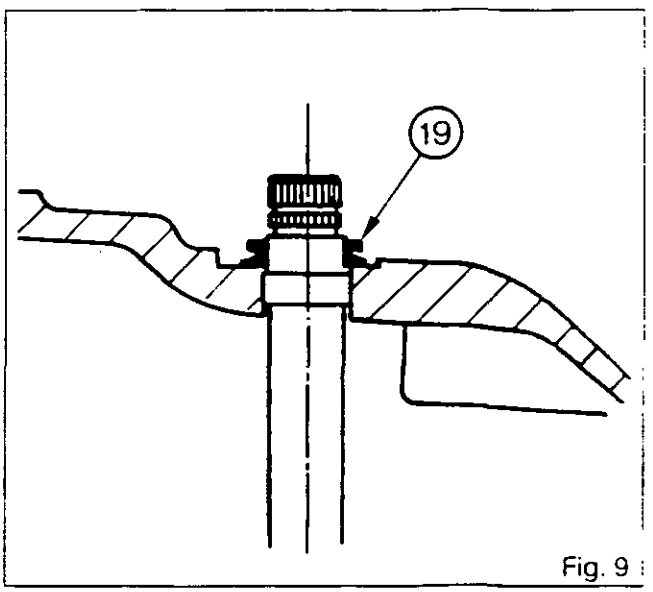


Fig. 9

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Rear Axle - Handbrake

Tractors with creeper gears

48. Refit the pinion **(2)** (if fitted).
49. Position the circlip **(1)**.
50. Refit the sleeve assembly (linking pin and coupler) and the creeper gears control fork. Carry out operations 22 to 31, chapter 5 D01.A.
    Note: If necessary reverse operations 9 to 12 (4 RM), chapter 5 D01.A.

Tractors without creeper gears

51. Refit the pinion **(2)** (if fitted).
52. Position the circlip **(1)**.
53. Refit the sleeve assembly (linking pin and coupler) and the creeper gears control fork. Carry out operations 44 and 45, chapter 6 F01.
    Note: If necessary reverse operations 9 to 12 (4 RM), chapter 5 D01.A.

Tractors with or without creeper gears

54. Refit the left cover. Carry out operations 8 to 17, chapter 8 I02.
55. Position the lever **(2)** (Fig. 10) of the cam **(14)** in contact with the lever **(13)** so as to obtain a distance of 315 mm ± 12 between the cable fastening axis and the support **(3)**. Fit the cotter pin **(1)** (Fig. 10).
56. Adjust the mechanism **(31)** with the adjusting nut, so that the cam displacement, from rest position to maximum position, is 60° (Fig. 11).
    Note: Access to the adjusting nut (4) is via the aperture of the plug (11) on the left cover (10) (Fig. 12).
57. Reconnect the control.
58. Adjust the handbrake control.
    Carry out operations 73 to 75.
    Remove the blocks between the cab supports and the trumpet housings. Fit the washers. Position the cab. Tighten the nuts to a torque of 27 - 35 Nm and the lock-nuts, smeared with Loctite 270, to 13 - 20 Nm. Refasten the protecting panels.
59. Refit the right-hand hydraulic cover. Carry out operations 15 to 27, chapter 8 I01.
60. Raise the tractor with a jack.
61. Refit the wheels.
62. Remove the props and the jack.
63. Tighten the wheel nuts to a torque of 400 - 450 Nm.
64. Remove the blocks at the front of the tractor and between the engine frame and the front axle.

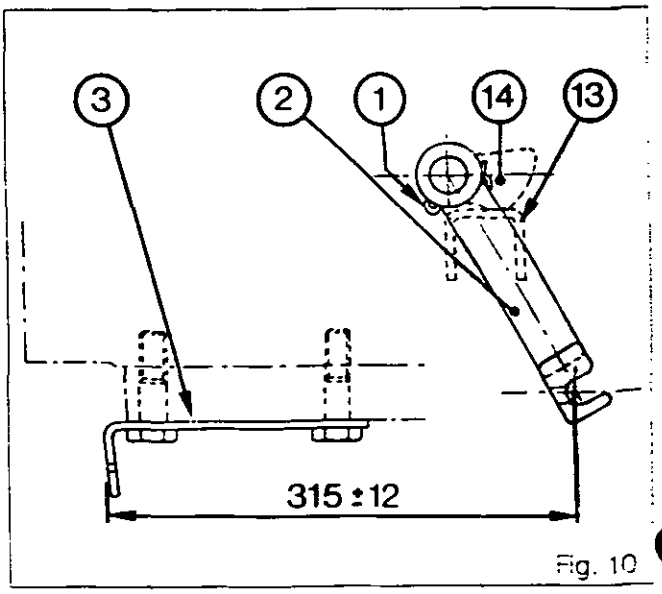


Fig. 10

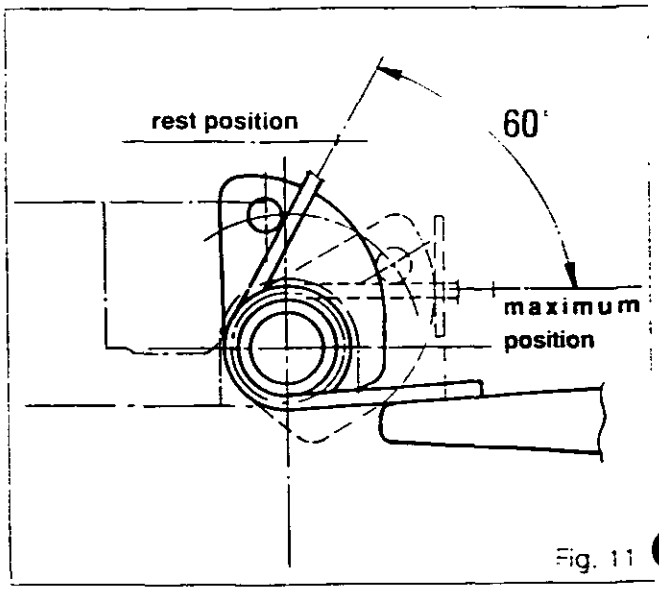


Fig. 11

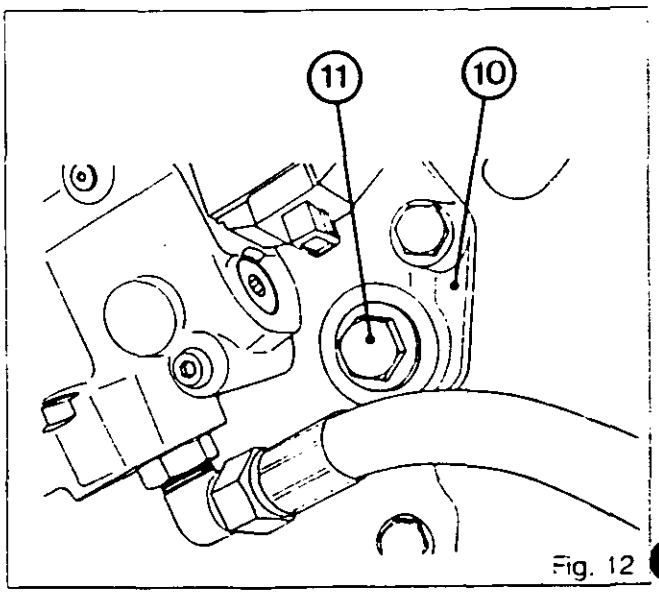


Fig. 12

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65. Top up the oil level of the rear axle housing.
66. Check the operation of the electrical circuits, of the low pressure switch, of the solenoids and of the filter vacuum switch.
67. Check the operation of the lift.
68. Check for leaks at the joint faces, covers and hydraulic connectors.

C. Fitting and adjustment of control

69. Introduce the cable **(1)** from below towards the cab interior and fasten with the clip **(2)** (Fig. 13).
70. Fix the cable end **(7)** on the brake lever **(4)** with the pin **(5)**, the washer **(6)** and the split pin **(3)** (Fig. 13).
Note: Check that the cable is not constrained.
71. Fit the outer cable stop **(2)** in the bracket **(1)** (Fig. 14).
72. Attach the end of the cable **(7)** to the lever **(6)** (Fig. 14).
73. Place the handbrake lever in the released position. Adjust so as to obtain a distance of 315 mm ± 12 between the nut **(5)** and the axis of the end of the cable **(7)** (Fig. 14).
74. Tighten the lock-nut **(3)** on the washer **(4)** (Fig. 14).
Note: For good alignment of the outer cable stop (2) and the cable (7), the nut (5) and the lock-nut (3) are mounted in front of the bracket (1) (Fig. 14).
75. Check the operation of the control.
    - Pull the lever. Initial travel should be approximately 8 notches. The warning light on the instrument panel should come on.
    - Release the lever. The control should revert freely to the rest position and the warning light on the instrument panel should go off.

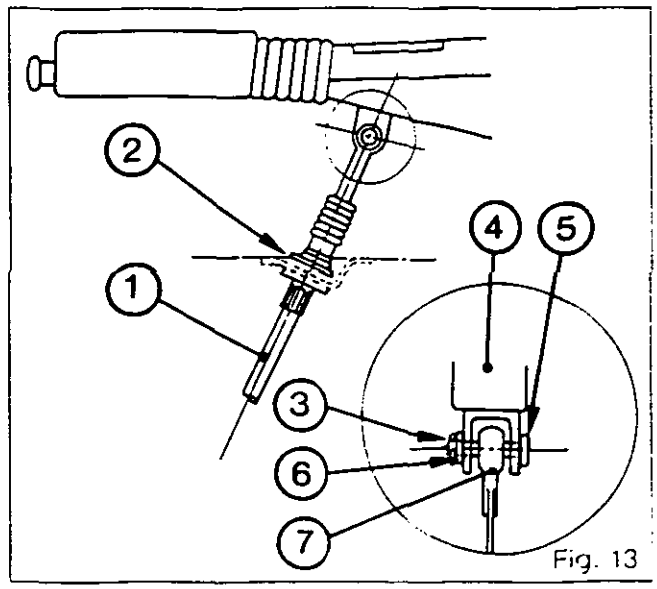


Fig. 13

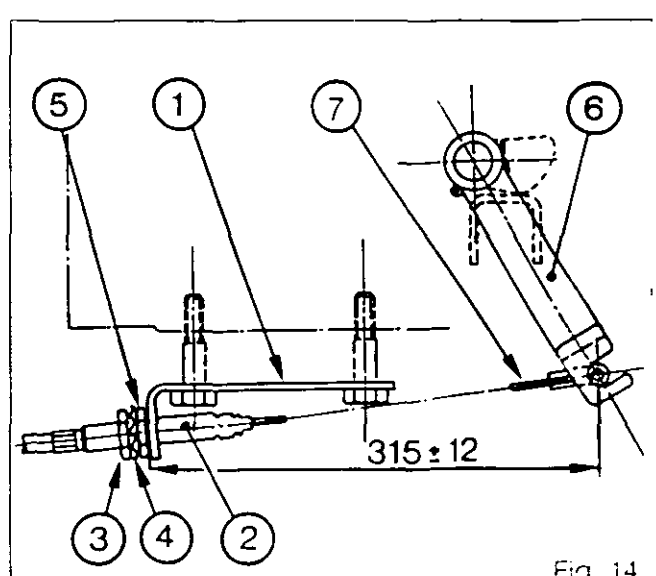


Fig. 14

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6 J01 Differential

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D. **Removal of differential assembly** ____ 7

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6J01.2

Rear Axle - Differential

General

The bevel crownwheel and pinion, whose movement is provided by the output shaft of the gearbox, drives the rear axle through a connecting shaft.
The helical bevel drive pinion is supported on either side by taper roller bearings.
The bearing cones are force-fitted on the pinion, and the rear bearing cup is also force-fitted in the rear axle housing. The front bearing cup moves freely in its bore to enable the shimming of the pinion.
The crownwheel is fixed to the differential housing by rivets. The differential assembly turns on two taper roller bearings supported by two side carriers screwed on to the rear axle housing.
The differential assembly comprises two housing halves containing four planetary pinions and two sun gears.
The pinion is fitted in the rear axle housing with a preload obtained by means of shims placed between the handbrake backing plate and the axle housing.
The shimming of the differential assembly is carried out with deflectors (shims) of different thicknesses placed behind the bearing cup of the left hand cup bearing.

Differential lock

The left hand carrier houses the differential lock mechanism.
The system comprises a piston and a splined sliding coupler rotating with the left sun gear. The piston acts on the sliding coupler when pressure from the 17 bar hydraulic circuit is supplied by the solenoid valve fitted on the right hand cover. The piston moves, pushing the sliding coupler and compressing the spring.
The teeth of the sliding coupler engage with a fixed coupler attached to the differential housing. In this position, the sun gears of the right and the left hand trumpet housings turn at the same speed. When the pressure is released, the coupler moves back towards the rear under the influence of the spring.

Parts list

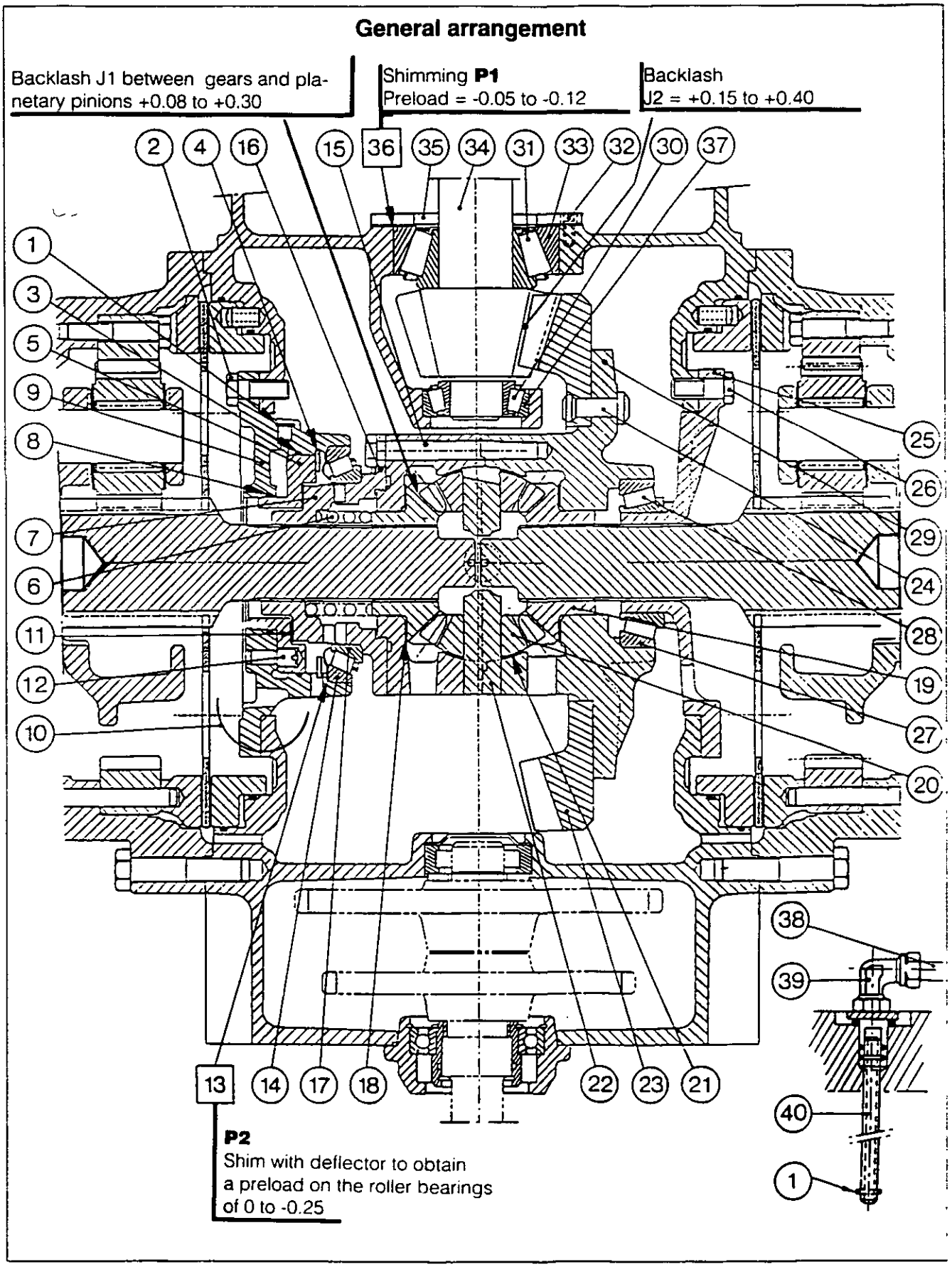
(1) O-ring
(2) Screw
(3) O-ring
(4) Circlip
(5) Piston
(6) Spring
(7) Sliding coupler
(8) O-ring
(9) Left hand carrier
(10) Differential lock hydraulic assembly
(11) Thrust washer
(12) Finger
[13] Deflector (shim)
(14) Bearing cup
(15) Screw
(16) Coupler
(17) Bearing cone
(18) Washer
(19) Sun gear
(20) Planetary pinions
(21) Washer
(22) Cross joint
(23) Crownwheel
(24) Rivet
(25) Right hand carrier
(26) Screw
(27) Bearing cup
(28) Bearing cone
(29) Crownwheel carrier
(30) Bearing cone
(31) Bearing cone
(32) Screw
(33) Bearing cup
(34) Bevel drive pinion
(35) Supporting plate
[36] Shim(s)
(37) Bearing cup
(38) Pipe
(39) Connector
(40) Differential lock supply tube

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Rear Axle - Differential

General arrangement

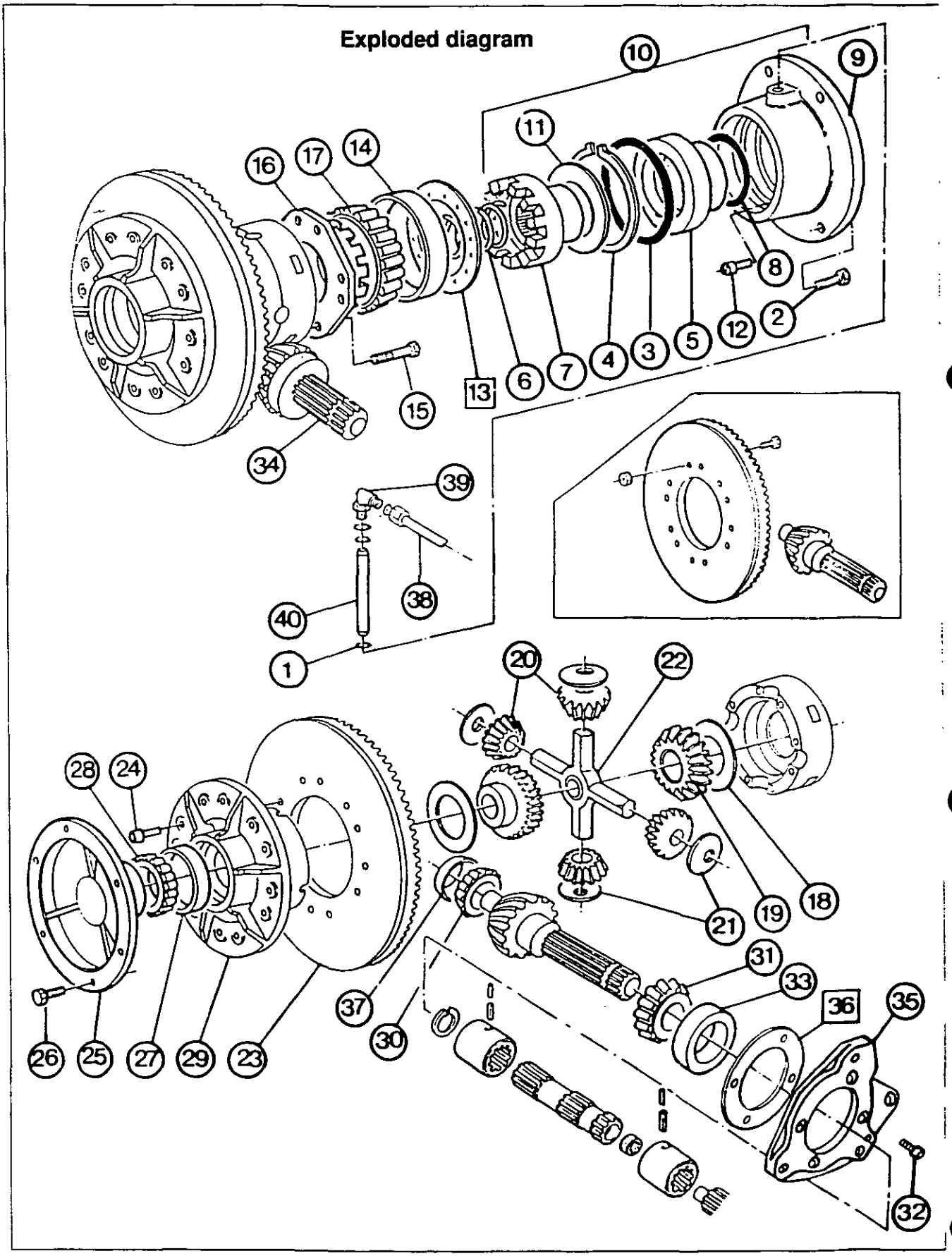


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Rear Axle - Differential

Exploded diagram



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A.Removal of left hand carrier and of differential lock assembly

Note: It is possible to work on the differential lock hydraulic assembly (10) with only the left hand axle housing removed.

1. Remove the left hand axle housing .

3000 tractors

Carry out operations 1 to 17, chapter 6C01.A.

3100 tractors

Carry out operations 1 to 15, chapter 6C02.A.

3000 - 3100 tractors

2. Disconnect the supply tube **(38)**, unscrew the connector **(39)** and withdraw the tube **(40)** (Fig. 1).
   Note: If access to the connector (39) is difficult, on «economy 4-speed p.t.o.» version tractors, remove the control (1) (Fig. 1).
3. Undo the screws **(2)** alternately so as to release the spring **(6)** gradually.
4. Remove the carrier **(9)**, the washer **(11)**, the sliding coupler **(7)** and the spring.

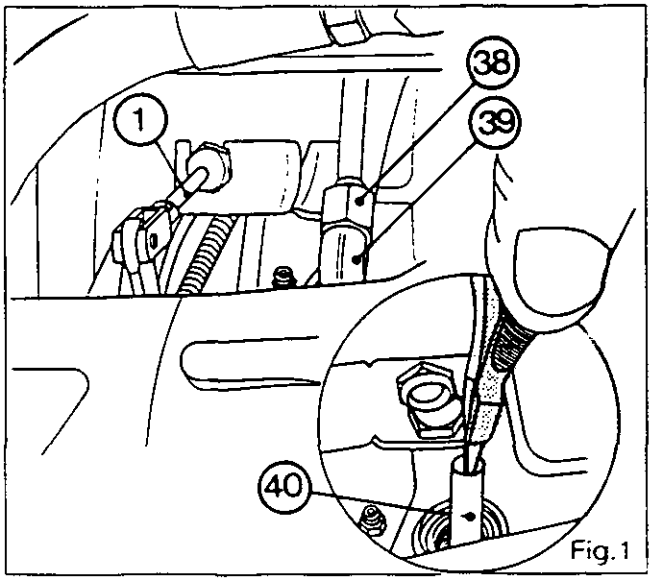


Fig.1

B. Disassembly and reassembly of differential lock

Disassembly

5. Withdraw the bearing cup**(14)** and the deflector **[13]**.
   Note: Mark the direction of mounting of the deflector.
6. Remove the circlip **(4)**.
7. Withdraw the piston **(5)** with the aid of a jet of compressed air (Fig. 2). Exercise caution.
8. Remove the O-rings **(3)**, **(8)** and **(1)**.
9. Unscrew the finger **(12)** (if necessary).

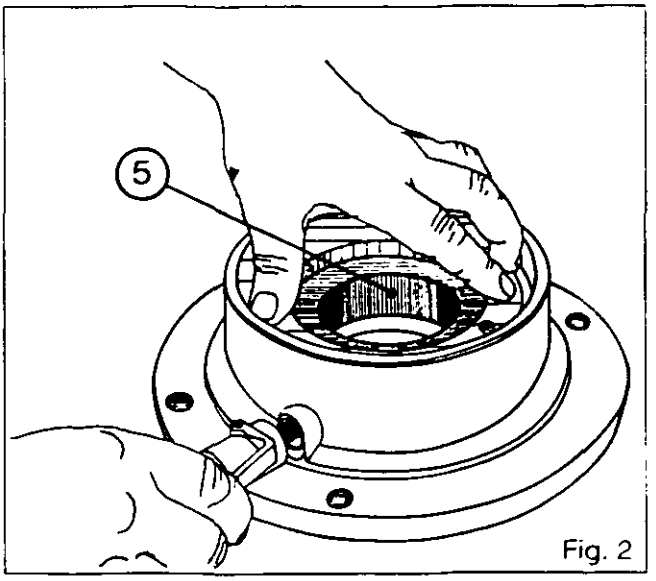


Fig. 2

Reassembly

10. Check the parts and replace any which are defective.
11. Clean the finger **(12)**, smear it with Loctite 221, then fit and tighten it on the carrier **(9)**.
12. Smear the O-rings **(3)** and **(8)** with miscible grease (Amber Technical or equivalent), in order to retain them correctly in the bottom of their respective grooves.
13. Using a plastic mallet, fit the piston **(5)** back in the carrier **(9)** (Fig. 3), paying attention to the position of the finger **(12)**.

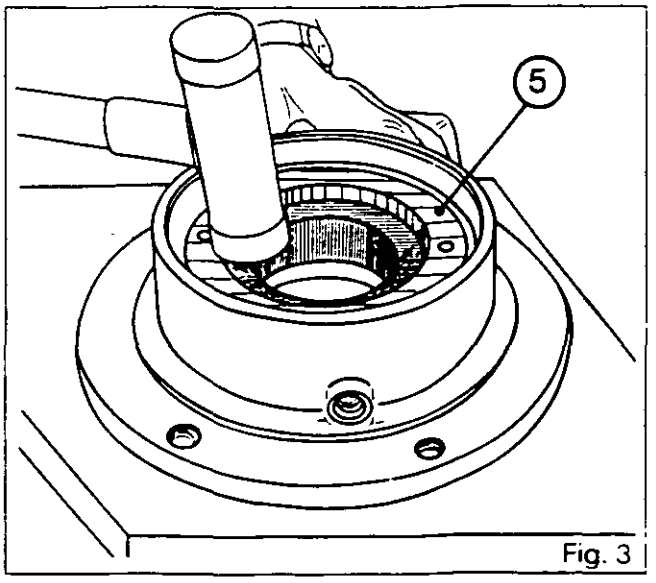


Fig. 3

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14. Fit the circlip **(4)**, the deflector **[13]** ensuring that it is fitted the right way round and the bearing cup **(14)** (Fig. 4).

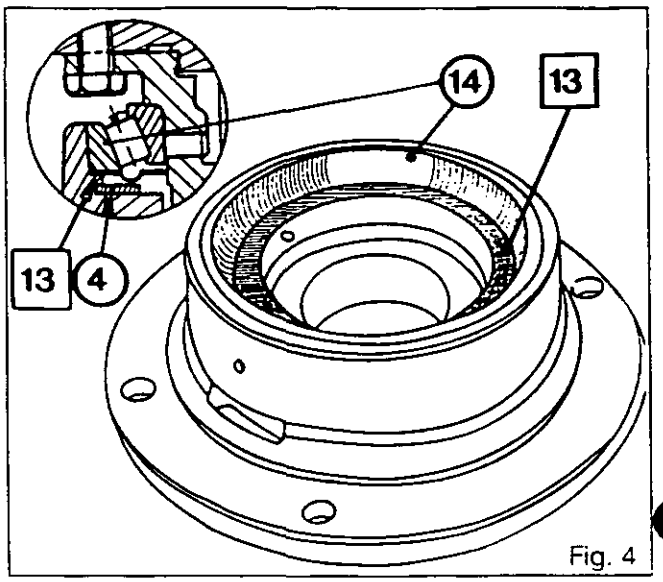


Fig. 4

C. Refitting of left hand carrier and of differential lock assembly

15. Fit the O-ring **(1)**.
16. Screw in two guide studs «G» diagonally opposite on the housing (Fig. 5).
17. Refit the spring **(6)**, the sliding coupler **(7)**, the thrust washer **(11)** and the carrier **(9)**.
Note: Position the feed port of the differential lock towards the top.
18. Fit and tighten two screws **(2)** to a torque of 85 - 130 Nm. Remove the guide studs. Fit and tighten the two other screws to the same torque (Fig. 5).
19. Fit the pipe **(40)** and the connector **(39)** (Fig. 1).

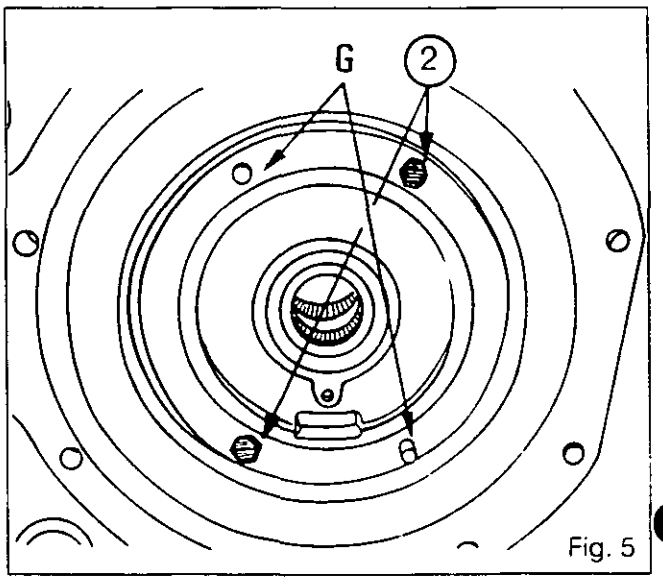


Fig. 5

Leak test

After working on the piston **(5)**, the seals **(3)** and **(8)** and the carrier **(9)**, it is necessary to check the assembly for leaks.

20. Fit a pressure gauge and valve on the supply connector **(39)**(Fig. 6).
21. Feed compressed air at approx. 5 bar into the system to check the correct movement of the piston. Reduce the pressure to 0.3 bar to carry out the leak test.
22. Close the valve. Over 1 minute the pressure gauge should not show any drop in pressure.
23. Disconnect the pressure gauge and connect the supply pipe **(38)** (Fig. 1).
If necessary: Reconnect the «economy 4-speed p.t.o.» control and carry out adjustment. Carry out operations 127 and 132 to 137, chapter 6D01.
24. Reconnect the left hand axle housing.

3000 tractors

Carry out operations 18 to 36, chapter 6C01.A.

3100 tractors

Carry out operations 16 to 33, chapter 6C02.A.

25. Check for leaks of the supply pipe **(38)** (Fig. 1) and the operation of the differential lock.

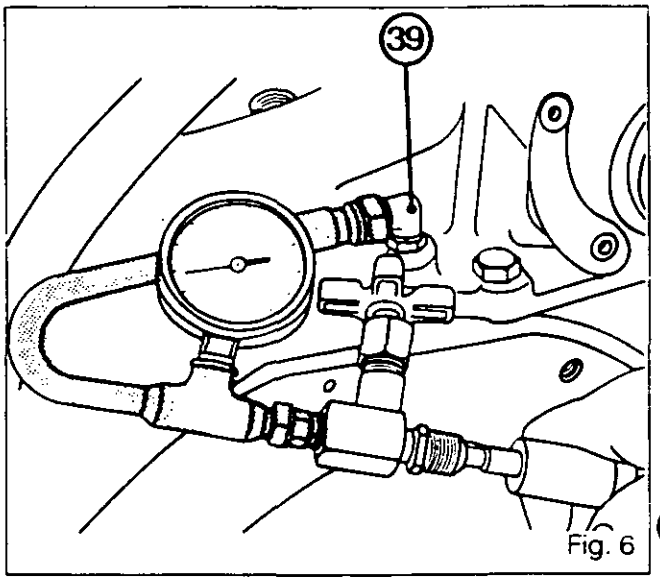


Fig. 6

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D. Removal of differential assembly

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26. Immobilise the tractor. Apply the handbrake. Chock the front wheels and the axle frame (see 3A.02 - Fig. 2).
27. Drain the rear axle only.
28. Lift the rear of the tractor with a trolley jack.
29. Place stands under the rear axle housing.
30. Remove the wheels.
31. Remove the right and left hand axle housing.

    3000 tractors

    Carry out operations 6 to 17, chapter 6C01.A.

    3100 tractors

    Carry out operations 6 to 15, chapter 6C02.A.

    Note: Check the space between the hood and the windscreen. (If the space is too narrow, remove the sheetmetal.)

    On both series of tractor, the cab should be supported on either side with suitable stands in front of the front support of the tank (Fig. 7). On the right hand side, pay attention to the heating pipes. If necessary, unscrew the fastening brackets.

3000 - 3100 tractors

32. Disconnect the fuel supply and return hoses and the harness to the tank gauge.

    Note: Mark the harness connectors.

33. Partly empty the tank. Remove the fueltank and then the tank support.
34. Remove the lift cover. Carry out operations 4 to 11, chapter 6B01.
35. Remove the top link support, the drive pinion and the layshaft.

2-speed p.t.o. tractors

Carry out operations 4 to 7, chapter 6D01.

4-speed p.t.o. tractors

Carry out operations 63 to 68 and 72 to 78, chapter 6D01.

36. Remove the pipe **(40)** (Fig. 8).
37. Support the differential assembly using a hoist and a G clamp (Fig. 9).
38. Slacken the screws **(2)** alternately so as to release the spring **(6)** gradually.
39. Remove the carrier **(9)**, the spring **(6)**, the coupler **(7)** and the washer **(11)**.
40. Remove the screws **(26)**.
41. Remove the cover **(25)**.
42. Withdraw the differential assembly from the housing (Fig. 9).

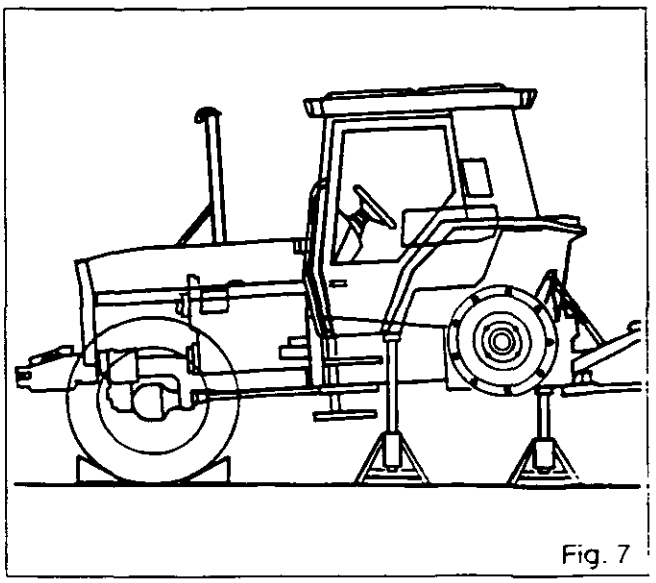


Fig. 7

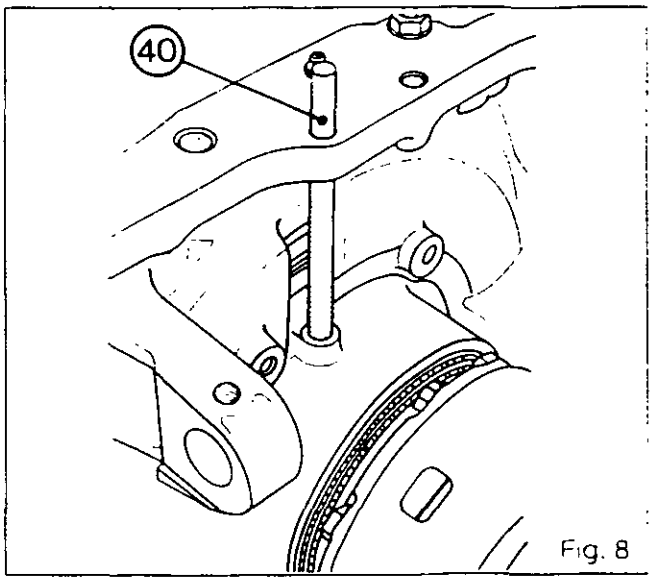


Fig. 8

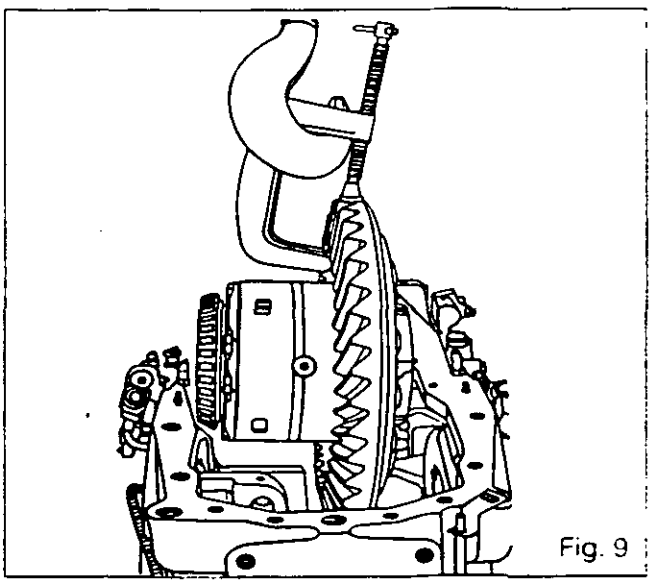


Fig. 9

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E. Disassembly of differential assembly and crownwheel

43. Place the assembly on a workbench.
44. Remove the bearing cones **(17)** - **(28)** and the cup **(27)** (Fig. 10 - 11 - 12).
45. Remove the screws **(15)**.
46. Remove the fixed coupler **(16)**.
47. Separate the two parts of the housing **(29)**.
    Note: These pieces each have the same number. They must be paired.
48. Remove the washers **(18)**, the sun gears **(19)**, the planetary pinions **(20)**, the washers **(21)** and the cross joint **(22)** (Fig. 13).
    Note: When the crownwheel is replaced, the bevel drive pinion must be replaced as well. These pieces each have the same number and must be paired.
    In the factory the crownwheel and the carrier are assembled by means of rivets.
    For the purposes of repair, the rivets are replaced with screws and nuts.

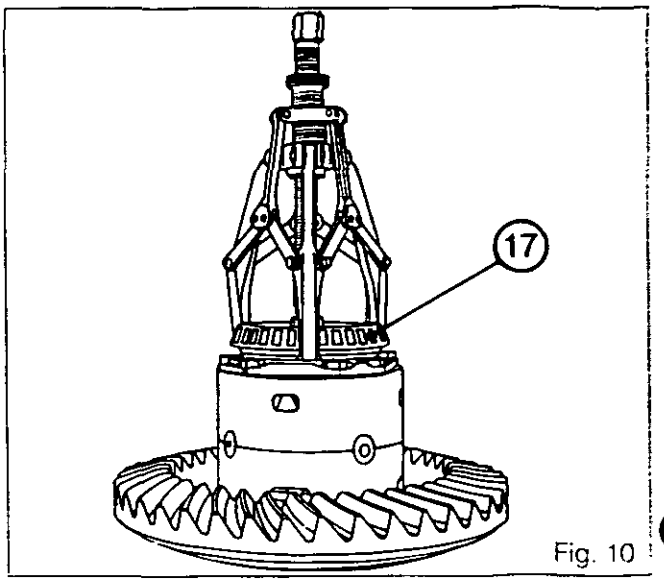


Fig. 10

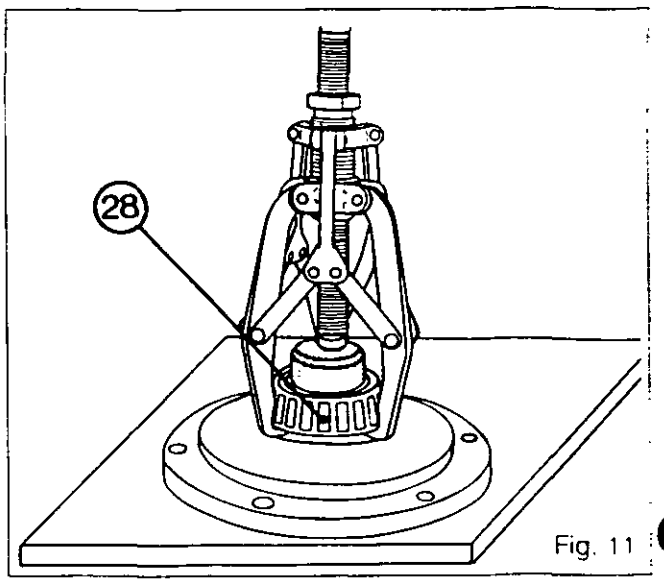


Fig. 11

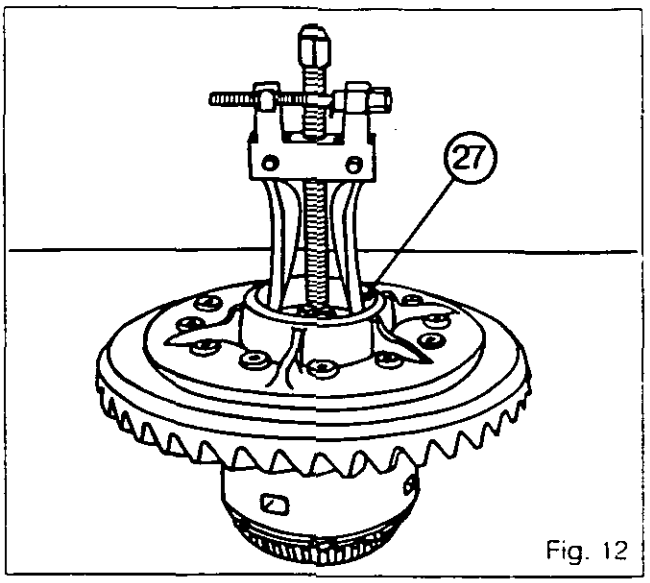


Fig. 12

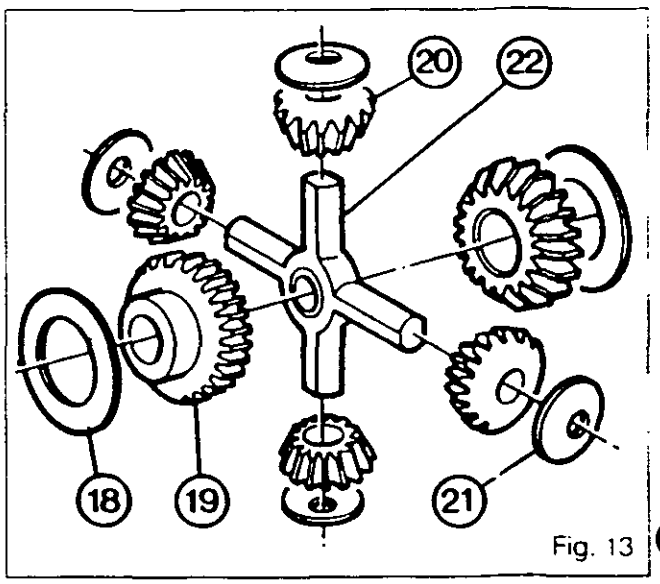


Fig. 13

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Disassembly of the crownwheel (23)

49. Remove the crownwheel from the housing.
50. Make a centre mark in the centre of each rivet **(24)** (crownwheel teeth side).
51. Drill the rivets to a depth of 10 mm with a 5 mm diameter drill (Fig. 14).
52. Drill out to a diameter of 12 mm and to the same depth.
53. *Drive the rivets out with a suitable drift punch* (Fig. 15).

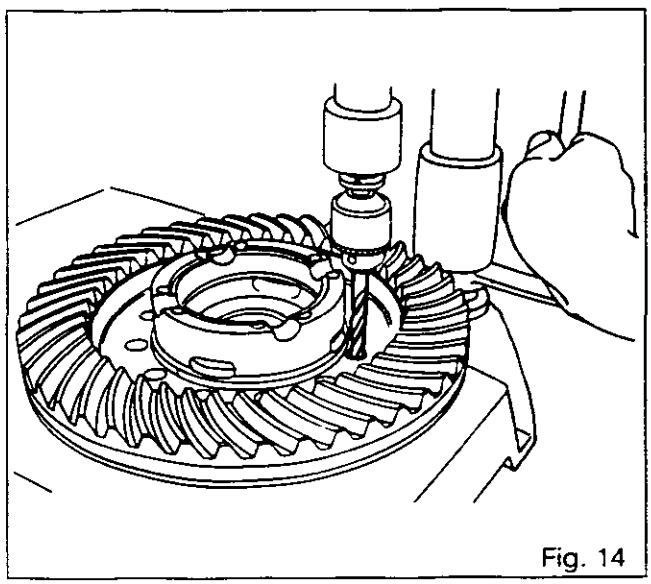


Fig. 14

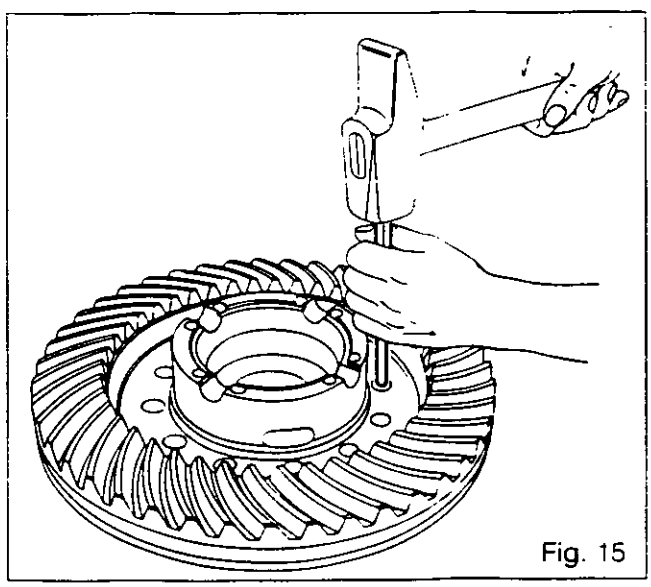


Fig. 15

F. Removal and disassembly of bevel drive pinion

54. Remove the right hydraulic cover. Carry out operations 2 to 14, chapter 8I01.
55. Remove the left hydraulic cover. Carry out operations 3 to 6, chapter 8I02.

Tractors without creeper gears

56. Drive out the double pins **(2)** and **(4)** from the sleeves **(1)** and **(5)**. Slide the sleeves towards one another on the shaft **(3)** (Fig. 16). Remove the shaft and sleeve assembly.

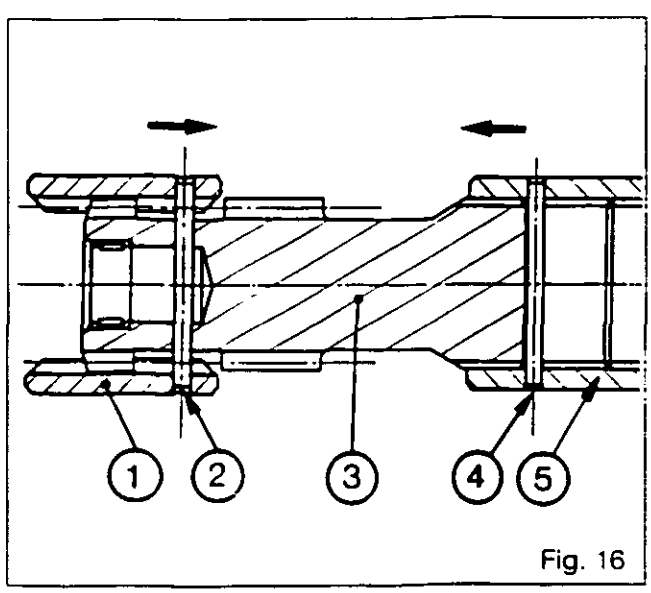


Fig. 16

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On 4WD tractors

If the double pins are not accessible, carry out operations 9 to 12, chapter 5D01.A.

57. Remove the circlip **(1)** and detach the gear **(2)** (if fitted) (Fig. 17).

Tractors with creeper gears

58. Carry out operations 3 to 8, chapter 5D01.A.
59. Carry out operations 13 to 16, chapter 5D01.A.
60. Remove the circlip **(1)** and detach the gear **(2)** (if fitted) (Fig. 17).

Tractors with or without creeper gears

61. Remove the handbrake mechanism assembly. Carry out operations 15 to 25, chapter 6I01.
62. Remove the screws **(32)**, the supporting plate **(35)** and the shims **[36]**.
63. Remove the bearing cup **(33)** and the bevel gear pinion fitted with bearing cones **(30)** and **(31)**.
64. Remove the bearing cup **(37)**.
65. Extract the bearing cones **(30)** and **(31)**.

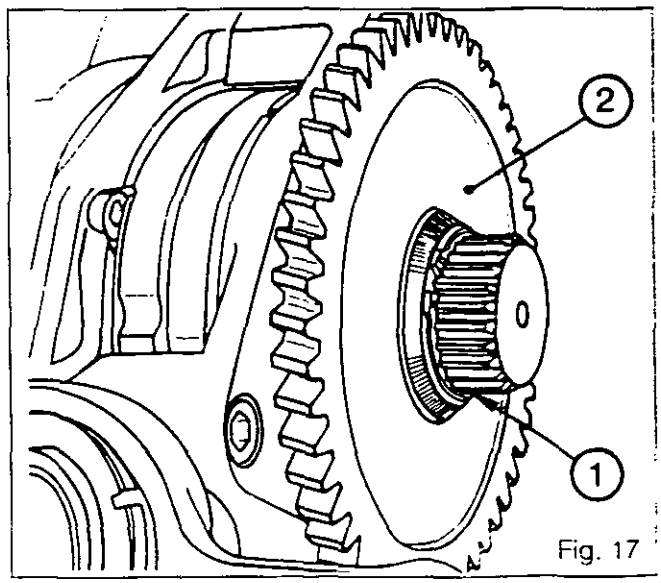


Fig. 17

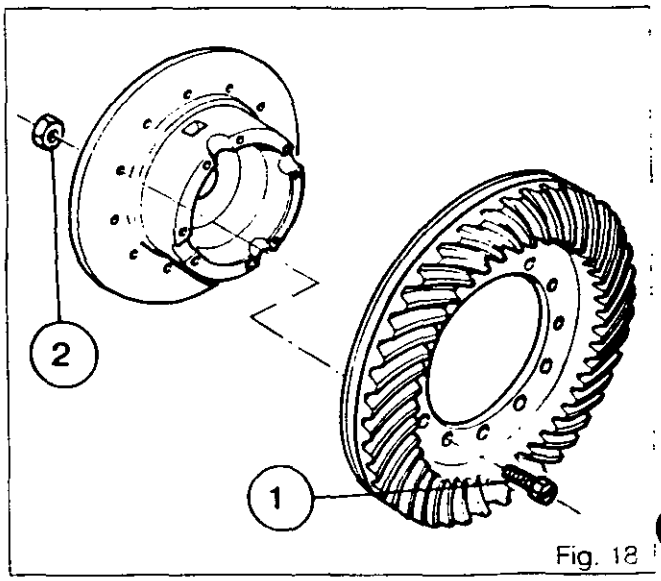


Fig. 18

G. Reassembly of crownwheel and differential assembly

66. Check that the crownwheel and the bevel gear pinion have the same number.
67. Clean the contact faces of the new crownwheel **(23)** and of the carrier **(29)** and the screws and nuts referred to in the spare parts catalogue.
68. Smear the screws **(1)** (Fig. 18) with Loctite 270 on the first threads and place them in the crownwheel and carrier.
69. Tighten and lock the nuts **(2)** (Fig. 18) to a torque of 150 -160 Nm.

Reassembly of differential assembly

70. Check the parts and replace any which are defective.
71. Reverse operations 46 to 48.
72. Smear the screws **(15)** with Loctite 270, then tighten them to a torque of 85 - 130 Nm.

Note: The clearance J1 between the planetary pinions and the bull gears must be between +0.08 and +0.30.

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73. Push the bearing cup **(27)**, the bearing cones **(17)** and **(28)** against the shoulder with the aid of a press and a suitable device (Figs. 19 - 20 – 21).

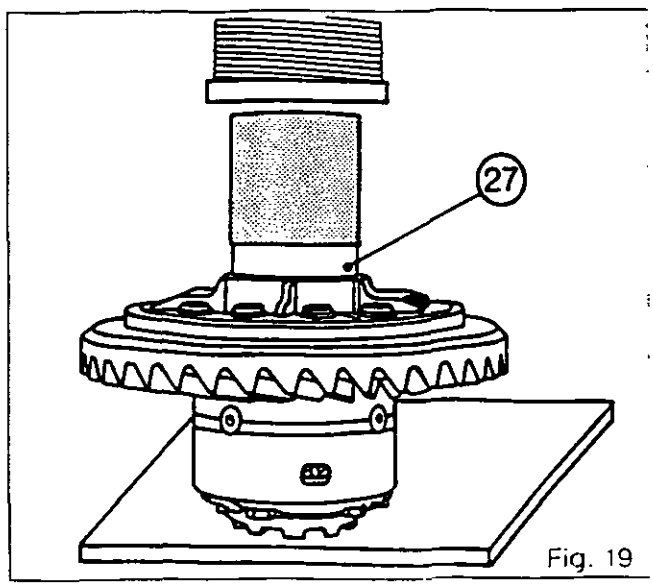


Fig. 19

H. Reassembly and refitting of the bevel drive pinion

Reassembly

74. Check the parts, replace any which are defective.

75. Using a press and a suitable device, push the bearing cones **(31)** and **(30)** against the bevel drive pinion (Figs. 22-23).

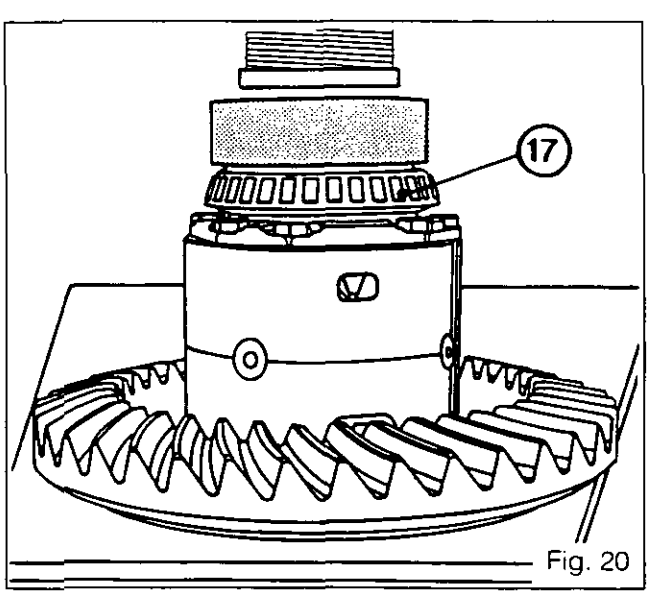


Fig. 20

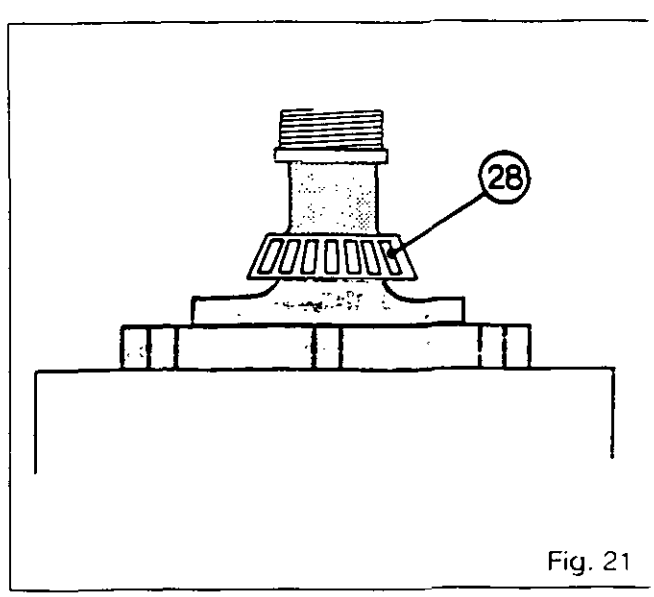


Fig. 21

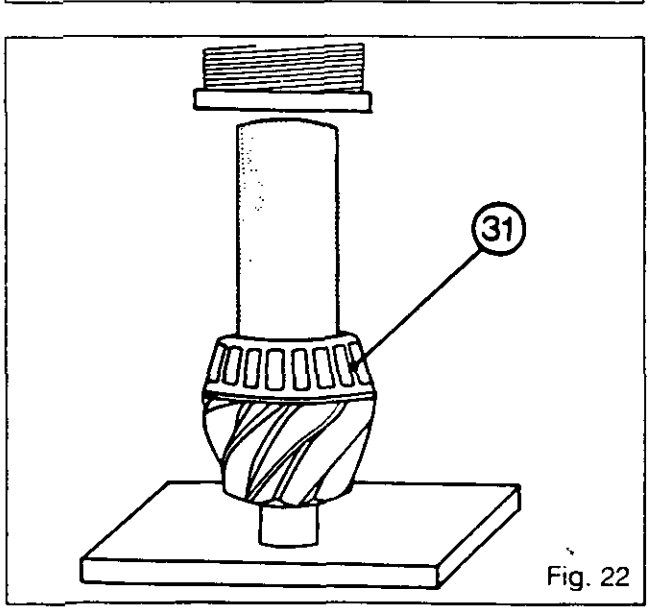


Fig. 22

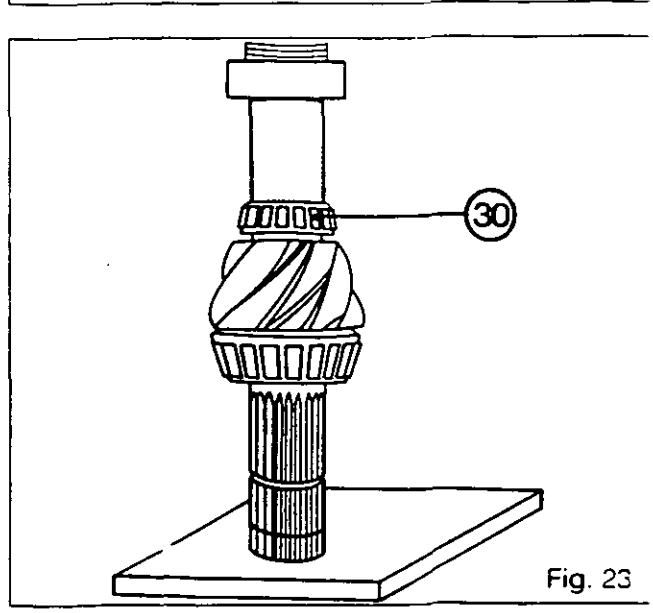


Fig. 23

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Rear Axle - Differential

Refitting

76. Smear the periphery of the cup **(37)** with Loctite 603 and push it against the shoulder in the housing using a suitable tool.
77. Fit the pinion with bearing cones and cup **(33)**.
Note : Ensure the bearing cones and cups are clean and lubricated.

Method 1 for setting pre-load.

78. To determine correct shim thickness, add shims to a greater thickness than "a", i.e. protrusion of cup **(33)** from housing face (Fig. 24) in order to provide some end float.
79. Screw two guide studs in opposite positions into the housing. Fit the shims **[36]** of the thickness determined in operation 78 and the supporting plate **(35)**.
80. Fit the screws **(32)**, remove the guide studs and tighten to a torque of 90 - 120 Nm.
81. Now calculate the shims required to obtain P1 (Fig. 25) as follows.
82. Place the tip of a dial indicator against the drive pinion (Fig. 26).
83. Through the opening for the right hand hydraulic cover, pull on the pinion shaft turning it back and forth to ensure the bearing cones and cups are correctly seated.
84. Now set the dial indicator to zero.
85. Repeat operation 83 while pushing.
86. The correct thickness of shims required is the reading from the dial indicator, plus the pre-load of ***0.05 to 0.12***, subtracted from shim thickness determined in operation 78.
87. Remove two screws **(32)**, screw in two guide studs. Remove the two other screws and the supporting plate **(35)**.
88. Fit the shims **[36]** selected in operation 86 and refit the supporting plate.
89. Fit the screws **(32)** smeared with Loctite 270. Remove the guide studs and tighten to a torque of 90 - 120 Nm.

2nd method (rear axle on a support only)

The principle involves removing or adding shims **[36]** to obtain torque of 0.80 to 2.00 Nm, measured with a rolling torque gauge or spring balance.

Note: Each time the screws (32) are refitted, always tighten to a torque of 90 - 120 Nm.

On the final refitting, smear the screws with Loctite 270 and apply the above – mentioned torque.

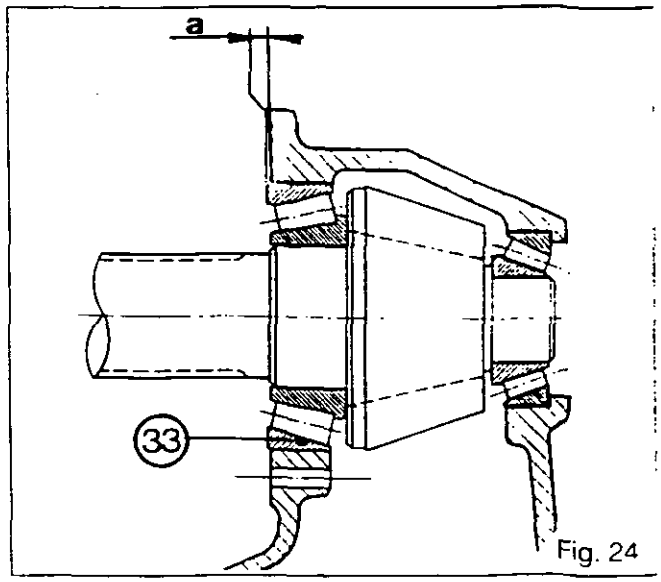


Fig. 24

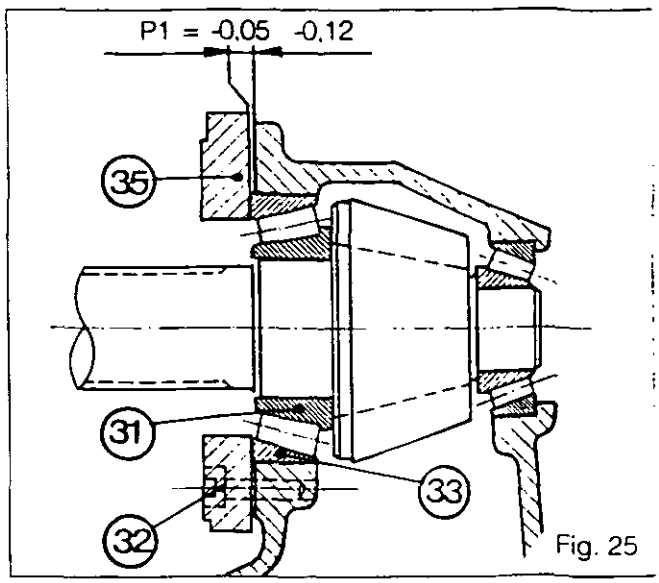
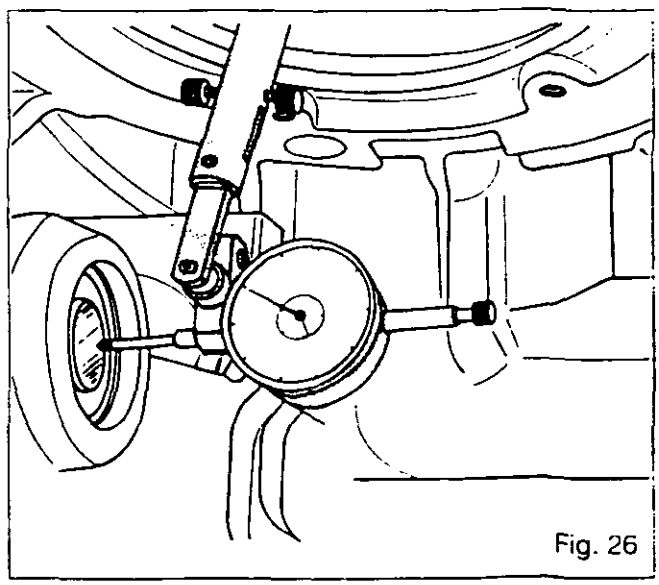


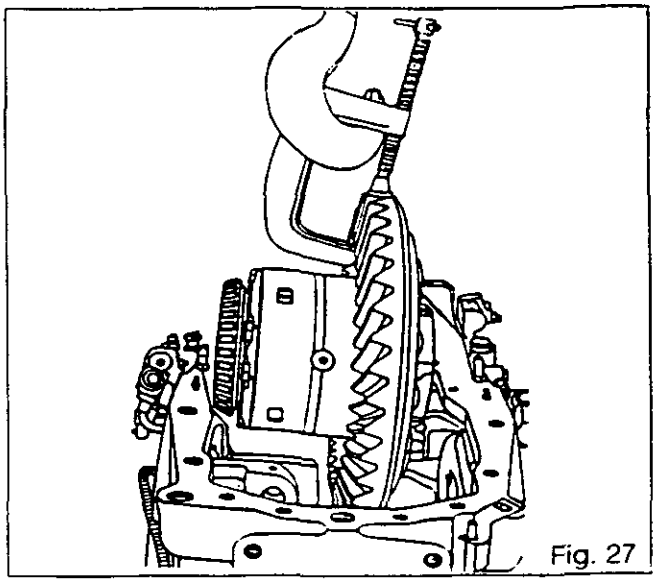
Fig. 25


Fig. 26

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I. Refitting of differential assembly

90. Place the differential assembly in the housing (Fig. 27).
91. Screw in two guide studs in opposite positions and mount the right hand carrier **(25)**.
    Note: Position the oil passage of the carrier downnwards.
92. Fit and tighten two screws to a torque of 85 - 130 Nm. Remove the two guide studs. Fit and tighten the two other screws to the same torque.
93. Remove the cup **(14)** and the deflector **[13]** of the left hand carrier**(9)**. Place the cup on the bearing cone **(17)**.
94. Mount tool 3376847 M91 in the housing using two screws **(2)** tightened to a torque of 85 - 130 Nm (Fig. 28).
95. Tighten the central screw of the tool to a torque of 10 Nm (Fig. 28).
    Note: Turn the crownwheel a few times to "seat" the bearing cones correctly in the cups. Recheck the tightening torque of the central screw of the tool.
96. Fit and tighten calibrated spacers **(A)** (Fig. 28) in the two other holes in the housing.
97. Now determine shims P2 (Fig. 29) to obtain pre-load of : **zero to +0.25**
98. Place a straight edge against the two calibrated spacers.
99. Measure the gap J between the finger of the tool and the straight edge **(B)** with a feeler gauge (Fig. 30).


Fig. 27

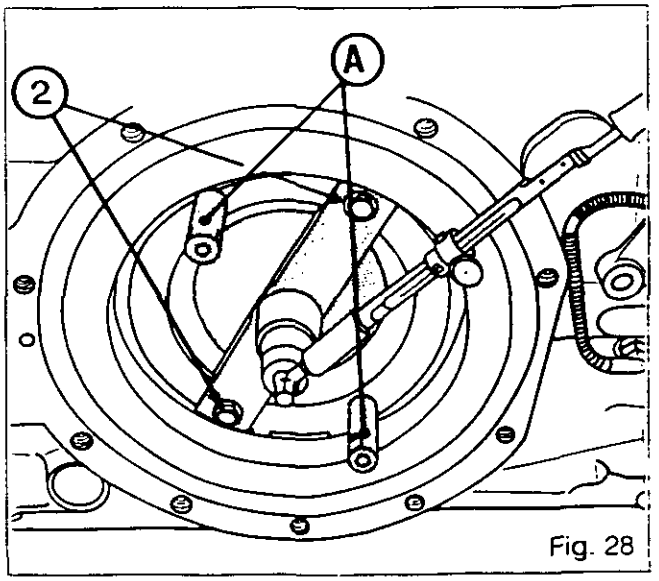


Fig. 28

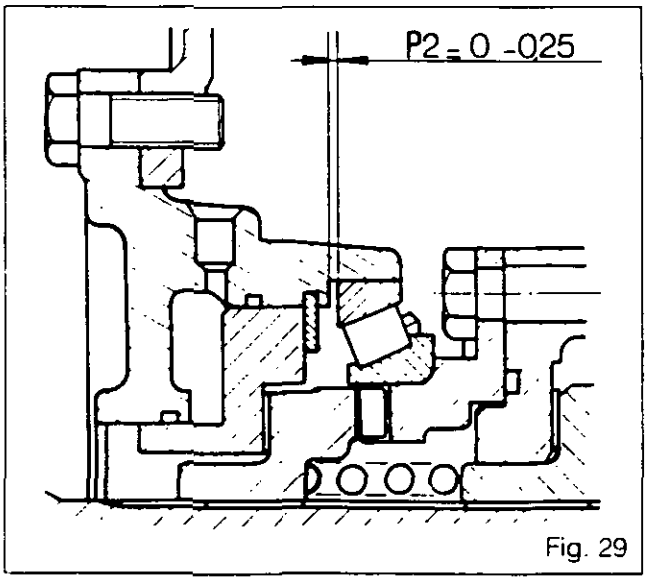


Fig. 29

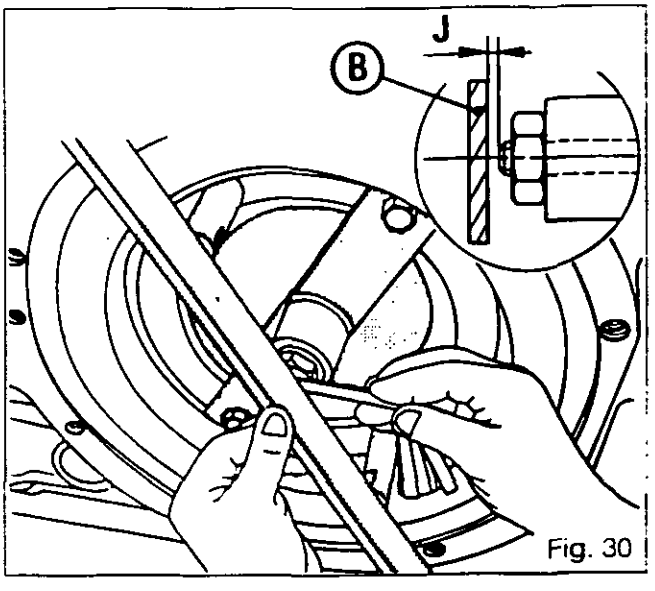


Fig. 30

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100. Calculate the distance C between the cup **(14)** and the contact face of the carrier **(9)** (Fig. 31).
C = (114 + J) - 70
101. On the carrier**(9)**, determine the distance Y with a depth gauge and a straight edge (Fig. 32).
102. Select the correct thickness of the deflector **[13]** (see table) to obtain:
P2 = C-Y
Note: For carrying out shimming P2 there are eight deflectors of different thicknesses. If the determined value P2 is between two tihicknesses deflector, select the thinner of the two.
103. Remove the tool and the cup **(14)**.
104. Place the deflector **[13]** selected in operation 102 and the cup **(14)** in the cover **(9)**.
Note: Ensure that the deflector is mounted the right way round (Fig. 33).
105. Screw in two guide studs in opposite positions.
Assemble : the washer **(11)**, the sliding coupler **(7)** and the spring **(6)** in the carrier **(9)**. Fit the assembly with the feed orifice of the differential lock towards the top.
106. Fit and tighten two screws to a torque of 85 - 130 Nm. Remove the two guide studs. Fit and tighten the two other screws to the same torque.
107. Check the backlash between the crownwheel and bevel drive pinion:
J2 = +0.15 to +0.40

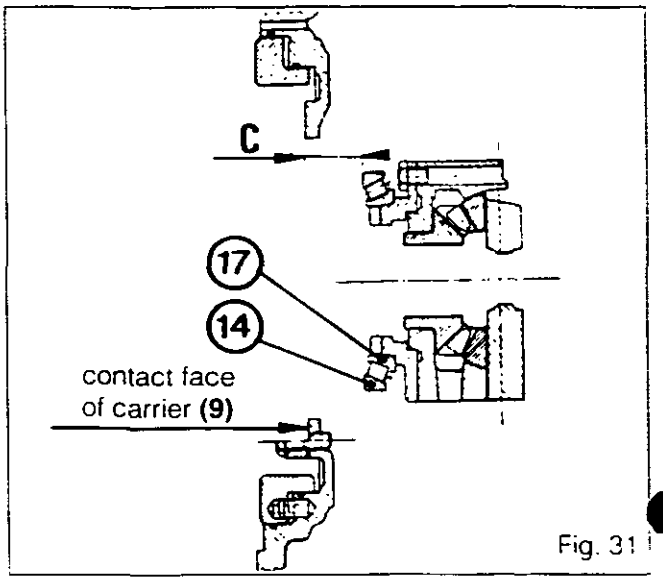


Fig. 31

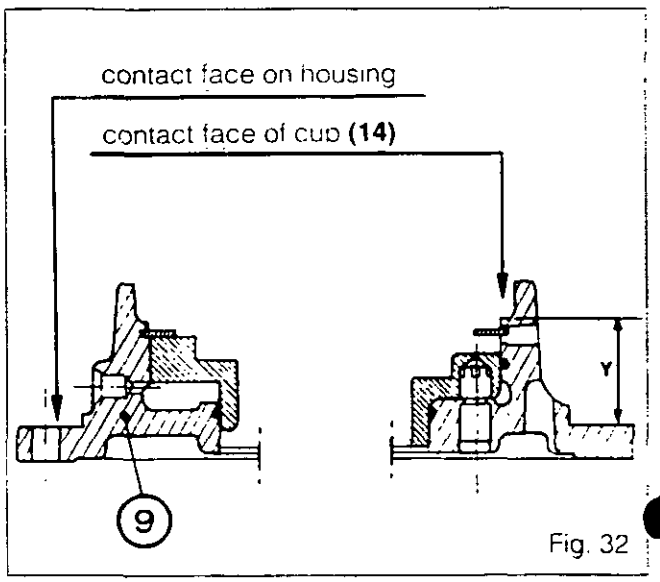


Fig. 32

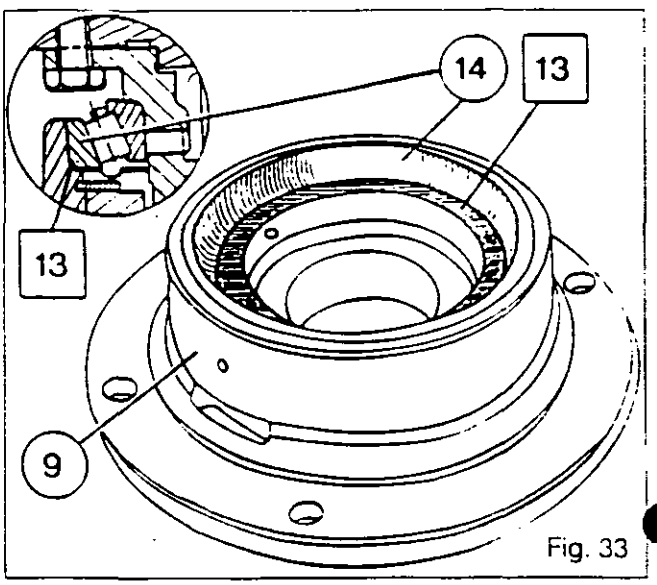
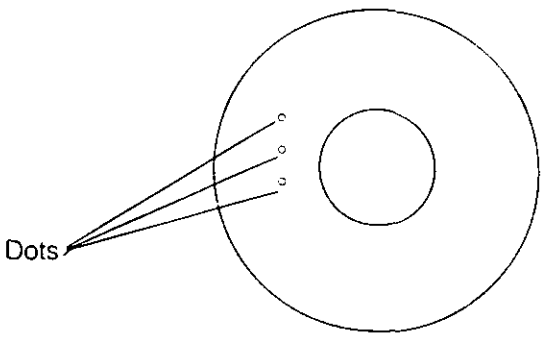


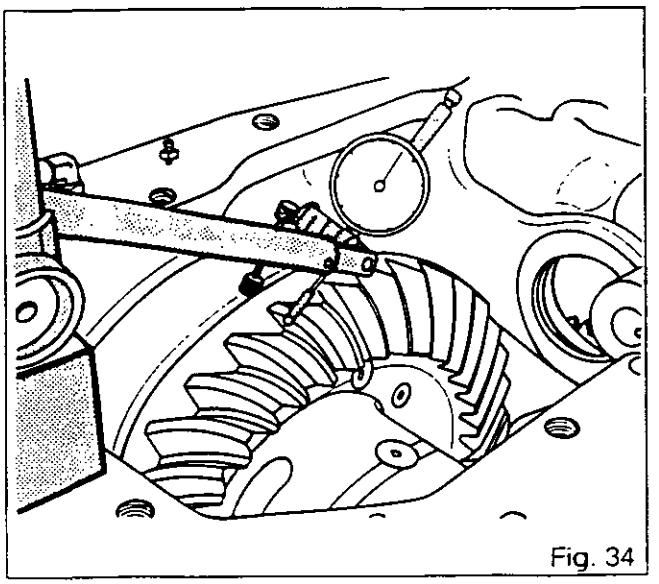
Fig. 33



Reference	Number of dots	mm
187 689 M1	0	0.73 - 0.78
892 173 M1	1	0.864 - 0.914
892 172 M1	2	0.991 - 1.041
892 171 M1	3	1.118 - 1.168
892 170 M1	4	1.245 - 1.295
191 124 M1	5	1.37 - 1.42
191 125 M1	6	1.49 - 1.54
521 401 M1	7	0.61 - 0.66

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108. Place the tip of the dial gauge on a tooth of the crownwheel (Fig. 34).
Note: Carry out this operation at four diametrically opposed points on the crownwheel. Clearance J2 is obtained as a function of the machining tolerances. If this clearance is outside the maximum tolerance, after shimming P2 has been carried out, it is possible to reduce the thickness of the deflector [13]. Place a shim of suitable thickness between the cup (27) and the carrier (29).
109. Check clearance J2 again.


Fig. 34

Refitting of the handbrake mechanism assembly

Note: The plate /5\ is rectangular. It must be positioned horizontally, lengthwise, on the pin(6) in the lever (13) to be correct (Fig. 35).
110. Carry out operations 39 to 47, chapter 6I01.

Tractors with creeper gears

111. Refit the gear **(2)** (if mounted) and the circlip **(1)** (Fig. 36).
112. Refit the fork and the sleeve, connecting shaft and coupler assembly. Carry out operations 22 to 30, chapter 5D01.A.
Reconnect the creeper gears control cable.
If necessary reverse operations 9 to 12, chapter 5 D01.A (4WD).

Tractors without creeper gears

113. Refit the gear **(2)** (if mounted) and the circlip **(1)** (Fig. 36).
114. Refit the sleeve, connecting shaft and coupler assembly. Carry out operations 44 and 45, chapter 6F01. If necessary reverse operations 9 to 12, chapter 5 D01.A (4WD).

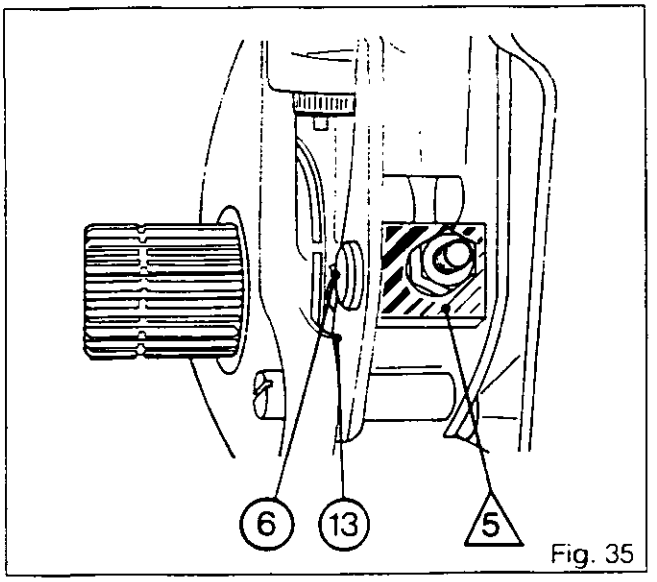


Fig. 35

Tractors with or without creeper gears

115. Refit the left hand cover. Carry out operations 7 to 11, chapter 8I02.
Mount the handbrake control support, the G.S. PTO support (if fitted), remove the guide studs, fit and tighten the screws to a torque of 72 - 96 Nm.
116. Position the control rod and adjust the handbrake mechanism.
Carry out operations 55 to 57, chapter 6I01.

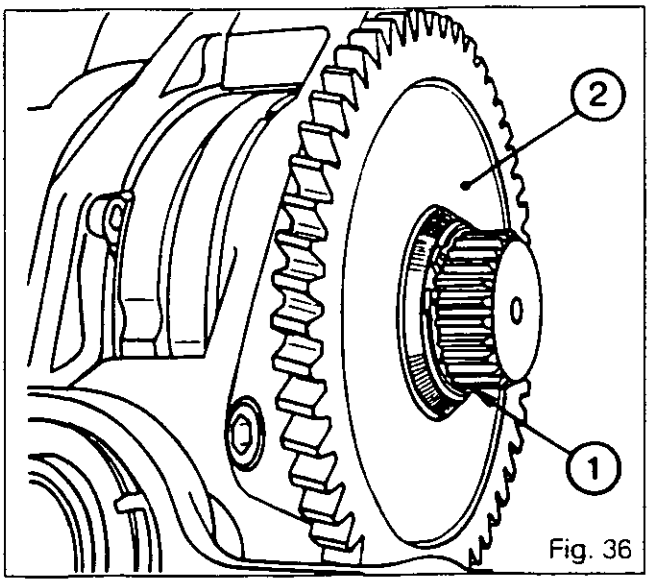


Fig. 36

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117. Reconnect the G.S. PTO control (if fitted), the supply hose of the lift valve, the supply pipe of the rams and the lift and lowering valves (yellow connector). Clip the wire assembly to the valve supply hose.
118. Refit the right hand hydraulic cover.
Carry out operations 15 to 27, chapter 8I01.
119. Refit the layshaft, the driving pinion and the top link support.

Tractors with 2-speed p.t.o.
Carry out operations 8 to 13, chapter 6D01.

Tractors with 4-speed p.t.o.
Carry out operations 79 to 82 and 85 to 92, chapter 6D01.
120. Refit the lift cover.
Carry out operations 53 to 57 and reverse operation 7, chapter 6B01.
Fix the harnesses with a clip.
121. Refit the fueltank.
Reconnect the fuel supply and return hoses and the harness of the tank gauge (connect as marked upon disassembly).
122. Refit the right hand and left hand trumpet housings.

3000 tractors
Carry out operations 18 to 31, chapter 6C01.A.

3100 tractors
Carry out operations 16 to 27, chapter 6C02.A.
Refit the stabiliser support.

3000 - 3100 tractors
123. Refill with fuel.
124. Refit the support with the auxiliary spool valves.
Carry out operations 65 to 69, chapter 6B01.
125. Check the adjustment of the controls:
Ground speed PTO : carry out operations 114 to 120, chapter 6F01.
Handbrake: Carry out operations 71 to 75, chapter 6I01.
Shiftable PTO : Carry out operations 47 and 52 to 58, chapter 6E02.
Economy 4-speed: Carry out operations 127 and 132 to 137, chapter 6D01.
Creeper gears: Carry out operations 24 and 29 to 34, chapter 5J01.
126. Raise the rear of the tractor with a trolley jack. Refit the wheels. Remove the stands under the rear axle. Tighten the wheel nuts to a torque of 400 - 450 Nm.
127. Top up the oil in the housing and remove the chocks. Refit the sheetmetal (if removed).
128. Start the engine. Carry out a road test. Check the operation of the controls and of the electrical circuits.
129. Check for leaks of the joint faces of the trumpet housings on the centre housing, of the covers and of the hydraulic connectors.

J. Service tool

Shimming tool 3376847 M91, available from the M.F. network.

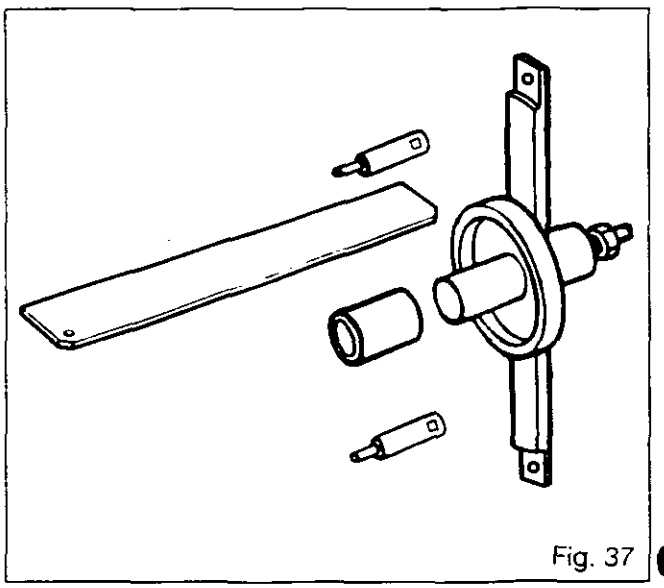


Fig. 37

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6 K01 Brake pistons and seals

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6K01.2

Rear Axle - Brake pistons and seals

General

The brake pistons are housed in two lateral cavities of the rear axle housing, concentric with the supporting face of each trumpet housing (see 5 A01, page 5). They comprise a shouldered part and are guided by 3 dowels force-fitted in the housing. Sealing is provided by 2 O-rings mounted in grooves of the rear axle housing. Each piston is controlled by a master cylinder supplied by a residual oil flow coming from the 17 bar valve. Each piston acts directly on a friction disc mounted on the planetary shaft at the entrance of the trumpet housing and a backplate centred by dowels and supported on the ring gear of the final drive unit. When the brake is released, there is minimal clearance between the piston and the disk. The brakes are self-adjusting and pedal travel remains constant. The discs are constantly lubricated by oil from the rear axle; the film of oil is maintained on the braking surfaces when they are not in use and cools the brakes when they are used.

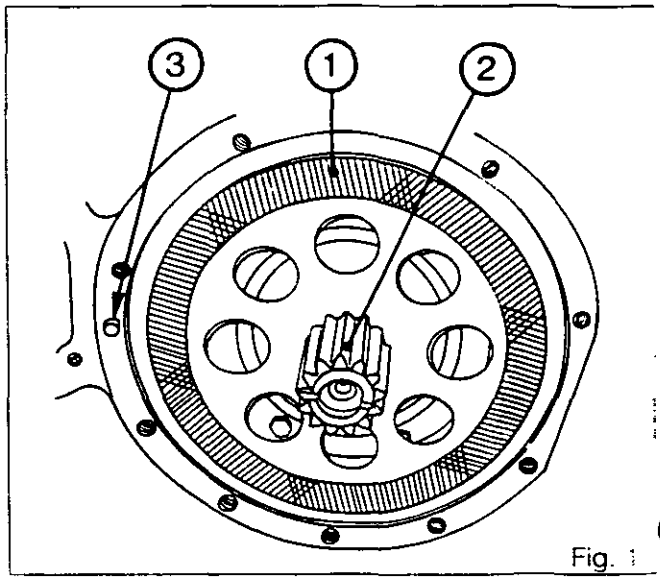


Fig. 1

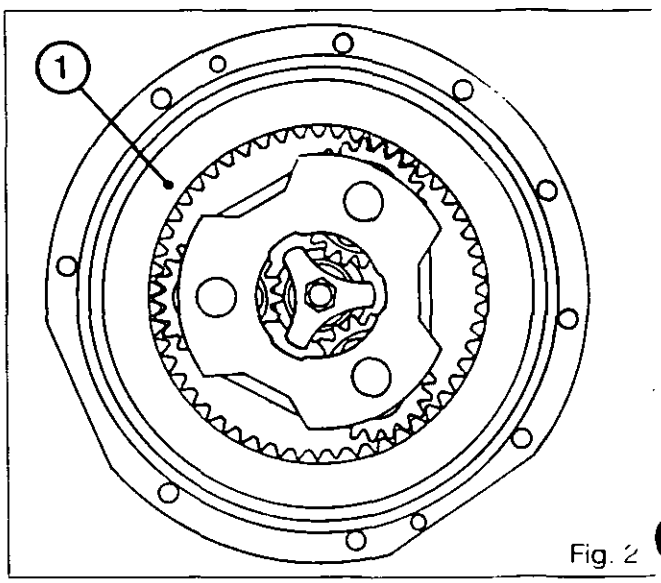


Fig. 2

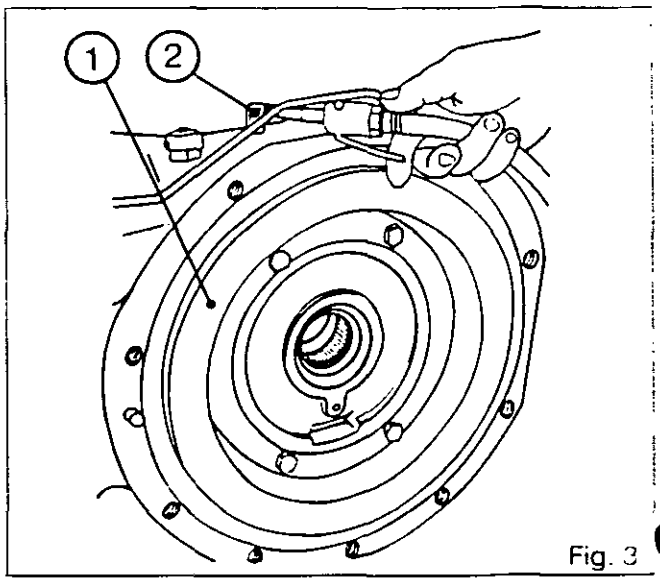


Fig. 3

A. Disassembly

3000 Tractors

1. Remove the trumpet housing. Carry out operations 1 to 15, chapter 6 C01.A.

3100 Tractors

2. Remove the trumpet housing. Carry out operations 1 to 13, chapter 6 C02.A.

3000 - 3100 Tractors

3. Remove the disc **(1)**, the planetary shaft **(2)**, the dowel **(3)** (Fig. 1).
4. Remove the backplate **(1)** (trumpet housing interior) (Fig. 2).
5. Withdraw the piston **(1)** from the housing with a jet of compressed air applied to the connector **(2)** (Fig. 3).
   Note: To facilitate access to the connector (2), if necessary, disconnect the economy 4-speed p.t.o. control and rotate the connector.

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6. Remove the O-rings **(1)** and **(2)** on the centre housing and discard them.

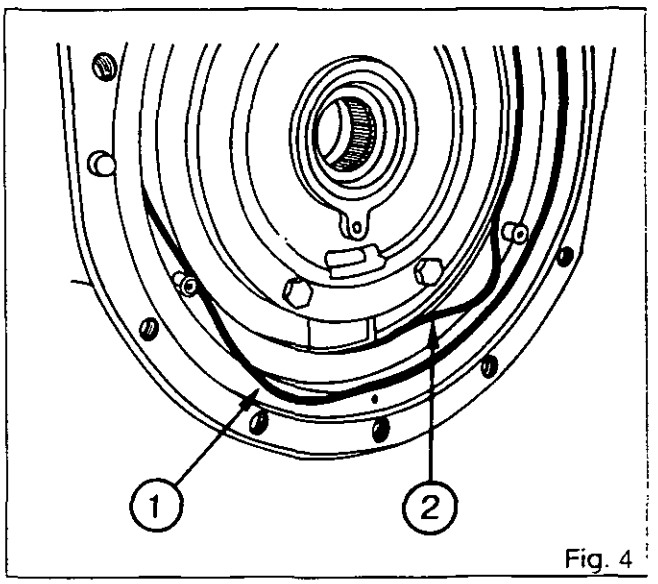


Fig. 4

B. Reassembly

3000 - 3100 Tractors

7. Clean and check the parts. Replace any which are defective.
8. Fit the piston **(1)** without seals in the housing **(2)** (Fig. 5).
   Note: Check that the piston slides freely in the bore of the housing and over the dowels (3) without binding (Fig. 5).
9. Fit new O-rings **(1)** and **(2)** (Fig. 6).
   Note: Lightly smear the seals with miscible grease («Amber technical» or equivalent) in order to keep them correctly at the bottom of the groove.

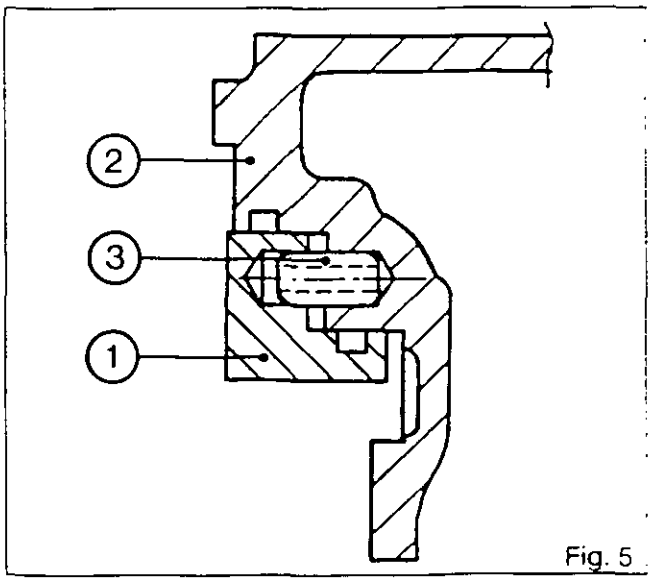


Fig. 5

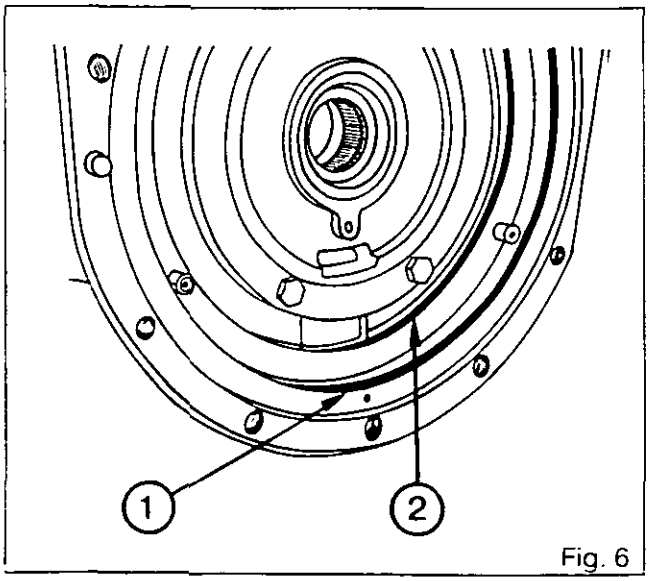
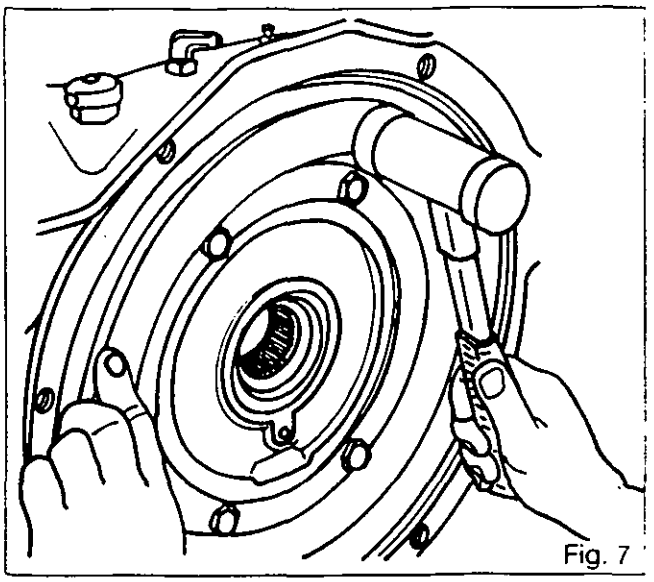


Fig. 6


Fig. 7

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10. Position the piston over the dowels, then fit it in to place with the aid of a plastic mallet, striking alternate points around the circumference (Fig. 7).
11. Hold the piston with two large washers and two screws diametrically opposed (Fig. 8).

Leak test (operations 12 to 15, Fig. 8).

If work is carried out on the brake piston and O-rings, it is necessary to check for leaks.

12. Fit a pressure gauge to the connector **(2)**.
13. Supply the circuit with compressed air at approx. 5 bar, so as to ensure operation of the piston. Reduce the pressure to 0.3 bar to carry out the test.
14. Close the pressure reducing valve. For 1 min, no reduction in pressure should be indicated at the pressure gauge.
15. Disconnect the pressure gauge. Remove the screws and the holding washers. Reconnect the brake hose.

3000 Tractors

Refitting the trumpet housing

16. Refit the trumpet housing. Carry out operations 18 and 19, chapter 6 C01.A.
17. Refit the planetary shaft **(2)**, the disc **(1)** and the dowel **(3)** (Fig. 1).
    Note: Check that the disc slides freely on the planetary shaft.
18. Carry out operations 22 to 34, chapter 6 C01.A.

3100 Tractors

Refitting the trumpet housing

19. Refit the trumpet housing. Carry out operations 16 and 17, chapter 6 C02.A.
20. Refit the planetary shaft **(2)**, the disc **(1)** and the dowel **(3)** (Fig. 1).
    Note: Check that the disc slides freely on the planetary shaft.
21. Carry out operations 20 to 31, chapter 6 C02.A

3000 - 3100 Tractors

22. Bleed the main braking circuit and the trailer braking circuit (if fitted), see C and D.
23. Test:
    - lifting
    - braking on the road
24. Check for leaks
    - between the trumpet housing and the rear axle housing
    - at the lift valve supply hose (left hand trumpet housing)

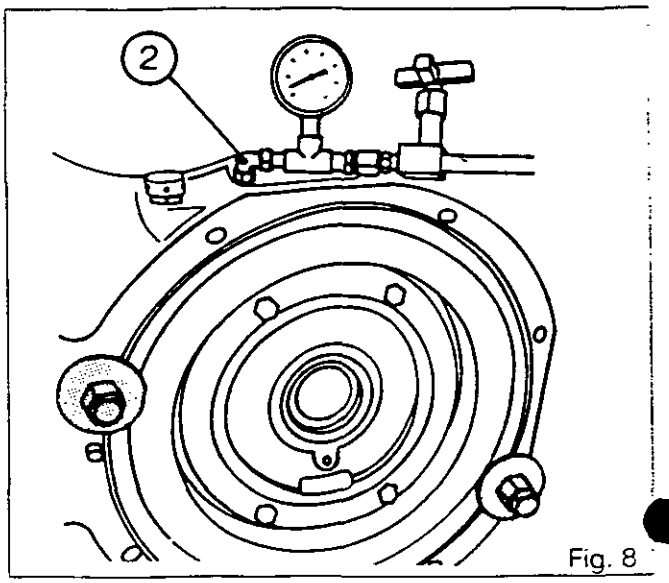


Fig. 8

C. Bleeding of main braking circuit

25. To each vent screw **(1)** on the left and right hand of the rear axle housing attach a transparent hose (int. dia. 6 mm) (Fig. 9).
26. Immerse the ends of the two hoses in a container partially filled with transmission oil (Fig. 9).
27. Run the engine at approx. 1200 rpm. Using suitably protected pliers or clamp stop up the return hose **(1)** (Fig 11).
28. Open the right vent screw. Check that there are no leaks between the pipe and the vent screw.
29. Unlock the brake pedals.
30. **Gently** depress the right pedal through its entire travel and release it in the same way. Repeat the operation several times until the oil flows without air bubbles.
31. Close the vent screw and remove the pliers .
32. Open the left vent screw. Check that there are no leaks between the pipe and the vent screw.
33. **Gently** depress the left pedal through its entire travel and release it in the same way. Repeat the operation several times until the oil flows without air bubbles.
34. Close the vent screw and remove the pliers.
35. Activate each pedal several times in order to position the brake pistons.
36. Check the hardness of action of each pedal.
    Note: If a problem of functioning should appear, carry out bleeding a second time.
    If the problem persists, check for leaks:
    - from the circuit
    - at the master cylinders
    - at the piston seals.

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D. Bleeding of trailer braking circuit

Note: It is imperative to bleed the main braking circuit before bleeding the trailer braking circuit.

37. To the vent screw of the pilot head of the trailer brake valve attach a transparent hose (int. dia. 4 mm) (Fig. 10).
38. Immerse the end of the hose in a container partially filled with transmission oil (Fig. 10).
39. Run the engine at approx. 1200 rpm. Using suitably protected pliers stop up the return hose **(1)** (Fig 11).
40. Open the vent screw. Check that there are no leaks between the pipe and the vent screw.
41. **Gently** depress the twin pedals. Repeat the operation several times until the oil flows without air bubbles.
42. Close the vent screw and remove the pliers.
43. *Connect a pressure gauge to the trailer brake connector (Fig. 12).*
44. Run the engine at approx. 2000 rpm.
45. **Gradually** depress the twin brake pedals.
46. The pressure obtained should be between 130 and 150 bar maximum.

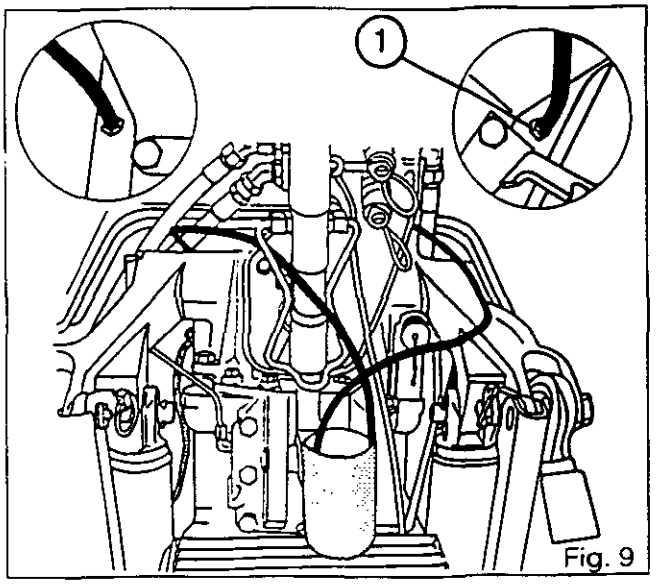
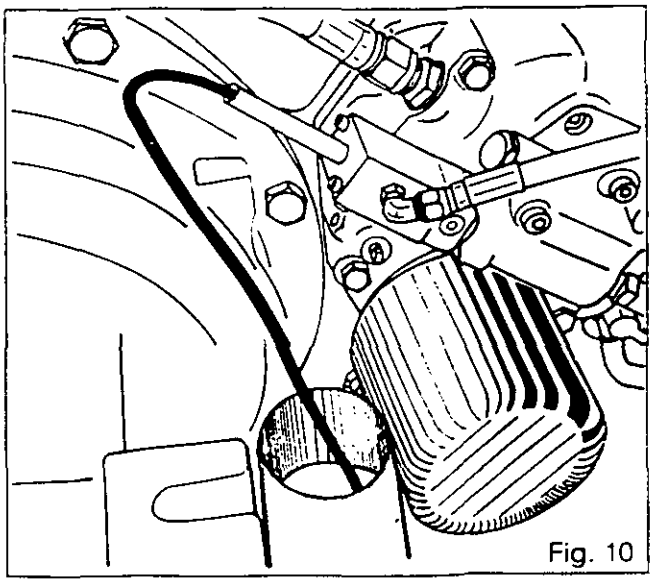


Fig. 9


Fig. 10

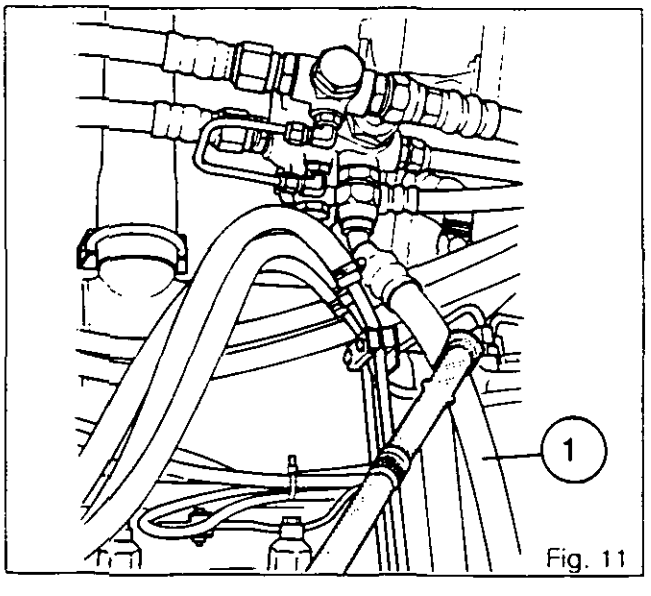


Fig. 11

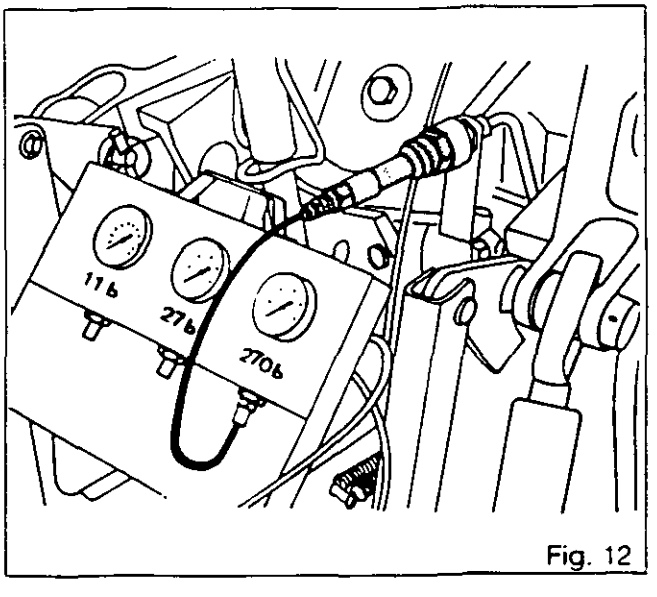


Fig. 12

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6 M01 Automatic hitch

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A. Adjustment of automatic hook control ____ 2

B. Adjustment of automatic hook ____ 3

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Rear Axle - Automatic hitch

A. Adjustment of automatic hitch control

Note: Operations 2 to 5 must be carried out when replacing the control cable.

1. Set the lever "U" to the «locked» position (Fig. 1).
2. Turn the clevis **(1)** until it meets the end of the threaded part of the cable **(7)**.
3. Attach the clevis **(1)** to the lever "U" with the clip **(2)**. Tighten the nut **(3)**.
4. Adjust the outer cable stop **(6)**, with the nut **(4)** reaching the end of the threaded part.
5. Tighten the nut **(5)**.
   Note: Check that the cable is not constrained.
6. Screw the clevis **(2)** until it reaches the threaded part of the cable **(4)** (Fig. 2).
7. Fit the clevis **(2)** to the lever "V" with the clip **(1)**.
   Note: Make sure that the lever "V" is in the locked position.
8. Tighten the nut **(3)**.
9. Fit the outer cable stop **(7)** in the support **(8)**, then tighten the nut **(6)** in such a way that the cable **(4)** is not subject to any constraint or any play.
10. Tighten the nut **(5)**.

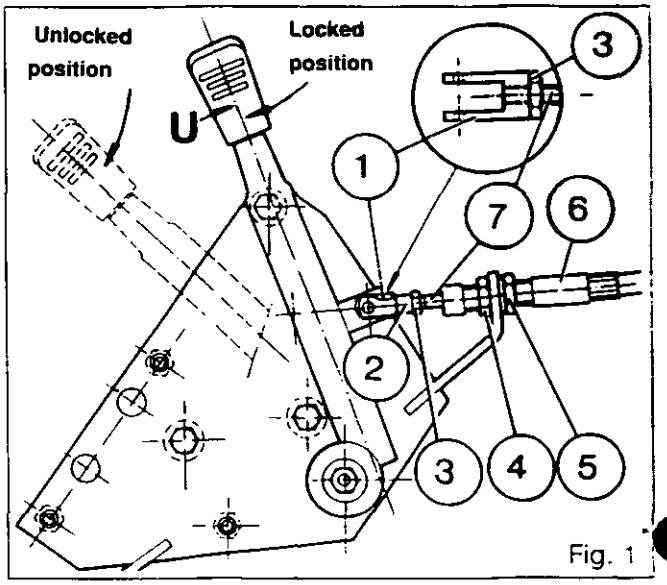


Fig. 1

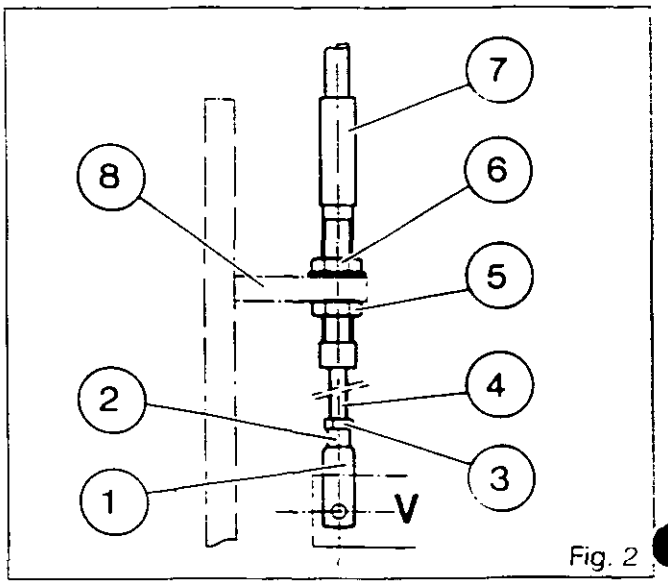


Fig. 2

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B. Adjustment of automatic hitch

11. Start the engine.
12. Press on the internal or external lift control button so that the lift system is in the continuous pumping position.
13. Raise the lower part of the hook with the aid of a trolley jack (Fig. 3).
14. Having ensured that the upper parts of the lift rods are fixed, adjust the length of the rods by turning the lower rod **(4)** so that it is able to engage the clevis **(3)** on the hook pin **(1)**, leaving a play of between 0 and 1 mm.
15. Fit the split pins **(2)**.
16. Activate the internal hitch control button inside the cab and check that there is play of 10.5 mm ±1.5 between the latch **(1)** and the locking pin **(2)** (Fig. 4).
17. Remove the trolley jack.
18. Check the operation of the hook.
19. Fit the protection plate.

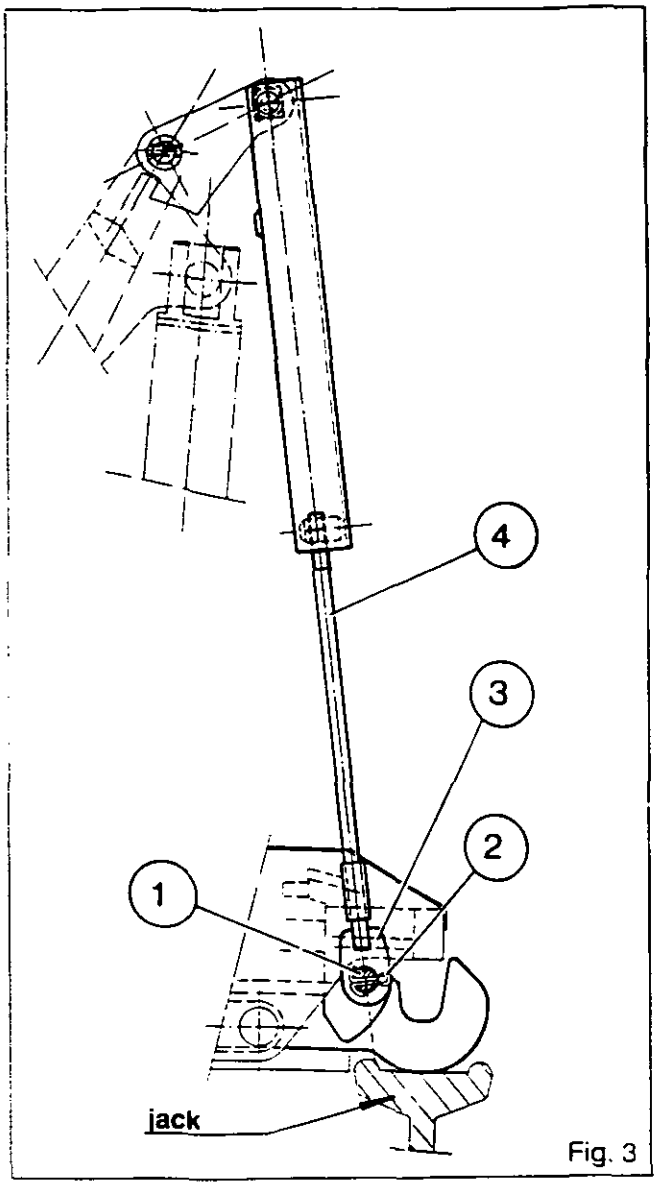


Fig. 3

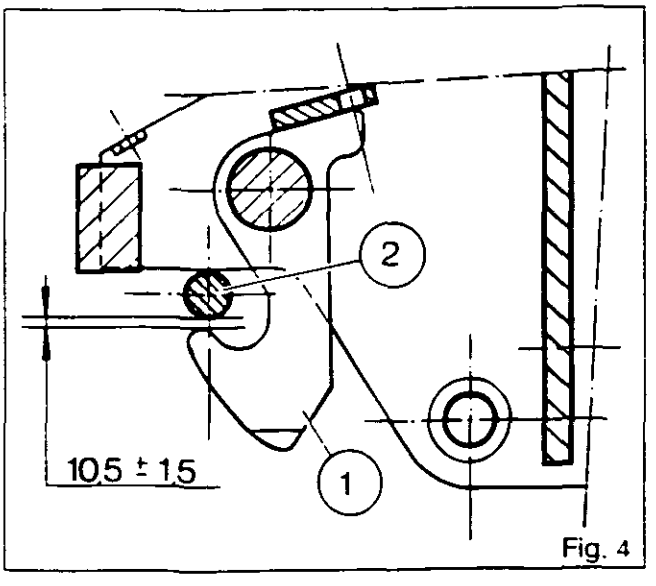


Fig. 4

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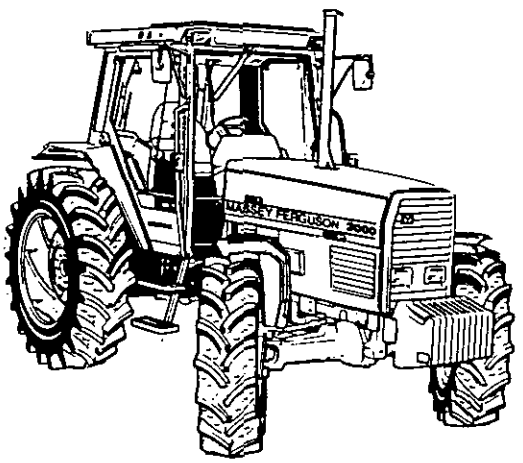
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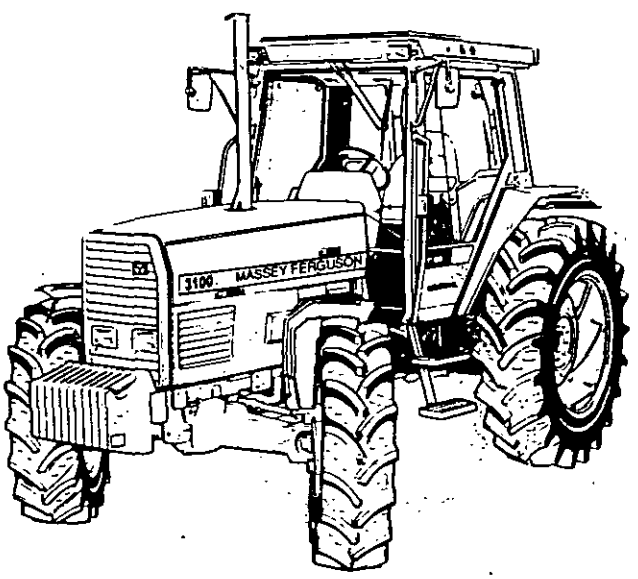
WORKSHOP SERVICE MANUAL

Part 2

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7 . FRONT AXLE 2 WD AND 4 WD

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7 A01 4 WD Clutch Assembly

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7 A01.2

Front axle - 4 WD clutch assembly

General

The clutch assembly for the drive to the front axle is mounted in the lower part of the rear axle housing. An inspection cover placed under the housing provides access to the unit which comprises :
- A shaft **(25)** turning on two taper roller bearings mounted in the bore of the centre housing.
- A hydraulic clutch assembly mounted on the shaft.
- A transfer gear **(15)** centred on the shaft by a bush **(43)**, driving the clutch plates **(36)**.

The transfer gear **(15)** has helical teeth and engages constantly with the gear **(7)** fitted on the bevel drive pinion.

The shaft is fitted with shims **[20]** placed between the cap **(22)** and the cup **(18)** so as to obtain play of 0 to +0.10 mm.

Operation

Disengaging

The 4WD solenoid valve sends oil at a pressure of 17 bar via a gallery in the centre housing, through bush **(11)** into the drilling in shaft **(25)**.
The piston **(30)** is forced by oil pressure along hub **(40)** and pulls drum **(42)** which compresses the Belleville washers **/34** and **/35** releasing plates **(36)**. The transfer gear **(15)** then runs freely on bush **(43)**.

Engaging

With the solenoid valve releasing the oil pressure, the Belleville washers push back the drum **(42)** which through the plates locks up with transfer gear **(15)** and drives shaft **(25)**. The returning oil is dumped back into the centre housing.

Parts list

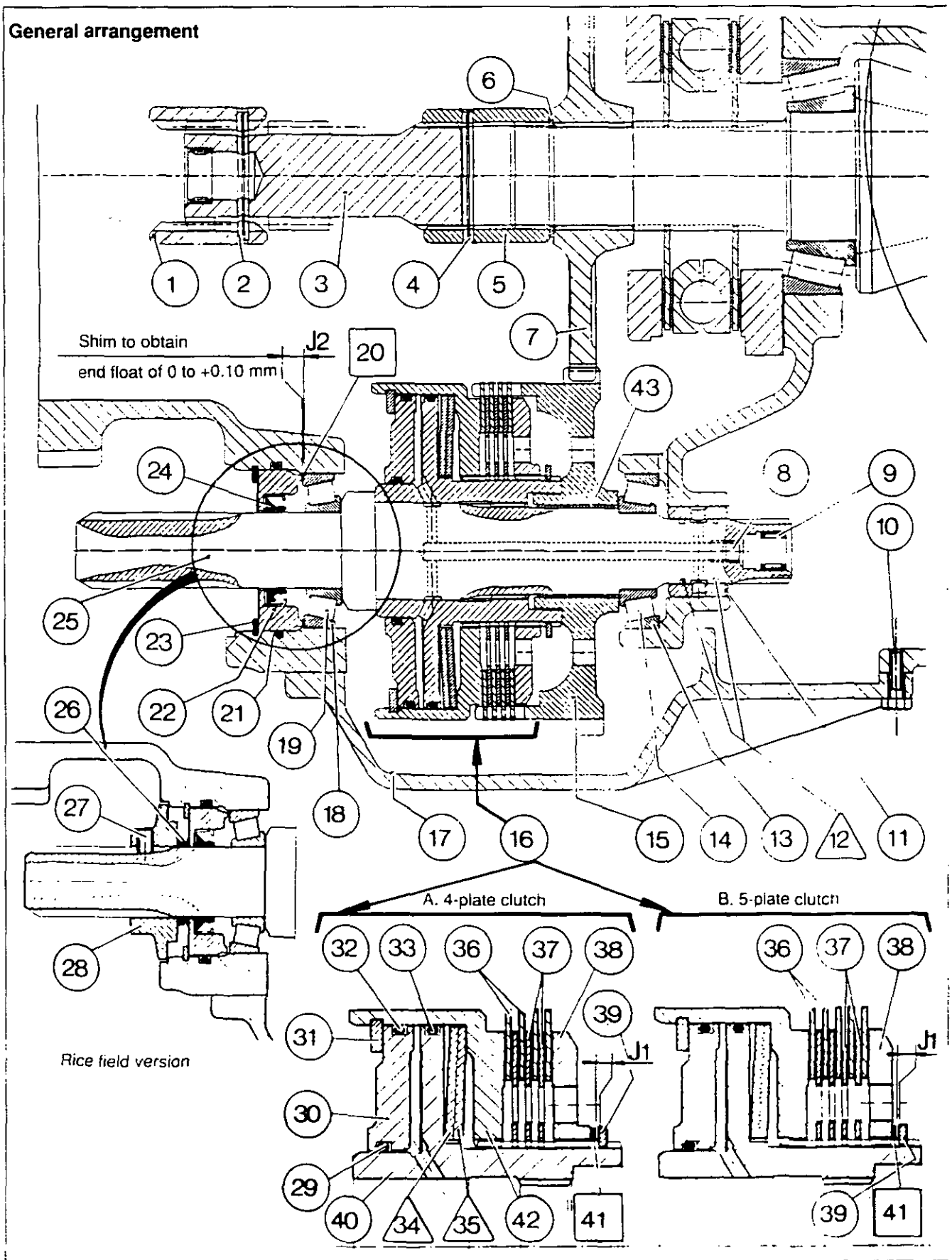
(1) Sleeve
(2) Double pin
(3) Shaft
(4) Double pin
(5) Sleeve
(6) Circlip
(7) Gear
(8) Plug
(9) Needle roller bearing
(10) Bolt
(11) Bush
/12 Seal rings
(13) Bearing cup
(14) Bearing cone
(15) Transfer gear
(16) Clutch assembly
(17) Cover
(18) Bearing cup
(19) Bearing cone
[20] Shim(s)
(21) O-ring
(22) Cap
(23) Circlip
(24) Seal
(25) 4WD drive shaft
(26) Seal
(27) Locking screw
(28) Flange
(29) O-ring
(30) Piston
(31) Circlip
(32) O-ring
(33) O-ring
/34 Belleville washer
/35 Belleville washer
(36) Outer plate
A : 4-plate clutch
B : 5-plate clutch
(37) Inner plate
A : 4-plate clutch
B : 5-plate clutch
(38) Cover
(39) Circlip
(40) Hub
[41] Shim(s)
(42) Drum
(43) Bush

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Front axle - 4 WD clutch assembly

General arrangement

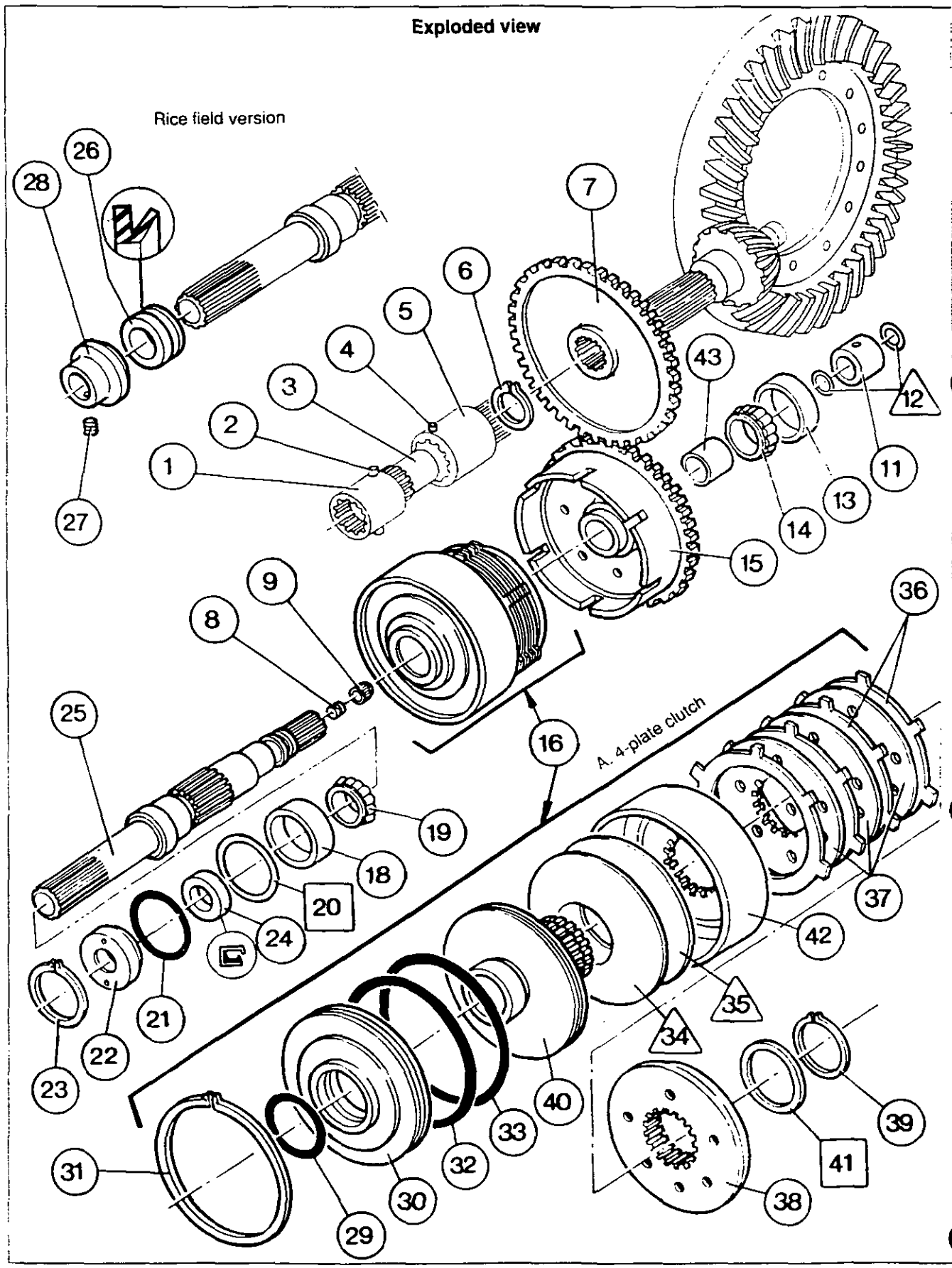


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7 A01.4

Front axle - 4 WD clutch assembly



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Front axle - 4 WD clutch assembly

A. Removal of clutch assembly

1. Immobilise the tractor. Drain the rear axle housing.
2. Disconnect the hoses for the front differential lock (plug the fittings). Remove the guard and the drive shaft.
3. Remove the bolts **(10)** and the cover **(17)**.
   Note: On tractors with a ground speed PTO (G.S. PTO), recover the spring (3), the plunger (2) and the retaining tube (1) (Fig. 1).
   On tractors equipped with a protector flange and rice field seal, remove the screw (27), the flange (28) and the seal (26).
4. Remove the circlip **(23)**.
5. Protect the splined section of the shaft **(25)**. Extract the cap **(22)** with its seal **(24)** using the locally made tool (see section E). Remove the seal **(24)** (Fig. 2).
6. Remove the O-ring **(21)**.
7. Remove the shims **[20]** and the cup **(18)**.
   Note: On tractors equipped with a G.S. PTO, set the control to the disengaged position.
8. Remove the shaft assembly **(25)** and bearing cone **(19)**, whilst keeping the clutch assembly **(16)** and transfer gear **(15)** together.
9. Remove the clutch assembly **(16)** with the transfer gear **(15)** and bearing cone **(14)**.
10. Using the locally made tool (see section E), remove the bush **(11)** (Fig. 3). This tool is essential for tractors with G.S. PTO. If necessary, also remove the cup **(13)** with a suitable extractor.

If removing the gear (7), it is necessary to remove the right-hand hydraulic cover.

11. Raise the relevant side of the tractor with a jack.
12. Place a stand in position and remove the wheel.
13. Remove the right-hand hydraulic cover.
    Carry out operations 2 to 14, chapter 8 I01.

Tractors without creeper gears

14. Drive out the double pins **(2)** and **(4)** of the coupling sleeves **(1)** and **(5)**.
15. Slide the sleeves towards each other on the shaft **(3)** and remove the shaft - sleeve assembly.
16. Remove the circlip **(6)** and the gear **(7)**.

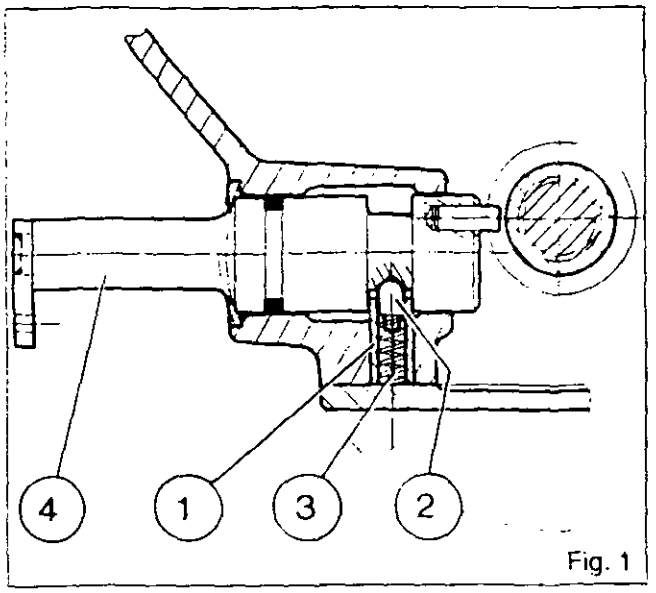


Fig. 1

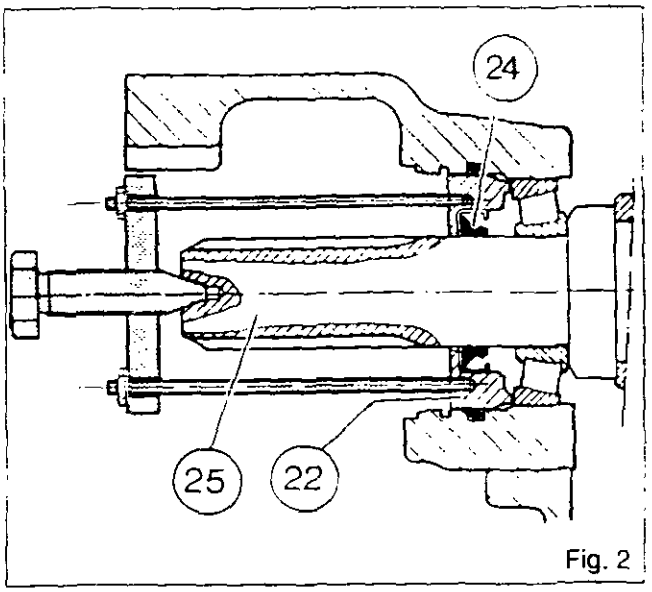


Fig. 2

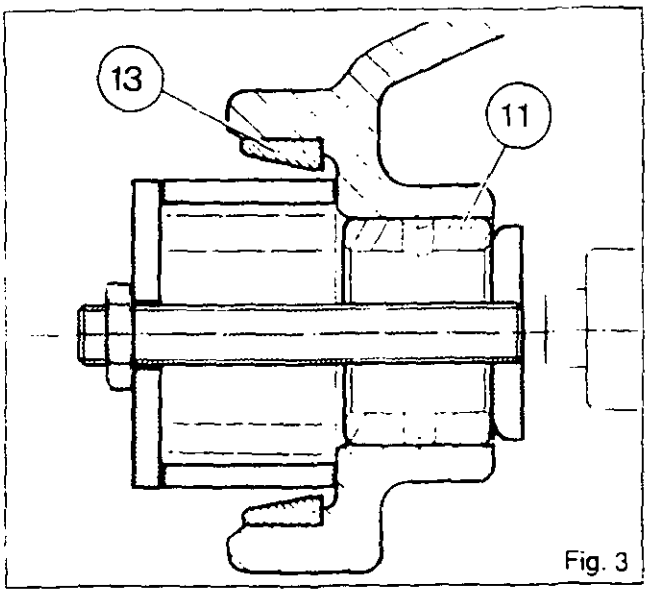


Fig. 3

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Front axle - 4 WD clutch assembly

Tractors with creeper gears

17. Carry out operations 3 to 8 and 13 to 16, chapter 5 D01.A.
18. Remove the circlip **(6)** and take off the pinion **(7)**.

B. Disassembly of clutch

19. Separate the transfer gear **(15)** from the clutch assembly **(16)**.
20. Remove the circlip **(31)**.
21. Remove the cover **(30)**.
22. Remove the O-rings **(29)** and **(32)**.
23. Compress the Belleville washers /**34**\ and /**35**\ with a press and a suitable device (Fig. 4).
24. Remove the circlip **(39)** and the shim(s) **[41]** (Fig. 4).
25. Remove the device.
26. Remove the cover **(38)**, the outer plates **(36)** and the inner plates **(37)**.
    Note: The number of outer plates and inner plates varies according to the type of tractor.
    Assembly A : 4 outer plates and 3 inner plates:
    - ***3050 to 3095 tractors without G.S. PTO.***

    Assembly B : 5 outer plates and 4 inner plates:
    - ***3050 and 3095 tractors with G.S. PTO from serial no. N309034 onwards.***
    - ***3115 - 3125 tractors with or without G.S. PTO.***
27. Separate the hub **(40)** from the drum **(42)**.
28. Remove the O-ring **(33)**.
29. Remove the Belleville washers /**34**\ and /**35**\.

Disassembly of shaft

30. Remove the two seal rings /**12**\.
31. Extract the bearing cone **(19)** with a press and a suitable device.
32. Extract the needle roller bearing **(9)**. Remove the plug.

Reassembly of shaft

Make sure that the oil drilling of the shaft is not blocked.

33. Tighten the plug **(8)** smeared with Loctite 542.
34. Fit the needle roller bearing **(9)** 2.5 mm back from the face F (Fig. 5).
35. Fit the bearing cone **(19)** against the shoulder of the shaft **(25)**.

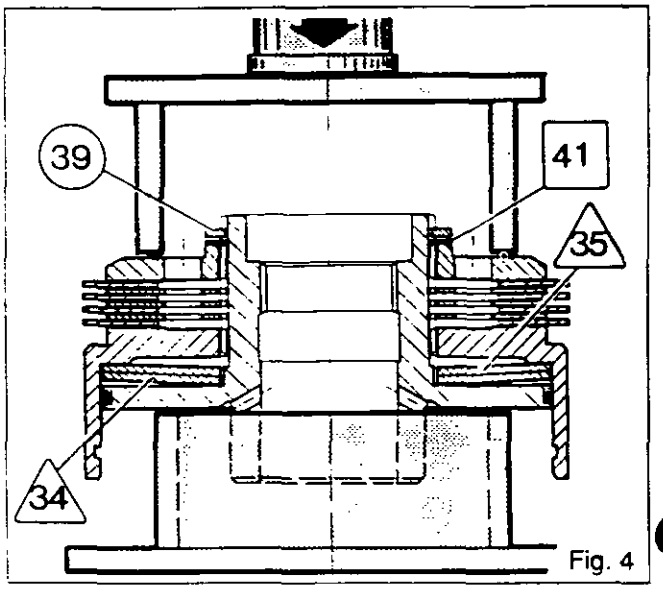


Fig. 4

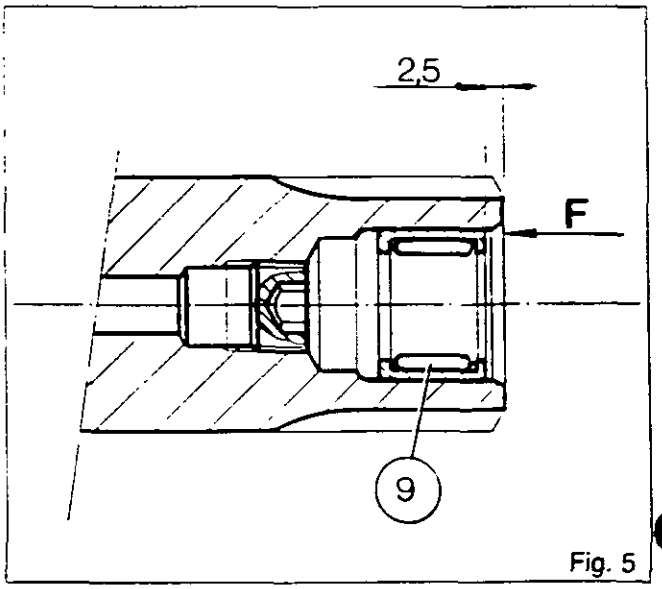


Fig. 5

C. Reassembly of clutch

36. Clean and check the parts. Replace those which are defective.
    Check that the oil drilling in hub **(40)** is not blocked.
37. Position the Belleville washers /**35**\ and /**34**\ in the drum **(42)** (Fig. 6).
38. Lubricate and fit the O-ring **(33)** on the hub **(40)**.
39. Position the hub **(40)** in the drum **(42)** up against the Belleville washers.
40. Fit the outer plates **(36)** and inner plates **(37)** alternatively, aligning the lugs and fit the cover **(38)**.

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41. **Shimming J1** (Fig. 7)
Using a press and a suitable device (Fig. 4) exert a force of approx 2000 daN, to compress the Belleville washers /**35**\ and /**34**\.
Fit the circlip **(39)**. Using a feeler gauge, determine the space X between the cover **(38)** and the circlip **(39)**. Select the shim(s) to obtain a play of :
J1 = 1.5 to 1.7 mm (Fig. 7).
42. Remove the circlip **(39)**.
43. Position the shim(s) selected in operation 41 between the cover and the circlip (the thickest shim on the circlip side).
44. Refit the circlip.
45. Lubricate and fit the O-rings **(32)** and **(29)** on the cover **(30)** and refit them.
46. Fit the circlip **(31)**.
47. Fit the clutch assembly **(16)** to the transfer gear **(15)**.
Note: The bush (43) is press-fitted into the transfer gear (15) and then rebored.

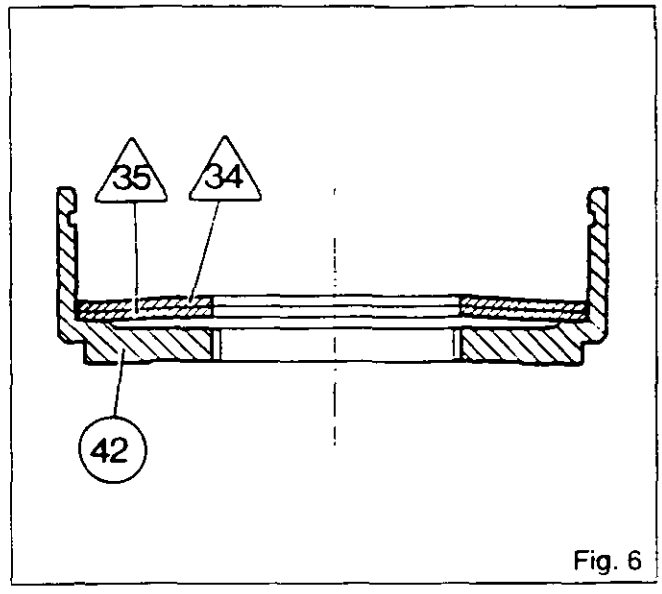


Fig. 6

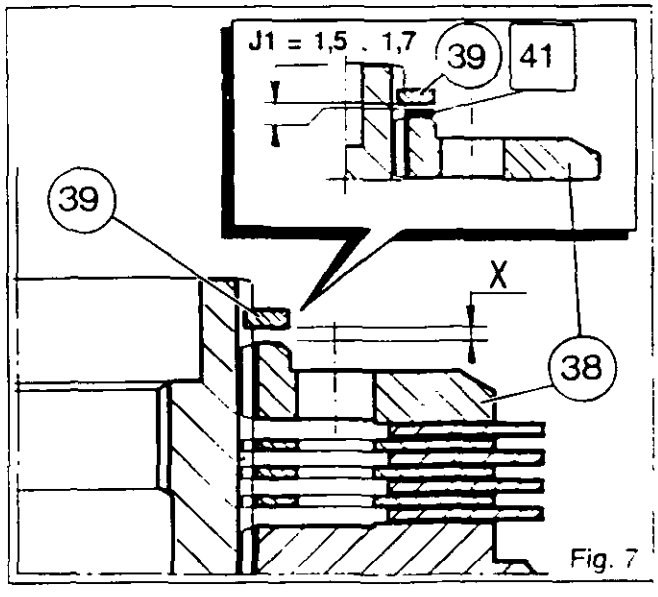


Fig. 7

D. Refitting of clutch assembly

If the gear (7) has been removed
Tractors without creeper gears
48. Refit the gear **(7)**.
49. Position the circlip **(6)**.
50. Carry out operations 103 and 104, chapter 6 F01.

Tractors with creeper gears
51. Refit the gear **(7)**.
52. Position the circlip **(6)**.
53. Carry out operations 22 to 31, chapter 5 D01 A.
54. Refit the right hydraulic cover.
Carry out operations 15 to 29, chapter 8 I01.
55. Fit the cup **(13)** (if removed).
56. Fit the bush **(11)** with a locally made tool (see section E) so that the bush is positioned 4 to 5 mm back from the rear face of the cup **(13)** (Fig. 8). Ensure that a hole in the bush aligns with the feed channel in the centre housing.
57. Fit the seal **(24)** in the cap **(22)**.

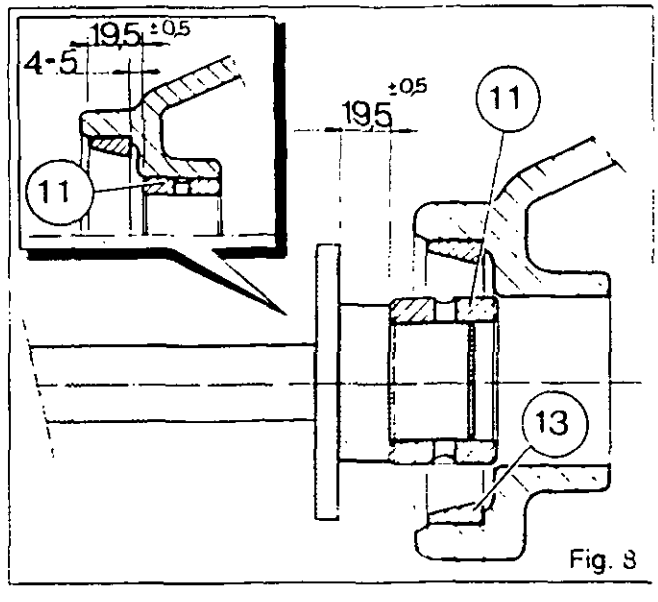


Fig. 8

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Front axle - 4 WD clutch assembly

58. In order to position the bearing cones correctly in the cups, shim as follows:
J2 = 0 to 0.10 mm. fit the bearing cone **(14)**, the shaft **(25)**, the cup **(18)**.
59. Protect the shaft splines.
60. Mount the cup **(22)** and the circlip **(23)**.
61. Place the tip of the dial gauge against the end of the shaft **(25)** (Fig. 9).
62. Pull on the shaft, turning it back and forth, in order to seat the bearing cones in the cups.
63. Set the dial gauge to zero.
64. Repeat operation 62 while pushing.
65. Select the thickness of the shims **[20]** required to obtain J2.
66. Remove the circlip **(23)**, the cap **(22)**, the cup **(18)** and the shaft **(25)**.
67. Place the seal rings **(12)** in the grooves of the shaft **(25)**. Join up the ends. Ensure that they turn freely.
68. Place the bearing cone **(14)** in the cup **(13)**. Fit the shaft **(25)** after having positioned the clutch assembly **(16)** and the transfer gear **(15)** in the housing.
69. Fit the cup **(18)** and the shim(s) **[20]** (smeared with grease) selected in operation 65.
70. Fit the O-ring **(21)** in the groove of the housing.
71. Mount the cap **(22)** and the circlip **(23)**, remove the protection of the shaft splines.
72. On tractors with rice field sealing, grease and fit the seal **(26)** with the lip facing towards the cap **(22)**. Remove the protection.
73. Mount the flange **(28)**, ensuring that there is suitable play between the flange and the housing.
74. Tighten the screw **(27)** smeared with Loctite 241.
75. Clean and degrease the joint face of the cover **(17)** and of the housing.
76. Smear the joint face of the cover with a sealing compound (Master Joint 510 or equivalent).

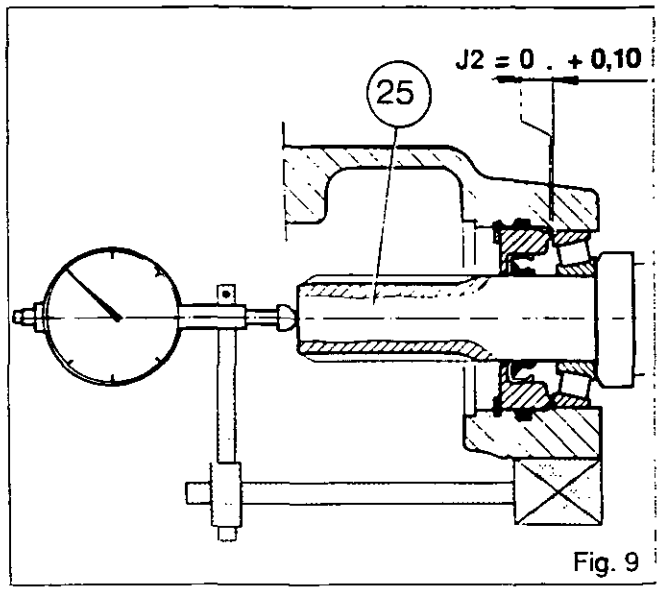


Fig. 9

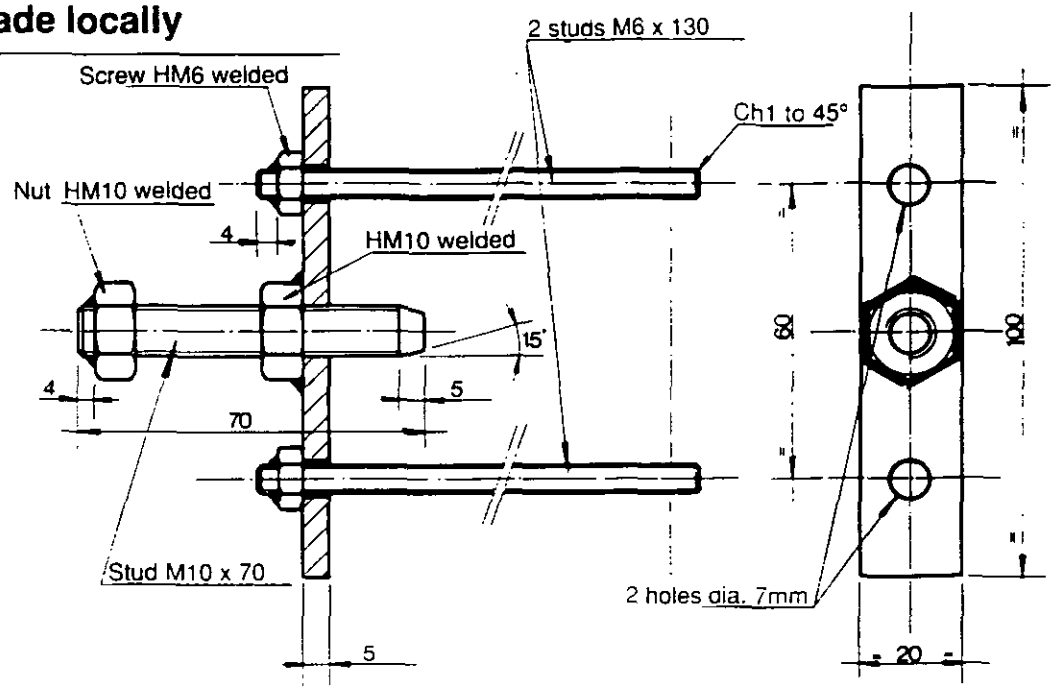
77. Screw in two guide studs in opposite positions on the housing.
78. On tractors equipped with a G.S. PTO, check the position of the lever **(4)**. Mount the retaining tube **(1)**, the plunger **(2)** and the spring **(3)** (Fig. 1).
79. Refit the cover **(17)**.
80. Remove the guide studs, fit and tighten the bolts **(10)** to a torque of 130 - 170 Nm.
81. Coat the two drive shaft couplings with "Anti-seize" grease or equivalent. Refit the drive shaft and reconnect the two hoses for the front differential lock.
82. Refill transmission with oil.
83. Check the operation of the clutch and of the G.S. PTO control (if fitted).
84. Check for leaks:
- at the joint faces of the cover under the rear axle housing
- at the right hydraulic cover (if removed)
- at the hydraulic connectors.

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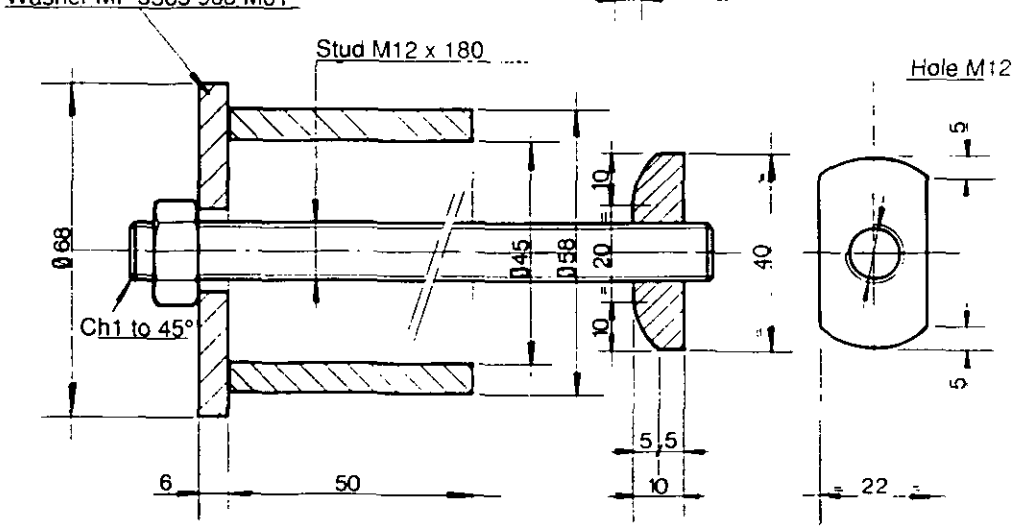
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E. Tools to be made locally

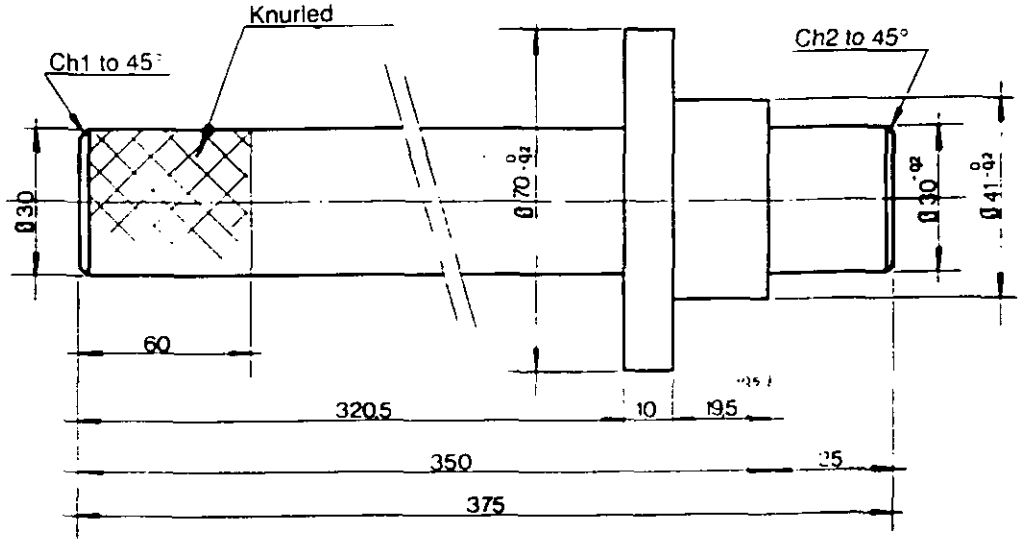
1. Cap extractor



2. Bush extractor



3. Bush fitting tool



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7 B01 Final drive units

CONTENTS

- General ____ 2

A. Removal of planetary carrier, sun gear, ring gear ____ 5

B. Refitting of ring gear, sun gear, planetary carrier ____ 5

C. Disassembly of wheel hub ____ 6

D. Reassembly of wheel hub ____ 6

E. Replacement of a wheel stud ____ 7

F. Disassembly of swivel housing ____ 7

G. Reassembly of swivel housing ____ 8

H. Removal and refitting of universal drive shaft ____ 9

I. Service tool ____ 11

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Front axle - Final drive units

General

The final drive unit comprises a housing **(47)** articulated on the front axle case through two swivels **(7)** and **(11)**. The wheel hub **(22)** turns on two taper roller bearings whose cups **(23)** and **(19)** are press fitted inside the hub. The bearing cone **(18)** is fitted on the housing and the opposing bearing cone **(25)** is fitted freely so that the assembly can be adjusted by means of shims **[26]**. The drive from the front differential is transmitted to the wheel hub through the universal drive shaft assembly **(10)**, the sun gear **(28)**, the planetary pinion **(38)** and the ring gear **(44)**. The ring gear is held by the circlip **(24)** on the ring gear carrier **(42)** which is fastened by a bolt on to the housing **(47)**.

Oil is contained by seal **(45)** between swivel housing **(47)** and hub **(22)** and seal **(16)** between swivel housing and outer drive shaft. There is another seal **(8)** between axle housing **(52)** and inner drive shaft.

"O"rings **(6)** and **(12)** are fitted to seal the swivel bearings.

Special cases

Improved sealing is provided in cases where prolonged use in wet conditions is likely, such as in rice fields. Special seals are fitted on the 4WD clutch output, on the rear axle case, in the differential input and on the final drive units.

Different categories of front axle :

Cat. 1 : MF 3050

Cat. 2 : MF 3060
MF 3065

Cat. 2.5: MF 3070
MF 3080
MF 3095
MF 3115

Cat. 3 : MF 3125

Parts list

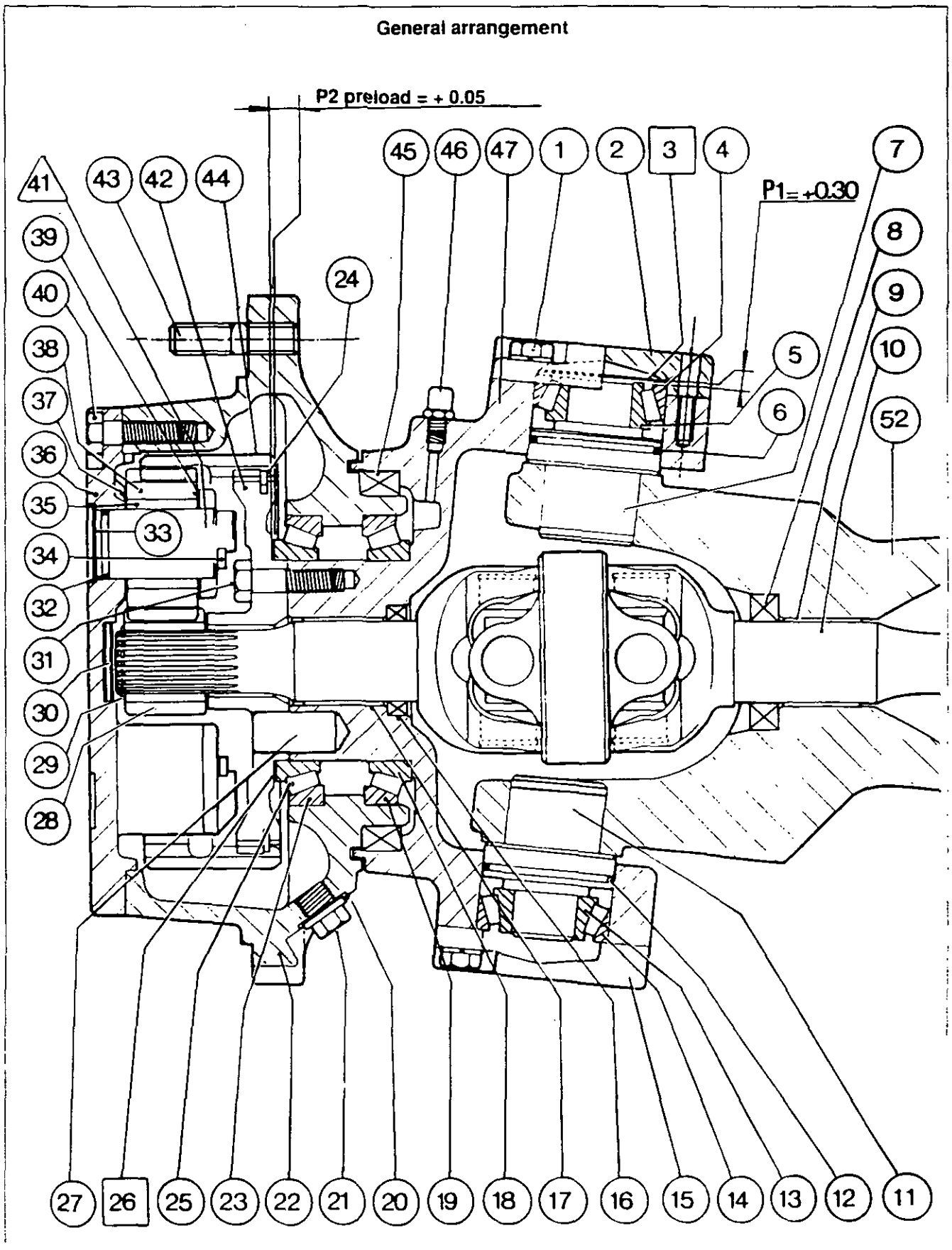
(1) Bolt
(2) Cover
[3] Shims
(4) Bearing cup
(5) Bearing cone
(6) O-ring
(7) Swivel pin
(8) Oil seal
(9) Bush
(10) Universal drive shaft
(11) Swivel pin
(12) O-ring
(13) Bearing cone
(14) Bearing cup
(15) Cover
(16) Oil seal
(17) Bush
(18) Bearing cone
(19) Bearing cup
(20) Seal
(21) Plug
(22) Wheel hub
(23) Bearing cup
(24) Circlip
(25) Bearing cone
[26] Shims
(27) Dowel pin
(28) Sun gear
(29) Circlip
(30) Thrust washer
(31) Screw
(32) O-ring
(33) Retaining ring
(34) Circlip
(35) Needle roller bearing
(36) Planetary carrier
(37) Plate
(38) Planetary pinion
(39) Plate
(40) Bolt
/41 Planetary pinion pin
(42) Ring gear carrier
(43) Wheel stud
(44) Ring gear
(45) Oil seal
(46) Breather or plug
(47) Swivel housing
(48) Pin
(49) Washer
(50) Stop
(51) Spacer
(52) Axle housing

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Front axle - Final drive units

General arrangement

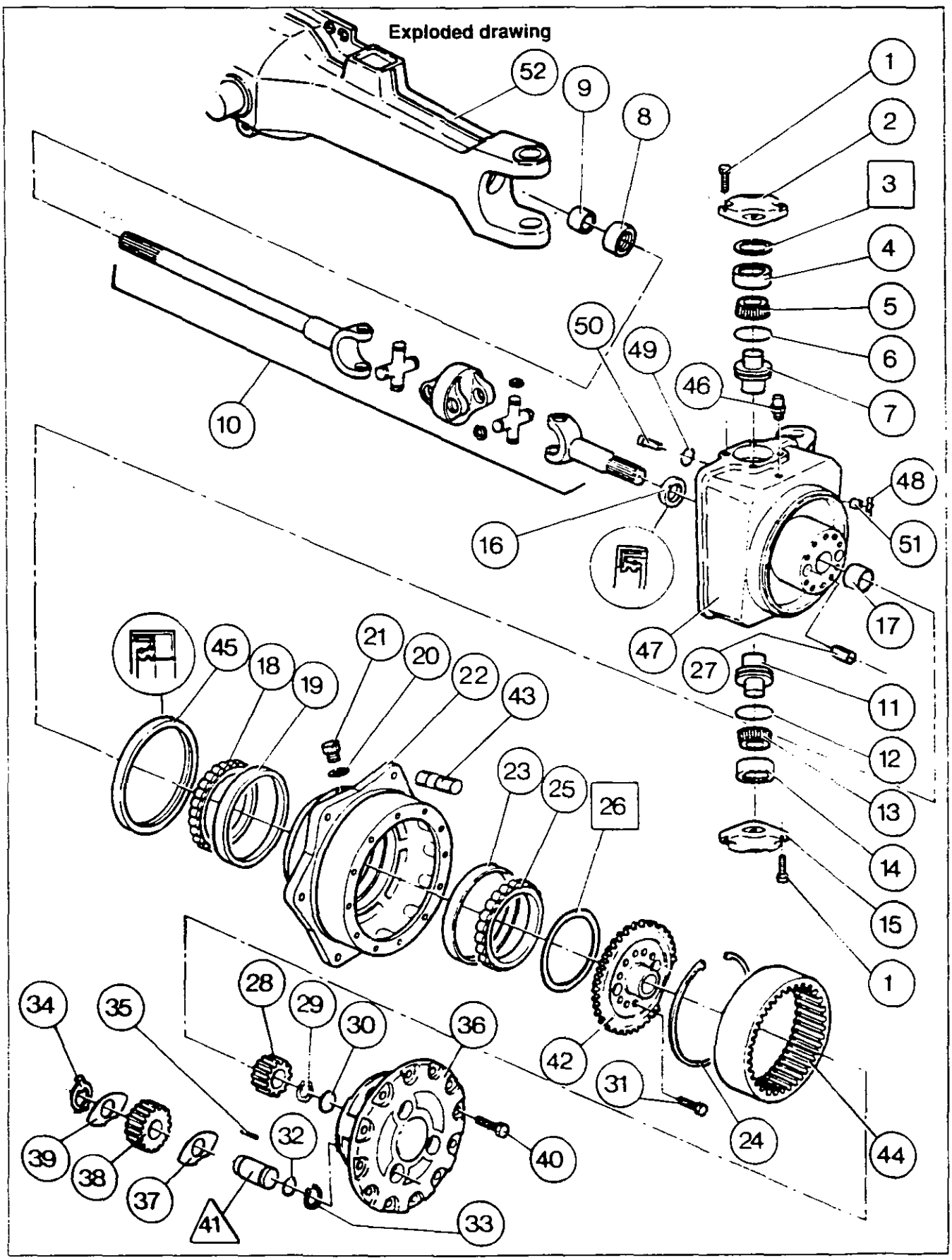


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Front axle - *Final drive units*



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A. Removal of planetary carrier, sun gear, ring gear

1. Chock the rear wheels. Apply the handbrake.
2. On 3000/3100 tractors, with the 4WD clutch engaged, lift the two wheels so that the wheel hub **(22)** turns freely. Place stands in position.
3. Remove the wheel on the relevant side.
4. Drain the final drive unit.
5. Remove screws **(40)**.
6. Remove the planetary carrier with the thrust washer **(30)**.
7. Remove the circlip **(29)** and the sun gear **(28)**.
8. Close the circlip **(24)** and remove the ring gear **(44)**.

Disassembly of planetary carrier

9. Place the planetary carrier in a vice with soft jaws.
10. Remove the circlips **(34)**.
11. Gradually drive out the planetary pinion pin **/41** (Fig. 1). Recover the needles. Remove the O-ring **(32)** and if necessary the retaining ring **(33)**.
12. Repeat operation 11 for the other two planetary pinions.

Reassembly of planetary carrier

13. Clean and check the parts. Replace those which are defective.
14. In one planetary pinion **(38)**, place the needles **(35)** smeared with bearing grease.
15. Replace the O-ring **(32)** on the planetary pinion pin **/41**. Refit the retaining ring **(33)** (if removed on disassembly).
16. Lightly engage the planetary pinion pin **/41** in the planetary carrier cover, ensuring that the notch of the pin is aligned with that of the cover, in order to fit the circlip **(34)**.Fit the plate **(37)**. Center the planetary pinion **(38)** with the needles. Engage the pin in the planetary pinion. Fit the plate **(39)**. Insert the pin as far as it will go and fit the circlip **(34)**.
17. Manually check the axial play and rotation of the planetary pinion.
18. Repeat operations 14 to 17 for the other two planetary pinions.

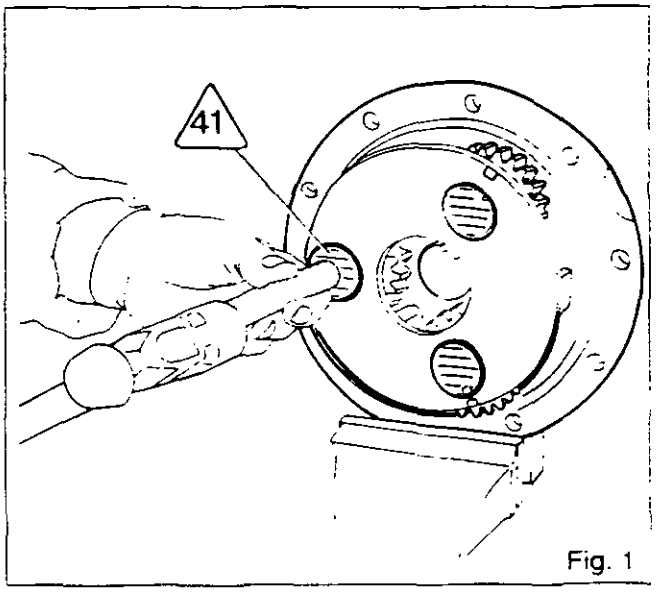


Fig. 1

B. Refitting of ring gear, sun gear, planetary carrier

19. Assemble the ring gear **(44)** on the ring gear carrier **(42)** with the circlip **(24)**, ensuring that it is properly positioned in the groove. Mount the sun gear **(28)** and fit the circlip **(29)**.
20. Screw two guide pins diametrically opposed on the wheel hub **(22)**.
21. Smear the joint face of the planetary carrier with a sealing compound (Loctite 520 or equivalent).
22. Check that the thrust washer **(30)** is present
23. Refit the planetary carrier.
24. Fit the screws **(40)**. Remove the guide pins. Tighten the screws to a torque of 91 - 112 Nm.
25. Turn the wheel hub so that the filler plug is in a horizontal position. Top up the oil level of the final drive unit. Refit the plug **(21)** with its seal **(20)**.
26. Refit the wheel. Remove the stands and the trolley jack. Tighten the nuts to a torque of 250 - 300 Nm
27. Remove the chocks and release the handbrake.
28. Carry out road test of front axle. Check for leaks on the joint face of the planetary carrier and of the filler-plug.

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C. Disassembly of wheel hub

29. Remove the planetary carrier. Carry out operations 1 to 6.
30. Remove the circlip **(29)** and the sun gear **(28)**. In view of the weight of the hub, place in a sling before removing.
31. Remove the screws **(31)**.
32. Use a locally made puller (see section I) to extract the wheel hub **(22)** (Fig. 2).
33. Remove the ring gear **(44)** assembled on the ring gear carrier **(42)** with the circlip **(24)**, the shims **[26]** and the bearing cone **(25)**. The shrink-fitted dowel pins **(27)** should remain in the swivel housing **(47)**.
34. If it proves necessary to replace the oil seal **(45)** and the bearing cones **(18)** and **(25)**, remove the oil seal **(45)**, extract the bearing cone **(18)** with a suitable extractor and disassemble the bearing cups **(19)** and **(23)**.

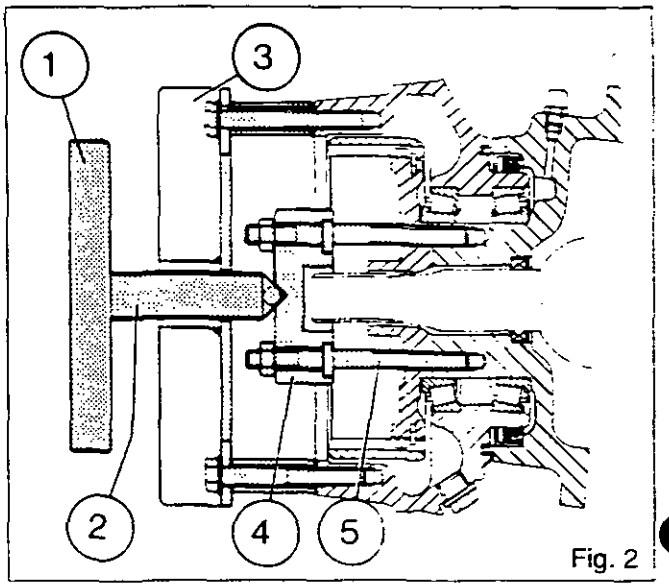


Fig. 2

D. Reassembly of wheel hub

35. Clean and check the parts. Replace those which are defective.
36. If the bearing cone **(18)** and the bearing cups **(19)** and **(23)** are to be replaced, push the bearing cone in the swivel housing and the bearing cups in the wheel hub until they meet the shoulder.
    Smear the outer periphery of the oil seal **(45)** with Loctite 542. Push against the shoulder without deforming it.
37. Fit the wheel hub **(22)** on the swivel housing **(47)**. Fit the bearing cone **(25)** supported by the bearing cup **(23)** to determine shims required to obtain :
    P2 = + 0.05 mm.
38. Using a depth gauge, check the height "A" of the ring gear carrier **(42)** (Fig. 3) and the protrusion "B" of the bearing cone **(25)** out from the housing **(47)** (Fig. 4).
39. Determine the thickness "SP" of the shims **[26]** (Fig. 5) to obtain the preload P2 using the formula :
    SP = (A-B) + 0.05 mm
    Note : Shims come in various thicknesses as per the parts book.
40. Fit the shims **[26]** (Fig. 6) chosen in operation 39 on the ring gear carrier **(42)** with bearing grease. Fit the assembled ring gear carrier **(42)**, ring gear **(44)** and shims **[26]**, with the two ends of the circlip **(24)** towards the bottom (Fig. 7).

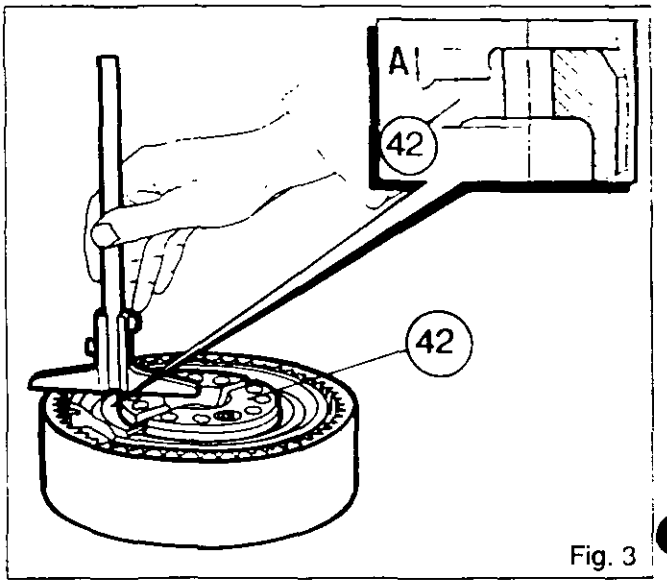


Fig. 3

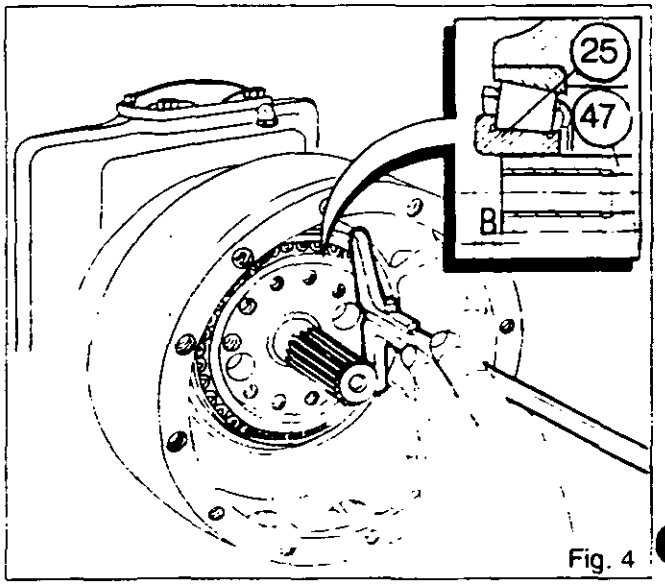


Fig. 4

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41. Smear the screws **(31)** with Loctite 270 and tighten them gradually and alternately to a torque of 113 - 125 Nm.
Note : Later axles fitted with 12.9 grade screws can be torqued to 125 - 155 Nm.
42. Refit the sun gear **(28)** and the circlip **(29)**.
43. Refit the planetary carrier. Carry out operations 20 to 28.

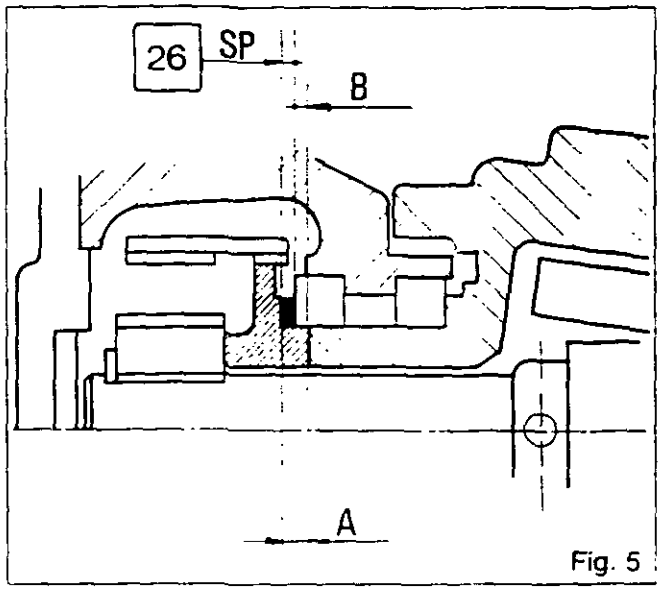


Fig. 5

E. Replacement of a wheel stud

44. Chock the rear wheels. Apply the handbrake.
45. Lift the relevant side with a trolley jack. Position a stand and remove the front wheel.
46. Unscrew the faulty stud using a nut and a lock-nut.
47. Lightly smear the new stud with Loctite 270 and fit it.
48. Lubricate the studs **(43)**. Refit the wheel. Remove the stand and the jack. Tighten the nuts to a torque of 250 - 300 Nm.

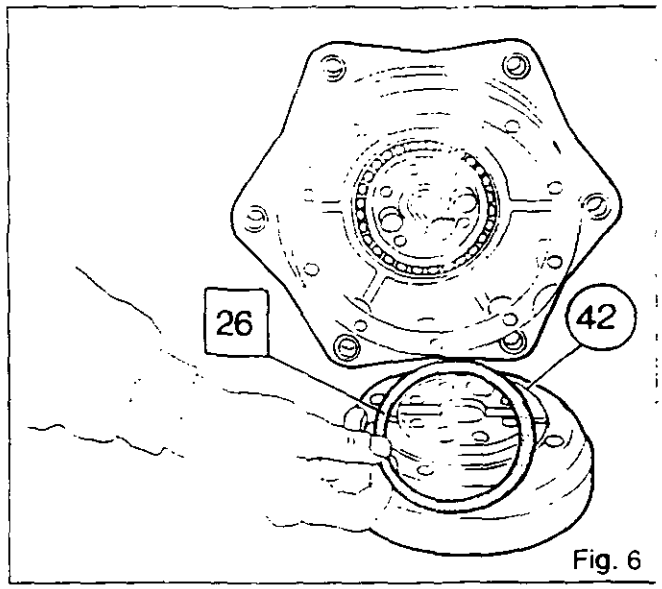


Fig. 6

F. Disassembly of swivel housing

49. Remove the planetary carriers. Carry out operations 1 to 6.
50. Remove the wheel hub. Carry out operations 30 to 34.
51. Remove the split pin and the nut from the steering ball joint. Remove the ball joint.
52. Support the swivel housing **(47)** in a sling.

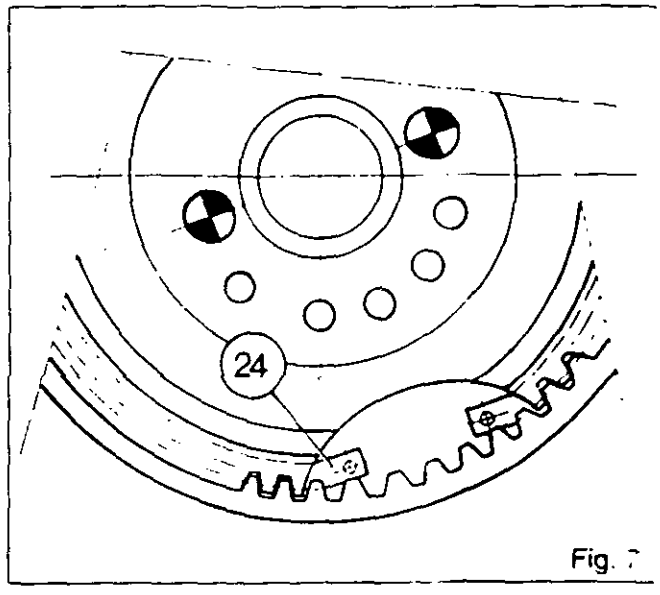


Fig. 7

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53. Remove the screws **(1)**, cover **(2)**, shims **[3]** and the bearing cup **(4)**. Extract the swivel pin **(17)** with tools MF 195C and MF451 (Fig. 8).
54. Remove the screws **(1)**, cover **(15)** and the bearing cup **(14)**. Extract the swivel pin **(11)** as described above for the upper swivel pin (Fig. 8).
    If necessary, remove the bearing cones **(5)** and **(13)** from the swivel pins
55. Protect the splines of the universal drive shaft so as not to damage the seal **(16)**.
56. Remove the swivel housing **(47)**.
57. Remove the seal **(16)**. If necessary, remove the breather **(46)** (if fitted) and drive out the bush **(17)**.
    Note: To avoid risk of leakage, the breather in the swivel housing was eliminated and replaced with a plug. Refer to service bulletin issued in 1990 for cut-in.
58. Remove the universal drive shaft assembly.
59. Remove the seal **(8)**. If necessary, extract the bush (9).

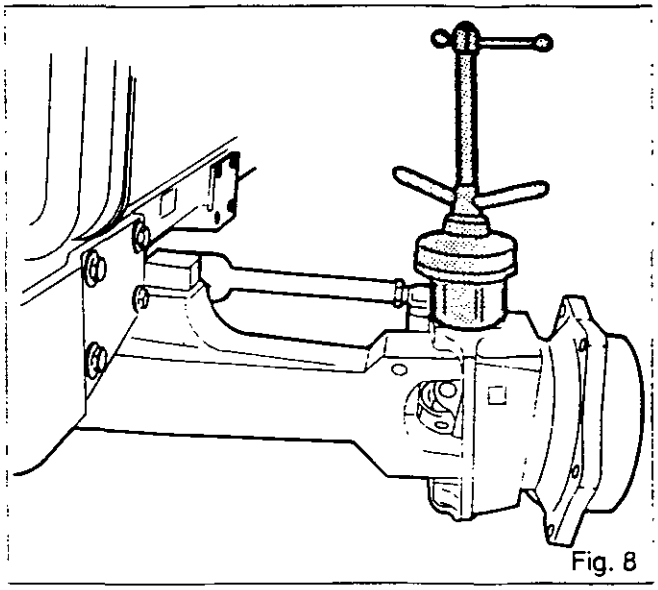


Fig. 8

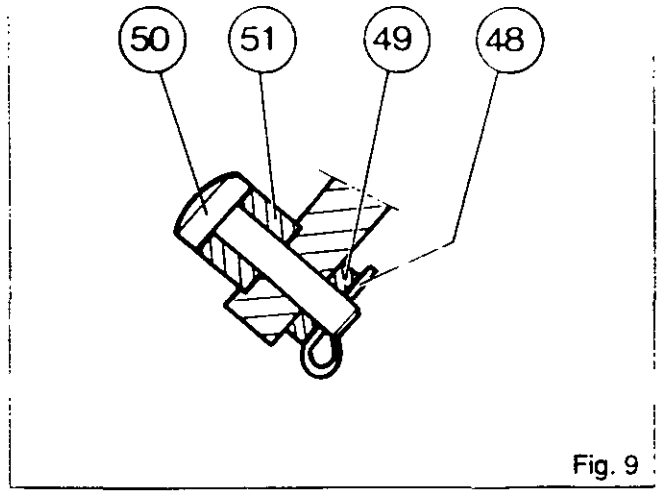


Fig. 9

G. Reassembly of swivel housing

60. Clean and check the parts. Replace those which are defective.
61. Fit the bush **(9)** (if removed). Smear the outer periphery of the new seal **(8)** with Loctite 542 and fit it against the shoulder of the axle housing **(52)**.
62. Lubricate the seal **(8)**. Refit the universal drive shaft **(10)**. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
63. Fit the bush **(17)** (if removed). Smear the outer periphery of the new seal **(16)** with Loctite 542 and fit it against the shoulder of the swivel housing **(47)**.
64. If the steering lock stops have been removed, refit them as shown in Fig. 9 depending on angle required..
    Push the bearing cones **(5)** and **(13)** (if removed) on to the swivel pins **(7)** and **(11)**. Replace the O-rings **(6)** and **(12)**.
65. Refit the swivel housing **(47)**. Position the swivel pin **(7)** in such a way that the swivel housing assembly is aligned with the axle case **(52)**.
66. Fit the swivel pin **(11)**, the bearing cup **(14)** and the cover **(15)**. Tighten the screws **(1)** evenly and alternately so as to push the swivel pin **(11)** into the axle case. Tighten the screws to a torque of 91 - 112 Nm.
67. Fit the bearing cup **(4)**, the shims **[3]** and the cover **(2)**. Fit and tighten the screws **(1)** in the manner described in operation 66.
    Check that the swivel pins (7) and (11) are properly in contact with the axle case.
68. Remove the cover **(2)**. Remove the shims **[3]**. Refit the cover and tighten the screws to a torque 11Nm.

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Shimming P1

69. With a dial gauge, measure the axial play **"J"** using a lever between the axle case and the swivel housing (Fig. 10).
70. Depending on the play **"J"** that is measured, determine the thickness of shims **[3]** needed to obtain (Fig. 11) :
    P1 = "J" +0.30
    (0.30 being the preload value).
71. Remove the screws **(1)**, the cover **(2)** and the bearing cup **(4)**. Pack the bearing cone **(5)** with bearing grease. Refit the bearing cup and the shims **[3]** selected in operation 70. Refit the cover. Smear the screws **(1)** with Loctite 241 and tighten them to a torque of 91 - 112 Nm.
72. Remove the cover **(15)** and bearing cup **(14)**. Pack the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Smear the screws **(1)** with Loctite 241 and tighten them to a torque of 91 - 112 Nm.
73. Refit the steering ball joint. Tighten the nut to a torque of 105 - 115 Nm. Lock the nut with a new split pin.
74. Refit the wheel hub. Carry out operations 36 to 41.
75. Remove the protection from the splines of the universal drive shaft. Fit the sun gear **(28)** and the circlip **(29)**.
76. Refit the planetary carrier. Carry out operations 20 to 28.

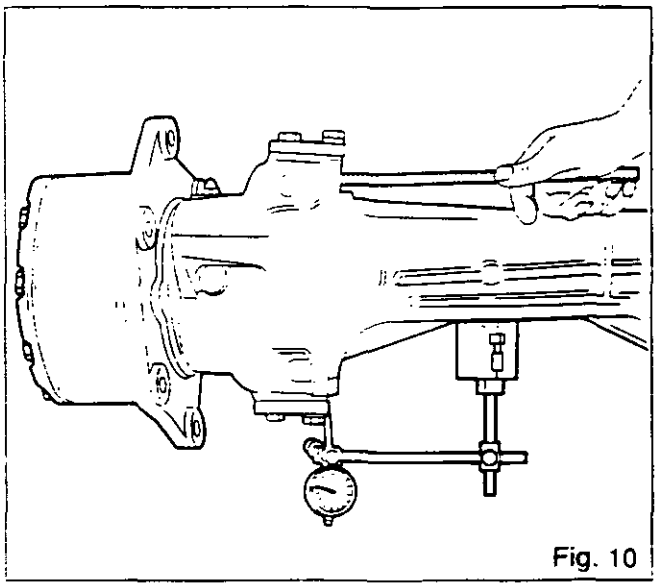


Fig. 10

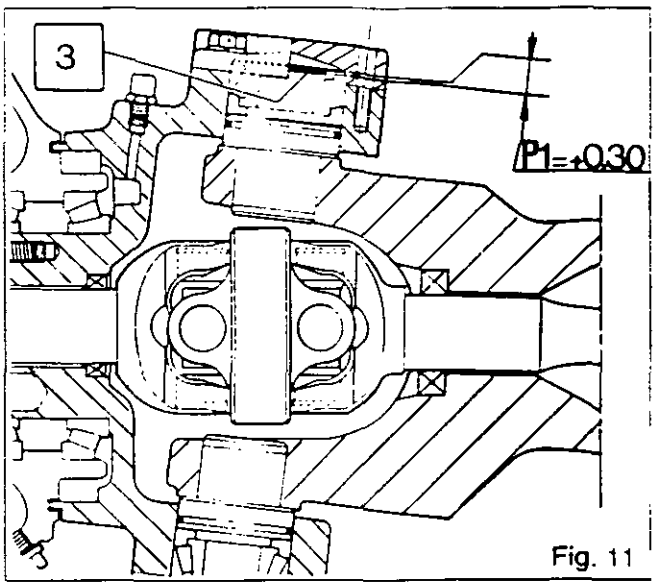


Fig. 11

H. Removal and refitting of universal drive shaft

Removal

77. Remove the planetary carrier. Carry out operations 1 to 6.
78. Remove the circlip **(29)**, sun gear **(28)** and the steering ball joint.
79. Remove the assembled swivel housing **(47)** and wheel hub **(22)**. Carry out operations 52 to 56.
80. Remove the universal drive shaft **(10)**.

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Front axle - Final drive units

Disassembly of universal joint (Fig. 12)

81. Place the drive shaft in a vice with soft jaws.
82. Remove the four circlips **(3)** of each extremity of the joint.
83. Use a plastic mallet to drive the central yoke **(2)** downwards until the bearing sleeve emerges.
84. Place the bearing sleeve in a vice and strike the yoke to drive it out.
85. Remove the opposite bearing sleeve in the same way and remove the section of the shaft.
86. Turn the whole shaft through 90. then repeat operations 83 to 85 to remove the universal joint from the shaft.
87. Place the outer section of the shaft assembly in the vice and repeat operations 82 to 86.

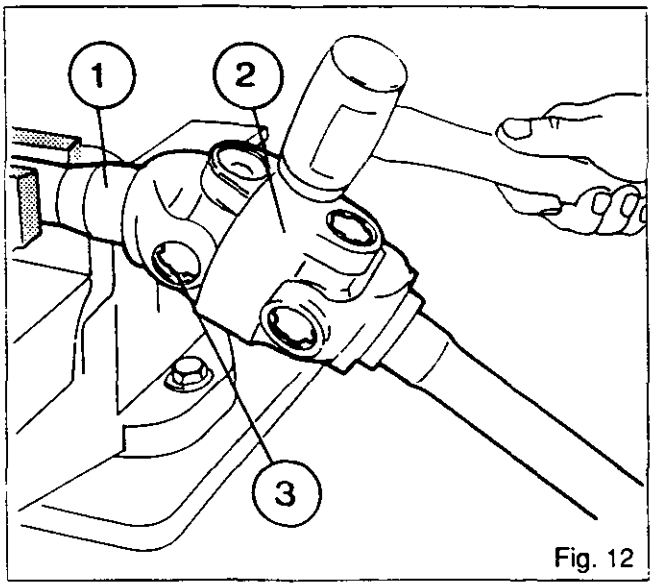


Fig. 12

Reassembly of universal joint

88. Clean and check the parts. Replace the universal joint assembly comprising the cross-pins. the seals. the bearings, the sleeves and the circlips.
89. Smear the needles with bearing grease and ensure that they are all in the sleeves.
90. Position the universal joint **(1)** in the yoke and push it as far as possible to the side (Fig. 13), so that the extremity of the cross-pin serves as a guide for fitting the sleeve with the needles.
91. Drive the sleeve **(1)** sufficiently into the yoke, holding the cross-pin (Fig. 14) in order to fit the circlip.
92. Fit the other sleeves and cross-pin in the same way.

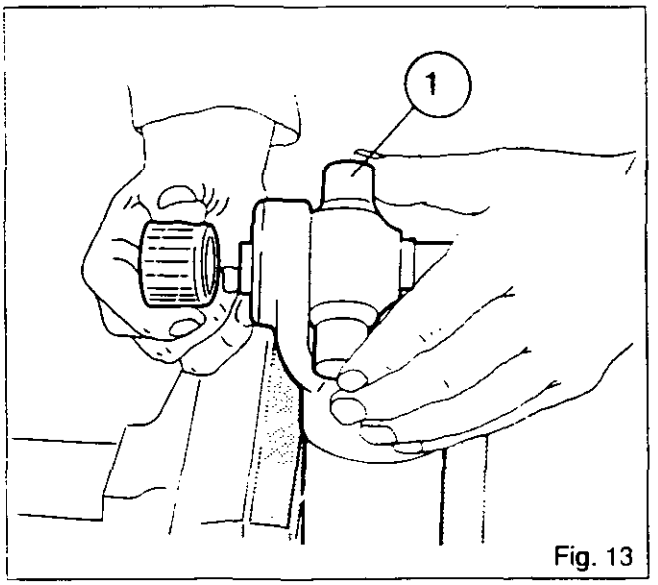


Fig. 13

Refitting

93. Refit the drive shaft assembly. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
94. Replace the seals **(6)** and **(12)**. Refit the assembled swivel housing and wheel hub.
95. Position the swivel pin **(7)** in such a way that the swivel housing assembly **(47)** is aligned with the axle case **(52)**.
96. Fit the swivel pin. **(11)** the bearing cup **(14)** and the cover **(15)**. Tighten the screws **(1)** evenly and alternately so as to push the swivel pin **(11)** into the axle case.

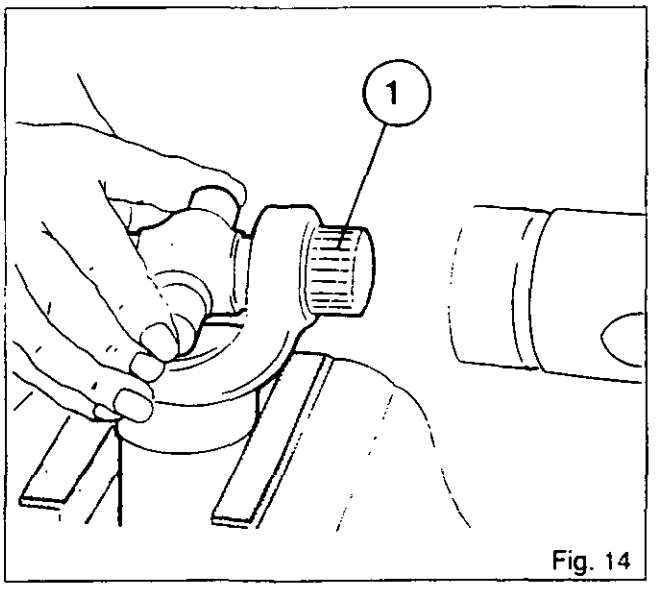


Fig. 14

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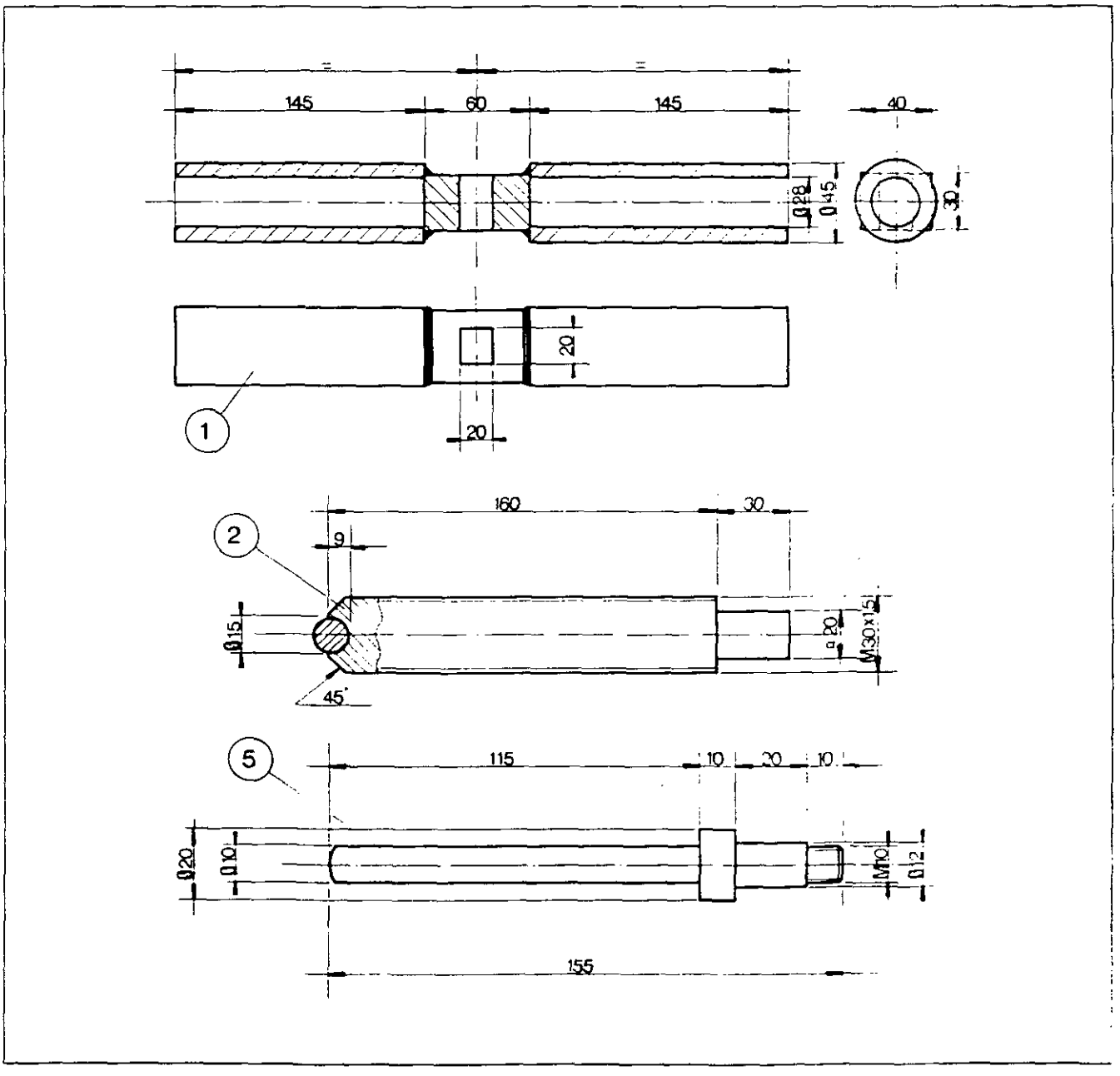
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97. Remove the cover **(15)** and the bearing cup **(14)**. Pack the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Tighten the bolts **(1)** smeared with Loctite 241 to a torque of 91 - 112 Nm.
98. Fit the bearing cup **(4)**, the shims **[3]** and the cover **(2)**. Tighten the bolts as in operation 96.
Check that the swivel pins (7) and (11) are properly in contact with the axle case (52).
99. *Remove the cover* **(2)**. *Remove the shims* **[3]** *and* the bearing cup **(4)**. Pack the bearing cone **(5)** with bearing grease. Refit the bearing cup, the shims and the cover. Tighten the bolts **(1)** smeared with Loctite 241 to a torque of 91 - 112 Nm.
100. Refit the steering ball joint. Tighten the nut to a torque of 103 - 115 Nm. Lock the nut with a new pin.
101. Remove the protection of the shaft. Refit the sun gear **(28)** *and the circlip* **(29)**.
102. Refit the planetary carrier. Carry out operations 20 to 28.

I. Service tool

Tool to be made locally.

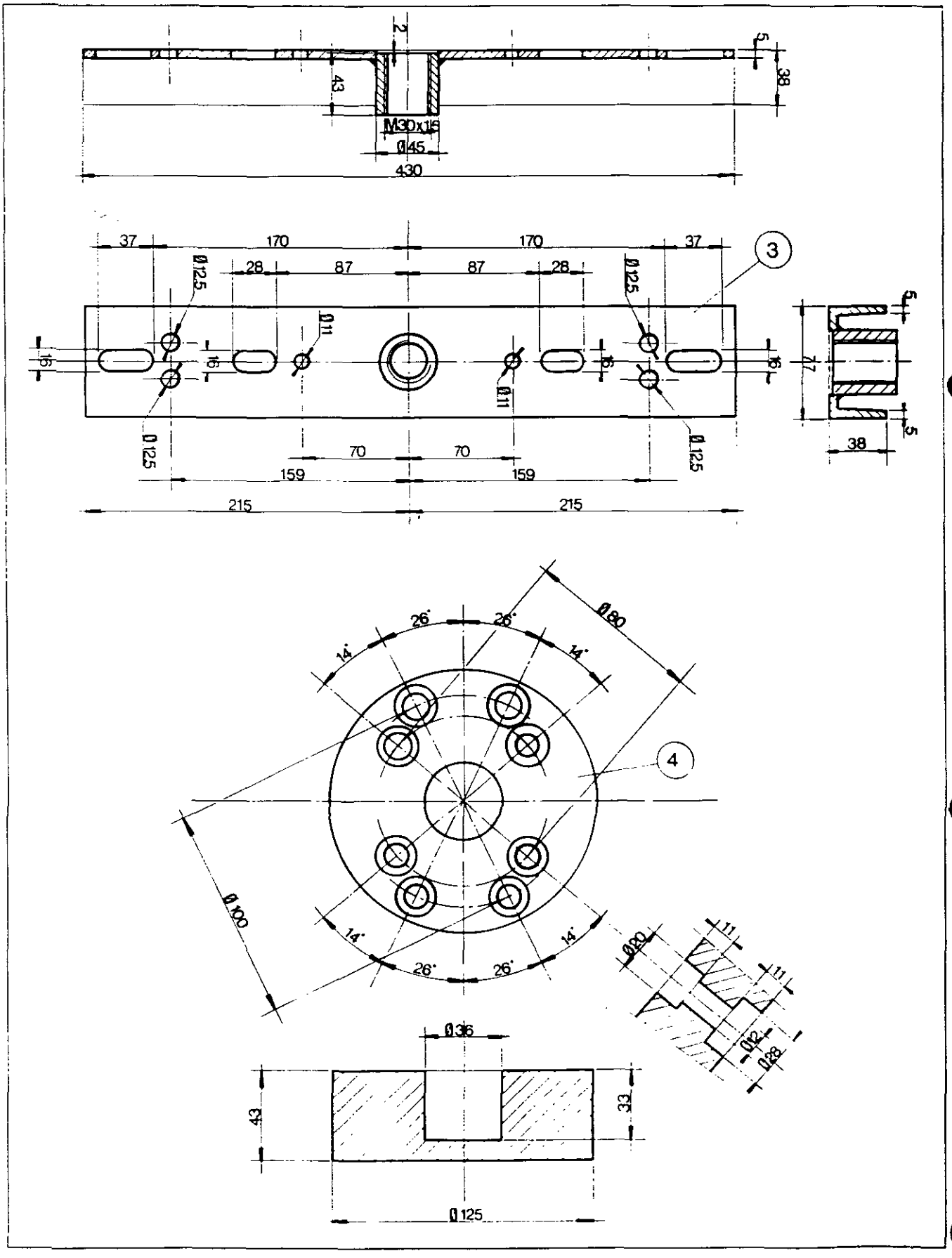
Wheel hub puller (see Fig. 2).



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Front axle - Final drive units



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7 B02 Final drive units

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Improved front axle - Final drive units

General

Note : This procedure applies to tractors equipped with improved front axles cat. 1 to 3.5 fitted from serial numbers :

- ***axles cat. 1 and 2***
  3050 : A209023
  3060/3065 : standard seal : A163015
  reinforced seal : A161005
- ***axle cat. 2.5***
  3070/80/85/95/3115/20 : A209011
- ***axle cat. 3.5***
  3125 : A007039

The final drive unit has a swivel housing **(47)** which articulates on the front axle round the two swivels **(7)** and **(11)**. The wheel hub **(22)** turns on two taper roller bearings whose cups **(23)** and **(19)** are force fitted in the housing. The bearing cone **(18)** is free on the swivel housing and the opposite bearing cone **(25)** is force fitted on the ring gear carrier **(42)**.

Unlike the non improved axle, the taper roller bearings are not adjustable. The components are produced with machining tolerances which do not require adjustment or shimming.

The drive from the front differential is transmitted to the wheel through the universal drive shaft assembly **(10)**, the sun gear **(28)**, and the wheel hub which is fastened to the planetary pinions **(38)** which react off the static ring gear **(44)**.

This ring gear is held by two rings **(24)** and **(26)** onto its carrier **(42)** which is splined onto the swivel housing **(47)** and locked in position by the central nut **(27)**.

The hub/housing is sealed by a double lip seal **(45)** working against the seal cage **(46)** and it also has a seal against water ingress **(50)**. The swivel housing is sealed on its input shaft by seal **(16)**.

The front axle housing is sealed on its drive shaft by seal **(8)**.

The two pivots are sealed by O'rings **(6)** and **(12)**.

Service tools (see section I p. 10)

MF 451B Wheel hub puller
MF451B3 Extractor for puller Ø M18
3376880 M1 Socket for ring gear carrier nut (axle ca 2.5 and 3.5)
3376926 M1 Socket for ring gear carrier nut (axle cat. 1 and 2)

Parts list

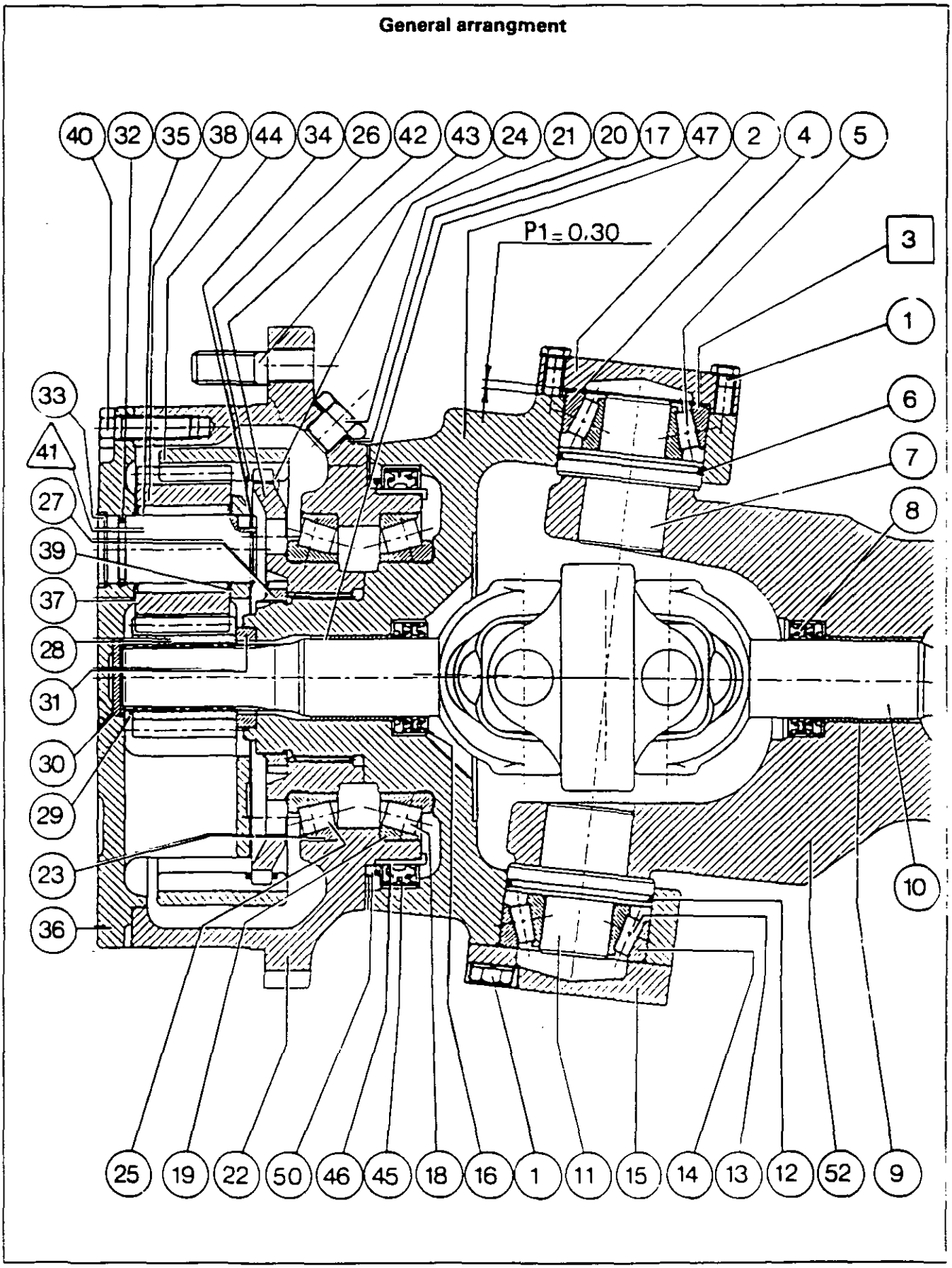
(1) Bolt
(2) Cover
(3) Shim(s)
(4) Bearing cup
(5) Bearing cone
(6) O-ring
(7) Swivel pin
(8) Oil seal
(9) Bush
(10) Universal drive shaft
(11) Swivel pin
(12) O-ring
(13) Bearing cone
(14) Bearing cup
(15) Cover
(16) Oil seal
(17) Bush
(18) Bearing cone
(19) Bearing cup
(20) Seal
(21) Plug
(22) Wheel hub
(23) Bearing cup
(24) Retaining ring
(25) Bearing cone
(26) Retaining ring
(27) Nut
(28) Sun gear
(29) Circlip
(30) Thrust washer
(31) Bush
(32) O-ring
(33) Retaining ring
(34) Circlip
(35) Needles
(36) Planetary carrier
(37) Plate
(38) Planetary pinion
(39) Plate
(40) Screw
(41) Planetary pinion pin
(42) Ring gear carrier
(43) Wheel stud
(44) Ring gear
(45) Oil seal
(46) Seal cage
(47) Swivel housing
(48) Stop screw
(49) Nut
(50) Oil seal
(51) Spacer (cat. 1 to 2.5)
(52) Axle housing
(53) Sintered bushing

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Improved front axle - Final drive units

General arrangment

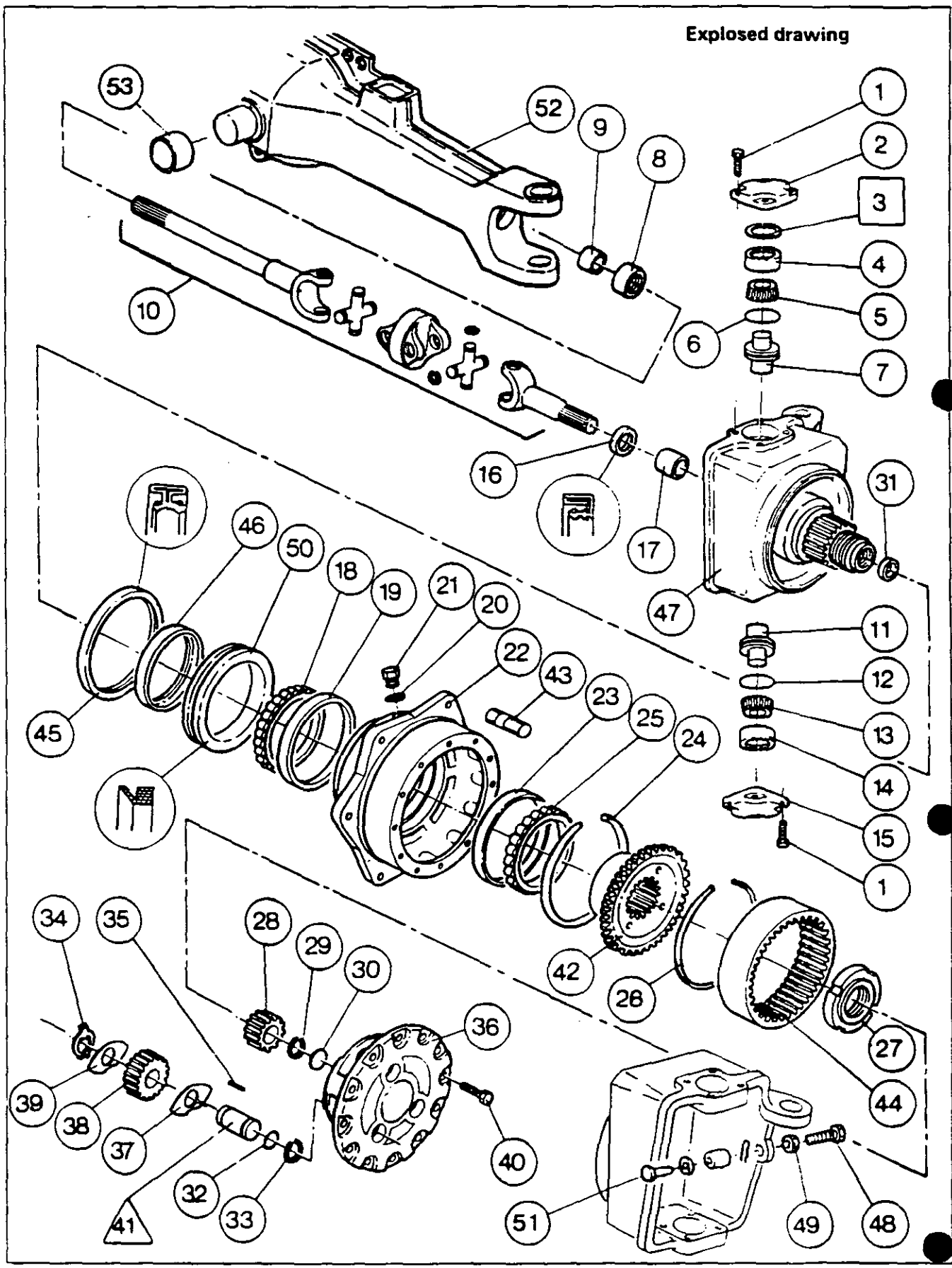


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Improved front axle - Final drive units



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A . Removal of planetary carrier, sun gear, ring gear

1. Block the rear wheels. Apply the handbrake.
2. The 4WD clutch being engaged, lift the two wheels to allow to the wheel hub **(22)** to turn freely. Position props.
3. Remove the wheel on the relevant side.
4. Drain the final drive unit.
5. Remove bolts **(40)**.
6. Remove the planetary carrier with the thrust washer **(30)**.
7. Remove the circlip **(29)** and the sun gear **(28)**.
8. Unstake the nut **(27)** and unscrew it using socket 3376880 M1 (axle cat. 2.5 and 3.5) or 3376926 M1 (axle cat. 1 and 2) (Fig. 2). Extract the ring gear carrier **(42)** assembly. Remove the retaining rings **(24) (26)**. Separate the ring gear **(44)** from the ring gear carrier.

Disassembly of planetary carrier

9. Place the planetary carrier in a vice with soft jaws.
10. Remove the circlip **(34)**.
11. Gradually remove the planetary pinion pin **/41** (Fig. 1), recover the needles. Remove the O'ring **(32)** and if necessary the retaining ring **(33)**.
12. Repeat operation 11 for both planetary pinions.

Reassembly of planetary carrier

13. Clean and check the parts, replace those which are defective.
14. In one planetary pinion **(38)**, place the needles **(35)** coated with bearing grease.
15. Replace the O'ring **(32)** on the planetary pinion pin **/41**, refit the retaining ring **(33)** (if removed).
16. Lightly engage the planetary pinion pin **/41** in the planetary carrier cover, insuring that the notch of the shaft is aligned with that of the cover to fit the circlip **(34)**. Fit the plate **(37)**. Center the planetary pinion **(38)** with its needles. Engage the pin in the planetary pinion. Fit the plate **(39)**. Insert entirely the pin and fit the circlip **(34)**.
17. Manually check the axial play and rotation of the planetary pinion.
18. Repeat operations 14 to 17 for the other two planetary pinions.

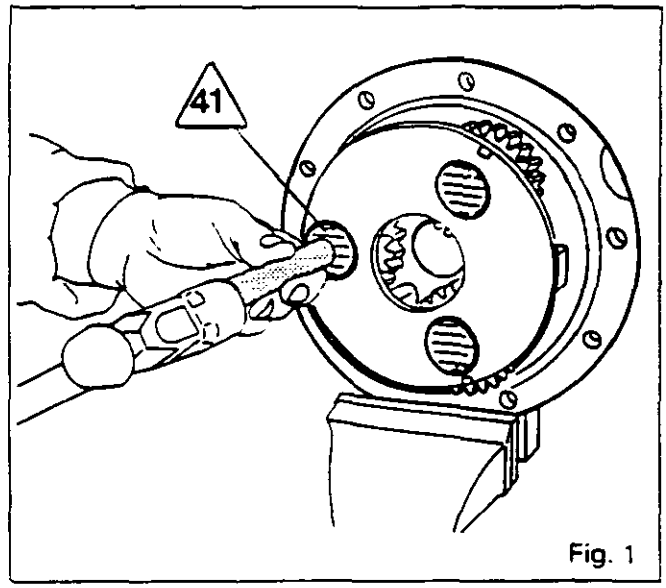


Fig. 1

B . Refitting of ring gear, sun gear, planetary carrier

19. Assemble the ring gear **(44)** on the ring gear carrier **(42)** with retaining rings **(24) (26)** ensuring that they are properly engaged in their grooves.
20. Fit the ring gear carrier **(42)** assembly on the splines of the swivel housings **(47)**.
21. Clean the threads of the nut **(27)**, lightly coat them with Loctite 270. Tighten to o torque of 400 - 450 Nm.
22. Lock the nut by bending its lock tab into the slot.
23. Manually check rotation of the wheel hub **(22)**.
24. Fit sun gear **(28)** and circlip **(29)**.
25. Screw two guide studs diametraly opposed on the wheel hub **(22)**.
26. Coat the joint of the planetary carrier with a sealing product (Loctite 510 or equivalent).
27. Check that the thrust washer **(30)** is present.
28. Refit the planetary carrier
29. Fit the bolts **(40)**. Remove the guide studs. Tighten the bolts to a torque of 91 - 112 Nm.
30. Turn the wheel hub to place the filler plug in a horizontal position. Top up the oil level of the final drive unit. Refit the plug **(21)** with its seal **(20)**.

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31. Refit the wheel. Remove the props and the trolley jack. *Tighten the nuts to a torque of 250 - 300 Nm.*
32. Remove the shims and release the handbrake.
33. Carry out road test of front axle. Check the sealing of the joint face of the planetary carrier and of the filler plug.

C . Disassembly of wheel hub

34. Remove the planetary carrier. Carry out operations 1 to 6.
35. Remove the circlip **(29)** and the sun gear **(28)**.
36. In view of the weight of the hub, place in a sling before removing. Unstake and unscrew the nut **(27)** with socket (Fig. 2) :
    - 3376926 M1 : axle cat. 1 and 2
    - 3376880 M1 : axle cat. 2.5 and 3.5
37. Remove the wheel hub **(22)**.
38. Remove the bearing cone **(18)** and if necessary extract the bearing cone **(25)** by the ring gear carrier **(42)** holes with a suitable extractor. Disassemble the bearing cups **(19) (23)**.
39. Remove the seal **(50)**. Extract the seal cage **(46)** (if necessary).

D . Reassembly of wheel hub

40. Clean and check the parts, replace those which are defective.
41. If the bearing cones **(18) (25)** and the bearing cups **(19) (23)** have to be replaced, push the bearing cone **(18)** on the swivel housing, the bearing cone **(25)** on the ring gear carrier **(42)** and the bearing cups on the wheel hub until they meet the shoulder.
    Note : The bearing cones (18) (25) and the bearing cups (19) (23) must imperatively be from the serie N (width tolerance = 0,1 instead of 0,2mm). The shimming of these bearings is determined by the machining tolerances of the swivel housing (47), the wheel hub (22) and the ring gear carrier (42). Each part could be replaced separately. If the rotation of the wheel hub (22) is incorrect after fitting, research the defective part.

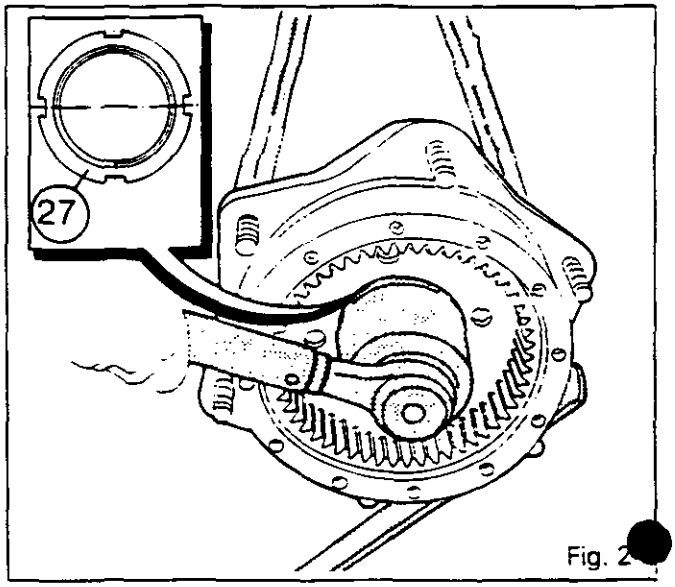


Fig. 2

42. With a locally made drift, push the seal cage **(46)** (if removed) until it meets the shoulder. Place the oil seal **(50)** the lip facing the oil seal **(45)**.
    Note : The tool is centered on the inner diameter of the wheel hub (22). To push the cage, it is necessary to remove the bearing cups (19) (23).
43. Fit the wheel hub **(22)** on the swivel housing **(47)**.
44. Engage the ring gear carrier assembled with the ring gear **(44)** on the splines of swivel housing.
45. Clean the threads of the nut **(27)**. Apply Loctite 270 and tighten to a torque of 400 - 450 Nm with special socket 3376880 M1.
46. Lock the nut by bending its lock tab into the slot.
47. Manually check the rotation of wheel hub **(22)**.
48. Refit the sun gear **(28)** and the circlip **(29)**.
49. Refit the planetary carrier. Carry out operations 28 to 33.

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E . Replacement of a wheel stud

50. Block the rear wheels. Apply the handbrake.
51. Lift the relevant side with a trokey jack. Position a prop and remove the front wheel.
52. Unscrew the faulty stud using a nut and a lock-nut.
53. Lightly coat the new stud with Loctite 270 and fit it.
54. Lubricate the studs. Refit the wheel. Remove the prop and the jack. Tighten the nuts to a torque of 250 - 300 Nm.

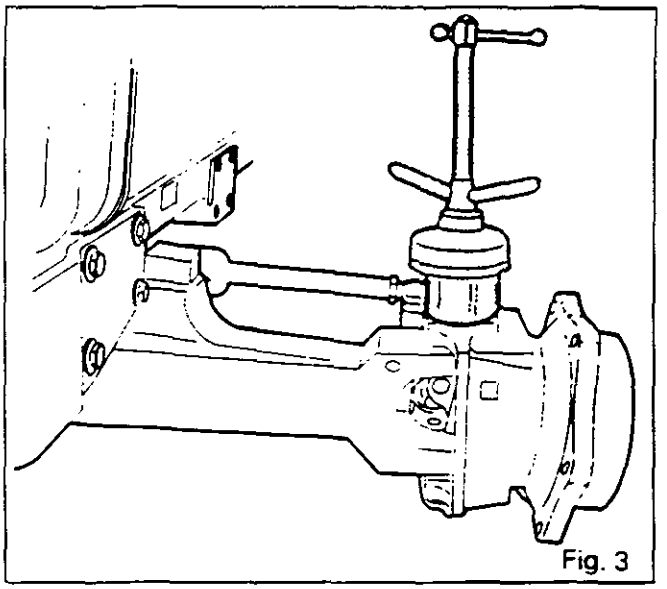


Fig. 3

F . Disassembly of swivel housing

55. Remove the planetary carrier. Carry out operations 1 to 6.
56. Remove the wheel hub. Carry out operations 35 to 38.
57. Remove seal **(45)** if necessary. Remove the pin and the nut of the steering ball joint. Extract the ball joint.
58. Place the swivel housing **(47)** in a sling.
59. Remove the bolts **(1)**, the cover **(2)**. Take off the shims **[3]** and the bearing cup **(4)**, extract the swivel pin **(7)** with remover MF451B and adaptor MF451B3 (Fig. 3).
60. Remove the bolts **(1)**. Remove the cover **(15)** and the bearing cup **(14)**. Extract the swivel pin **(11)** as described above for the upper swivel pin (Fig. 3). **If necessary**, extract the bearing cones **(5)** **(13)** of the swivel pins.
61. Protect the splines of the universal drive shaft as not to damage the seal **(16)**.
62. Remove the swivel housing **(47)**.
63. Remove the seal **(16)** and drive out the bush **(17)**. ***Note : The bush (31) is fitted with Loctite 270. To avoid risk of leakage, the breather of the swivel housing has been suppressed.***
64. If necessary, remove the universal drive shaft. Remove the seal **(8)** and extract the bush **(9)**.

G . Reassembly of swivel housing

65. Clean and check the parts, replace those which are defective.
66. If removed, fit the bush **(9)** and the new seal **(8)** against the shoulder of the axle housing **(52)**, oil the seal **(8)**. Refit the universal drive shaft. Introduce a guide through the filling hole to align the left drive shaft with the differential.
67. If removed, fit the bush **(17)** and the new seal **(16)** against the shoulder of the axle housing **(47)**.

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68. The steering lock adjustment of axles cat.1 to 2.5 is made by spacers **(51)** of different lenghts fitted on swivel housing **(47)**. For axles cat. 3.5 adjust the screw **(48)** (Fig. 4) . According to the turning circle required, report to the table here below. After adjustment, lock the nut **(49)** :

Dimension **X**	Turning circle
77 mm	35°
63 mm	40°
34 mm	50°

69. Refit the swivel housing **(47)**. Position the swivel pin **(7)** provided with O'ring **(6)** so that the swivel housing assembly is aligned with the axle case **(52)**.
70. Fit the swivel pin **(11)** provided with O'ring **(12)**, the bearing cup **(14)**, the cover **(15)**. Tighten the bolts **(1)** evenly and alternately to push the swivel pin **(11)** into the axle housing. Tighten the bolts to a torque of 91 - 112 Nm.
71. Fit the bearing cup **(4)**, the shims **[3]**, the cover **(2)**. Fit and tighten the bolts **(1)** in the same way that in operation 70. **Check that the swivel pins (7) (11) are properly in contact with the axle housing.**
72. Remove the cover **(2)**, remove the shims **[3]**. Refit the cover and tighten the bolts to a torque of 91 - 112 Nm.

Shimming P1.

73. With a dial gauge, measure the axial play using a lever between the axle housing and the swivel housing (Fig. 5).
74. According to the play **J**, determine the thickness of shims **[3]** to obtain (Fig. 6) :
P1 = J + 0,30 (0,30 being the preload value)
75. Remove the bolts **(1)**, the cover **(2)**, the bearing cup **(4)**, coat the bearing cone **(5)** with bearing grease. Refit the bearing cup, the shims **[3]** selected in operation 74. Refit the cover. Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
76. Remove the cover **(15)** and the bearing cup **(14)**. Coat the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
77. Using a locally made drift push seal **(45)** (if removed) against the shoulder.Refit the steering ball joint. Tighten the nut to a torque of 103 -115 Nm. Lock the nut with a new pin.
78. Refit the wheel hub. Carry out operations 41 to 47.
79. Remove the protection on the splines of the universal drive shaft. Fit the sun gear **(28)** and the circlip **(29)**.
80. Remove the planetary carrier. Carry out operations 25 to 33.

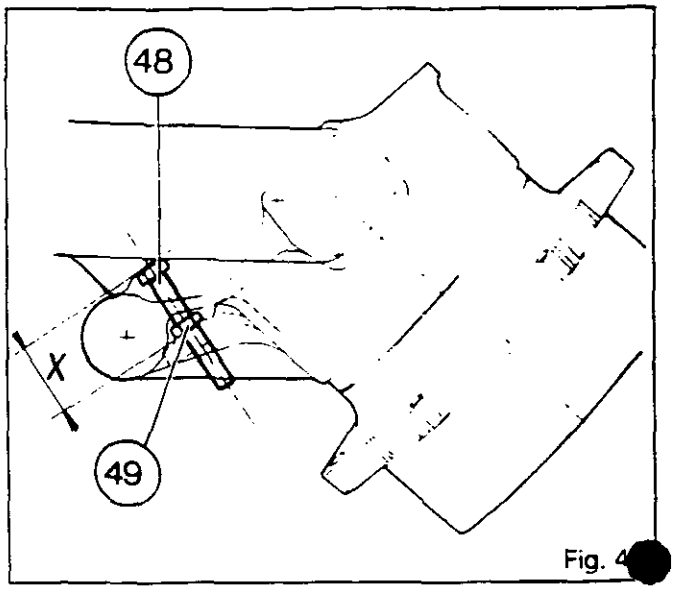
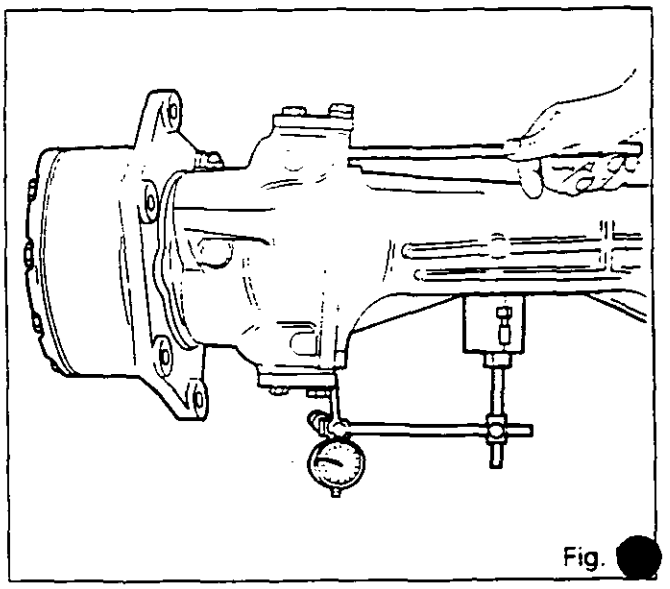


Fig. 4


Fig. 5

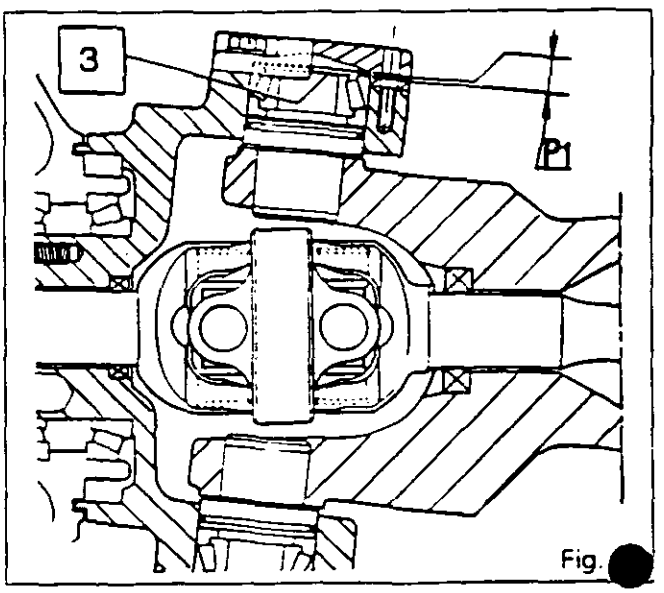


Fig. 6

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H. Removal and refitting of universal drive shaft

Removal

81. Remove the planetary carrier. Carry out operations 1 to 6.
82. Remove the circlip **(29)**, the sun gear **(28)** and extract the steering ball joint.
83. Remove the swivel housing **(47)** assembly and the wheel hub **(22)**. Carry out operations 58 to 62.
84. Remove the universal drive shaft **(10)**.

Disassembly of universal joint (Fig. 7)

85. Maintain the external section **(1)** of the universal drive shaft in a vice with soft jaws.
86. Remove the four circlips **(3)** from each end of the universal joint.
87. Use a plastic mallet to drive the central yoke **(2)** downwards until the bearing sleeve protrudes.
88. Place the bearing sleeve in a vice and tap the central yoke from the bearing.
89. Remove the opposing bearing sleeve in the same way and remove the external section of the shaft.
90. Turn the shaft assembly through 90°, then repeat operations 87 to 89 to disengage the universal joint from the shaft.
91. Place the interior section of the drive shaft in the vice and repeat operations 86 to 90.

Reassembly of universal joint

92. Clean and check the parts. Replace the universal joint assembly comprising the yokes, the seals, the bearings, the sleeves and the circlips.
93. Coat the needles with bearing grease and ensure that they are all in the sleeves.
94. Position the universal joint **(1)** in the yoke and move it sideways as far as possible to provide a guide for the needle rollers of the bearing sleeve being installed (Fig. 8).
95. Drive the sleeve **(1)** into the yoke deep enough to permit insertion of the circlip (Fig. 9).
96. Fit the other sleeves and universal joints in the same way.

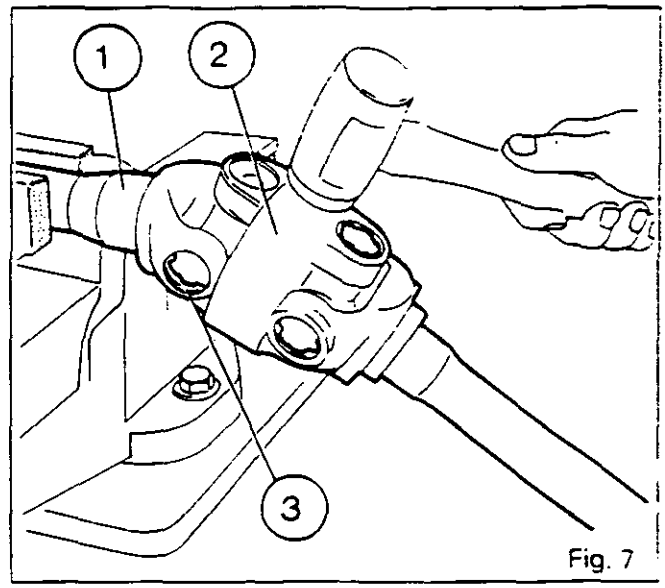


Fig. 7

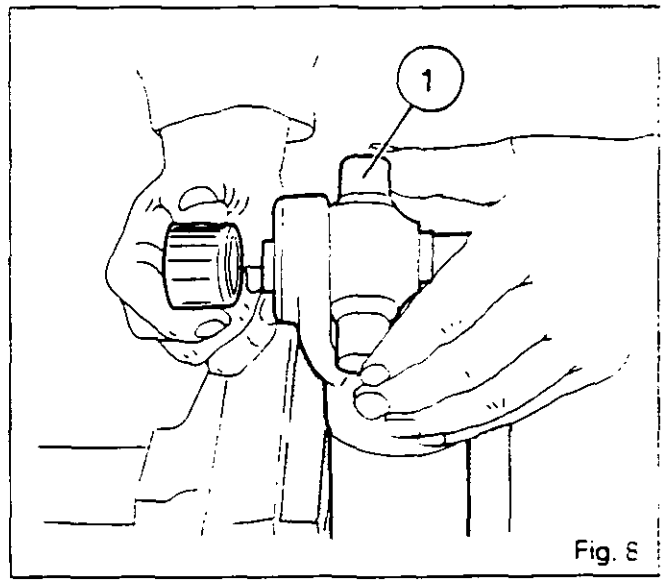


Fig. 8

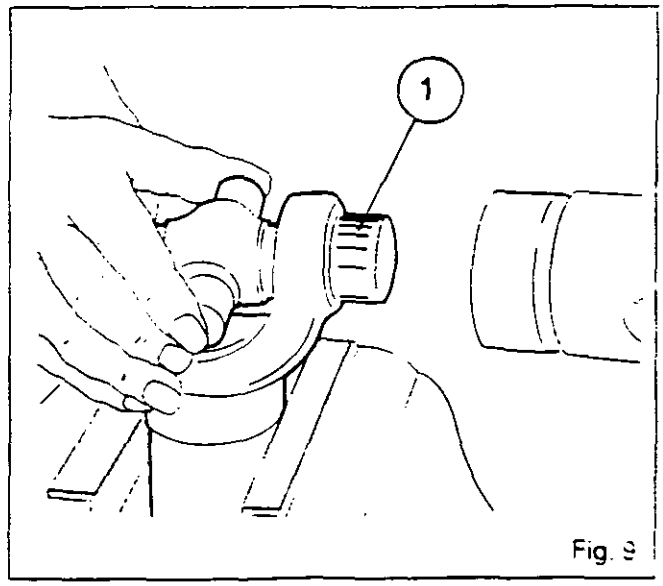


Fig. 9

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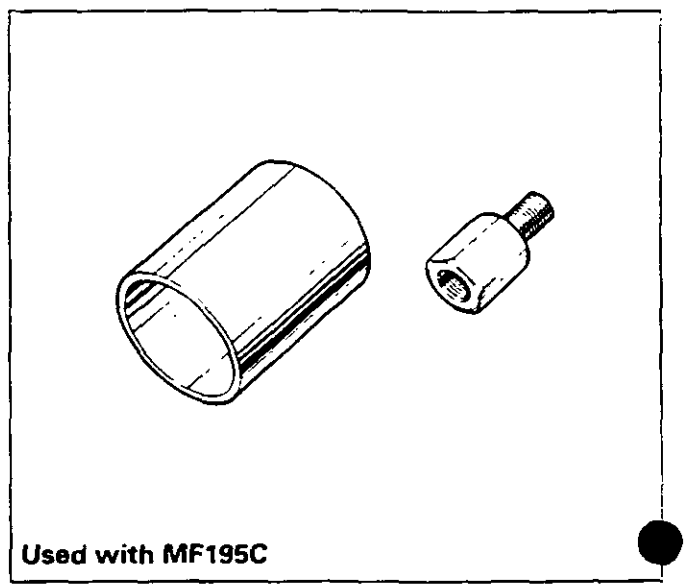
Refitting

97. Refit the universal drive shaft. Introduce a guide *through the filling hole to align the left drive shaft* with the differential.
98. Replace the seals **(6)** and **(12)**. Remove the swivel housing assembly and wheel hub.
99. Position the swivel pin **(7)** in such a way that the swivel housing **(47)** assembly is aligned with the axle case **(52)**.
100. Fit the swivel pin **(11)**, the bearing cup **(14)**, the cover **(15)**. Tighten the screws **(1)** evenly and alternately to push the swivel pin **(11)** into the axle case.
101. Remove the cover **(15)** and the bearing cup **(14)**. Coat the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a a torque of 91 - 112 Nm.
102. Fit the bearing cup **(4)**, the shims **[3]**, the cover **(2)**. Tighten the bolts as in operation 100. **Check that the swivel pin (7) and (11) are properly in contact with the axle case (52).**
103. *Remove the cover* **(2)**. *Remove the shims* **[3]** *and* the bearing cup **(4)**. Coat the bearing **(5)** with *bearing grease. Refit the bearing cup, the shims* and the cover. Apply Loctite 241 on bolts **(1)** and *tighten to a a torque of* 91 - 112 *Nm.*
104. Refit the steering ball joint. Tighten the nut to a torque of 103 - 115 Nm. Stake the nut with a new pin.
105. Remove the protection of the shaft. Refit the sun gear **(28)** and the circlip **(29)**.
106. Refit the planetary carrier. Carry our operations 25 to 33.

I . Service tools

A . Tools available on the MF network

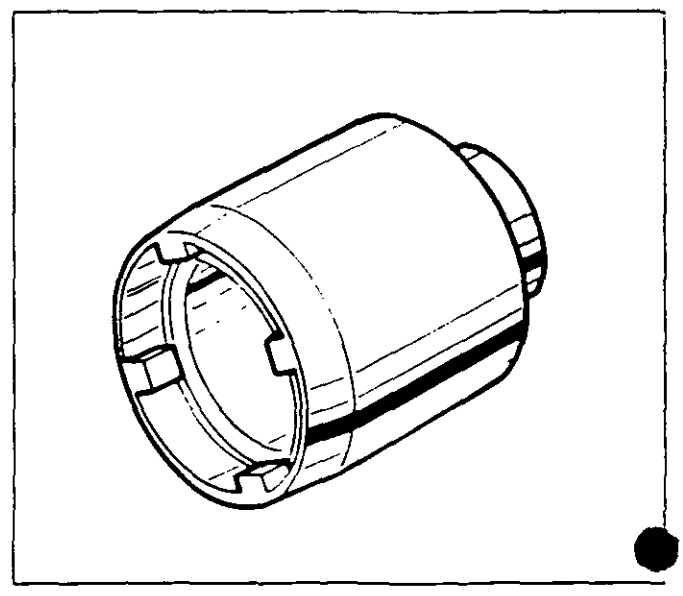
MF451B Wheel hub puller
MF451B3 Adaptor for puller Ø M18.



Used with MF195C

3376880 M1 Socket for ring gear carrier nut (cat. 2.5 and 3.5)

3376926 M1 Socket for ring gear carrier nut (cat. 1 and 2)

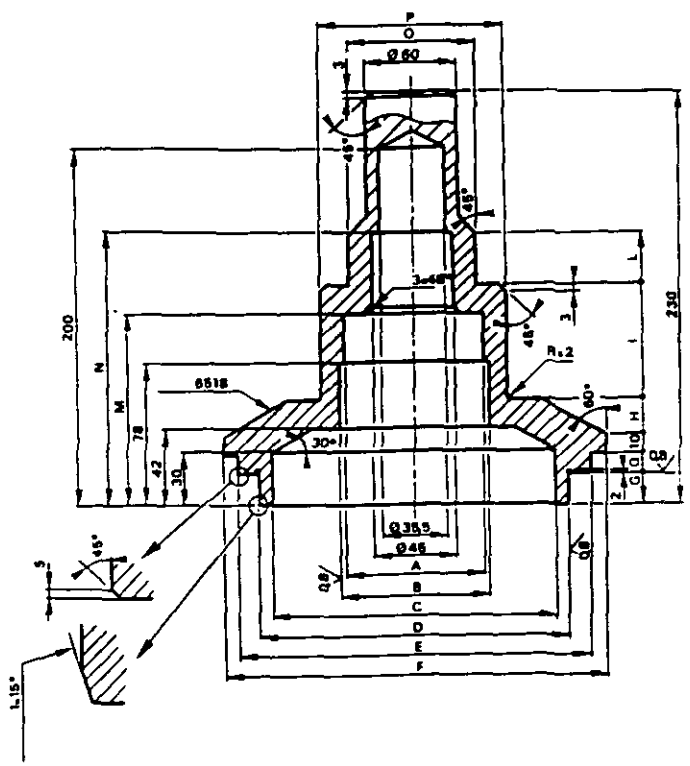


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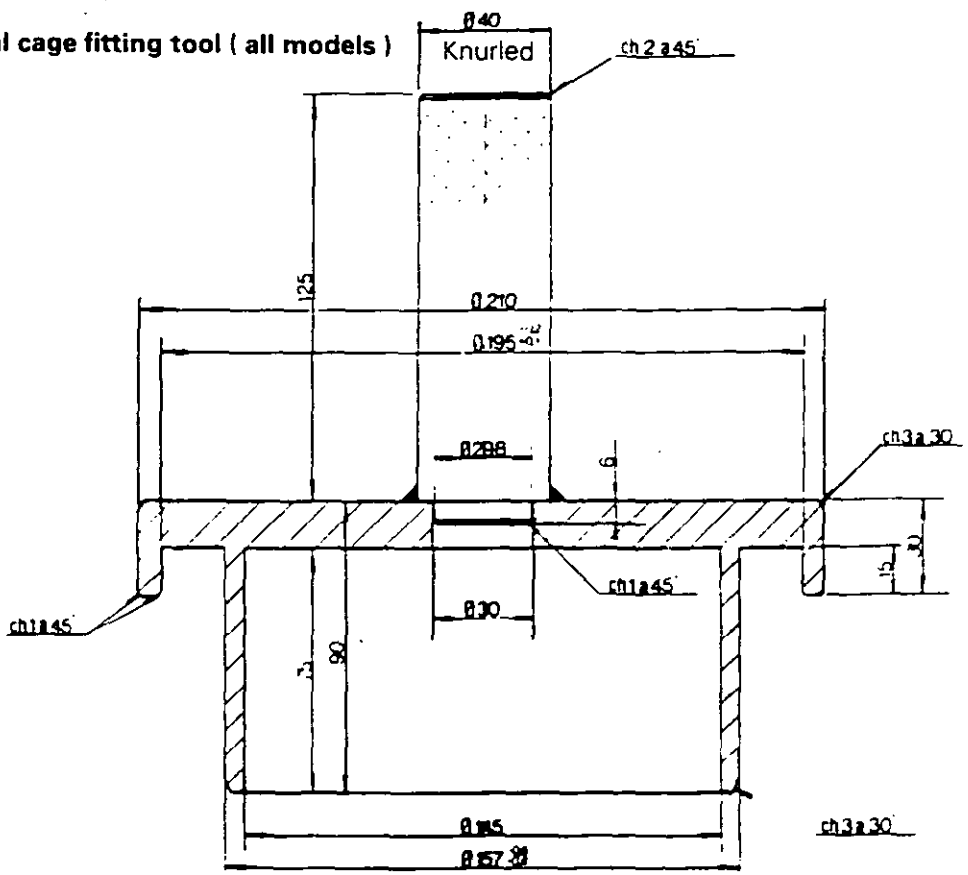
B . Tools to be made up locally

Swivel housing oil seal fitting tool

	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
Cat. 1 - 2	Ø 76	Ø 81,3+0,3+0,2	Ø 156	Ø 168,8 +0,1/0	Ø 194,2	Ø 210	18,5	19	64	28	106	151	Ø 70	Ø 102	10,1 0/-0,1
Cat. 2,5 - 3,5	Ø 86	Ø 87,3 +0,3+0,2	Ø 180	Ø 193,8 +0,1/0	Ø 219,2	Ø 240	20,5	17	67	42	118	173	Ø 76	Ø 108	9,50/-0,1



Seal cage fitting tool (all models)



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7 C01 Differential

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7C01.2

Front axle - Differential

General

The bevel crownwheel and pinion assembly containing the differential lock device (hydralock) is mounted in a casing **(7)** comprising two bearing halves **(43)** fastened by bolts **(42)**.
The bevel drive pinion is mounted at the rear of the casing on two opposed taper roller bearings. Its position can be adjusted by means of shims **[8]** situated behind the head roller bearing. The preload of the roller bearings is adjusted by controlled tightening of the nut **(1)**.
The assembly is sealed by two seals **(4)** and **(2)**. Axles of categories 2.5 and 3 have an O-ring **(41)** mounted on the bevel drive pinion and axles of categories 1 and 2 have an O-ring **(40)** fitted in the spacer **(3)**.
Axles of categories 1 to 2.5 have two planetary pinions **(38)** and one pin **(36)** and axles of category 3 have four planetary pinions and two pins.
The clearance between the crownwheel and bevel drive pinion is adjusted by shims **[22]** placed behind the cup **(29)**.
Preload of the case and crownwheel assembly is done with the splined nut **(32)**.

Parts list

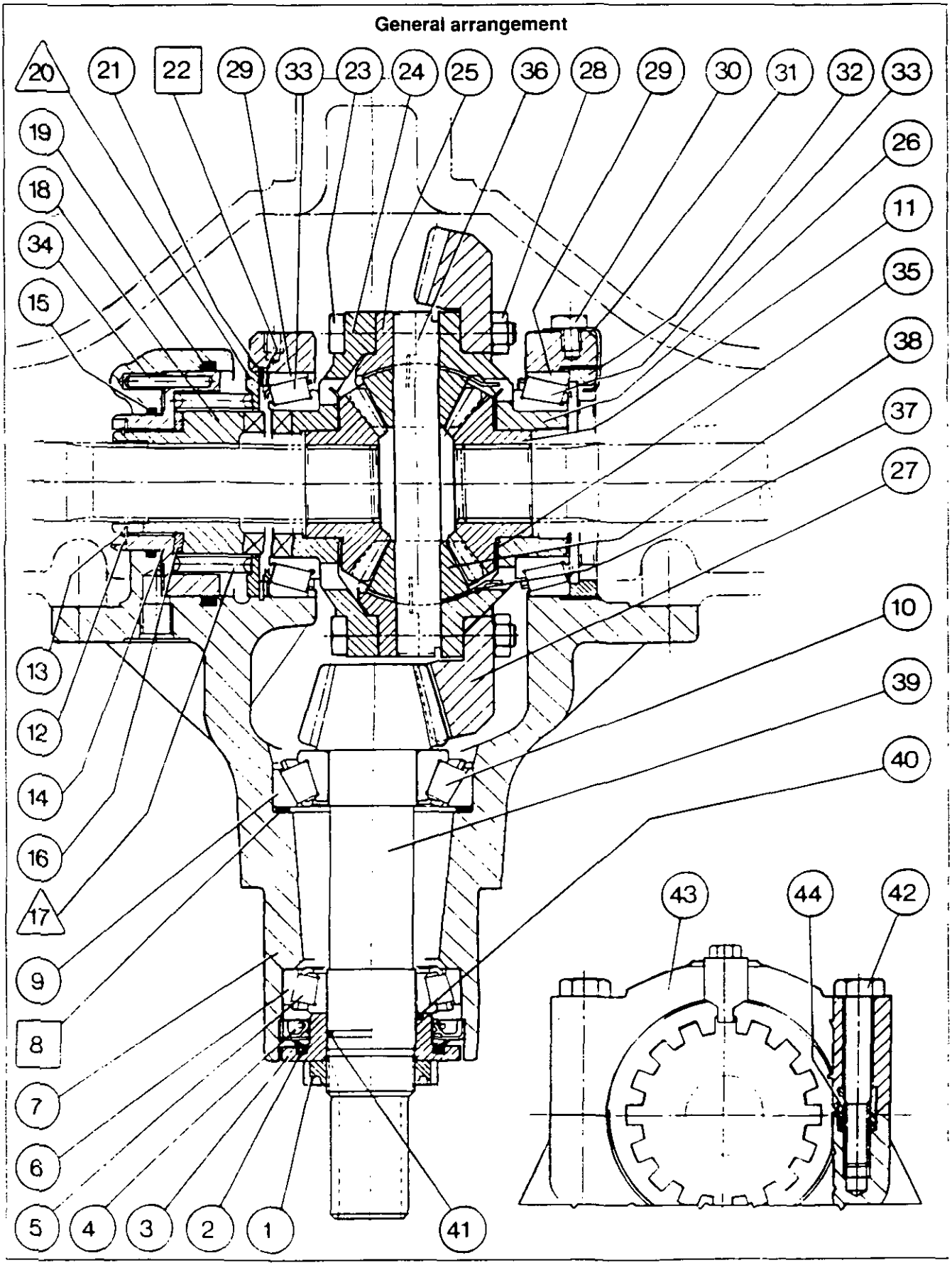
(1) Slotted nut
(2) Lip seal
(3) Spacer
(4) Sealing ring
(5) Bearing cone
(6) Bearing cup
(7) Casing
[8] Shim(s)
(9) Bearing cup
(10) Bearing cone
(11) Diff. gear
(12) Lug washer
(13) Retaining ring
(14) Piston
(15) O-ring
(16) Thrust washer
/17 Spring
(18) Dog tooth coupler
(19) O-ring
/20 Guide washer
(21) Washer
[22] Shim(s)
(23) Bolt
(24) Cover
(25) Housing half
(26) Housing half
(27) Crownwheel
(28) Nut
(29) Cup
(30) Bolt
(31) Locking plate
(32) Splined nut
(33) Bearing cone
(34) Dowel
(35) Washer
(36) Planetary pinion pin
(37) Spherical washer
(38) Planetary pinion
(39) Bevel drive pinion
(40) O-ring (cat. 1 - 2)
(41) O-ring (cat. 2.5 - 3)
(42) Bolt
(43) Bearing half
(44) Centring bush

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Front axle - Differential

General arrangement

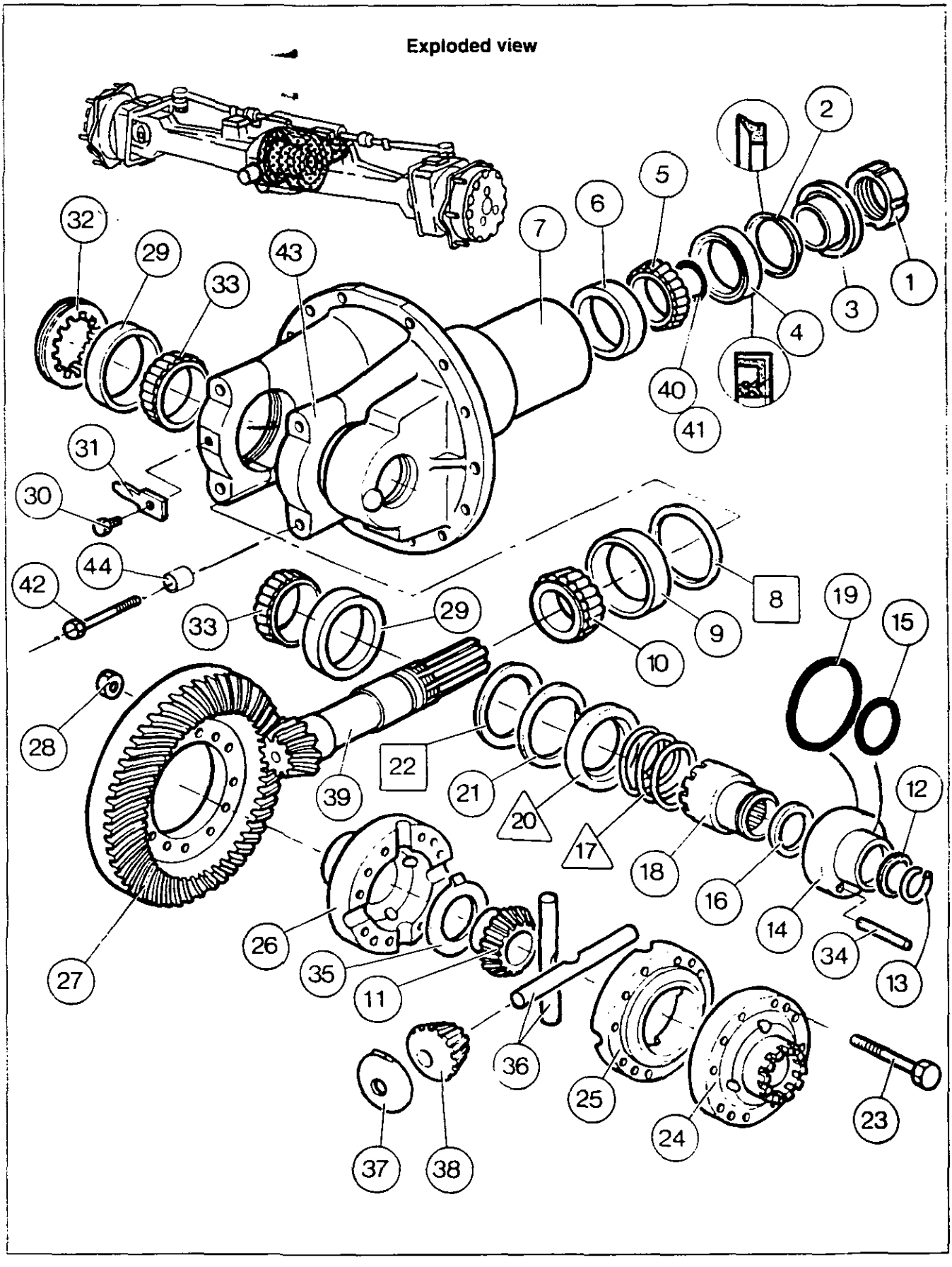


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Front axle - Differential

Exploded view



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Front axle - Differential

A. Splitting front axle / frame

1. Chock the rear wheels and apply the handbrake.
2. Disconnect the two hoses of the front differential lock (plug the channels). Remove the shield and the drive shaft.
3. Drain the axle.
4. Raise the tractor with a jack positioned under the axis of the axle housing. Place a stand (Fig. 3) under the lower engine housing. Remove the wheels.
5. Disconnect the pipes of the steering cylinder, marking their position (plug the channels).
6. Place the front axle in slings (Fig. 3).
7. Remove the bolts **(1)** and the grease nipple **(3)**. Remove bearing **(2)** and washer **(4)** (Fig. 1).
8. Remove the front axle, disengaging it from its rear bearing, and place it on a support. Remove the chamfered washer **(7)** (Fig. 1).
   Note: On tractors equipped with a belly weight, it is necessary to remove this in order to remove the front axle.

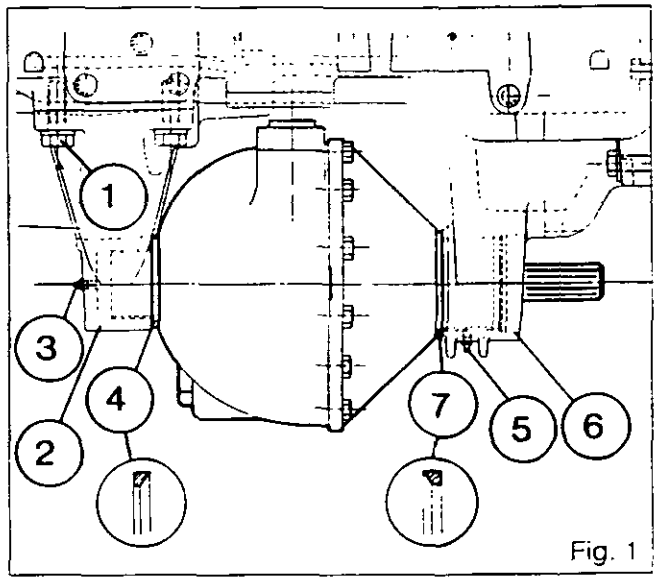


Fig. 1

B. Removal of swivel housings, wheel hubs and universal drive shafts

Note: Exercise care when carrying out this operation

9. Remove the steering ball joints.
10. Place the swivel housing assembly in a sling.
11. Remove the swivel housings. Carry out operations 53 and 54, chapter 7B01.
12. With the help of another person, remove the assemblies.
13. If necessary, remove the seals **(8)** (Fig. 2)

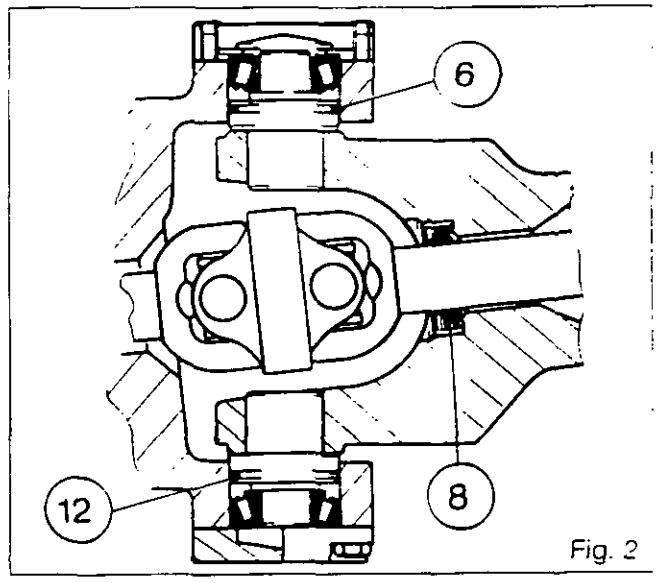
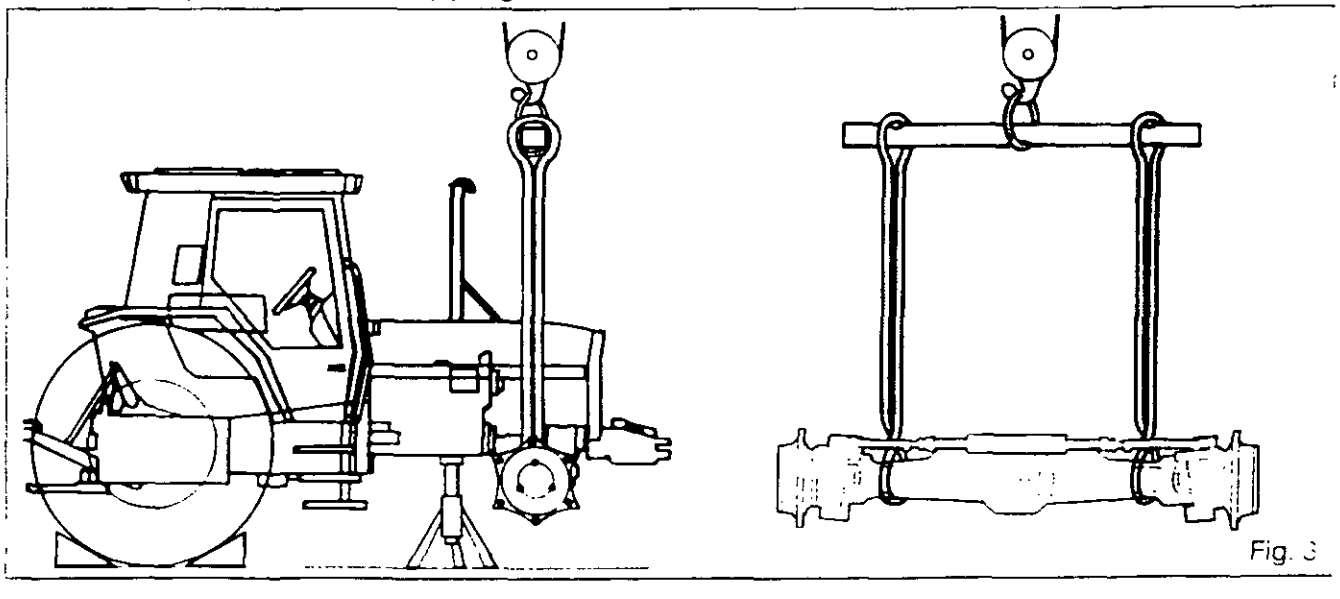


Fig. 2


Fig. 3

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C. Removal of differential case assembly

14. Remove the bolts **(1)** and detach the steering cylinder **(2)**, taking care not to lose the centring bushes or the rings **(3)** (depending on the category) (Fig. 4).
15. Remove the bolts **(1)**. Detach and remove the differential case assembly **(8)** (Fig. 5).
On tractors equipped with front axles of categories 1 - 2 - 2.5, the differential case is centred by means of dowels force-fitted in the axle casing **(52)**, and on category 3 axles by means of rings, likewise force-fitted.

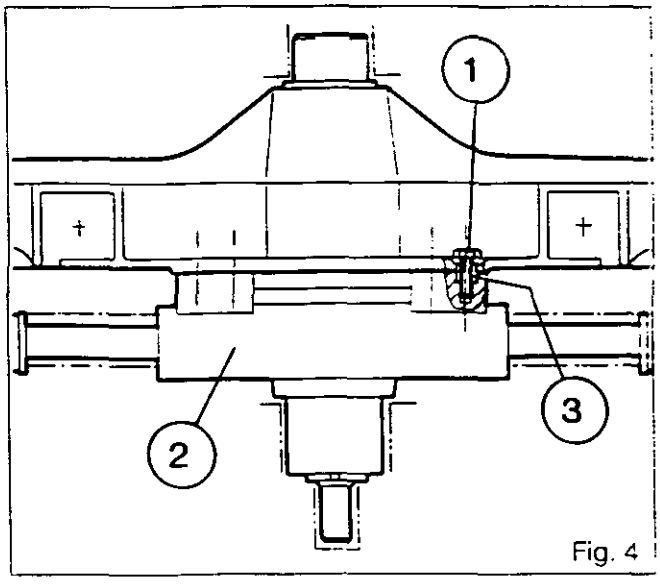


Fig. 4

D. Disassembly of differential

16. Place the casing **(7)** in a soft-jawed vice (Fig. 6).
17. Remove the bolt **(30)** and its retainer **(31)** (Fig. 6).
18. Remove the splined nut **(32)** using the special, locally made spanner (see section M).
19. Remove the four bolts **(42)**, detach the bearing halves **(43)** (Fig. 6).
Note: Carefully remove the bearing half on the lock control side; with the spring (17) compressed, the washer (21) should remain in the casing (7).
20. Remove the complete differential assembly with the bearing cones **(33)** and the cups **(29)** (Fig. 7). Separate the cups from the taper roller bearings. Remove the shim(s) **[22]**.
Note: Keep the bearing cones and cups paired if they are to be reused .

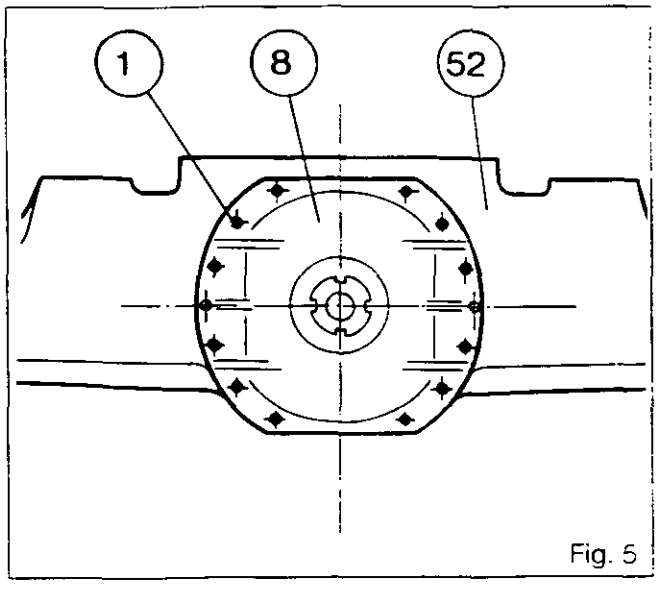


Fig. 5

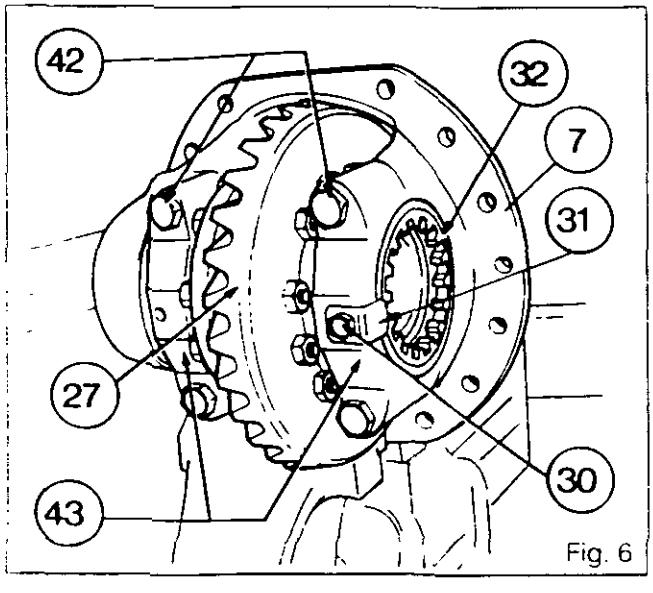


Fig. 6

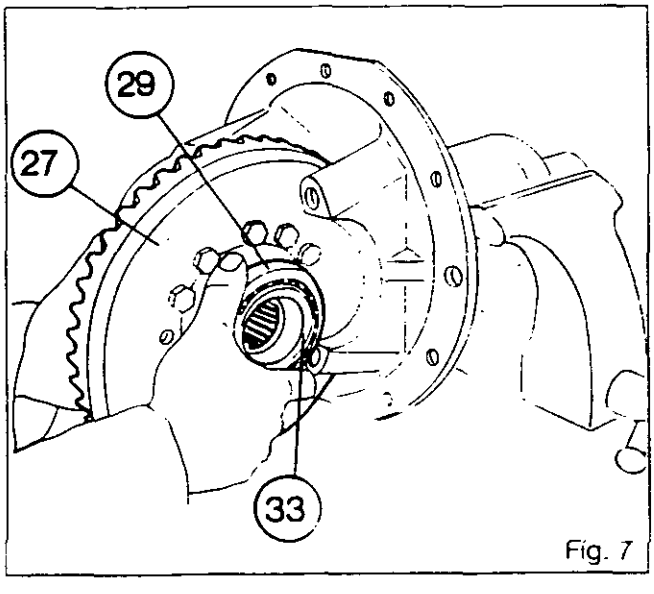


Fig. 7

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Front axle - Differential

21. If necessary, extract the two bearing cones **(33)**.
22. Place the differential assembly in a soft-jawed vice. Remove the nuts **(28)**. Take out the bolts **(23)**. ***Note: Prior to disassembly, mark the position of the bearing halves (25) and (26) and of the cover (24) so that they can be paired when refitting.***
23. Separate the bearing halves **(25)**, **(26)** and the cover **(24)**.
24. Remove the gear **(11)** and washer **(35)**.

Front axle, category 1 - 2 - 2.5 (Fig. 8)

25. Separate the pin **(36)**, the planetary pinions **(38)** and the spherical washers **(37)**.

Front axle, category 3 (Fig. 9)

26. Separate the two pins **(36)**, the planetary pinions **(38)** and the spherical washers **(37)**.

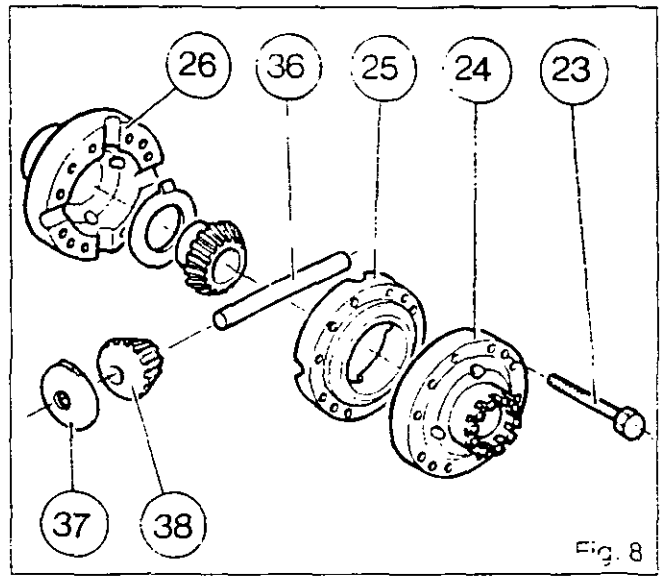


Fig. 8

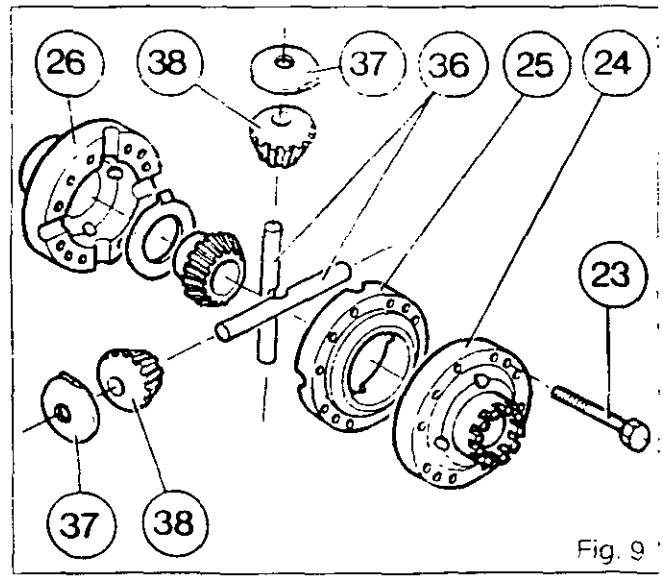


Fig. 9

E. Removal of differential lock (Fig. 10)

27. Using tool MF 471, correctly centred, compress the spring /**17**\ until the supporting washer **(21)** is free.
28. Remove the washer **(21)**.
29. Gradually relax the spring /**17**\.
30. Remove the service tool MF 471.
31. Remove the guide washer /**20**\ of the spring.
32. Remove the spring /**17**\.
33. Remove the retaining ring **(13)** of the dog tooth coupler **(18)**.
34. Dismantle the coupler **(18)**, the thrust washer **(16)** and the lug washer **(12)**.
35. Remove the piston **(14)**.
36. Take out the O-rings **(15)** and **(19)**.

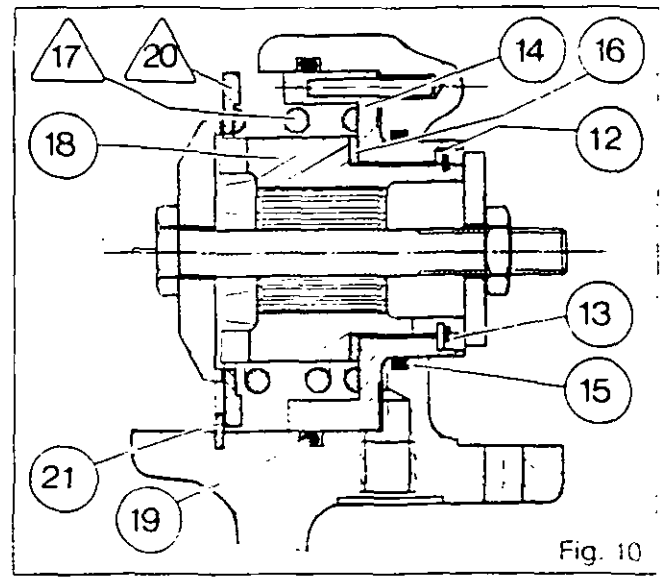


Fig. 10

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F. Removal of bevel drive pinion

37. Unlock the nut **(1)** and untighten it with Facom spanner n° 125-80 or equivalent (Fig. 11).
38. Remove the bevel gear pinion **(39)** together with the bearing cone **(10)**.
39. **Front axles category 2.5 and 3:** Remove the O-ring **(41)**.
40. Remove the bearing cone **(10)** of the bevel drive pinion.
41. Remove the cup **(9)** and the shims **[8]**.
    Remove the spacer **(3)**. Take out the seal **(2)**.
    Front axles category 1 and 2: Remove the O-ring **(40)**.
42. Remove the sealing ring **(4)**, the cone **(5)** and the cup **(6)**.

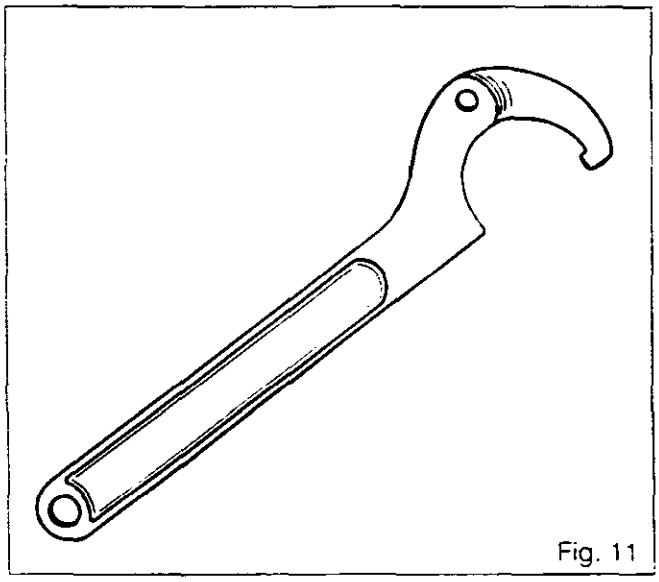


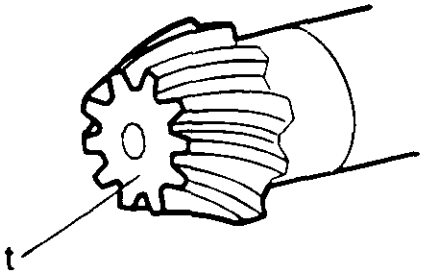
Fig. 11

G. Reassembly of bevel drive pinion

43. Before reassembly, clean the parts and replace those which are defective. Check that the channels of the differential lock are not obstructed.
    Note: If it should prove necessary to replace the crownwheel (27) or the bevel drive pinion (39), the two parts should be replaced together.
44. Adjust the position of the bevel drive pinion (Fig. 12). The thickness of the shims needed to position the bevel drive pinion correctly is calculated according to the following formula:
    SP = A - (d+t)
    where:
    SP: required thickness of shims **[8]**
    A: distance measured between the bearing cone **(10)** placed in the cup **(9)** and the machined face F of the casing **(7)**.
    d: nominal dimension varying according to the type of axle.

category 1 (3050)	=	118
category 2 (3060-3065)	=	118
category 2.5 (3070 up to 3115-3120)	=	118
category 3 (3125 -3140)	=	135

    t: actual dimension marked on the head of the bevel drive pinion. This value may be positive or negative (to be added or subtracted from nominal dimension **d**).



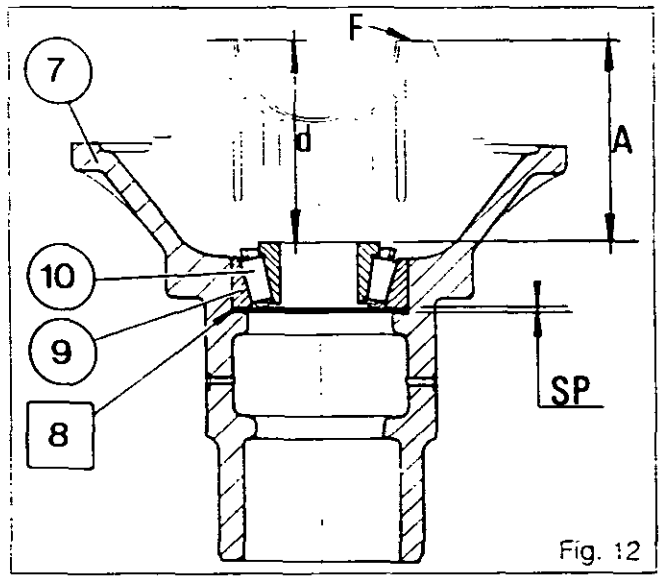


Fig. 12

Method of operation (Fig. 12)

45. Position the cup **(9)** and the bearing cone **(10)** in the casing **(7)** without the shims **[8]**.
    Using a depth gauge, measure dimension A.
    Take care to seat the bearing cone correctly in the cup. Having taken the measurement, apply the formula to determine the thickness of the shims needed.

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46. Remove the bearing cone **(10)** and cup **(9)** again.
47. Push the bearing cone **(10)** against the shoulder of the bevel drive pinion using a press and a suitable tool (Fig. 13).
48. Place the shim **[8]** of the previously calculated thickness in the casing.
49. Fit the cup **(9)**.
50. Place the cup **(6)** in the casing as far as it will go.
51. Position the bevel drive pinion **(39)** prepared with the cone **(10)**.
52. Smear the bearing surface of the bearing cone **(5)** with Loctite 601 and position it on the bevel drive pinion.
53. Fit the O-ring **(41) (axles category 2.5 and 3)**, the O-ring **(40) (axles category 1 - 2)**.
54. Smear the periphery of the sealing ring **(4)** with Loctite 542 and push it into the casing **(7)** as far as it will go, with the metal part turned towards the exterior of the casing.
55. Fit the seal **(2)** in the spacer **(3)** with the lip facing towards the interior of the housing.
56. Smear the interior of the spacer **(3)** with Loctite 601, then position it temporarily at the end of the bevel drive pinion. Grease the exterior of the spacer and the lip joint **(2)**. Place the spacer finally in contact with the bearing cone **(5)**.
57. Replace the nut **(1)**, smear it with Loctite 270 and then tighten it lightly on the bevel drive pinion.
    Note: Check that there is clearance between the spacer (3) and housing.
58. Rotate the bevel drive pinion through a few turns. Using a torque wrench and an adapted grooved sleeve, check that the rotational torque is between 2.5 and 3.5 Nm (Fig. 14). Tighten or untighten the nut **(1)** with Facom spanner n° 125-80 or equivalent until the desired rotational torque is obtained.
59. Lock the nut **(1)** by bending its collar in 3 equidistant grooves.

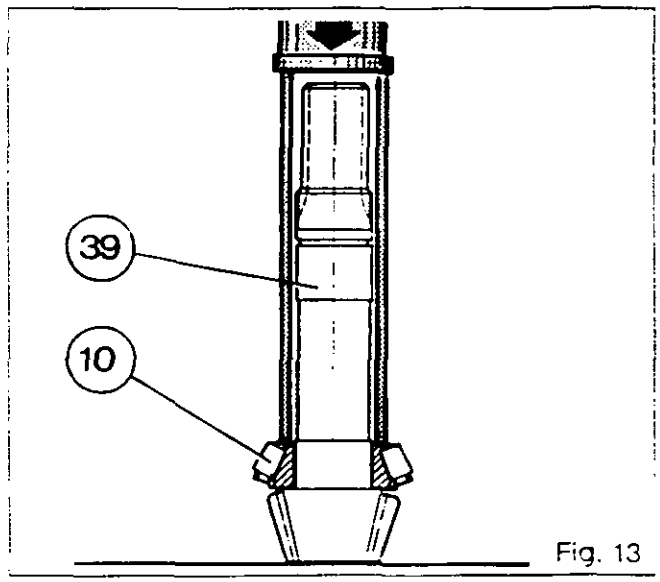


Fig. 13

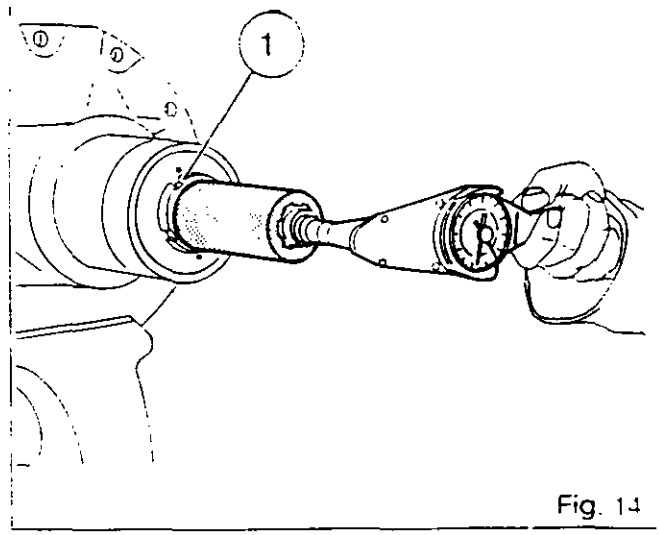


Fig. 14

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H. Reassembly of differential lock

60. Mount the thrust washer **(16)** on the coupler **(18)**. Fit the assembly in the piston **(14)**. Fit the lug washer **(12)** and position the retaining ring **(13)** in the groove of the coupler.
Note: The toothing of the coupler has been strengthened (see service bulletin Tract.89/005).
61. Mount the piston **(14)** together with the coupler **(18)** in the packingless casing.
Note: The dowel (34) is force-fitted in the piston. Check that the piston and the dowel slide freely in the housing.
Having carried out the check, remove the piston together with the coupler.
62. Fit new O-rings **(15)** and **(19)**. Position the piston with the coupler, then insert it with the aid of a plastic mallet, striking it on the periphery.
63. Position the spring **(17)** and the washer **(20)**, with the shoulder of the washer facing the spring. Tension the assembly with service tool MF 471 until the washer **(21)** slides freely in the groove of the casing.
64. Loosen the service tool MF 471, taking care to ensure that the spring cannot escape.
65. Fit the bearing cone **(33)**, if it has been removed, on the housing half **(26)** using a press or a suitable tool (Fig. 15).
66. Fit the other bearing cone **(33)**, if it has been removed, on the cover **(24)**.
67. Assemble the housing half **(25)** in the cover **(24)** (with claw teeth), observing the marking made at the time of dismantling.
68. Position the washer **(35)** on the axle gear **(11)**. Place the assembly in the housing half **(25)**, putting the tab of the washer in one of the holes of the housing half.

Front axles, category 1 - 2 - 2.5 (Fig. 8)

69. Place the two planetary pinions **(38)** and the two spherical washers **(37)** on the planetary pinion pin **(36)**, then place the assembly in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)**.

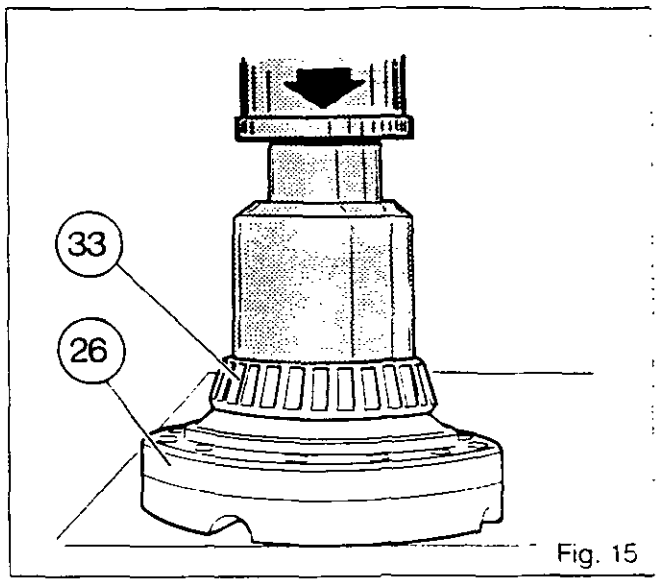


Fig. 15

Front axles, category 3 (Fig. 9)

70. Place the four planetary pinions **(38)** and the four spherical washers **(37)** on the two pins **(36)**, then place the assemblies in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)**.

Front axles, categories 1 to 3

71. Place the other washer **(35)** on the other gear **(11)**. Place the assembly in the housing half **(26)**, taking care to ensure that the position of the tab of the washer **(35)** is correct.
72. Position the housing half **(26)** assembly on the housing half **(25)**, maintaining the assembly position marked at the time of dismantling.
73. Position the crownwheel **(27)** on the housing half **(26)**. Fasten together the housing halves **(25)** and **(26)**, the cover **(24)** and the crownwheel.
Fit the bolts **(23)** and smear them with Loctite 270.
Tighten the nuts **(28)** to a torque of 66 - 73 Nm.
74. Position the cups **(29)** on their cones **(33)**.
75. Place the crownwheel assembly in the casing **(7)** (Fig. 7).
76. Check that the centring bushes **(44)** are present. Fit the shims **[22]**. Position the bearing halves **(43)**. Moderately tighten the bolts **(42)** so that the cups **(29)** move freely.

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77. Put the housing in a horizontal position in a soft-jawed vice, the crown uppermost (Fig. 16).
78. Put a dial gauge in place. Tighten the nut **(32)** (Fig. 16) and turn the crownwheel a few times to seat the bearing cones properly in the cups. Tighten the nut again to eliminate the axial play.
79. Tighten the nut **(32)** a further 3 notches to obtain the correct preload.
80. Check the backlash between the teeth of the crownwheel and of the pinion with a dial gauge (Fig. 17). Take three readings at three equidistant points. Determine the average of the three readings. This should be within the following values :
    Category 1 and 2 = 0.17 mm - 0.22 mm
    Category 2.5 = 0.15 mm - 0.20 mm
    Category 3 = 0.10 mm - 0.20 mm
    If the reading is too high, reduce the thickness of the shims **[22]**. If it is too low, increase the thickness until a correct backlash is obtained.
81. Remove the bearing bolts **(42)** one by one. Smear them with Loctite 270 and tighten them to a torque of 136 - 150 Nm.
82. Refit the locking plate **(31)** with the bolt **(30)** smeared with Loctite 270 and tighten to a torque of 16-26 Nm. Lock the nut **(32)**, bending the tab of the locking plate in the appropriate groove.

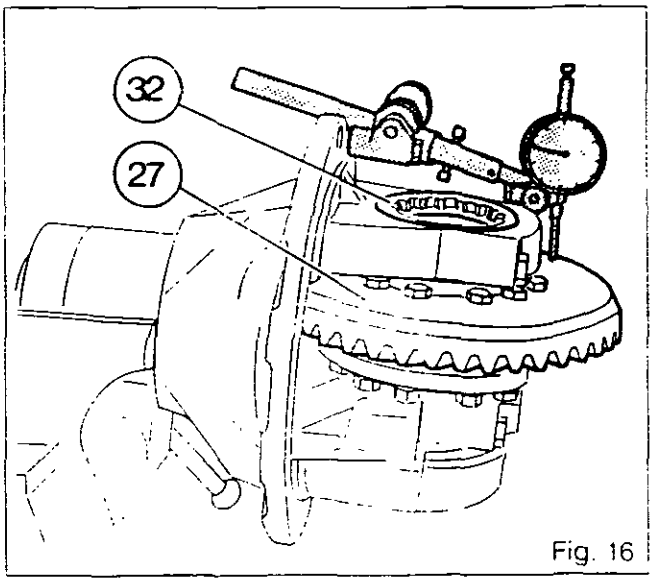


Fig. 16

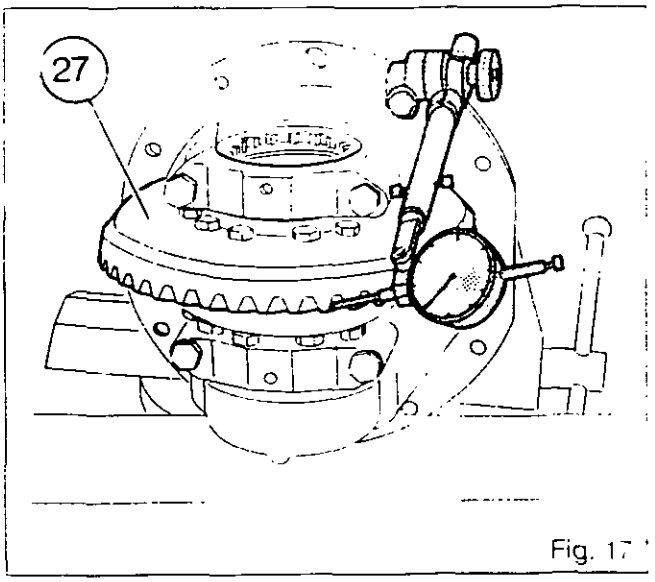


Fig. 17

I. Piston leak test

83. Connect a pressure gauge equipped with a valve to the supply connector of the differential lock.
84. Supply the circuit with compressed air at a pressure of approx. 5 bar and check the movement of the piston **(14)**.
    Reduce the pressure to 0.3 bar and close the valve.
    The pressure gauge should not show any drop in pressure for 1 minute.
85. Remove the pressure gauge and valve assembly.

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Front axle - Differential

J. Refitting of differential case assembly

86. Clean and check the parts. Replace those which are defective.
Note: To avoid risk of leakage, the breather in the swivel housing was eliminated and replaced with a plug. Refer to service bulletin Front Axle 011 issue 1.
87. Check that the centring pins (category 1 - 2 - 2.5) and bushes (category 3) are present on the axle casing **(52)**.
88. Smear the joint face of the differential case on the axle case with sealing compound Loctite 510 or equivalent and screw in two diametrically opposed guide studs.
89. Refit the differential case assembly **(8)**.
Remove the guide studs. Fit and tighten the bolts **(1)** (Fig. 5) to a torque of 91 - 112 Nm.
90. Check that the centring bushes **(3)** are present and refit the steering cylinder **(2)**. Apply Loctite 270 on bolts **(1)** and tighten to a torque of 102 - 112 Nm (Fig. 4).

K. Refitting of swivel housings, wheel hubs and universal drive shafts

91. If the seals **(8)** (Fig. 2) have been removed, smear the new seals with Loctite 542 on the periphery and fit them against the shoulder. Replace the seals **(6)** and **(12)** (Fig. 2).
92. With the help of another person, fit the assemblies. Slide the universal drive shafts in the axle case without damaging the seals **(8)**. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
93. Turn the wheel hubs to engage the drive shafts.
94. Refit the swivel housings. Carry out operations 95 to 100, chapter 7B01.

L. Reassembly of front axle / frame

95. Put the washer **(7)** in place, lightly smeared with grease (the chamfer facing towards the axle (Fig. 1)). Place the front axle in slings (Fig. 3) and position it so that it is in contact with its support **(6)** (Fig. 1).
Note: The rear support of the axle is fixed to the frame on tractors 3050 to 3070 and detachable on types 3080 to 3125.
96. Fit the washer **(4)** (the chamfer facing towards the axle (Fig. 1)) with the bearing **(2)** against the washer **(4)** in such a way as to eliminate play. Fit and tighten the bolts **(1)** (Fig. 1) smeared with Loctite 270 to a torque of 520 - 640 Nm.
97. Fit the grease nipple **(3)**. Grease the bearings **(2)** and **(6)** (Fig. 1) with a grease gun.
98. Reconnect the pipes of the steering cylinder (marked at the time of dismantling).
99. Raise the tractor with a jack. Refit the wheels. Remove the stand. Tighten the nuts to a torque of 250 - 300 Nm.
100. Top up the axle oil and check the oil level of the final drives.
101. Coat the two drive shaft couplings with "Anti-seize" grease or equivalent. Refit the drive shaft. Reconnect the two hoses of the front differential lock.
102. Remove the blocks and release the handbrake.
103. Carry out a road test on the front axle and differential lock control.
104. **Check for leaks:**
- of the seals and of the joint face of the differential case
- of the hydraulic connectors.

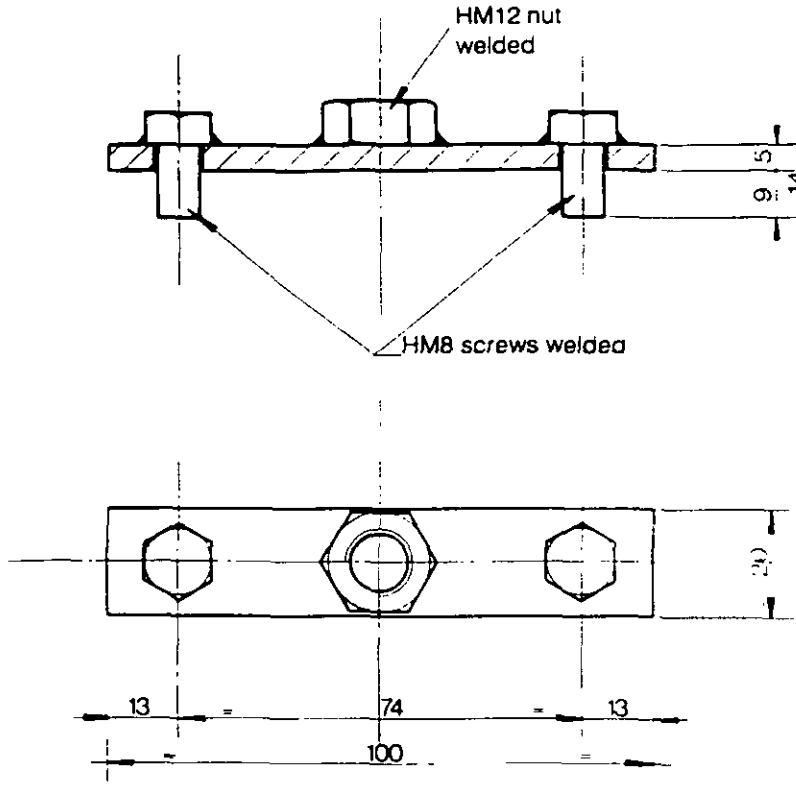
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M . Service tools

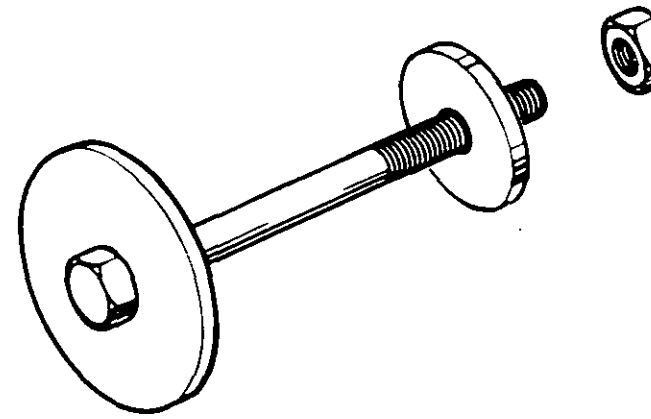
1 . Tool to be made locally

Special spanner for splined nut



2 . Tool available from the MF network

Spring compression tool MF471



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7 C02 Differential

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Improved front axle - Differential

General

Note : This procedure applies to tractors equipped with improved front axles cat. 1 to 3.5 fitted from serial numbers :

- axles cat. 1 and 2
3050 : A209023
3060/3065 : standard seal : A163015
reinforced seal : A161005
- axle cat. 2.5
3070/80/85/95/3115/20 : A209011
- axle cat. 3.5
3125 : A007039

The bevel crownwheel and pinion assembly containing the differential lock device (hydralock) is mounted in a casing **(7)** comprising two bearing halves **(43)** fastened by screws **(42)**.
The bevel drive pinion is mounted at the rear of the casing on two opposed taper roller bearings. Its position can be adjusted by means of shims **[8]** situated behind the head roller bearing. The preload of the roller bearings is adjusted by means of shims **[2]** located between the spacer **/45** and the bearing cone **(5)**.

The assembly is sealed by two seals **(4)** and **(40)** fitted on the bevel drive pinion. Axles of categories 1 - 2 and 2.5 have two planetary pinions **(38)** and a pin **(36)**, those of category 3.5 are fitted with four planetary pinions and two pins.
Backlash between the crownwheel and bevel drive pinion is set by means of shims **[22]** placed behind the cup **(29)**.
Preload of the case and crownwheel assembly is done with the splined nut **(32)**.
A riveted plate on the RH side of the front axle housing shows the category and the serial number.

Service tools (see section M)

MF451B Swivel pin bearing remover
MF451B.3 Adaptor for remover diam M18
MF471 Spring compression tool
3376881 M1 Special spanner for slotted nut of bevel drive pinion (axles cat. 2.5 and 3.5)
3376927 M1Special spanner for slotted nut of bevel drive pinion (axles cat. 1 and 2).

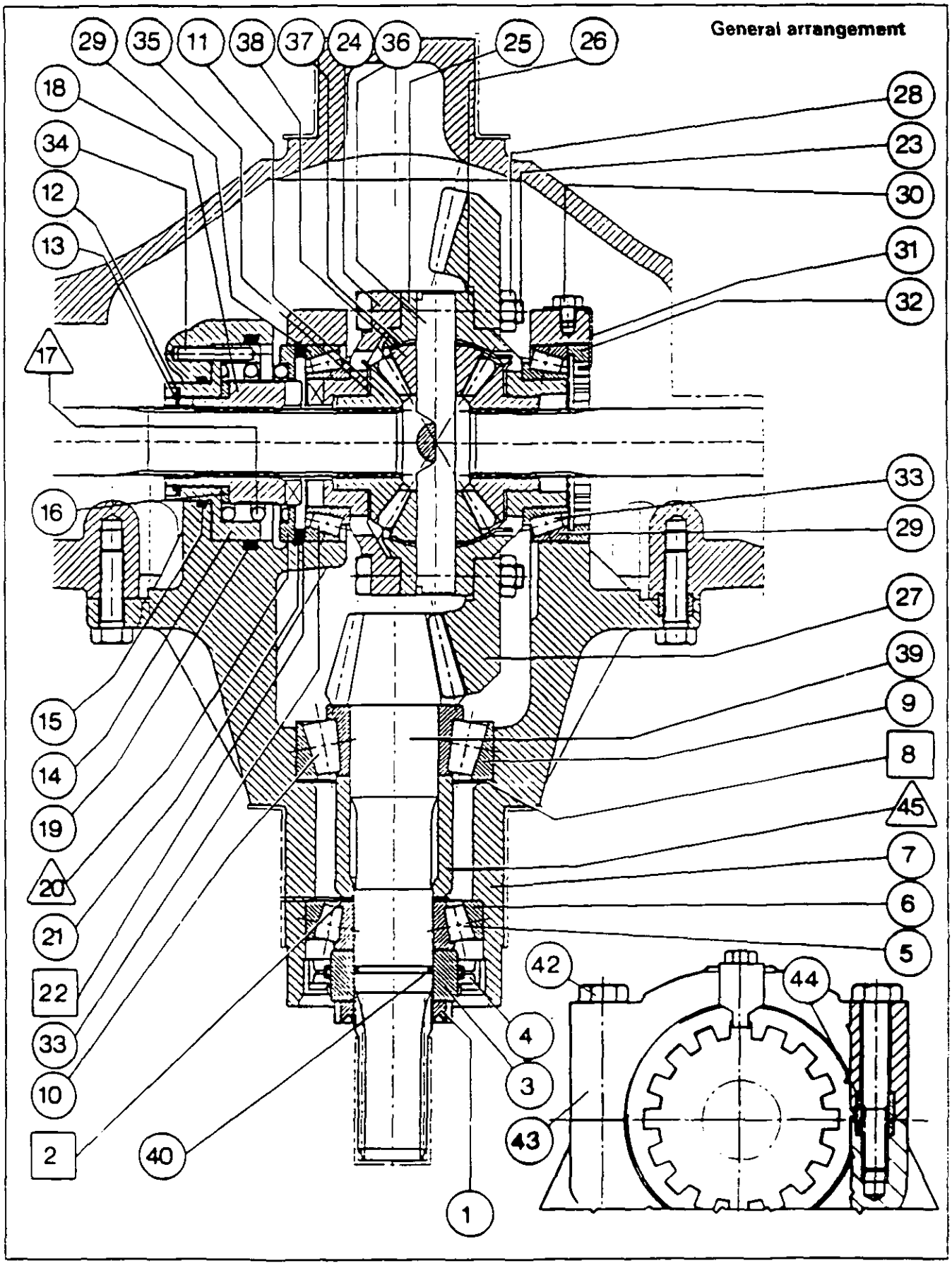
Parts list

(1) Slotted nut
[2] Shim(s)
(3) Spacer
(4) Seal
(5) Bearing cone
(6) Bearing cup
(7) Casing
[8] Shim(s)
(9) Bearing cup
(10) Bearing cone
(11) Diff. gear
(12) Lug washer
(13) Retaining ring
(14) Piston
(15) O'ring
(16) Thrust washer
/17 Spring
(18) Dog tooth coupler
(19) O'ring
/20 Guide washer
(21) Washer
[22] Shim(s)
(23) Bolt
(24) Cover
(25) Housing half
(26) Housing half
(27) Crownwheel
(28) Nut
(29) Cup
(30) Bolt
(31) Locking plate
(32) Splined nut
(33) Bearing cone
(34) Dowel
(35) Washer
(36) Planetary pinion pin
(37) Spherical washer
(38) Planetary pinion
(39) Bevel drive pinion
(40) O'ring
(42) Bolt
(43) Bearing half
(44) Centring bush
/45 Spacer

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Improved front axle - Differential



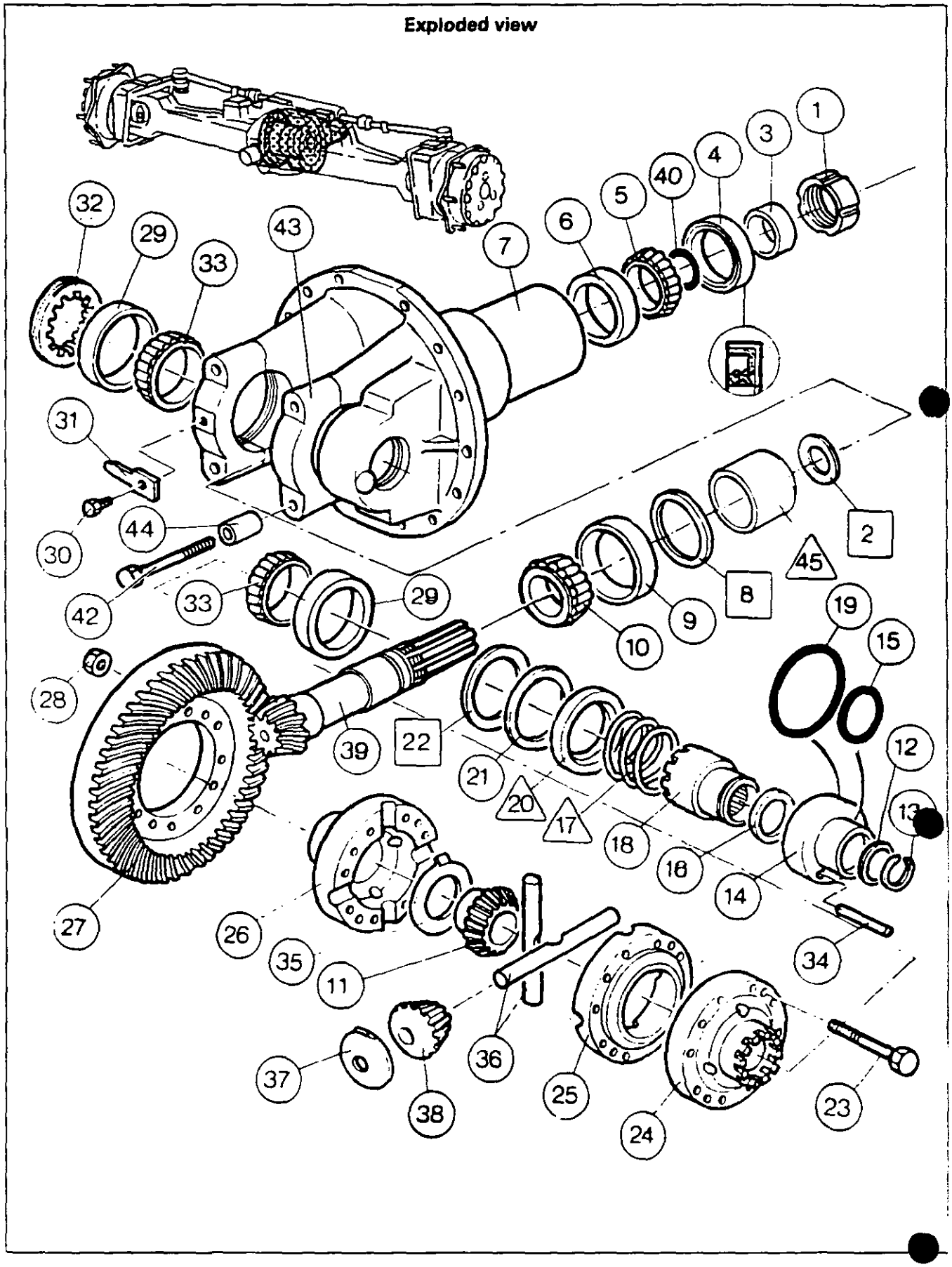
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7C02.4

Improved front axle - Differential

Exploded view



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Improved front axle - Differential

A . Splitting front axle / frame

1. Block the rear wheels and apply the handbrake.
2. Disconnect the two hoses of the front differential lock (plug the channels). Remove the shield and the transmission shaft.
3. Drain the axle.
4. Raise the tractor with a jack positioned under the axis of the axle housing. Place a prop (Fig. 2) under the lower engine housing. Remove the wheels.
5. Disconnect the pipes of the steering cylinder, marking their position (plug the channels).
6. Place the front axle in slings (Fig. 2).
7. Remove the bolts **(1)** and the grease nipple **(3)**. Remove bearing **(2)** and washer **(4)** (Fig. 1).
8. Remove the front axle, disengaging it from its rear bearing, and place it on a support. Remove the chamfered washer **(7)** (Fig. 1).
   Note : On tractors equipped with a belly weight, it is necessary to remove this in order to remove the front axle.

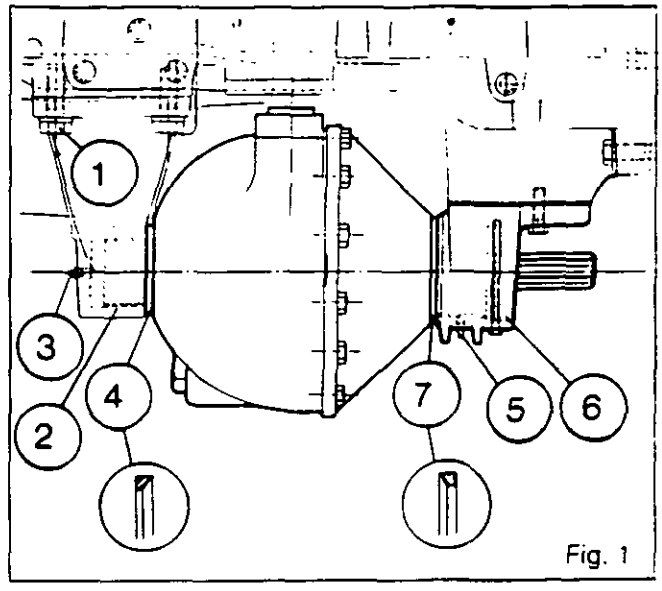
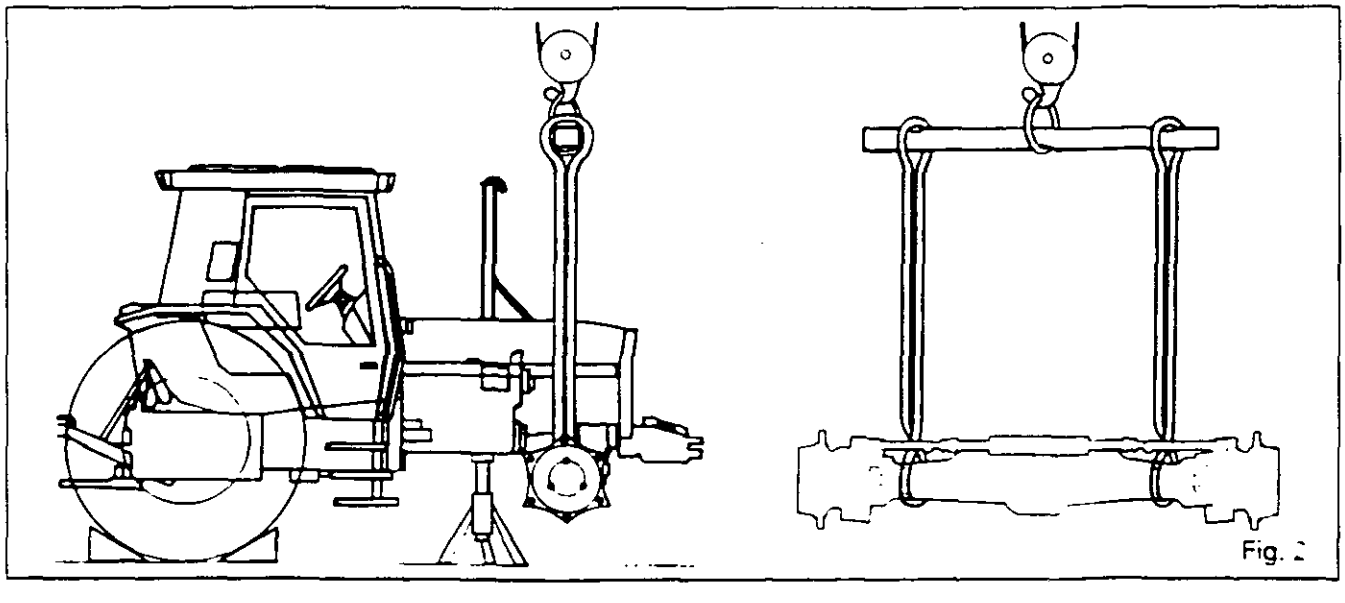


Fig. 1

B . Removal of swivel housings, wheel hubs and universal drive shafts

Note : Exercise care when carrying out this operation.

9. Remove the steering ball joints.
10. Place the swivel housing assembly in a sling.


Fig. 2

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Removal of swivel housings (Fig. 3 - 4)

11. Remove bolts **(1)** and cover **(2)**. Remove shims **(3)**. Extract swivel pin **(7)** with tool MF451B and adaptor MF451B3.
12. Remove the lower swivel pin as explained previously.
13. With the help of another person, remove the assemblies.
14. If necessary, remove oil seals **(8)** (Fig. 3).

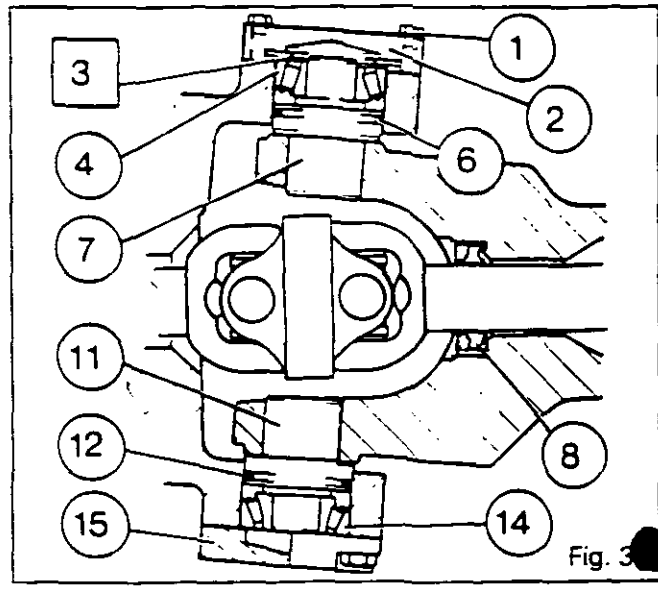
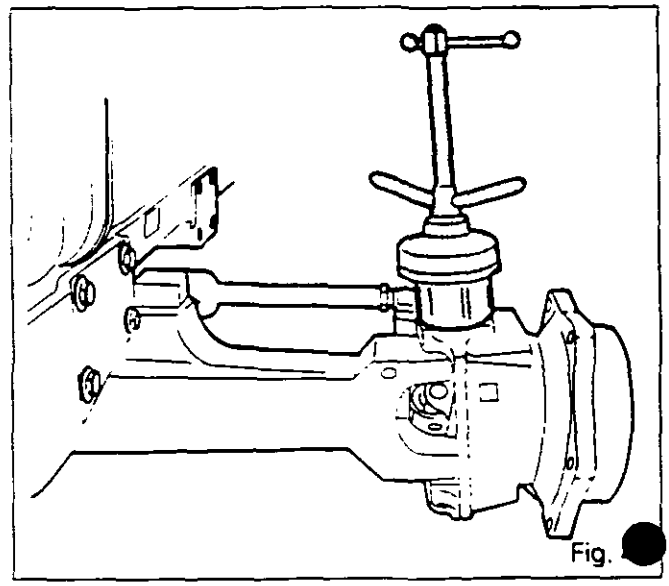


Fig. 3

C . Removal of differential case assembly

15. Remove the bolts **(1)** and detach the steering cylinder **(2)**, taking care not to lose the centring bushes or the rings **(3)** (Fig. 5).
16. Remove the bolts **(1)**. Detach and remove the differential case assembly **(8)** (Fig. 6).
    On improved axles, the differential case is centred by means of bushes force-fitted in the axle casing **(52)**.


Fig.

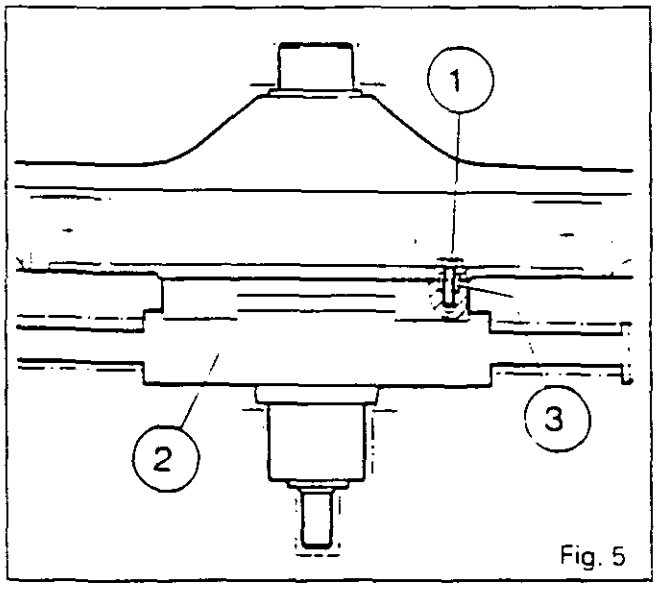


Fig. 5

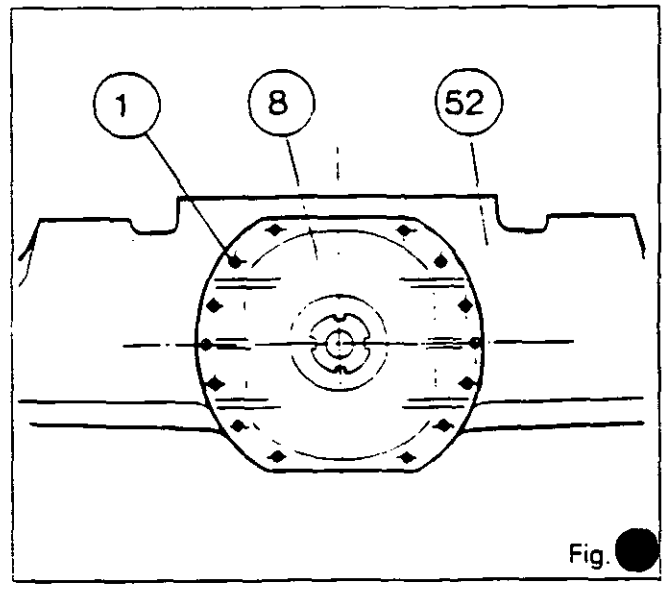


Fig.

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D . Disassembly of differential

17. Place the casing **(7)** in a soft-jawed vice (Fig. 7).
18. Remove the bolt **(30)** and its retainer **(31)** (Fig. 7).
19. Remove the splined nut **(32)** using the special, locally made spanner (see section M).
20. Remove the four screws **(42)**, detach the bearing halves **(43)** (Fig. 7).
    Note : Carefully remove the bearing half on the lock control side ; with the spring (17) compressed, the washer (21) should remain in the casing (7).
21. Remove the complete differential assembly with the bearing cones **(33)** and the cups **(29)** (Fig. 8). Separate the cups from the taper roller bearings. Remove the shim(s) **[22]**.
    Note : Keep the bearing cones and cups paired if they are to be reused.
22. If necessary, extract the two bearing cones **(33)**.
23. Place the differential assembly in a soft-jawed vice. Remove the nuts **(28)**. Take out the bolts **(23)**.
    Note : Prior to disassembly, mark the position of the bearing halves (25) and (26) and of the cover (24) so that they can be paired when refitting.
24. Separate the bearing halves **(25)**, **(26)** and the cover **(24)**.
25. Remove the gear **(11)** and washers **(35)**.
26. According to category, separate one or two pins **(36)**, the planetary pinions **(38)** and the spherical washers **(37)** (Fig. 9).

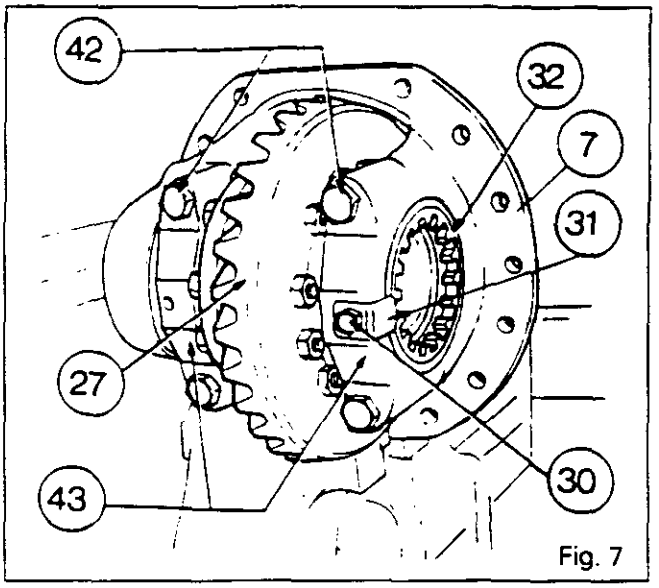


Fig. 7

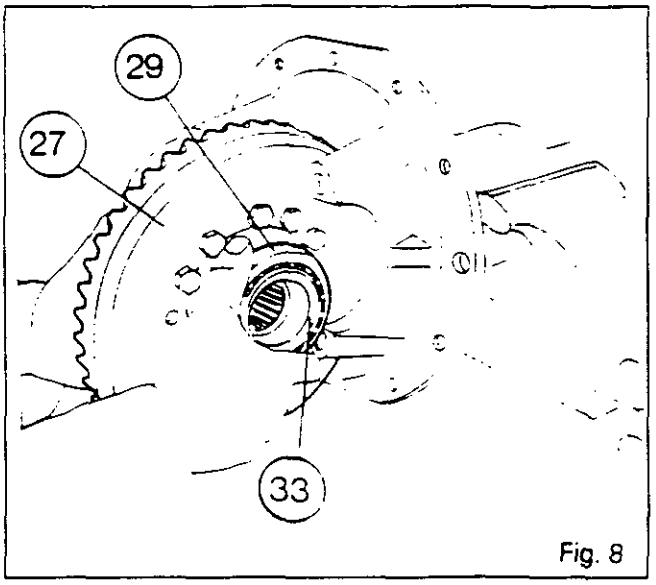


Fig. 8

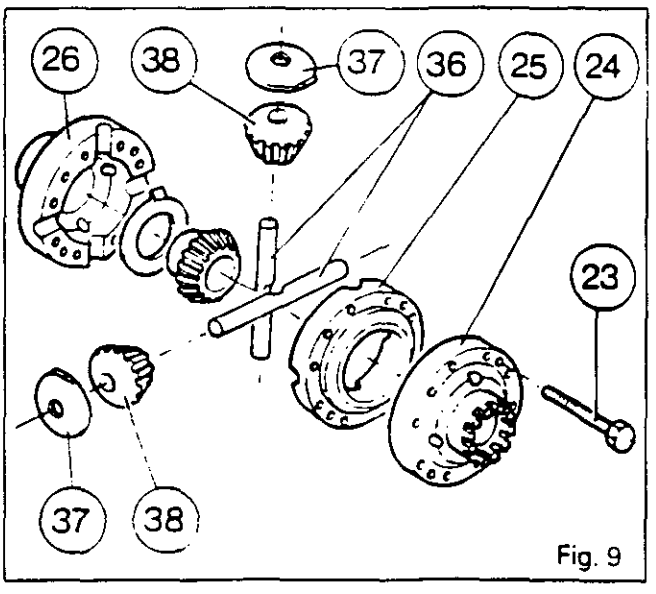


Fig. 9

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E . Removal of differential lock (Fig. 10).

27. Using tool MF471, correctly centred, compress the spring **/17** until the supporting washer **(21)** is free.
28. Remove the washer **(21)**.
29. Gradually relax the spring **/17**.
30. Remove the service tool MF471.
31. Remove the guide washer **/20** of the spring.
32. Remove the spring **/17**.
33. Remove the retaining ring **(13)** of the dog tooth coupler **(18)**.
34. Dismantle the coupler **(18)**, the thrust washer **(16)** and the lug washer **(12)**.
35. Remove the piston **(14)**.
36. Take out the O'rings **(15)** and **(16)**.

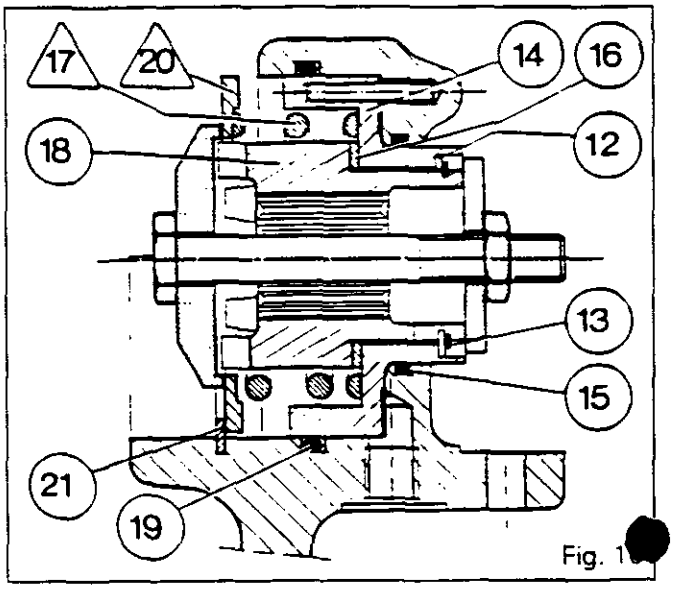


Fig. 1

F . Removal of bevel drive pinion

37. Unstake the nut **(1)** and maintain it using the special spanner (Fig. 11 - 12) :
    - 3376927 M1 : Cat. 1 and 2
    - 3376881 M1 : Cat. 2.5 and 3.5

    Untighten the bevel drive pinion clockwise using the special sleeve "C" (Fig. 11) locally manufactured (see section M).
38. Remove the bevel drive pinion together with cone **(10)**, spacer **/45**, shims **[2]** and O'ring **(40)**.
39. From the bevel drive pinion, remove O'ring **(40)**, shims **[2]**, spacer **/45**.
40. Extract cone **(10)** from bevel drive pinion.
41. Remove cup **(9)** and shims **[8]**.
42. Remove spacer **(3)**, drive out cup **(6)** with its cone **(5)** in order to extract the seal ring **(4)**.

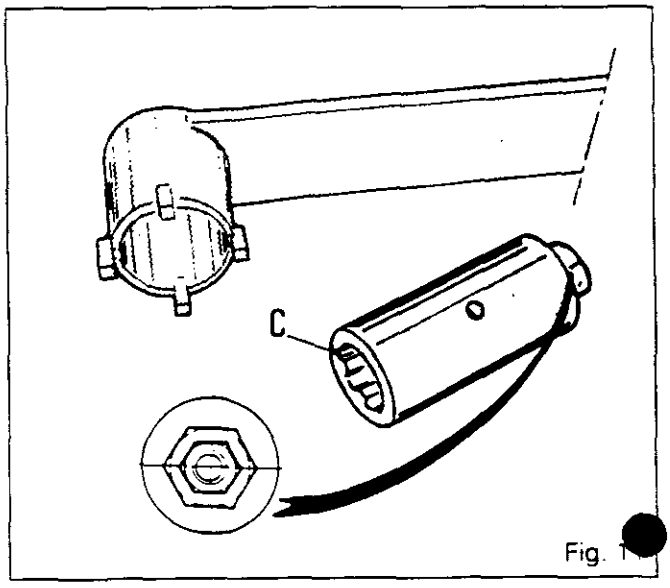
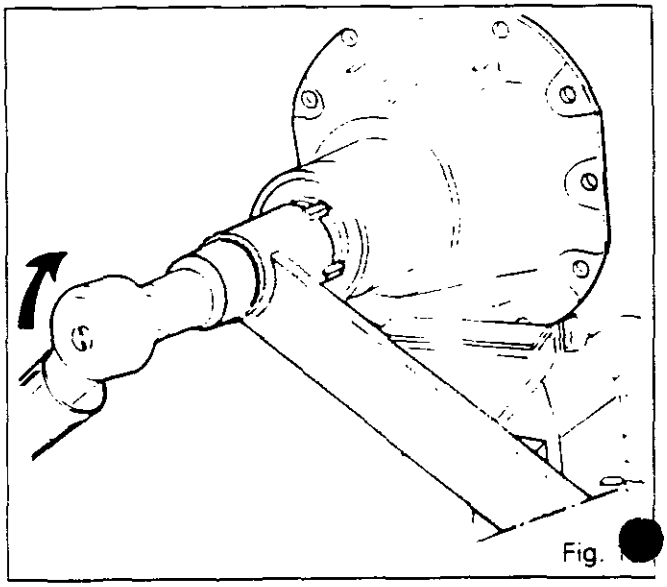


Fig. 1

G . Reassembly of bevel drive pinion

43. Before reassembly, clean the parts and replace those which are defective. Check that the channels of the differential lock are not obstructed.
    Note : If it should prove necessary to replace the crownwheel (27) or the bevel drive pinion (39), the two parts should be replaced together.


Fig. 1

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44. Adjust the position of the bevel drive pinion (Fig. 13). The thickness of the shims needed to position the bevel drive pinion correctly is calculated according to the formula : **SP = A - (d±t)**
    SP : required thickness of shims **[8]**
    A : distance measured between the bearing cone **(10)** placed in the cup **(9)** and the machined face F of the casing **(7)**.
    d : nominal dimension = 118± 0.1 (cat. 1-2-2.5)
    133.5 ± 0.1(cat. 3.5)
    t : actual dimension marked on the head of the bevel drive pinion (Fig. 14). This value may be positive or negative (to be added or subtracted from nominal dimension **d**).

Method of operation (Fig. 13)

45. Position the cup **(9)** and the bearing cone **(10)** in the casing **(7)** without the shims **[8]**. Using a depth gauge, measure dimension A. Take care to seat the bearing cone correctly in the cup. Having taken the measurement, apply the formula to determine the thickness of the shims needed.
46. Remove the bearing cone **(10)** and cup **(9)** again.
47. Push the bearing cone **(10)** against the shoulder of the bevel drive pinion using a press and a suitable tool (Fig. 15).
48. Place the shim **[8]** of the previously calculated thickness in the casing.
49. Fit the cup **(9)**.
50. Place the cup **(6)** in the casing as far as it will go.
51. On the bevel drive pinion prepared with cone **(10)**, engage the spacer **/45** with its chamfer facing the bevel drive pinion splines.
52. Place the bevel drive pinion assembly into the casing and fit the shims **[2]**, then fit cone **(5)** and spacer **(3)** (Fig. 16).

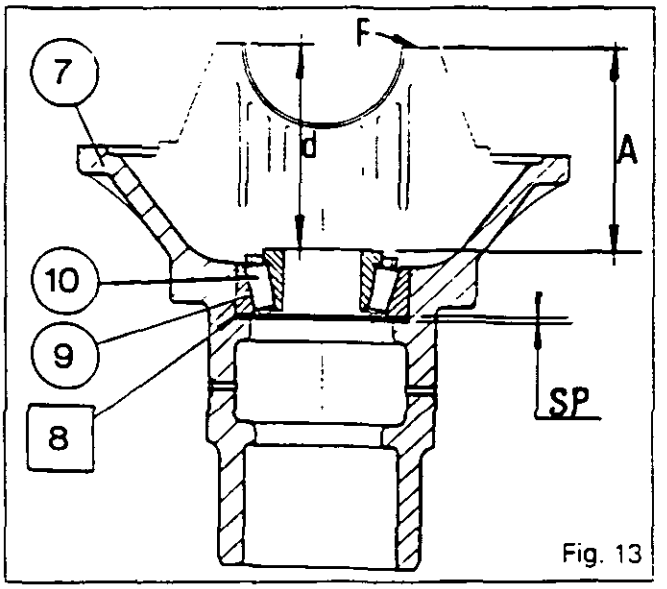


Fig. 13

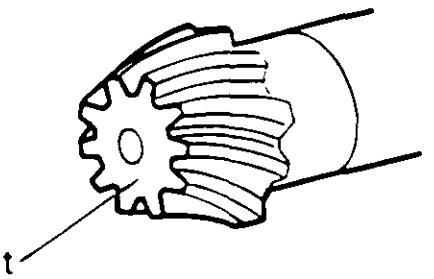


Fig. 14

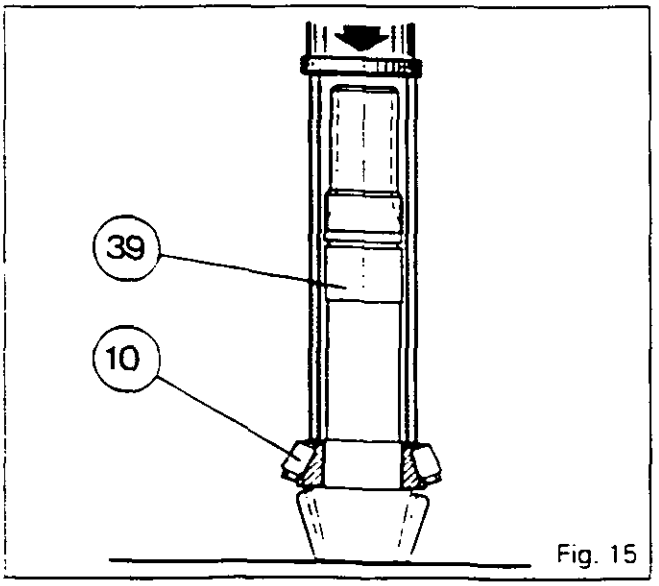


Fig. 15

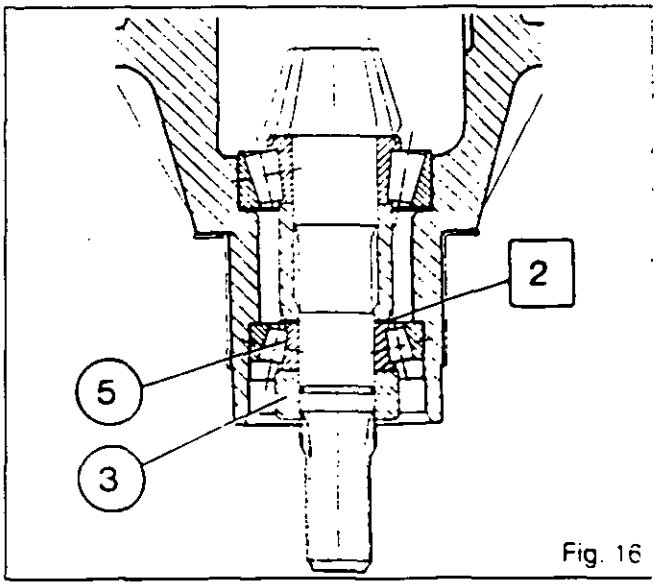


Fig. 16

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53. Maintain nut **(1)** with the special spanner 3376927 M1 or 3376881 M1. Using the special sleeve and a torque wrench, turn the bevel drive pinion, to obtain a torque of 250 - 295 Nm (Fig. 17).
54. Preload the bevel drive pinion.
    Method : The principle consists of removing or adding shims **[2]** to obtain a rotational torque of 1 to 3 Nm.
55. Rotate the bevel drive pinion through a few turns using a torque wrench and the special sleeve (Fig. 18). Check that the above torque is correct.
    Note : The torque of 250 - 295 Nm should be applied to every refitting of nut (1).
56. After setting, maintain nut **(1)** and untighten the bevel drive pinion.
57. Fit O'ring **(40)**. Apply Loctite 270 on nut **(1)**. Rotate the bevel drive pinion until torque of 250 - 295 Nm is obtained, lock the nut by bending its tab in two opposite slots. Check nut **(1)** is free of burrs. Oil the seal ring **(4)** and fit it into the casing using a locally made drift (see section M).

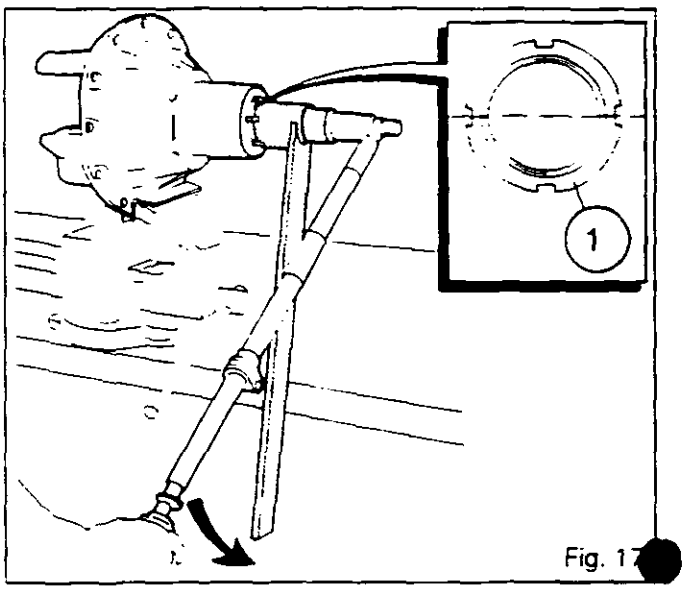
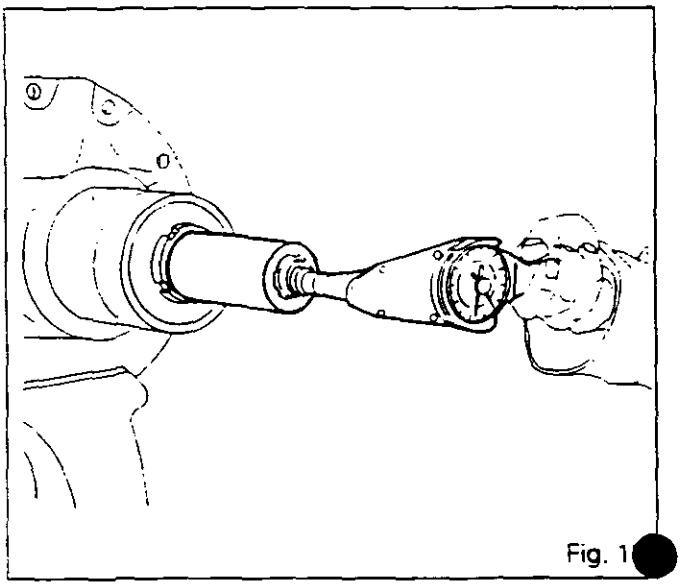


Fig. 17


Fig. 18

H . Reassembly of differential lock

58. Mount the thrust washer **(16)** on the coupler **(18)**. Fit the assembly in the piston **(14)**. Fit the lug washer **(12)** and position the retaining ring **(13)** in the groove of the coupler.
59. Fit the piston **(14)** together with the coupler **(18)** in the packingless casing.
    Note : The dowel (34) is force-fitted in the piston. Check that the piston and the dowel slide freely in the housing. Having carried out the check, remove the piston together with the coupler.
60. Fit new O'rings **(15)** and **(19)**. Position the piston with the coupler, then insert it with a plastic mallet, striking it on the periphery.
61. Position the spring **/17** and the washer **/20**, with the shoulder of the washer facing the spring. Tension the assembly with service tool MF471 until the washer **(21)** slides freely in the groove of the casing.
62. Loosen the service tool MF471, taking care to ensure that the spring cannot escape.
63. Fit the bearing cone **(33)** (if removed) on the housing half **(26)** using a press or a suitable tool (Fig. 19).

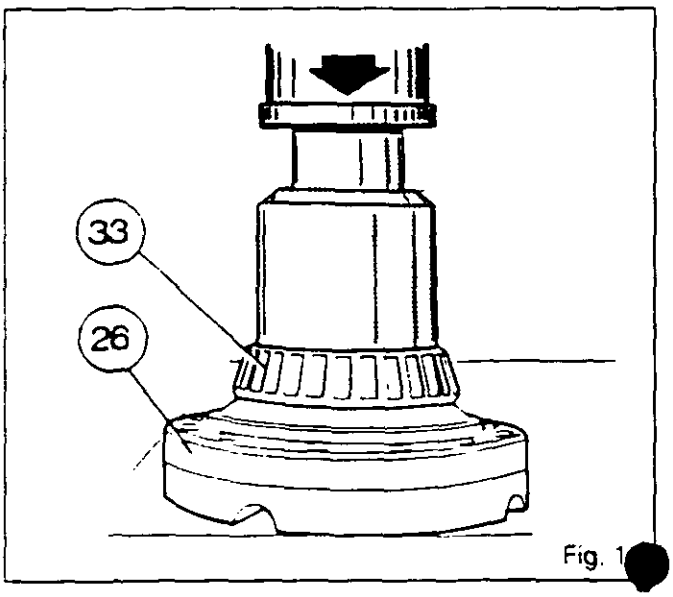


Fig. 19

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64. Fit the other bearing cone **(33)** (if removed) on the cover **(24)**.
65. Assemble the housing half **(25)** in the cover **(24)** (with claw teeth) observing the marking made at the time of dismantling.
66. Position the washer **(35)** on the axle gear **(11)**. Place the assembly in the housing half **(25)**, putting the tab of the washer in one of the holes of the housing half.
67. According to category, place the corresponding number of planetary pinions **(38)** and washers **(37)** on two or one pin **(36)**. Then place the assemblies in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)** (Fig. 9).
68. Place the other washer **(35)** on the other gear **(11)**. Place the assembly in the housing half **(26)**, taking care to ensure that the position of the tab of the washer **(35)** is correct.
69. Position the housing half **(26)** assembly on the housing half **(25)** maintaining the assembly position marked at the time of dismantling.
70. Position the crownwheel **(27)** on the housing half **(26)**. Fasten together the housing halves **(25)** and **(26)**, the cover **(24)** and the crownwheel.
Fit the bolts **(23)** and smear them with Loctite 270. Tighten the nuts **(28)** to a torque of 79 - 87 Nm.
71. Position the cups **(29)** on their cones **(33)**.
72. Place the crownwheel assembly in the casing **(7)** (Fig. 8).
73. Check that the centring bushes **(44)** are present. Fit the shims **[22]**. Position the bearing halves **(43)**. Moderately tighten the bolts **(42)** so that the cups **(29)** move freely.
74. Put the housing in a horizontal position in a soft-jawed vice, the crown uppermost (Fig. 20).
75. Put a dial gauge in place. Tighten the nut **(32)** (Fig. 20) and turn the crownwheel a few times to seat the bearing cones properly in the cups. Tighten the nut again to eliminate the axial play.
76. Tighten the nut **(32)** a further 3 notches to obtain the correct preload.
77. Check the backlash between the crownwheel and the pinion with a dial gauge (Fig. 21). Take three readings at three equidistant points. Determine the average of the three readings to obtain backlash of 0.13 to 0.28 mm.
If the reading is too high, reduce the thickness of the shims **[22]**. If it is too low, increase the thickness until a correct backlash is obtained.

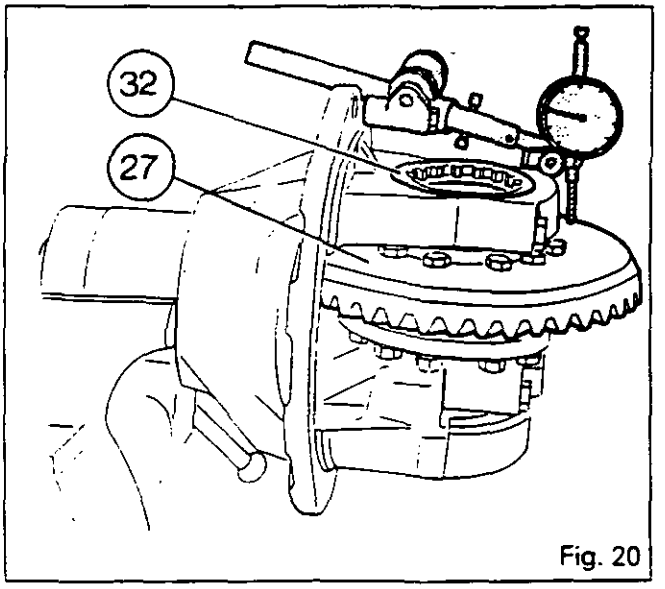


Fig. 20

78. Remove the bearing bolts **(42)** one by one. Smear them with Loctite 270 and tighten them to a torque of 136 - 150 Nm.
79. Refit the locking plate **(31)** with the bolt **(30)** smeared with Loctite 270 and tighten to a torque of 16 - 26 Nm. Lock the nut **(32)**, bending the tab of the locking plate in the appropriate groove.

I . Piston leak test

80. Connect a pressure gauge equipped with a valve to the supply connector of the differential lock.
81. Supply the circuit with compressed air at a pressure of approx. 5 bar and check the movement of the piston **(14)**.
Reduce the pressure to 0.3 bar and close the valve. The pressure gauge should not show any drop in pressure for 1 minute.
82. Remove the pressure gauge and valve assembly.

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J . Refitting of differential case assembly

83. Clean and check the parts. Replace those which are defective.
Note : To avoid risk of leakage, the breather valve on the axle housing has been eliminated and replaced with a plug.
84. Check that the centring bushes are present on the axle housing.
85. Coat the joint face of the differential case on the axle housing with sealing compound, Loctite 510 or equivalent, and screw in two diametrically opposed guide studs.
86. Refit the differential case assembly **(8)**.
Remove the guide studs. Fit and tighten the bolts **(1)** (Fig. 6) to a torque of 91 - 112 Nm.
87. Check that the centring bushes **(3)** are present and refit the steering cylinder **(2)**. Apply Loctite 270 on bolts **(1)** and tighten them to a torque of 102 - 112 Nm (Fig. 5).

K . Refitting of swivel housings, wheel hubs and universal drive shafts (Fig. 22).

88. If the oil seals **(8)** have been removed fit them against the shoulder. Replace the seals **(6)** and **(12)**.
89. Oil the seals **(8)** and with the help of another person, fit the assemblies. Slide the universal drive shafts in the axle housing without damaging the seals. Introduce a guide through the filling hole to align the left drive shaft with the differential.
90. Turn the wheel hubs to engage the drive shafts.
91. Position the pin **(7)** aligning the swivel housing **(47)** with the axle housing **(52)**.
92. Fit the pin **(11)**, the cup **(14)**, the cover **(15)**. Tighten the bolts **(1)** evenly and alternately to press the pin **(11)** into the axle housing.
93. Remove the cover **(15)** and the cup **(14)**. Apply bearing grease on the cone **(13)**. Refit the cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
94. Fit the cup **(4)**, the shims **[3]**, the cover **(2)**. Tighten the bolts as in operation 92.
Note : Check that pins (7) and (11) are in contact with the axle housing (52).

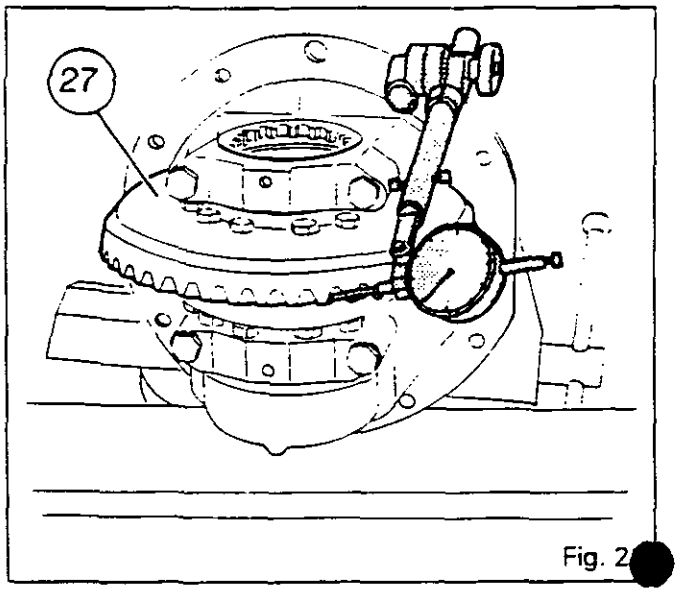


Fig. 2

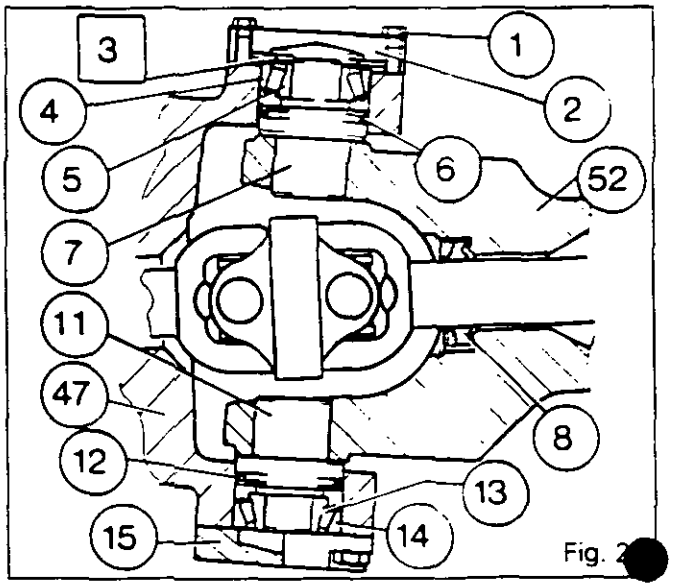


Fig. 2

95. Remove the cover **(2)**. Take off the shims **[3]** and the cup **(4)**. Coat the cone **(5)** with bearing grease. Refit the cup, the shims and the cover. Tighten the bolts **(1)** coated with Loctite 241 to the torque of 91 - 112 Nm.
96. Refit the ball joints. Tighten the nuts to the torque of 103 - 115 Nm. Lock the nuts with new pins.

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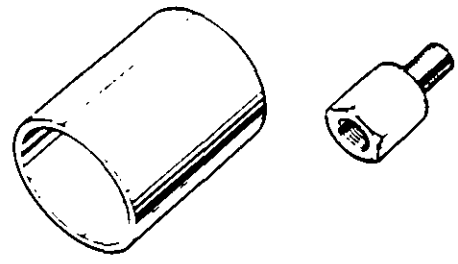
L . Reassembly of front axle / frame

97. Lightly coat the washer **(7)** with grease and put it in place, the chamfer facing the axle (Fig. 1). Place the front axle in slings (Fig. 2) and position it so that it is in contact with its support **(6)** (Fig. 1)
Nota : The rear support of axle is removable on 6 cylinder engines.
98. Fit the washer **(4)** (the chamfer facing towards the axle (Fig. 1)) with the bearing **(2)** against the washer **(4)** in such a way as to eliminate play. Fit and tighten the bolts **(1)** (Fig. 1) coated with Loctite 270 to a torque of 520 - 640 Nm.
99. Fit the grease nipple **(3)**. Grease the bearings **(2)** and **(6)** (Fig. 1) with a grease gun.
100. Reconnect the pipes of the steering cylinder (marked at the time of dismantling).
101. Raise the tractor with a jack. Refit the wheels. Remove the prop. Tighten the nuts to a torque of 250 - 300 Nm.
102. Top up the axle oil and check the oil level of the final drives.
103. Coat the two sleeves with "Anti-seize" grease or equivalent. Refit the drive shaft and the shield. Reconnect the two hoses of the front differential lock.
104. Remove the blocks and release the handbrake.
105. Carry out a road test on the front axle and differential lock control.
106. **Check for leaks** :
. at the seals and the joint face of the differential case.
. at the hydraulic connectors.

M . Service tools

1. Tools available from the MF network

MF451B Swivel pin bearing remover (Fig. 23)
MF451B3 Adaptor for remover diam M18 (Fig. 23)
MF471 Spring compression tool (Fig. 24)
3376881 M1 Special spanner for slotted nut of bevel drive pinion, cat. 2.5 and 3.5 axles (Fig. 25)
3376927 M1 Special spanner for slotted nut of bevel drive pinion, cat. 1 and 2 axles (Fig. 25)



used with MF195C

Fig. 23

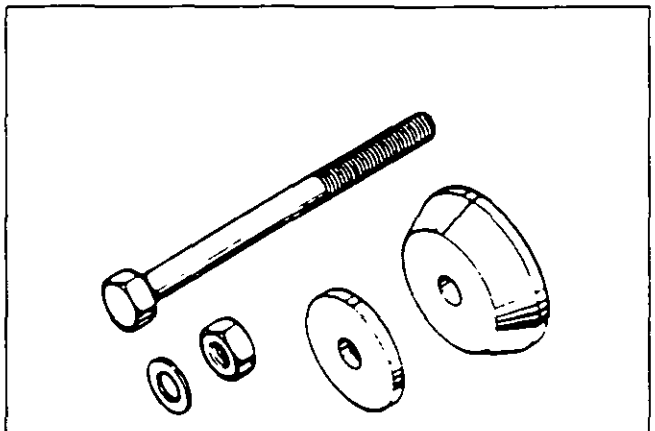


Fig. 24

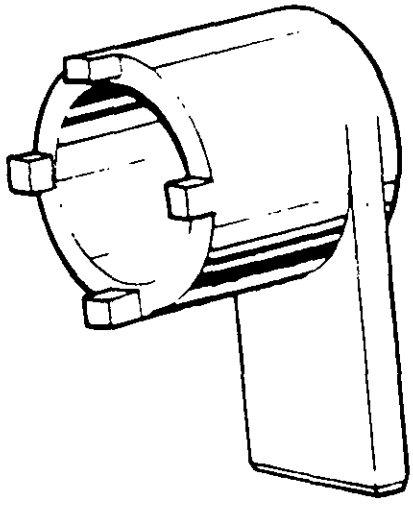
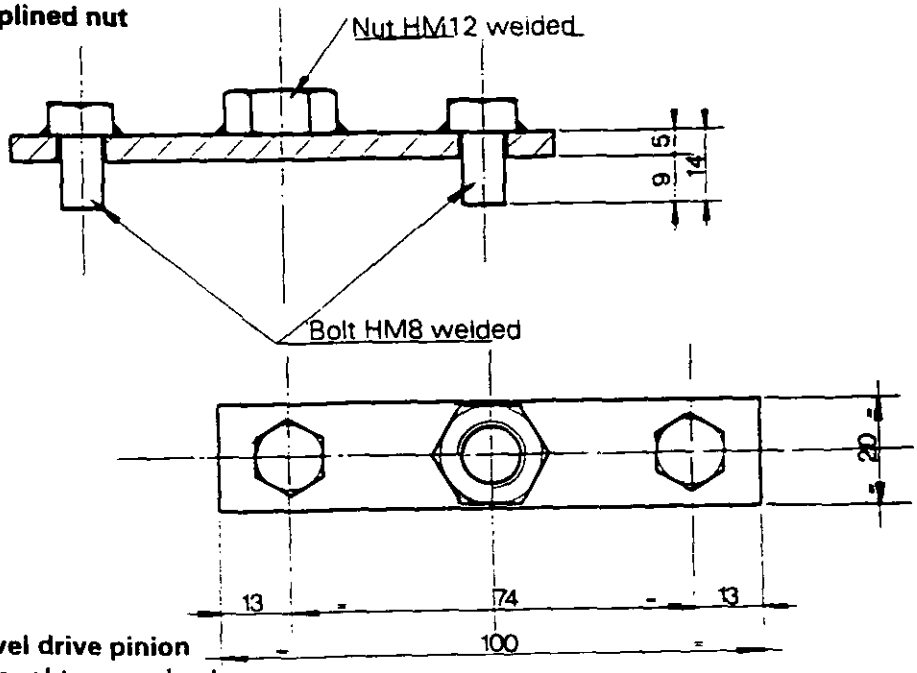


Fig. 25

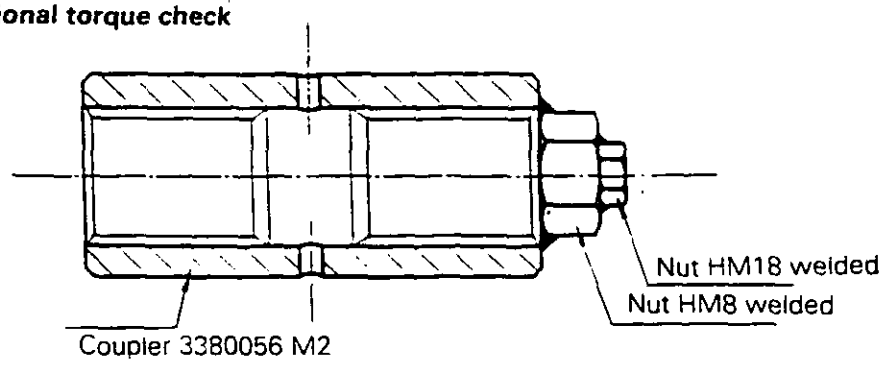
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2. Tools to be made locally

Special spanner for splined nut

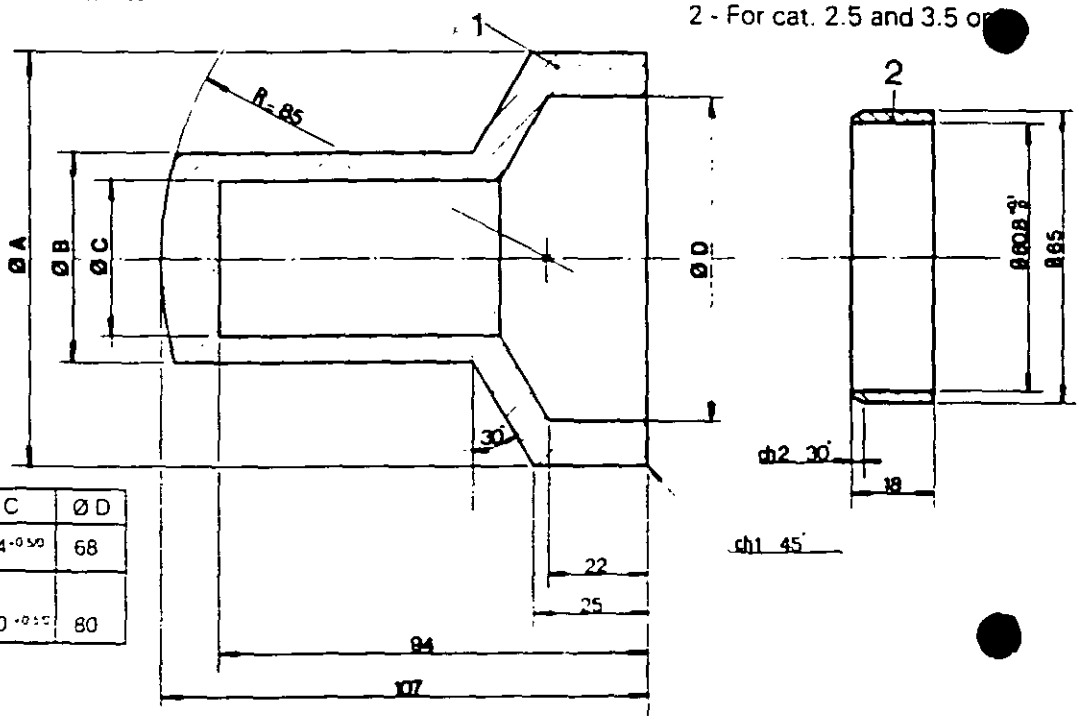


Special sleeve for bevel drive pinion
tightening and rotational torque check



Drift for bevel drive pinion oil seal

2 - For cat. 2.5 and 3.5 only



	ØA	ØB	ØC	ØD
Cat 1 - 2	81.80	40	25.54 $^{-0.50}$	68
Cat 2.5 3.5	91.80	47	34.90 $^{-0.50}$	80

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7 D01 2WD front axle

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B. Removal and refitting of hub, spindle and spindle arm ____ 7

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7D01.2

Front axle - 2 WD Front axle

General

The front axle comprises the following parts:
- A cast support identical to that of the 4-wheel-drive version, whose lower rear part comprises a bearing supporting the 2nd steering swivel pin (4-cylinder engine) or a removable swivel pin (6-cylinder engine).
- A front bearing fixed on the cast support holding the 1st steering swivel pin.
- An axle beam articulated on two swivels.
- Two spindle arms.
- Two spindles mounted in the bores of the spindle arms.
- A double acting ram linked to the spindles by two steering arms.

There are three axle versions depending on the type of tractor:

MF 3050-3060-3065
Standard axle with 6-hole hub.

MF 3070
Standard axle with 6-hole hub or heavy-duty axle with 6- or 8-hole hub.

MF 3080-3095-3115-3125
Heavy-duty axle with 6- or 8-hole hub.

Key

		Version: standard 6-hole hub	Version: heavy-duty 6- or 8-hole hub
(1)	Pin	•	
(2)	Nut	•	•
(3)	Washer	•	•
(4)	Bearing cone	•	•
(5)	Spindle	•	•
(6)	Bearing cup	•	•
(7)	Dust cap	•	•
/8\	Thrust washers	•	
(9)	Grease nipple	•	•
(10)	Nut	•	•
(11)	Axle Beam	•	•
(12)	Steering arm	•	•
(13)	Seal	•	
(14)	Bush	•	•
(15)	Spindle arm	•	•
(16)	Bush	•	
(17)	Washer	•	
/18\	Sealing ring	•	•
(19)	Bearing cone	•	•
(20)	Hub	•	•
(21)	Bearing cup	•	•
(22)	Cover	•	•
(23)	Rivet	•	•
(24)	Nut		•
(25)	Washer		•
(26)	Belleville washers		•
/27\	Sealing ring		•
(28)	Bearing cone		•
(29)	Bearing cup		•
/30\	Sealing ring		•
(31)	Lock washer		•
(32)	Spacers	•	•
(33)	Screw	•	
(34)	Washer	•	
(35)	Nut	•	
(36)	Bolt	•	•
(37)	Steering ram	•	•
(38)	Screw	•	•
(39)	Washers	•	•
(40)	Nuts	•	•
(41)	Sleeve	•	•
(42)	Screw	•	•
(43)	Steering rod	•	•
(44)	Screw	•	•
(45)	Nuts	•	•
(46)	Sleeve	•	•
(47)	Pin	•	•
(48)	Washer	•	•
(49)	Nut	•	•
(50)	Ball joint	•	•
(51)	Pin	•	•
(52)	Nut	•	•
(53)	Ball joint	•	•
(54)	Support	•	•
(55)	Bush	•	•
(56)	Thrust washer	•	•
(57)	O-ring	•	•
(58)	O-ring	•	•
(59)	Nut	•	•
(60)	Lock nut	•	•
(61)	Bushes	•	•
(62)	Grease nipple	•	•

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Pont Avant

Heavy-duty axle, 6- or 8-hole hub

Standard axle, 6-hole hub

A-A cross-section

View from F

Standard axle

Standard axle

Heavy-duty axle

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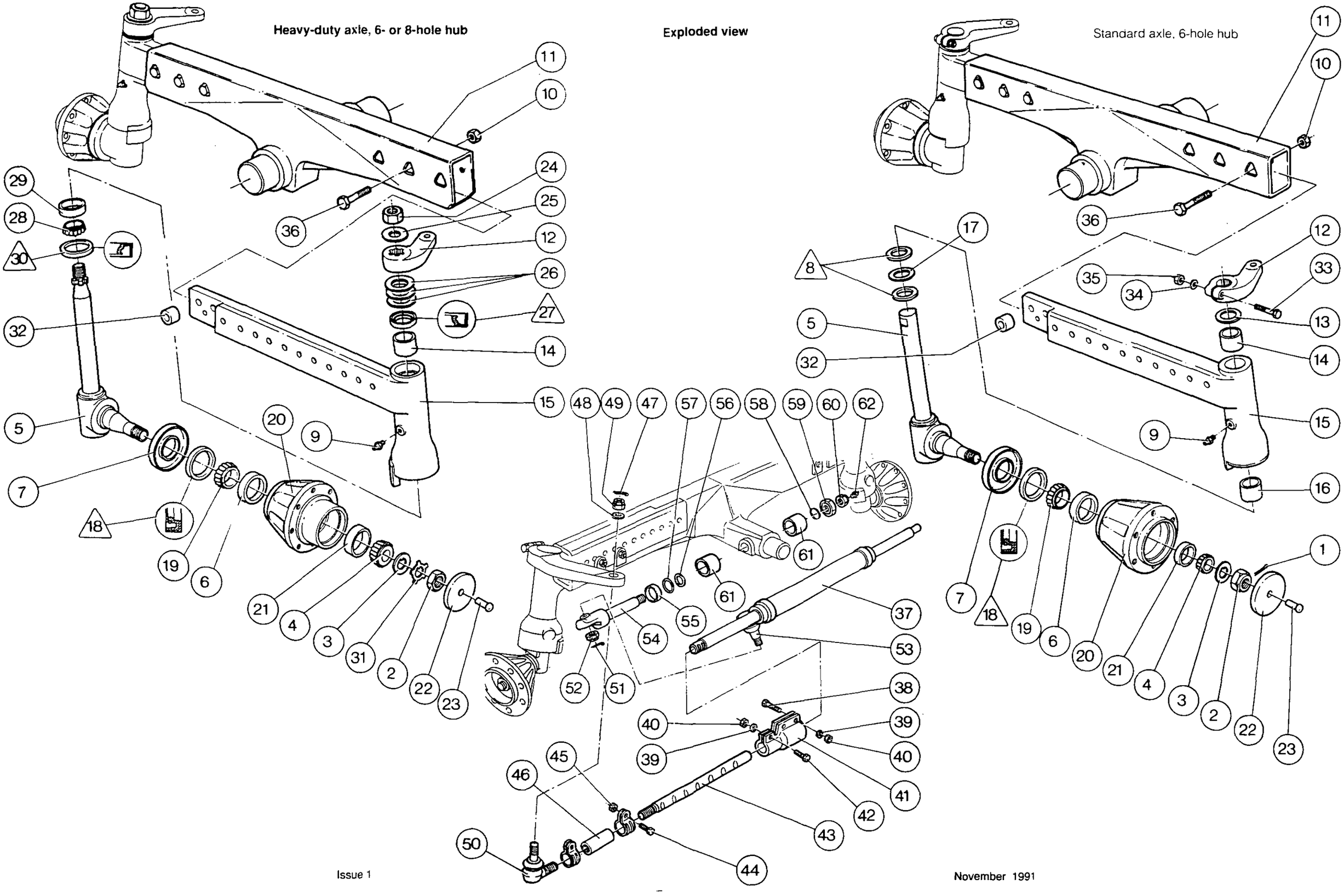
Front axle - 2 WD Front axle

7D01.5

Heavy-duty axle, 6- or 8-hole hub

Exploded view

Standard axle, 6-hole hub



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A. Removal and refitting of steering arm ball joint

Removal

1. Chock the rear wheels and apply the handbrake.
2. Lift the relevant wheel with a jack. Remove the pin **(47)**, the nut **(49)** and the washer **(48)**.
3. Extract the ball joint **(50)** from the steering arm **(12)**.
4. Loosen the nuts **(45)**, turn the sleeve **(46)** in order to separate the ball joint **(50)** from the rod **(43)**.

Refitting

5. Clean and check the parts. Replace any which are defective.
6. Mount the ball joint **(50)** in the steering arm **(12)**.
7. Couple the sleeve **(46)** to the rod **(43)** and the ball joint **(50)**.
8. Fit the washer **(48)**, tighten the nut **(49)** to a torque of 108 - 122 Nm and lock it with the pin **(47)**.
9. Remove the jack.
10. Remove the chocks and release the handbrake.
11. Adjust the toe-in (see section E).

B. Removal and refitting of hub, spindle and spindle arm

Removal

12. Chock the rear wheels and apply the handbrake.
13. Lift the front of the tractor with a jack positioned in the axis of the axle and insert props.
14. Remove the relevant wheel.
15. Extract the cover **(22)**.
16. Remove the pin **(1)**, loosen the nut **(2)**, remove the washer **(3)** (standard axle).
    Release and loosen the nut **(2)**, remove the lock washer **(31)**, remove the washer **(3)** (heavy-duty axle).
17. Remove the bearing cone **(4)**.
18. Remove the wheel hub **(20)** from the spindle **(5)**.
19. Extract the sealing ring /**18**\ and remove the bearing cone **(19)**.
20. Extract the cups **(6)** and **(21)** from the hub **(20)**.
21. Remove the dust cap **(7)**.

There are 3 axle versions:

MF 3050-3060-3065
Standard axle with 6-hole hub.

MF 3070
Standard axle with 6-hole hub or heavy-duty axle with 6- or 8-hole hub.

MF 3080-3095-3115-3125
Heavy-duty axle with 6- or 8-hole hub.

Standard axle with 6-hole hub

22. Remove the nut **(35)**, the washer **(34)** and the screw **(33)**.
23. Withdraw the steering arm **(12)** from the spindle **(5)**.
24. Withdraw the spindle **(5)** from the spindle arm **(15)**.
25. Remove the washers /**8**\ and **(17)**.
26. Extract the rings **(14)** and **(16)** from the arm **(15)**.

Heavy-Duty axle with 6- or 8-hole hub

27. Remove the nut **(24)** and the washer **(25)**.
28. Withdraw the steering arm **(12)** from the spindle **(5)**. Remove the Belleville washers **(26)**.
29. Withdraw the spindle **(5)** from the spindle arm **(15)**.
30. Separate the bearing cone **(28)** from the spindle **(5)**.
31. Extract the sealing rings /**30**\ and /**27**\ from the spindle arm **(15)**.
32. Extract the bush **(14)** and the cup **(29)** from the arm **(15)**.

Standard or heavy-duty axle

33. Remove the screw **(36)** and the nuts **(10)**.
34. Withdraw the spindle arm **(15)** from the axle beam **(11)**, remove the grease nipple **(9)**.

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Front axle - 2 WD Front axle

Refitting

Standard or heavy-duty axle

35. Clean and check the parts. Replace any which are defective.
36. Mount the spindle arm **(15)** in the axle beam **(11)**, fasten it with screws **(36)** and nuts **(10)** placed in the seats of the axle.
    Tightening torque of screws **(36)**:
    - Standard axle : 350 - 430 Nm
    - Reinforced axle : 400 - 600 Nm

Standard axle with 6-hole hub

37. With a punch, push in the bushes **(14)** and **(16)** against the shoulder in the spindle arm **(15)**.
38. Fit the dust cap **(7)** on the spindle **(5)**.
39. Place washers /**8**\ and **(17)** on the spindle , orientate the grooves of washers /**8**\ towards washer **(17)**.
40. Introduce the spindle **(5)** into the arm **(15)**.
41. Place the seal **(13)** in the seat of the steering arm **(12)**.
42. Fit the steering arm **(12)** on the spindle **(5)**.
43. Position the screw **(33)** in the recess in the spindle **(5)**, fit the washer **(34)**. Tighten the nut **(35)** to a torque of 250 - 300 Nm.
    Note: Ensure that the spindle (5) is fitted without any play.

Heavy-duty axle with 6- or 8-hole hub

44. With a punch, push in the bush **(14)** against the shoulder in the spindle arm **(15)**.
45. Push in the sealing ring /**27**\ against the shoulder in the spindle arm with the lip facing outwards.
46. Push the dust cap **(7)** on the spindle **(5)**.
47. Position the bearing cup **(29)** in the spindle arm.
48. Push the sealing ring /**30**\ in the spindle arm with the lip facing outwards.
49. Push the bearing cone **(28)** on the spindle, then introduce the spindle into the spindle arm.
50. Position the Belleville washers **(26)**, the steering arm **(12)** and the washer **(25)**. Smear the nut **(24)** with Loctite 241, tighten to a torque of 550-580 Nm.

Standard or heavy - duty axle

51. Using a press or an appropriate device push the cups **(6)** and **(21)** against the shoulder in the hub **(20)**.
52. Grease the bearing cone **(19)** (MF1105 grease or equivalent) and place it in the cup **(6)**.
53. Push the sealing ring /**18**\ into its seat against the shoulder, the lip turned outwards (Fig. 1).

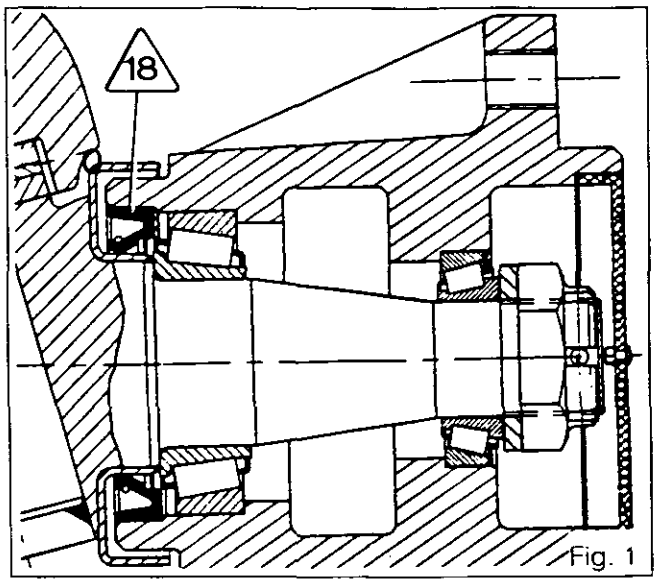


Fig. 1

54. Fill the cavity of the hub **(20)** with MF1105 grease or equivalent.
55. Mount the wheel hub **(20)** on the spindle **(5)**.
56. Grease the bearing cone **(4)** (MF1105 grease or equivalent) and place it on the spindle in contact with the bearing cup **(21)**.
57. Position the washer **(3)**, the nut **(2)** (standard axle), the lock washer **(31)**, the nut **(2)** (heavy-duty axle). After tightening the nut to a torque of 81 Nm, slacken it by 1/12 to 1/16 of a turn to obtain play of between 0 and 0.13.
58. Lock the nut **(2)** on the spindle with the pin **(1)** (standard axle). Bend back the tab of the lock washer **(31)** on the nut **(2)** (heavy-duty axle).
59. Check that the hub turns smoothly.
60. Fill the cavity of the hub **(20)** (nut side) with MF1105 grease or equivalent.
61. Close the hub with the cover **(22)**.
62. Clinch a rivet **(23)** in the hole of the cover. Fit the grease nipple **(9)**.
63. Refit the wheel, remove the props and tighten the bolts to a torque of 140 - 200 Nm. Grease the spindle arm **(15)**.
64. Remove the chocks and release the handbrake.
65. Adjust the toe-in (see section E).

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C. Removal and refitting of steering ram

Removal

66. Chock the rear wheels and apply the handbrake. Lift the front of the tractor with a jack positioned in the axis of the axle.
67. Disconnect and block the ram supply hoses.
Note: Mark the position of the hoses before removal.
68. Loosen the nuts **(45)**, turn the sleeves **(46)** to separate the ball joints **(50)** from the steering rods **(43)**.
69. Remove the pin **(51)** and the nut **(52)**. Withdraw the ball joint **(53)** from the support **(54)**.
70. Remove the steering ram assembly.
71. Unscrew the ball joint **(53)** (if necessary).
72. Dismantle the nuts **(40)**, the washers **(39)** and the screws **(38)**. Separate the sleeves **(41)** equipped with rods **(43)**.

Refitting

73. Clean and check the parts. Replace any which are defective.
74. Assemble the sleeves **(41)** equipped with rods **(43)** on the ram. Fit the screws **(38)** and washers **(39)** and tighten the nuts **(40)**.
75. Screw the ball joint **(53)** (if fitted) on the steering ram.
76. Refit the ram assembly on the support **(54)**.
77. Tighten the nut **(52)** of the ball joint to a torque of 100-120 Nm and fit the pin **(51)**.
78. Couple the sleeves **(46)** to the rods **(43)** and to the ball joints **(50)**.
79. Connect the ram supply hoses.
80. Withdraw the jack. Remove the chocks and release the handbrake.
81. Adjust the toe-in (see section E).
82. Check for leaks of the ram connectors.

D. Removal and refitting of front axle

Removal

83. Chock the rear wheels and apply the handbrake.
84. Lift the front of the tractor with a jack positioned in the axis of the axle.
85. Position a stand under the crankcase.
86. Remove the front wheels.
87. Remove the screws **(36)** and the nuts **(10)**.
88. Remove the nuts **(40)**, the washers **(39)** and the screws **(38)**.
89. Remove the assemblies **(1)** (Fig. 2).
90. Remove the pin **(51)** and the nut **(52)**, withdraw the ball joint **(53)** from the support **(54)**, detach the ram from the axle **(11)**.

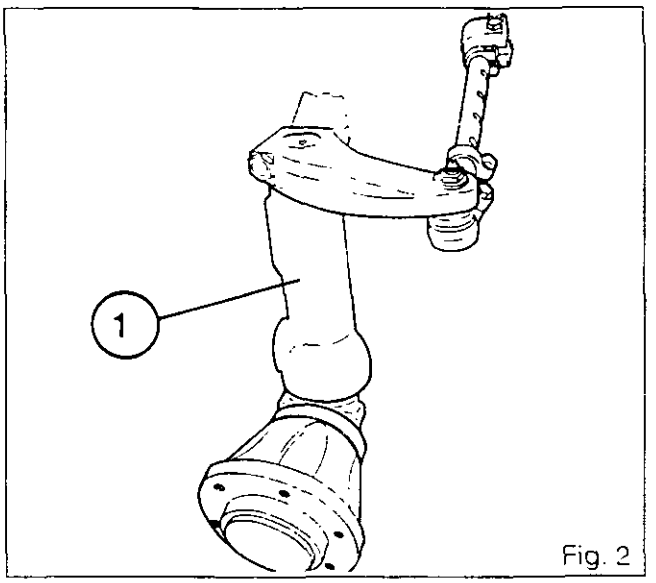


Fig. 2

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Front axle - 2 WD Front axle

91. Hoist the axle (Fig. 3).
92. Remove the screws **(1)** and the grease nipple **(3)**. Remove the front bearing **(2)** and the washer **/4** (Fig. 4).
93. Remove the front axle, disengaging it from its rear bearing **(5)** with the washer **/6** (Fig. 4).
94. Remove the lock nut **(60)** and the nut **(59)** with its seal **(58)**, remove the support **(54)**. The bush **(55)**, the thrust washer **(56)** and the o-ring **(57)** remain on the support **(54)**.
95. If necessary, withdraw the bushes **(61)** from the axle.

Refitting

96. Clean and check the parts. Replace any which are defective.
97. If necessary, fit the bushes **(61)** with a locally made tool (see section G).
98. Position the bush **(55)**, the thrust washer **(56)** and the seal **(57)** and refit the support **(54)**.
99. Tighten the nut **(59)** with O-ring **(58)** on the support **(54)**, then slacken it so as to obtain axial play of 0.05 to 0.25.
100. Using a spanner wrench, tighten the lock nut **(60)** to 120-150 Nm. Check that the support swivels freely.
101. Hoist the axle. Position the washer **/6** (the chamfer facing the axle side, Fig. 4). Fit the axle in the support **(5)**.
102. Position the washer **/4** (the chamfer facing the axle side, Fig. 4). Mount the front bearing **(2)** so as to eliminate play between the washers and the axle as far as possible.
103. Smear the screws **(1)** with Loctite 270. Tighten to a torque of 540-620 Nm. Detach the hoist.
104. Fit the grease nipple **(3)** (Fig. 4).
105. Refit the ram assembly **(37)** on the support **(54)**. Tighten the nut **(52)** to a torque of 100-120 Nm and fit the pin **(51)**.
106. Grease the bearings **(2)** and **(5)** (Fig. 4) and the ram support **(54)**.
107. Grease the rods **(43)** with molybdenum disulphide. Refit the assemblies **(1)** (Fig. 2). Fit the nuts **(10)** and the screws **(36)**. Tighten to a torque of :
- Standard axle : 350-430 Nm
- Heavy-duty axle : 400-600 Nm

108. Fit the screws **(38)**, the washers **(39)** and the nuts **(40)**. Tighten to a torque of 75-81 Nm.
109. Refit the front wheels. Remove the stand under the crankcase. Tighten the bolts to a torque of 140-200 Nm.
110. Remove the chocks and release the handbrake.
111. Adjust the toe-in (see section E).

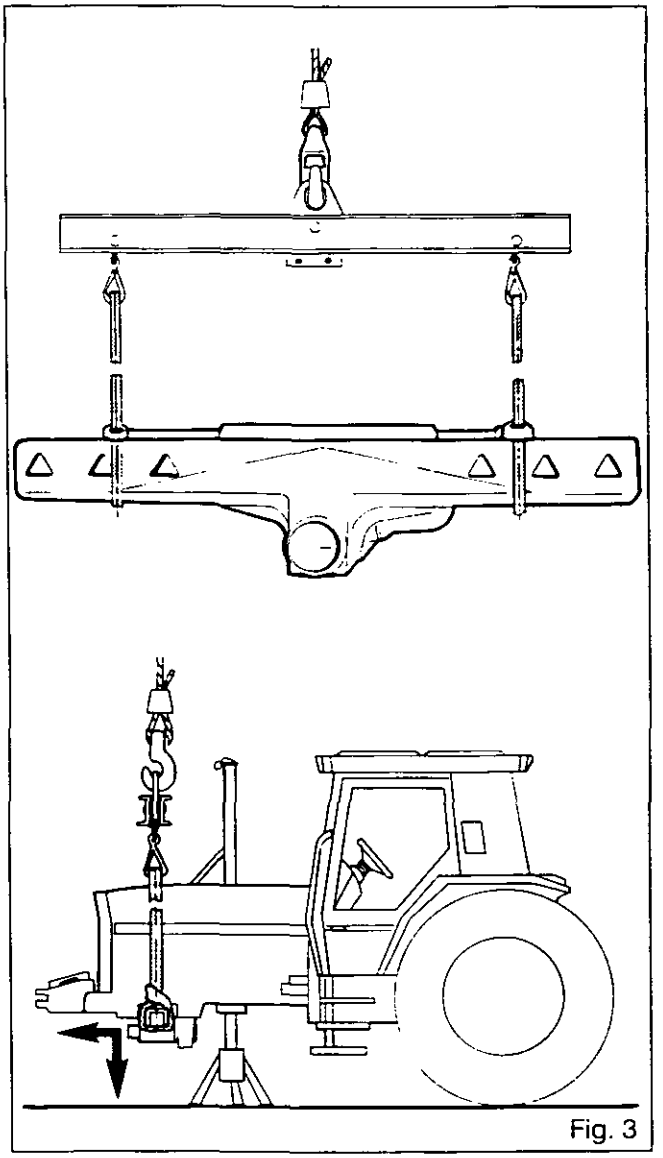


Fig. 3

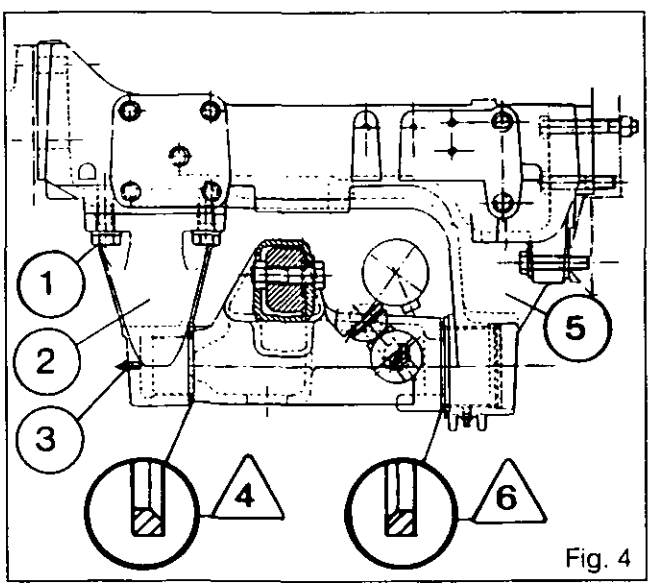


Fig. 4

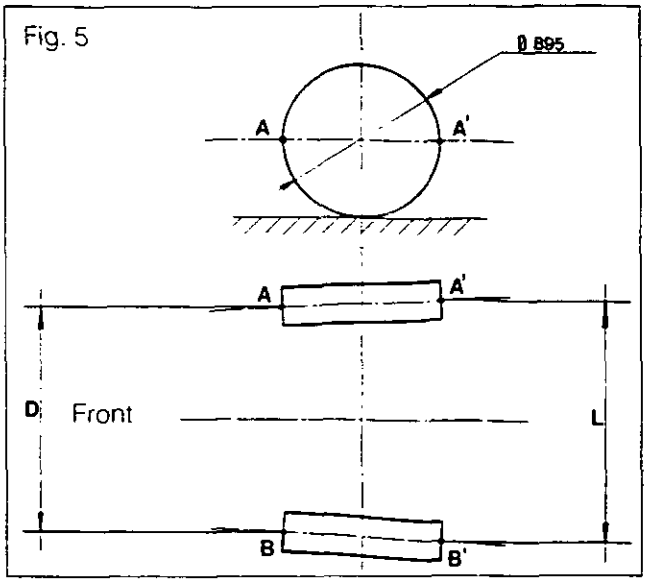
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E. Adjustment of toe-in

112. Set the steering to the central position. It is necessary to adjust the sleeves **(46)** so as to obtain a toe-in of 0 to 14 mm. The toe-in is measured at points A,A' and B,B', determined by a diameter of 895 mm traced on the flanks of the tyres (Fig. 5). It is obtained from the difference of the two values L and D.

Note: If the toe-in is measured on a diameter other than 895 mm, correct the value accordingly. Once adjustment has been carried out, tighten the nuts (45) to a torque of 45-55 Nm.



F. Track adjustment

113. Lift the front of the tractor in the axis of the axle.
114. Remove the screws **(36)** and **(42)** and the nuts **(10)** and **(40)** (Fig. 6).
115. Place the spindle arms in the desired position.
116. Fit the bolts **(36)**. Tighten to a torque of :
   - Standard axle : 350-430 Nm
   - Heavy-duty axle : 400-600 Nm
117. Fit the rods **(43)** according to the position of the arms.
   Fit the screws **(42)**, the washers **(39)** and the nuts **(40).** Tighten to a torque of 75-81 Nm.
   Note: When the tractor is used with the widest track, the spacer (32) must be used when fitting the 3rd screw (36) (Fig. 7).

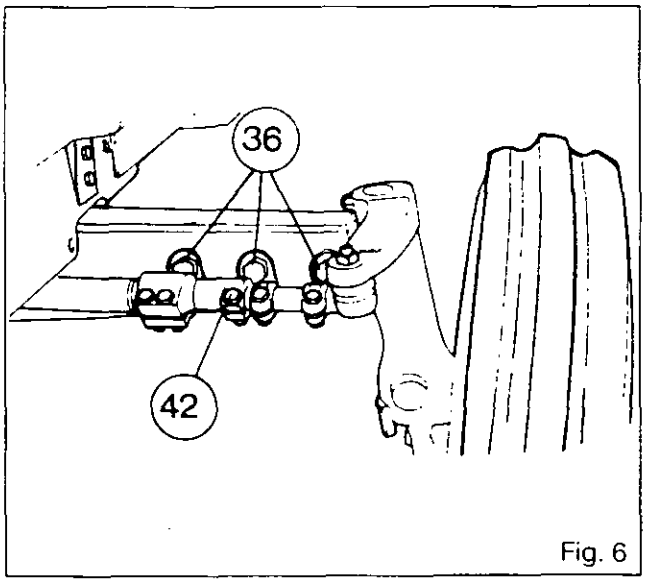


Fig. 6

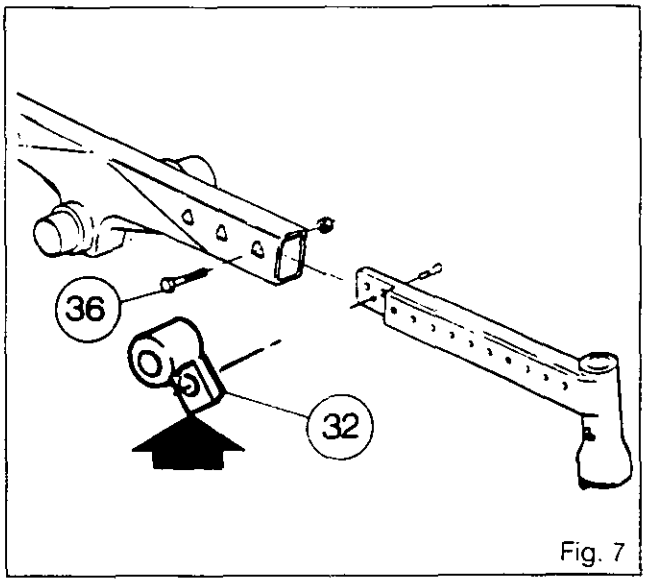


Fig. 7

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7 E01 Steering column

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A. Removal ____ 3

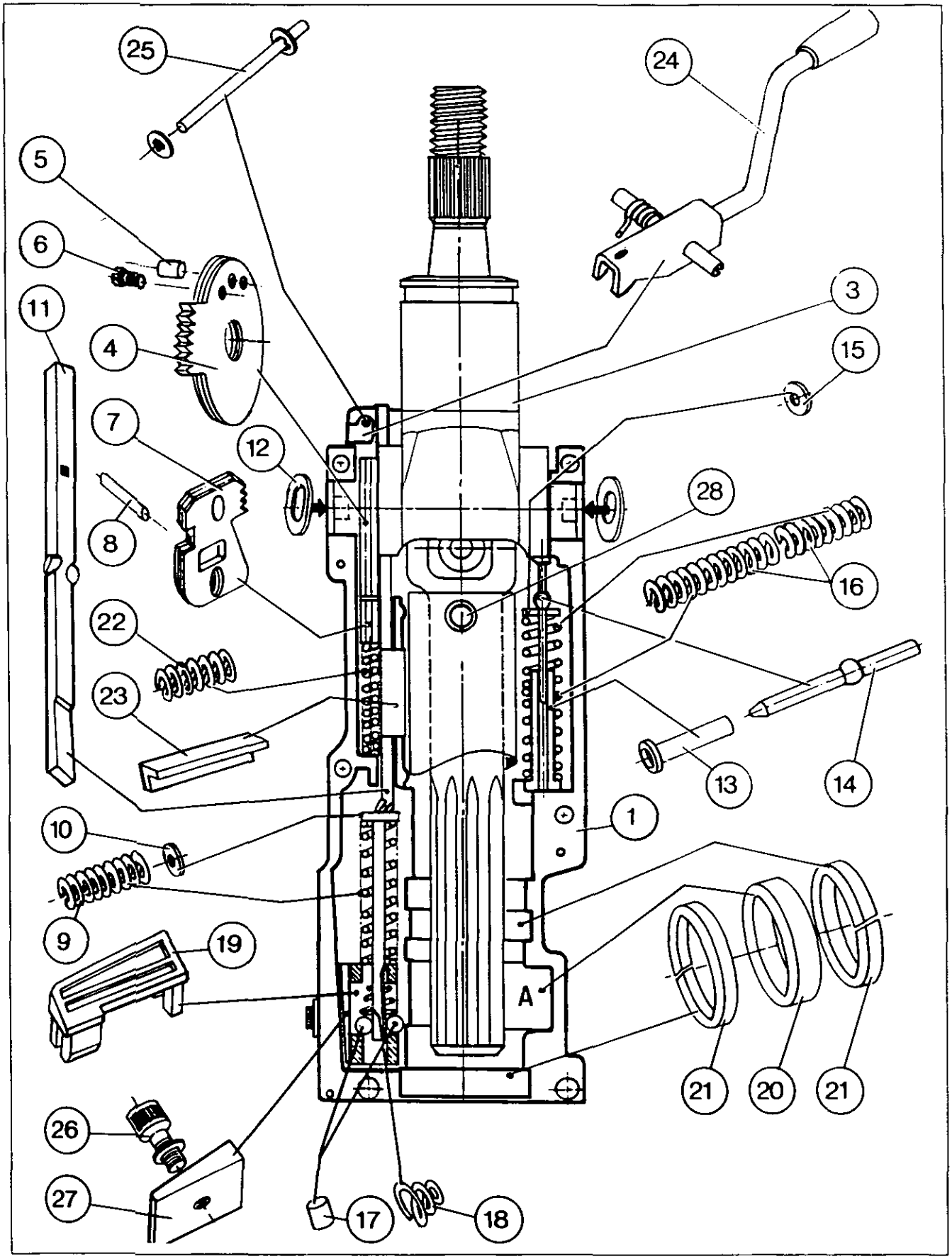
B. Disassembly of tilt mechanism ____ 3

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7E01.2

Front axle - Steering column



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Front axle - Steering column

A . Removal

1. Remove :
   - the instrument panel cover,
   - the steering wheel and the boot.
2. Withdraw the steering column from the instrument panel after having removed the 4 bolts at the base of the column.
3. Place the column assembly on a bench and remove the 2 screws from the plastic half housings.
4. Remove lever **(24)** and pin **(25)**.

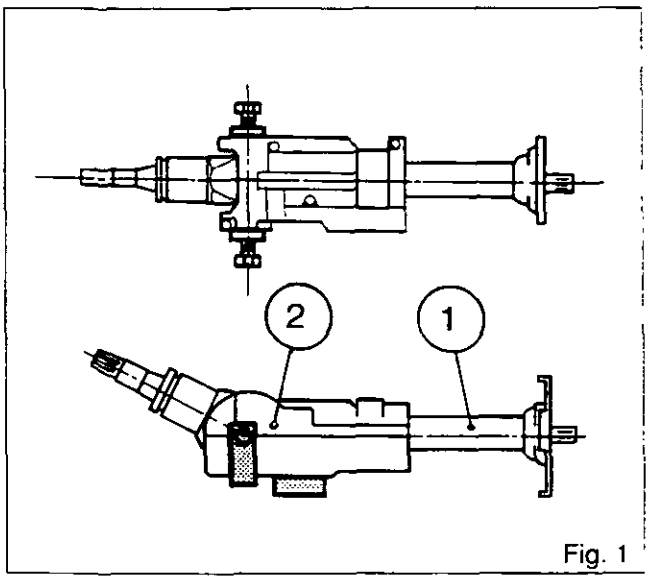


Fig. 1

B . Disassembly of tilt mechanism

5. Fit the yoke of special tool 3582244M1 on housing **(1)**, lining up the 2 screws with the holes in the swivel joints **(3)**. Tighten the 2 screws (Fig. 1).
6. Place a shim about 20 mm thick under housing **(1)** in order to line the assembly up correctly.
7. Remove the 6 screws with a 5 mm Allen key.
8. Remove top housing **(2)**.
9. Remove : guide **(19)**, rollers **(17)**, spring **(18)**, guide **(23)** and spring **(22)** (use a screwdriver).
10. Tilt joint **(3)** to reduce the pressure of springs **(16)**. Remove guide **(13)**, rod **(14)**, springs **(16)** and washer **(15)** (with a screwdriver).
11. Remove the yoke and withdraw the column assembly from housing **(1)**, complete with corrugated washers **(12)**.
12. Drive out pin **(8)** and remove rod **(11)** complete with rack **(7)**, spring **(9)** and washer **(10)**.
13. Remove the 2 screws **(6)** with a 3 mm Allen key. These screws are difficult to extract because they are fitted with Loctite.
14. Remove rack **(4)**.

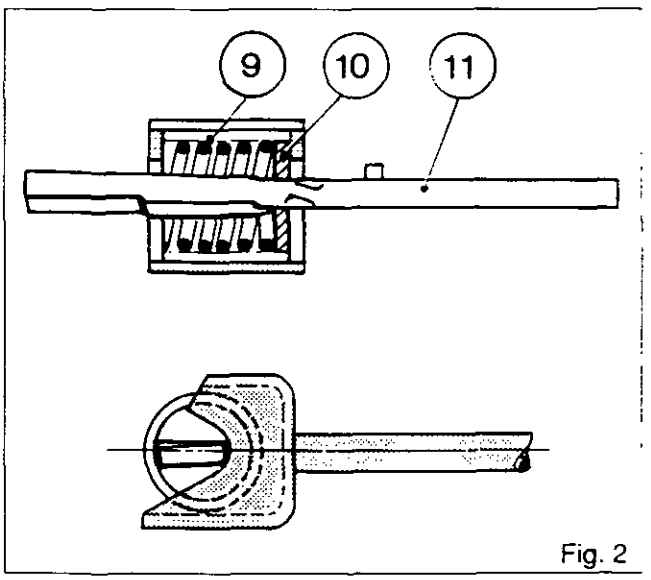


Fig. 2

Reassembly

15. Insert pin **(5)** in rack **(4)**, with the domed end outwards.
16. Fit rack **(4)** onto body **(3)** with the 2 screws **(6)**, having coated them with Loctite 270.
17. Prepare rod **(11)** with washer **(10)** and spring **(9)**.
18. Place the rod in a vice and, using compression tool 3582244M1, Item 2, compress the spring as shown in figure 2.

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19. Fit the rod/tool assembly in position in housing **(1)**.
20. Fit rack **(7)** and insert pin **(8)** coated with Loctite 648.
21. Position spring **(18)** and rollers **(17)** on each side of rod **(11)**, with the chamfers facing downwards. Fit guide **(19)** (note the position of rollers **(17)** and spring **(18)**).
22. Fit 2 corrugated washers **(12)** on the swivel joints of body **(3)** and place the assembly in housing **(1)**. Take care with the two washers **(12)**. Position bush **(20)** in recess A in housing **(1)**. Dowel **(28)** must be facing upwards.
23. Fit the clamping yoke as for disassembly. Also place the shim under housing **(1)**.
24. Fit spring **(22)** using a screwdriver to compress it. Fit guide **(23)**, with the thickest part against the spring.
25. Tilt body **(3)** and fit **(13)** **(14)** **(15)** and **(16)**. Use a screwdriver to compress **(16)**.
26. Hold guide **(19)** with the thumb and remove the compression tool.
27. Fit rings **(21)**, positioning the gaps at 180° to each other.
28. Fit the top half housing **(2)**. Note that rings **(21)** and corrugated washers **(12)** have to be adjusted by hand.
29. Reverse operation 1 to 4.

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7 E02 Steering column - 2nd generation

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- **General** ____ 2

- **Operation** ____ 2

A. **Removing and refitting the steering column** ____ 5

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F. **Replacing the guide bushes** ____ 7

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7E02.2 Front axle - Steering column 2nd gen.

General

The steering column assembly consists of the following two sections:

- the fixed lower section comprising a tube and an attaching base plate,
- the moving upper section comprising a tube and a welded yoke as well as a housing including the steering wheel height and tilt adjusting mechanisms.

Operation

Height adjustment

When the control rod **(4)** is moved to the high position, rod **T** causes the elbow lever **(8)** to swivel and lower arm **(15)** which is hinged on pin **(14)**.
Adjusting screw **[5]** attached to the arm bears on the lock plate **(16)** which is released, allowing the upper section of the steering column to move.
The spring **(3)** returns the control lever **(4)** to its initial position.
The stop **(25)** limits the movement of both sections.

Tilt adjustment

When the control lever **(4)** is moved to the low position, it presses on rod **T** which pushes on the end of the notched lever **(9)** and frees it from the rack **/10** allowing it to tilt the housing **(20)**. The two return springs **(17)** allow the positioning of the steering wheel.
Adjusting screw **[5]** allows the meshing of the teeth on the rack **/10** and notched lever **(9)** to be adjusted.

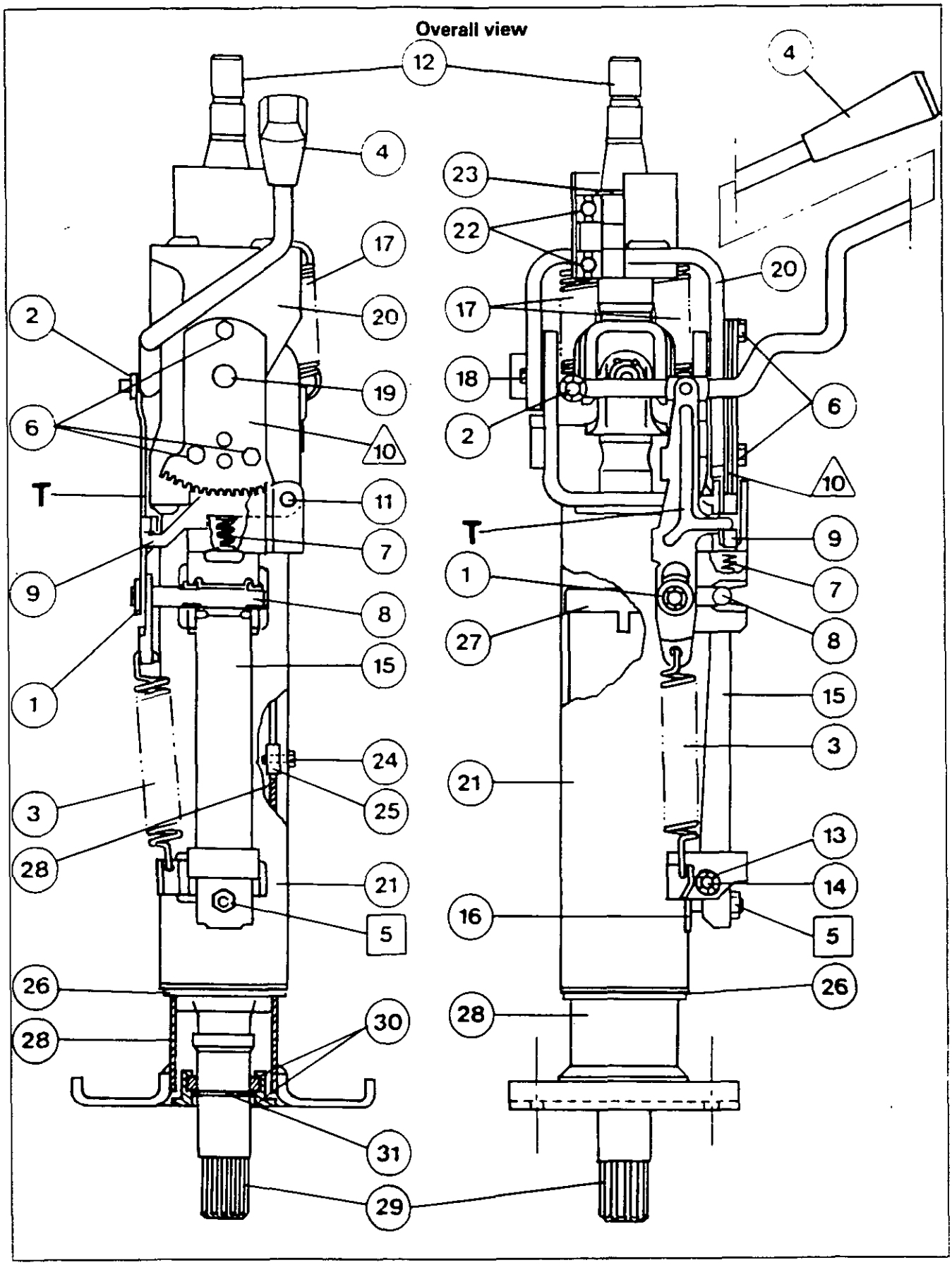
List of parts

(1) Retaining washer
(2) Retaining washer
(3) Spring
(4) Control lever assembly
[5] Adjusting screw
(6) Bolt
(7) Spring
(8) Elbow lever
(9) Notched lever
/10 Rack
(11) Pin
(12) Upper shaft
(13) Retaining washer
(14) Pin
(15) Arm
(16) Lock plate
(17) Springs
(18) Pin
(19) Pin
(20) Housing
(21) Moving column
(22) Bearings
(23) Circlip
(24) Bolt
(25) Stop
(26) Bush
(27) Bush
(28) Fixed column
(29) Lower shaft
(30) Bushes
(31) Circlip

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Front axle - Steering column 2nd gen. 7E02.3

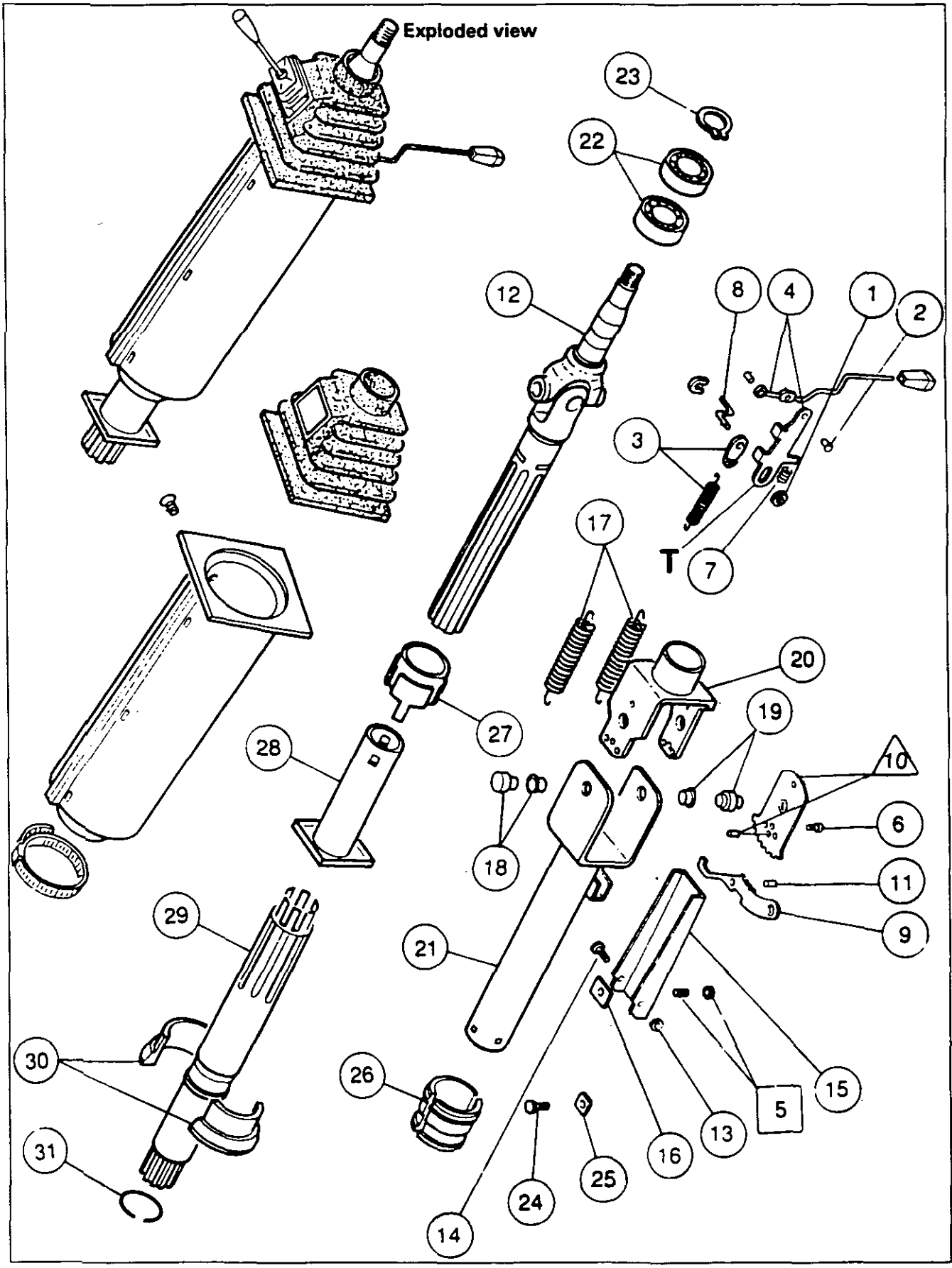


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7E02.4

Front axle - Steering column 2nd gen.



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Front axle - Steering column 2nd gen. 7E02.5

A. Removing and refitting the steering column

Removal

1. Using the lever on the right-hand side under the steering wheel, pull the steering column as far towards the driver as possible.
2. Remove the steering wheel and the dashboard covering.
3. On tractors equipped with a Dynashift gearbox, disconnect the control switch **(1)** located under the dashboard (Fig. 1).
4. Take out the bolts **(2)** attaching the base of the column onto the cab support (Fig. 1).
5. Remove the assembly by tilting it so that the base is withdrawn via the dashboard support.

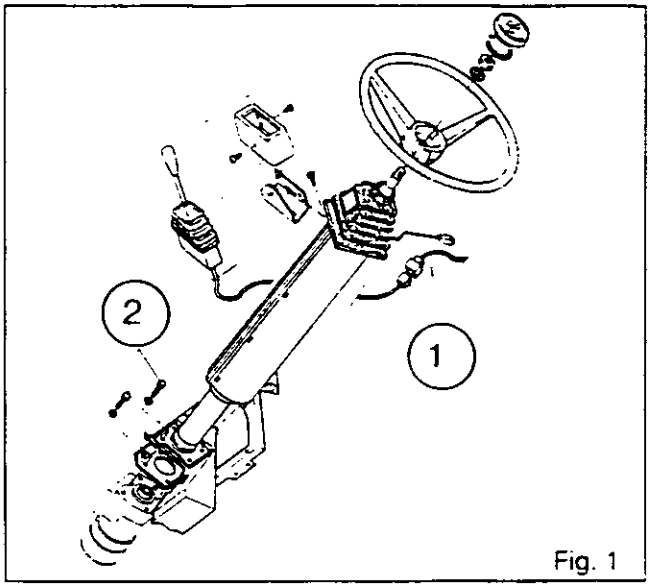


Fig. 1

Refitting

6. Check the operation of all the positions of the steering column.
7. Lightly coat the splines in shaft **(29)** with Loctite «Anti-Seize» grease or equivalent.
8. Carry out procedures 2 to 5 in reverse order.
   Note: Tighten the steering wheel nut to a torque of 57 - 78 Nm.
9. Check the operation of the electrical equipment and the A, B, C, D speeds (for Dynashift type tractors).

B . Disassembling and reassembling the control lever assembly

Disassembly

10. Remove the steering column. Carry out procedures 1 to 5.
11. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
12. Remove and discard the retaining washers **(1)** and **(2)**. Remove the spring **(3)**, lever **(4)** with the dust cover and lever **(8)**.

Reassembly

13. Refit the levers **(4)** and **(8)** and the spring **(3)**. Replace the retaining washers **(1)** and **(2)**.
14. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]** (3 mm Allen wrench).
15. Carry out procedure 11 in reverse and carry out procedures 6 to 9.

C . Removing and refitting the notched lever and rack

Removal

16. Remove the steering column. Carry out procedures 1 to 5.
17. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
18. Remove and discard the retaining washers **(1)** and **(2)**. Remove the spring **(3)**, lever **(4)** with the dust cover.
19. Compress spring **(7)** by pressing on the notched lever **(9)**. Take out the bolts **(6)**. Remove the rack **/10**.
20. Drive out pin **(11)**. Remove the notched lever **(9)** and spring **(7)**.

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Refitting

21. Carry out procedure 20 in reverse.
22. Compress spring **(7)**. Position the rack **/10** as per Fig. 2 to avoid any interference with lever **(4)**. Fit and tighten bolts **(6)** after coating them with Loctite 241.
23. Refit the lever **(4)**, rod **T** and spring **(3)**. Replace the retaining washers **(1)** and **(2)**.
24. Adjust the lever **(4)**, with rod **T** in contact with the notched lever **(9)**, using the adjusting screw **[5]** (3 mm Allen wrench).
25. Carry out procedure 17 in reverse and carry out procedures 6 to 9.

D. Disassembling and reassembling the locking assembly

Disassembly

26. Remove the steering column. Carry out procedures 1 to 5.
27. Remove the housing in two halves around the steering column.
28. Remove the adjusting screw **[5]** (3 mm Allen wrench). Remove and discard the retaining washer **(13)**. Drive out the pin **(14)**.
29. Remove the arm **(15)** and lock plate **(16)**.

Reassembly

30. Carry out procedure 29 in reverse.
31. Fit the pin **(14)**. Replace the retaining washer **(13)**.
32. Fit and set the adjusting screw **[5]** and lever **(4)** with rod **T** in contact with the notched lever **(9)**.
33. Carry out procedure 27 in reverse and carry out procedures 6 to 9.

E. Replacing the shafts and bearings

Disassembly

34. Remove the steering column. Carry out procedures 1 to 5.
35. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
36. Slide the dust cover over the control lever **(4)**.
37. Compress spring **(7)** by pressing on the notched lever **(9)**. Remove the bolts **(6)**. Remove the rack **/10**.
38. Remove the springs **(17)**.

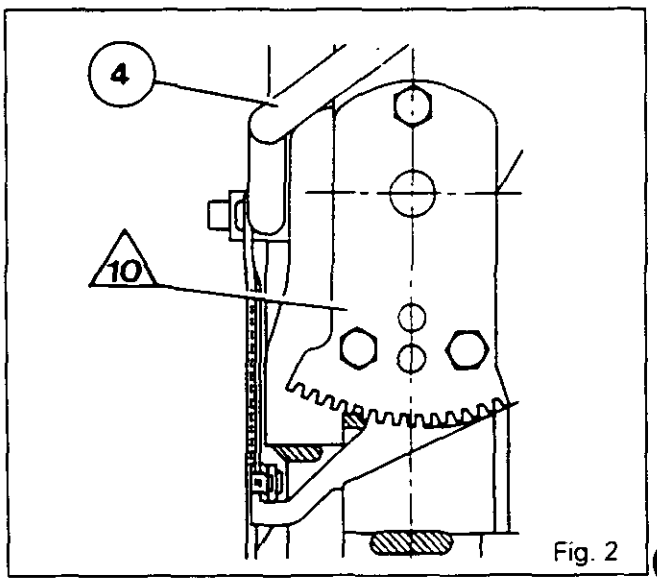


Fig. 2

39. Uncrimp pin **(18)**. Drive out pins **(18)** and **(19)**.
40. Separate the housing **(20)** from the moving column **(21)**.
41. Remove the circlip **(23)**. Separate the upper shaft **(12)** from the housing **(20)**.
42. Drive out the lower shaft **(29)** from the moving column **(21)**.
43. Extract the bearings **(22)** from the housing **(20)**.

Reassembly

44. Fit the bearings **(22)** in the housing **(20)** using a suitable fixture.
45. Assemble the upper shaft **(12)** on the bearings **(22)**. Fit the circlip **(23)**.
46. Assemble the lower shaft **(29)** equipped with bushes **(30)** and circlip **(31)** on the fixed column **(28)**.
Note: Deform the column tube by striking it with a punch so as to lock the bushes (30) in position.
47. Reassemble the housing **(20)** and mobile column **(21)** assemblies. Fit pins **(18)** and **(19)**. Crimp pin **(18)**.
48. Refit the springs **(17)**.
49. Compress spring **(7)**. Position the rack **/10** as per Fig. 2 to avoid any interference with lever **(4)**. Fit and tighten the bolts **(6)** after coating them with Loctite 241.
50. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]** (3 mm Allen wrench).
51. Carry out procedure 35 in reverse and carry out procedures 6 to 9.

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F . Replacing the guide bushes (26) (27) (30)

Disassembly

52. Remove the steering column. Carry out procedures 1 to 5.
53. Remove the housing in two halves around the steering column.
54. Loosen the adjusting screw **[5]** (3 mm Allen wrench). Remove the lock plate **(16)**.
55. Remove the bolt **(24)** from the stop **(25)**.
56. Extract the bush **(26)**.
57. Separate the moving column **(21)** from the fixed column **(28)**.
58. Extract the bush **(27)**.

Reassembly

59. Position bush **(27)**.
60. Place the stop **(25)** in the groove on the fixed column **(28)**.
61. Assemble the mobile column **(21)** with the fixed column **(28)**.
62. Fit the bolt **(24)** without tightening it so that bush **(26)** can be installed. After installing the bush, tighten the bolt moderately. Check that the moving column **(21)** slides freely.
63. Refit the lock plate **(16)**. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]**.
64. Carry out procedure 53 in reverse and carry out procedures 6 to 9.

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8 . HYDRAULICS

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8 B01 TRAILER BRAKING
8 C01 "REXROTH" AUXILIARY SPOOL VALVES
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8 E01 HYDROSTATIC STEERING
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8 A01 Description of circuit

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Hydraulics - Description of circuit

A. General circuit

The hydraulic system of the 3000-3100 tractors is of the open centre type. It is divided into two separate circuits fed by a two-stage gear pump, fitted on the internal face of the right cover. Via a 150 micron strainer also fitted on the right cover, the pump uses the transmission oil contained in the common reservoir formed by the centre housing and the gearbox. A 15 micron pressure filter is fitted on the low flow circuit before the Orbitrol steering unit. The hydraulic pump is driven by the teeth of the PTO clutch housing.

B. Low-pressure circuit, low flow

This circuit gives priority to supplying the hydrostatic steering system where the pressure can reach 170 bar. After satisfying the needs of the steering valve (Orbitrol), the oil is sent to a distribution valve fixed under the hood. This valve has a number of functions:

- Pressure maintaining valve
  Downstream of the Orbitrol, the distribution valve maintains the operating pressure of the various transmission elements at 17 bar.
- Cooling, lubrication and clutch and brake master cylinder supply circuit
  After supplying the various transmission elements, the distribution valve sends the oil to the oil cooler if it is hot, or directly to the gearbox and PTO lubrication system if it is cold. The lubrication pressure is maintained by a valve set at 1.5 bar, fitted on the front left of the gearbox. The residual flow from the distribution valve also supplies the clutch and brake master cylinders.

Functions supplied by the low flow circuit

The 17 bar circuit supplies the various transmission functions in parallel, via solenoid valves screwed into the main gallery of the right cover.
None of these are priority functions and they can be actuated simultaneously.
Certain of the solenoid valves (4WD, PTO etc.) are connected to the Autotronic device.
The functions supplied by the low-pressure circuit are as follows:

. The hydrostatic steering
. The hi/lo (Hare/Tortoise) range
. The differential lock (front and rear)
. The 4WD clutch
. The speedshift
. The A/B range
. The PTO circuits:
- clutch
- PTO brake
- Front PTO (option)

C. High-pressure circuit, high flow

The second stage of the pump supplies, in this sequence:

- The trailer brake valve, which has priority
- The auxiliary spool valves
- The lift control valve (rear linkage)

The oil not used by the trailer brake valve supplies the auxiliary spool valves fitted on the rear of the lift cover.
Exiting from the auxiliary spool valves, a hose supplies the lift valve situated on the left side cover.
The excess flow from these three spool valves returns to the pump intake manifold without passing through the strainer. A safety valve fitted in the delivery pipe of the right hand cover protects the high-pressure circuit.

D. Description, layout of parts

Parts list

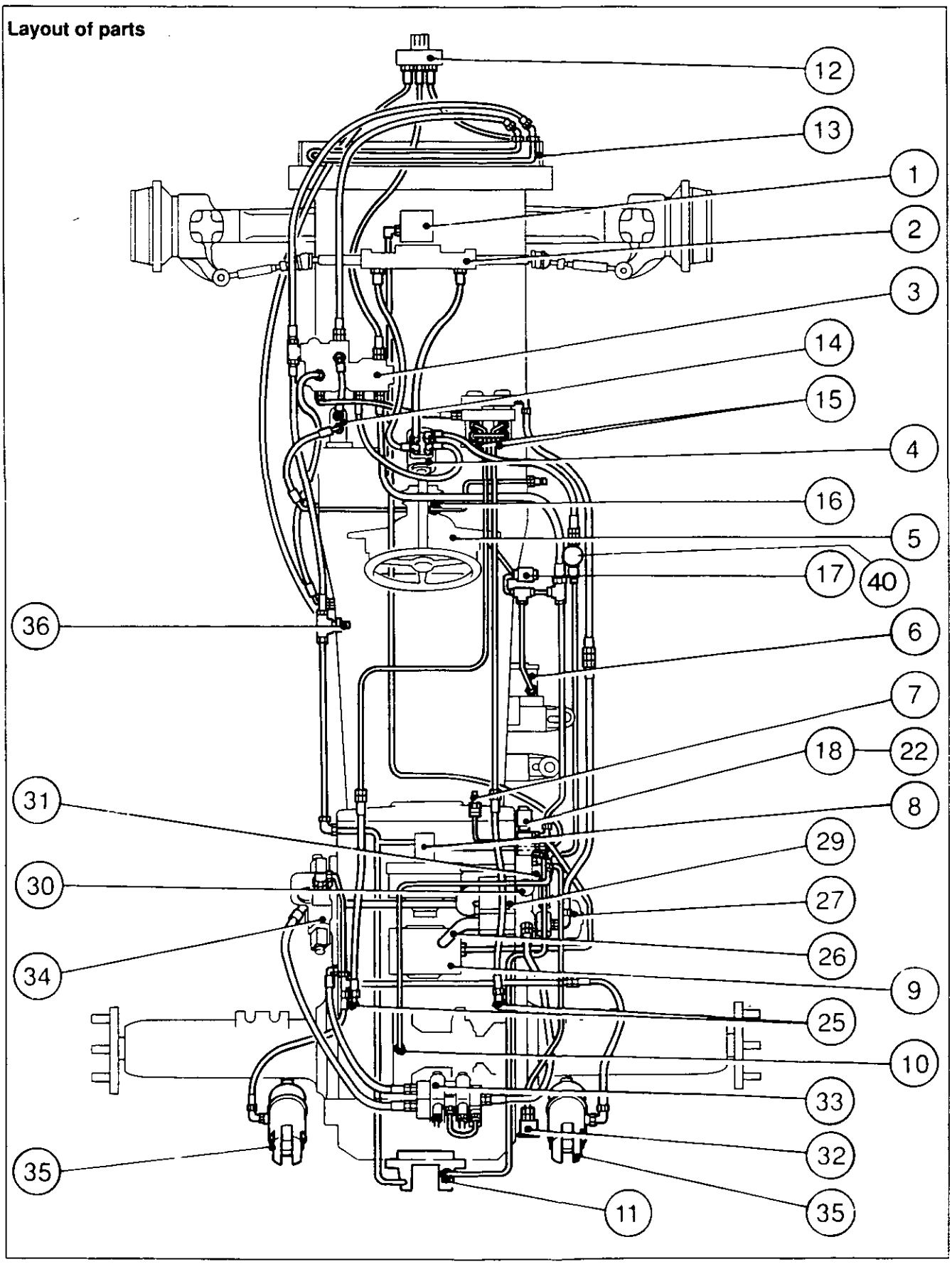
(1) Front differential lock
(2) Steering ram
(3) 17 bar distribution valve
(4) Hydrostatic steering unit (Orbitrol)
(5) Speedshift
(6) A/B range
(7) Hare/Tortoise range
(8) PTO clutch
(9) 4WD clutch
(10) Rear differential lock
(11) PTO brake
(12) Front PTO (if fitted)
(13) Oil cooler
(14) Clutch master cylinder
(15) Brake master cylinders
(16) Clutch hydraulic receptor
(17) Speedshift solenoid valve
(18) Hare/Tortoise solenoid valve
(19) Differential lock solenoid valve
(20) PTO solenoid valve
(21) PTO brake solenoid valve
(22) 4WD solenoid valve
(23) Front PTO solenoid valve (option)
(24) Low-pressure switch
(25) RH and LH brake
(26) Pump inlet pipe
(27) 150 micron suction strainer
(28) Filter vacuum switch
(29) Hydraulic pump
(30) Safety valve
(31) Trailer brake valve
(32) Trailer brake connector
(33) Auxiliary spool valve
(34) Lift valve
(35) Lift rams
(36) 1.5 bar valve
(37) Diagnostic connector
(38) A/B spool
(39) Lubrication : Speedshift - reverse shuttle - gearbox, PTO
(40) 15 micron pressure filter

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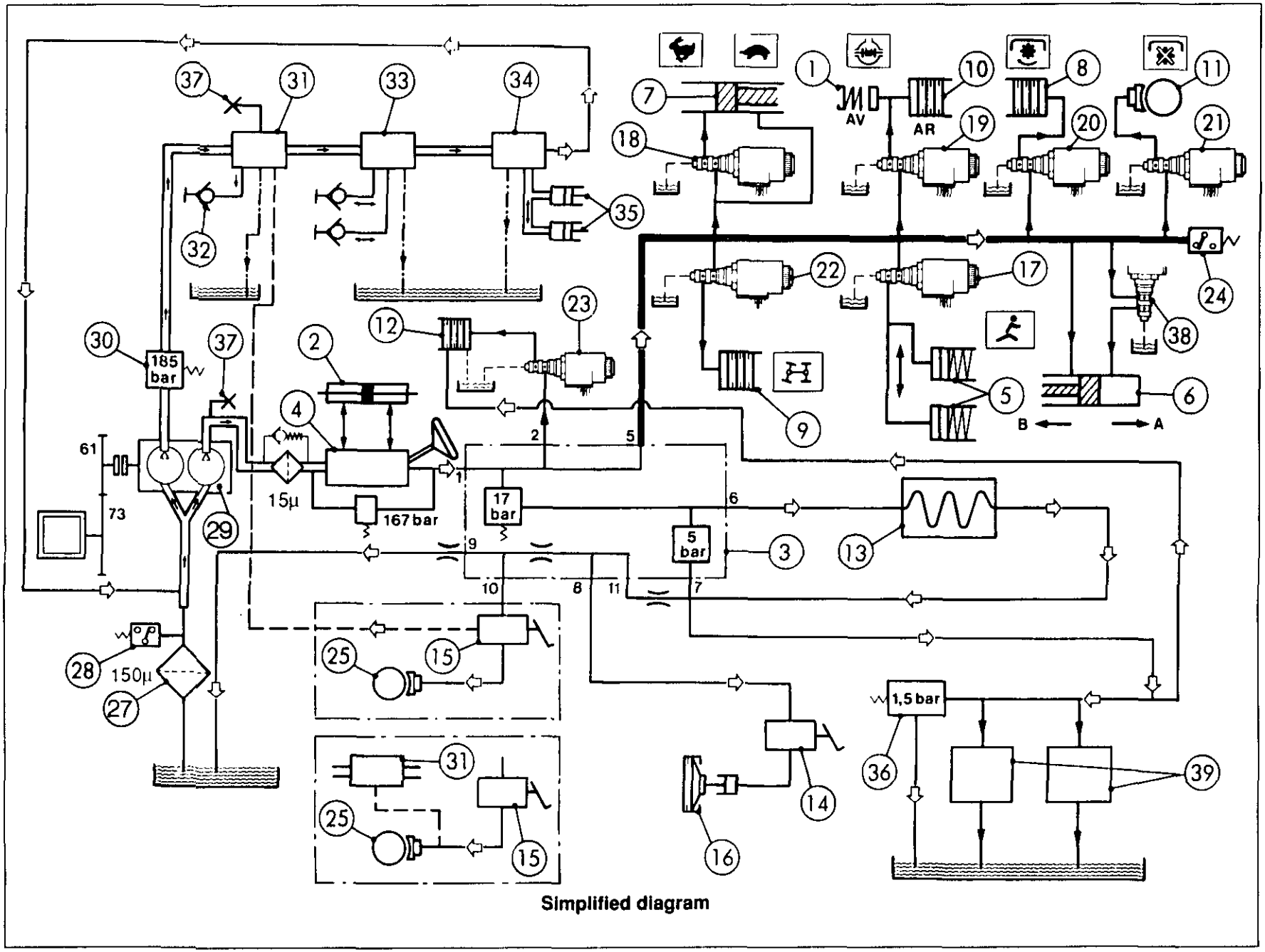
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Hydraulics - Description of circuit

Layout of parts



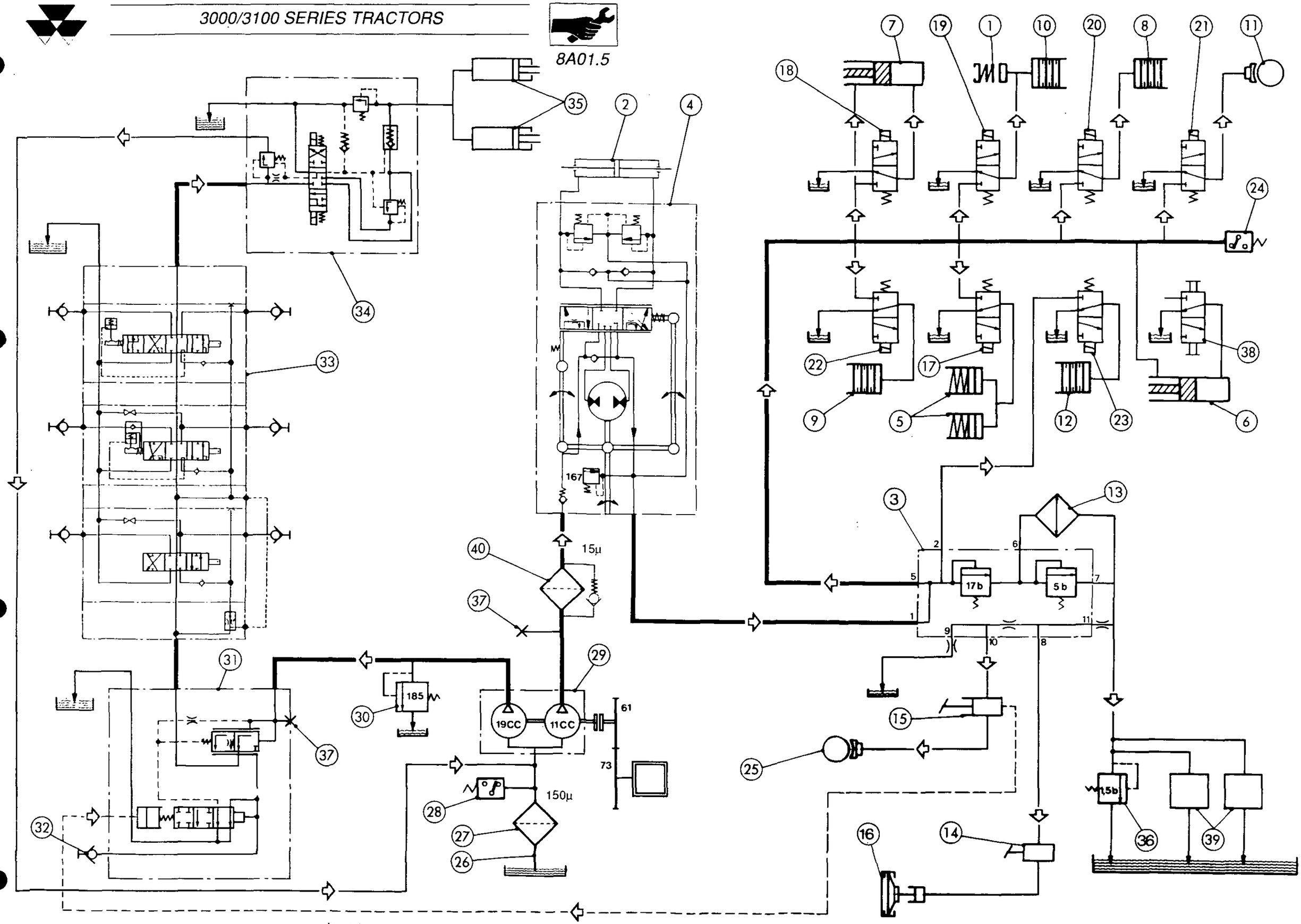
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Simplified diagram

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8 B01 Trailer braking

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B. **Operation, trailer brakes released and partial trailer braking** ____ 5

C. **Partial braking and maximum braking of the trailer** ____ 7

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Hydraulics - Trailer braking

General

3000/3100 tractors can be equipped with a trailer braking system consisting of:

- A valve assembly (spool valve) fitted on the right-hand hydraulic cover.
- A pipe linking the trailer braking valve to a connector situated at the rear of the tractor.
- A pipe connected to the master cylinders or to a supply hose of the main right-hand brake (depending on version) linked to the pilot head of the valve.

The valve is supplied as a matter of priority by the high-pressure circuit. The oil not used for the braking of the trailer is sent to the auxiliary spool valves.

The valve controls the flow and pressure towards the trailer brakes. It is controlled by the pressure of the tractor braking circuit so as to obtain tractor/trailer braking that is progressive and proportional to the effort applied to the pedal. The trailer brake only works if the two pedals are coupled.

Description of the trailer braking valve (Fig. 1)

Flow control valve (1)
Provides control of the flow Qx and regulation of the hydraulic flow, transmitting the pressure to the trailer-brakes (see pages 4 and 6).

Control spool assembly(2)
Changes the position of the flow control valve and regulates the trailer braking pressure.

Check valve(3)
Prevents oil flowing back from brake line B to port N (see pages 4 and 6).

Pressure relief valve (4)
with loaded springs **(8)**
Limits the maximum brake pressure.

Pilot flow housing (5)
with piston **(6)** *and bleed screw* **(7)**
Operates the trailer brake valve via a sensing line from the tractor brakes.

Designation of ports

(see pages 4 and 6)

B Supply to the trailer brake connection (junction)
N Continuation to the auxiliary spool valve
P Pressure
R Return to sump
Y Supply coming from the tractor braking system

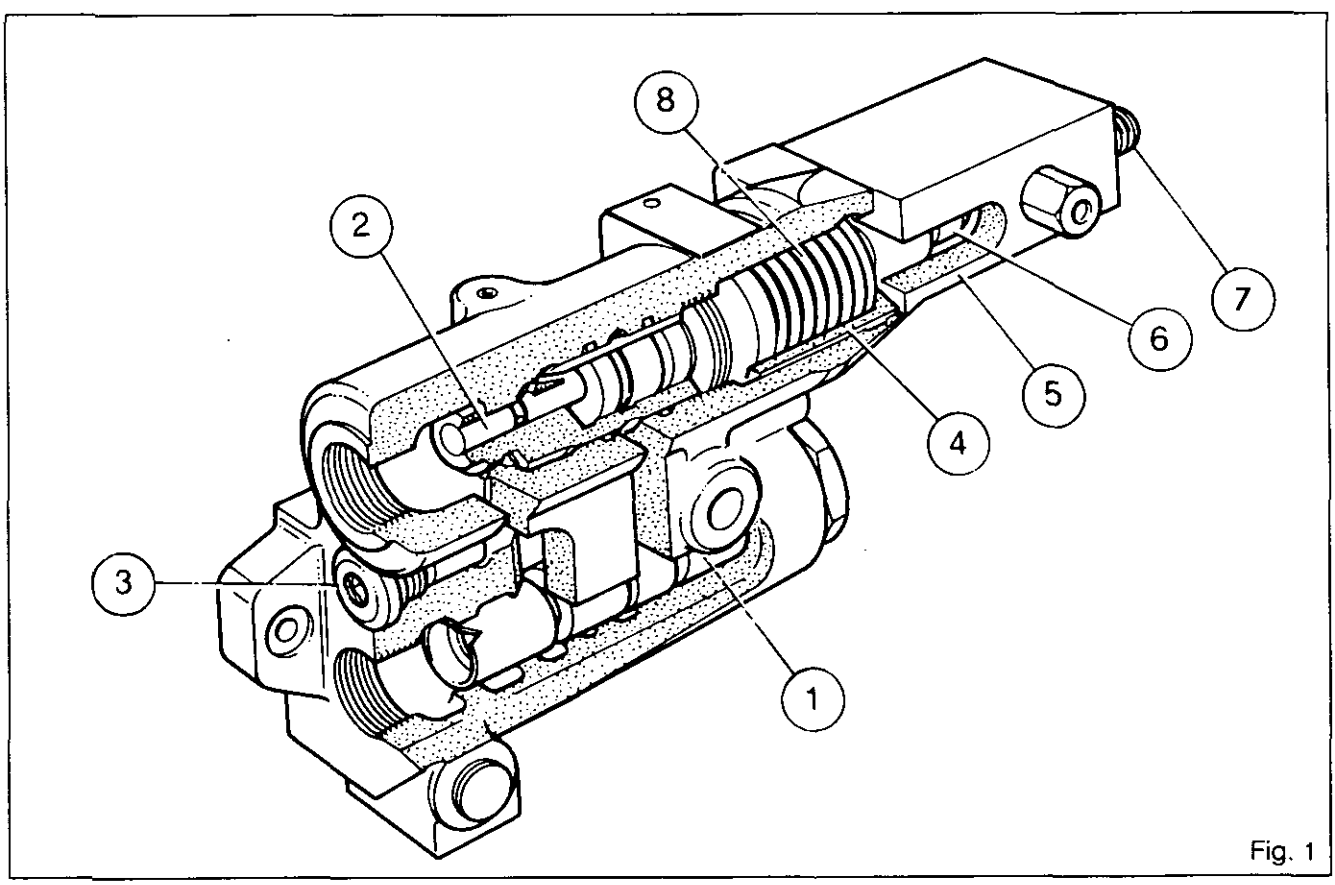


Fig. 1

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A. Removal and refitting of trailer brake valve

Removal (Fig. 2)

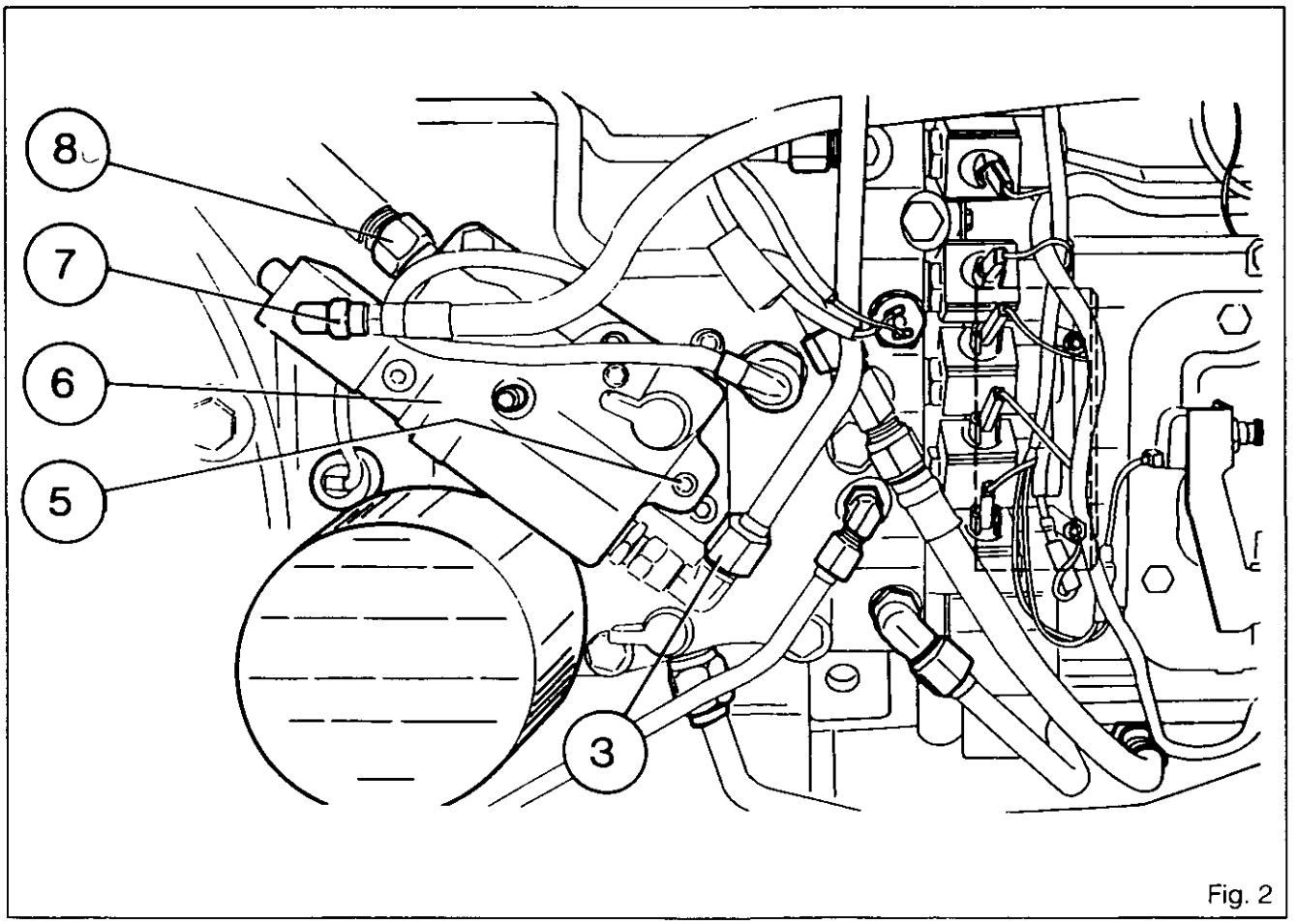


Fig. 2

1. **Disconnect and block:**
   - the hose **(7)** of the pilot housing,
   - the supply hose **(8)** of the auxiliary spool valve and the tube **(3)** of the trailer brake connector.
2. Remove the screws **(5)** and the valve **(6)**.

Refitting

3. Clean the joint faces of the hydraulic cover and of the valve.
4. Replace the O-rings **(1)** and **(2)** (Fig. 3).
5. Refit the valve, fit and tighten the screws **(5)** to a torque of 21 - 24 Nm.
6. **Reconnect** : The tube **(3)** of the trailer brake connector, the supply hose **(8)** of the spool valve and the hose **(7)** of the pilot housing.
7. Bleed the main brake and the trailer brake and check the pressure. Carry out sections C and D, chapter 6K01.

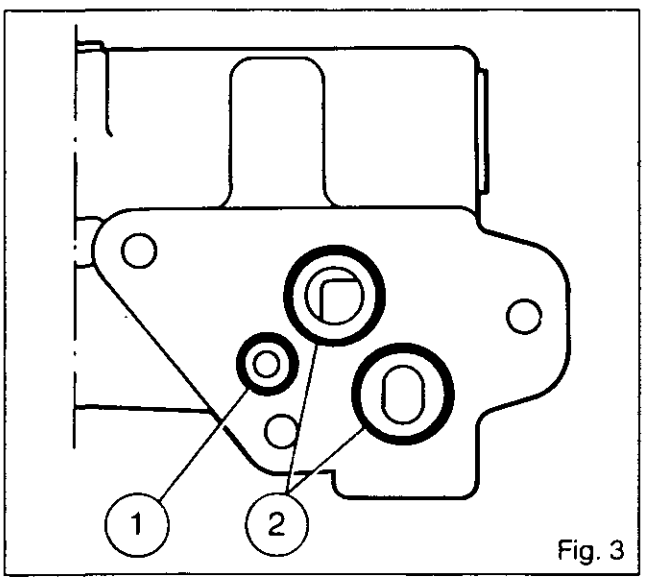
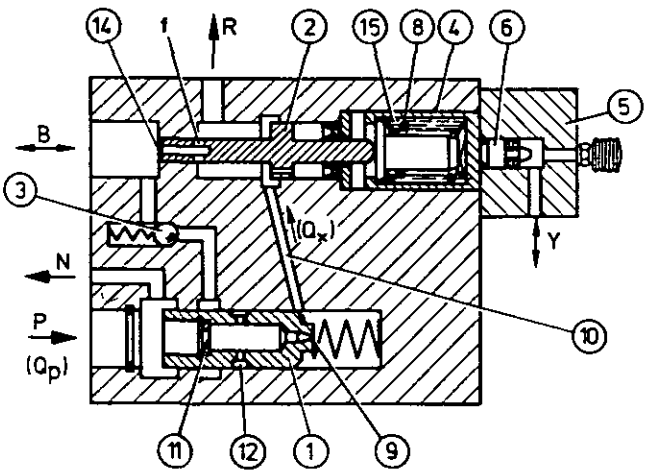


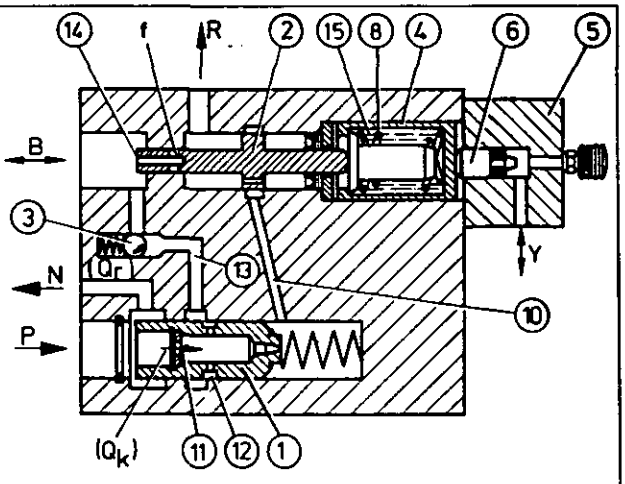
Fig. 3

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Hydraulics - Trailer braking





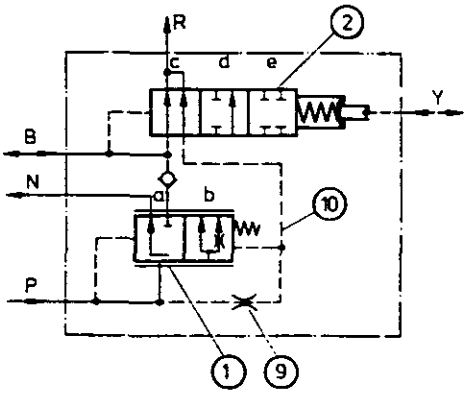


Fig. 4 - Trailer brakes released

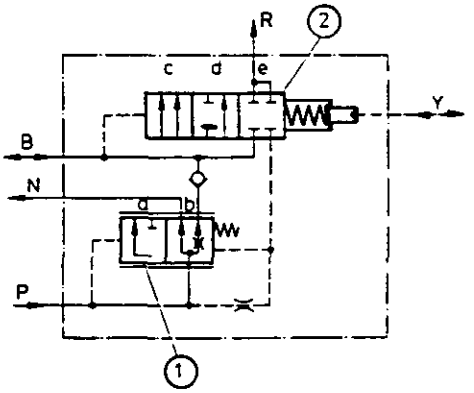
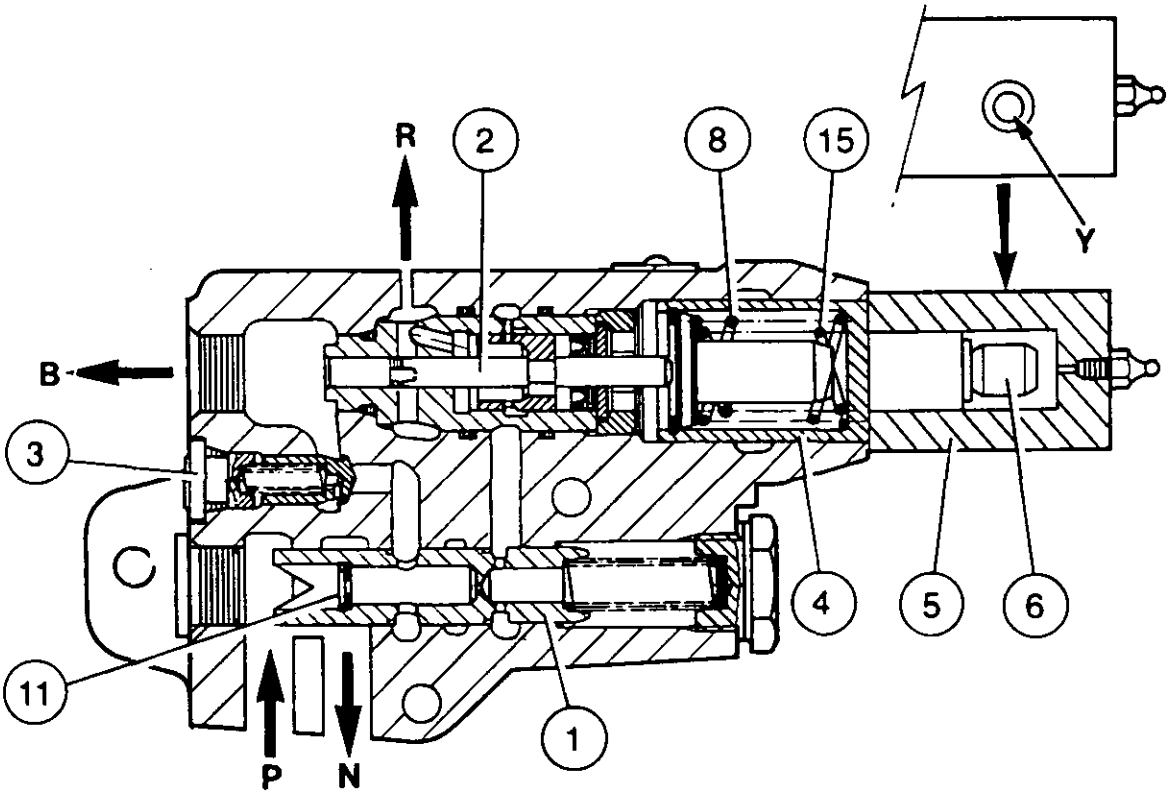


Fig. 5 - Partial trailer braking, initial braking operation.



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B. Operation, trailer brakes released and partial trailer braking

Trailer brakes released (Fig. 4)

There is no pressure in sensing line Y (no effort applied to the pedals).

Port B (supply to the trailer brake junction) is open to return line R via channel f of the control spool **(2)**.

Flow QP coming from the pump passes through port P in flow control valve **(1)**.

A flow QP - QX is sent towards the port N (continuation to the auxiliary spool valve and the lift valve). A partial flow QX (approx. 0.6 l/min) coming from port P and going towards the diaphragm **(11)**, the restrictor **(9)**, the gallery **(10)** and the control spool **(2)** comes back to line R.

Consequently the pressure drop produced by restrictor **(9)** holds flow control valve **(1)** in the fully open position a, where it has no regulating function.

Partial braking of the trailer

Initial braking operation (Fig. 5)

The piston **(6)** of the pilot flow housing **(5)** is supplied under pressure by the tractor braking system (effort applied to the brake pedals).

Note: To improve braking efficiency, the diameter of the pilot piston valve has been increased from 16 to 20 mm.
This modification has been introduced on 3000 tractors from serial number R 030013 onwards.

The pressure arrives via port Y. The control spool **(2)** is then pushed to the left, obstructing channel f and interrupting the communication between port B (towards the trailer brake junction) with the return line R, and thus the connection with the gallery **(10)**.

Control spool **(2)** moves from position c to position e.

Control flow QX is cut off and the flow control valve **(1)** moves to position b (regulating position).

A constant flow QK flows from port P to port B (towards the trailer brake junction) via the diaphragm **(11)**, the channel **(12)**, the line **(13)** and the check valve **(3)**. The surface of the diaphragm **(11)** is calculated in accordance with the constant flow QK.

The residual flow QR passes through the control valve **(1)** then to port N (continuity to the auxiliary spool valve and the lift valve).

The line from port B (towards the trailer brake junction is placed under pressure and acts on the surface **(14)** of the control spool **(2)** against the pressure exerted on the piston **(6)** by the tractor braking system.

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Hydraulics - Trailer braking

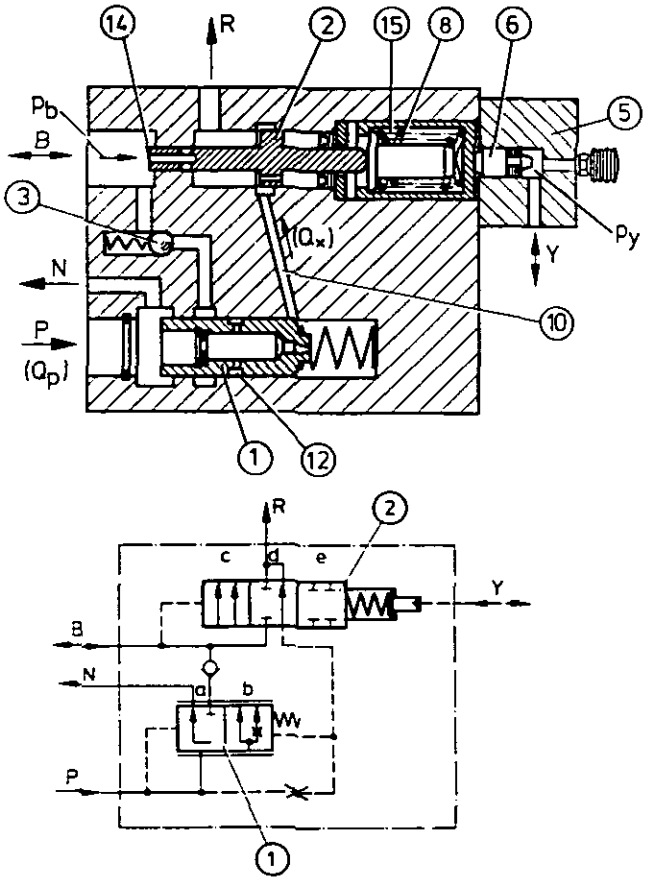


Fig.6 - Partial braking of trailer

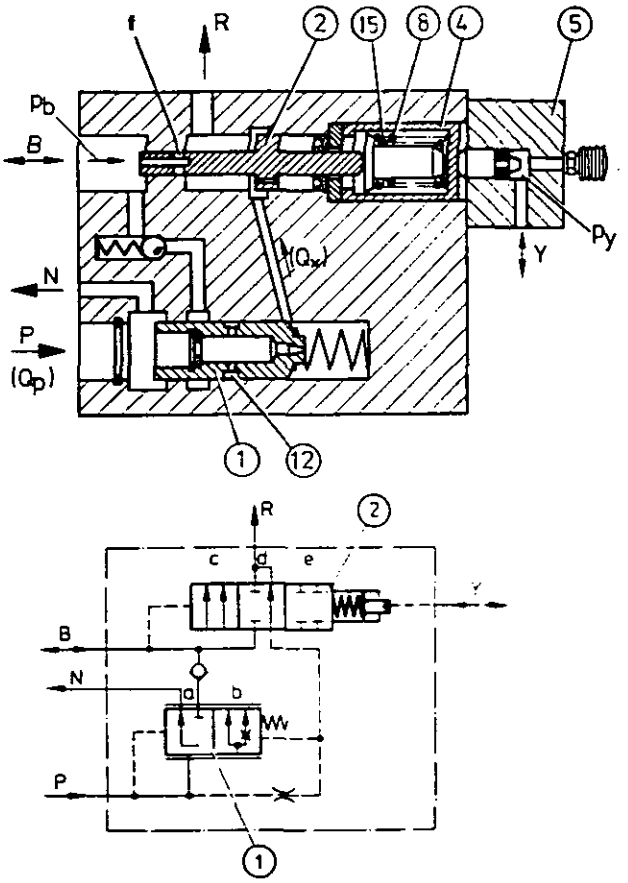
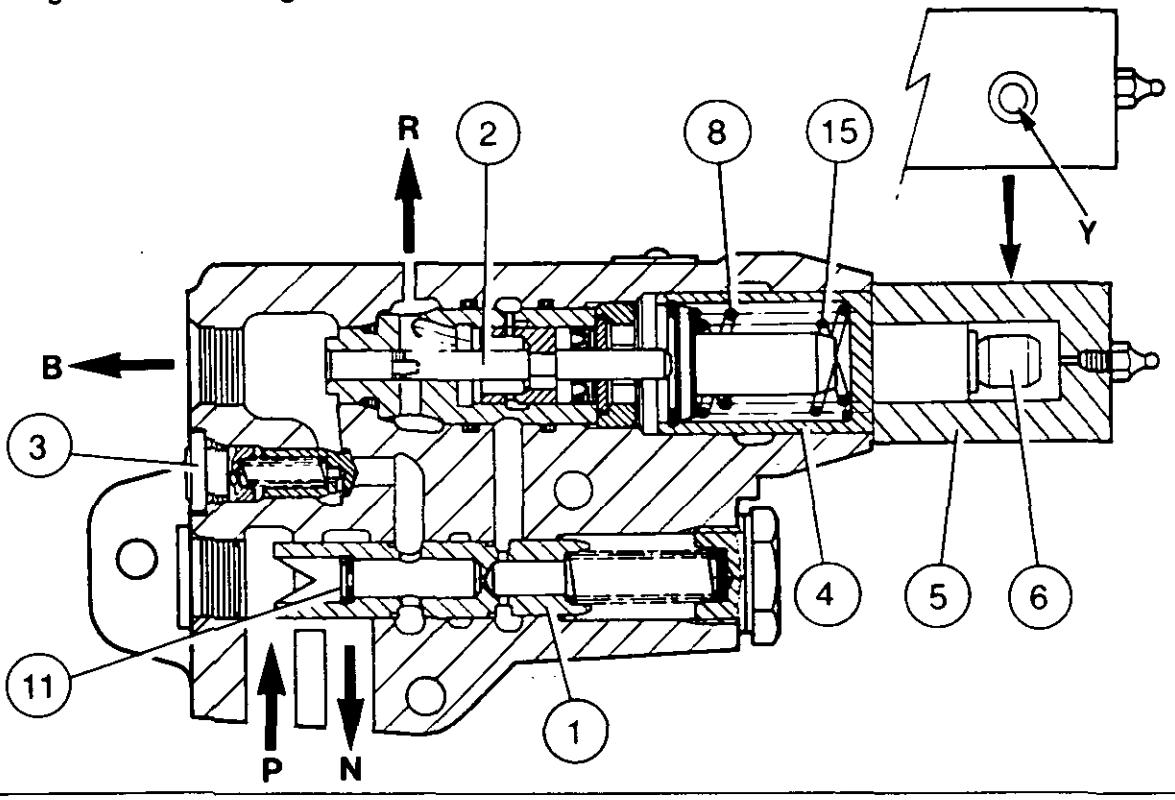


Fig 7 - Maximum braking of trailer; limited braking pressure



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C. Partial braking and maximum braking of trailer

Partial braking of trailer (Fig. 6)

Pressure Pb existing in the trailer brake line (pressure acting on the active surface **(14)** of the control spool **(2)**) equalises with the pressure Py (coming from the tractor braking system) acting on the piston **(6)** of the pilot flow housing **(5)**.

The line from port B (towards the trailer brake junction) is cut off from the return port R. Therefore the oil is trapped within the trailer braking system. When the pressures have equalised the control spool **(2)** is in position d.

The flow control valve **(1)** then moves to position a, where it has no regulating function.

As when the trailer brakes are released, flow Qp - Qx is directed to port N (continuity to the auxiliary spool valve and the lift valve) and control flow Qx is sent towards the return line R via the control spool **(2)**.

Maximum braking of trailer (Fig. 7)

Limited braking pressure

Flow control valve **(1)** and control spool **(2)** occupy the same positions (a and d) as for partial braking.

Flows Qp and Qx are the same as for partial braking. The maximum admissible braking pressure for the trailer is attained (Pb = 150 bar). There can be no increase in trailer braking pressure, even if the braking pressure of the tractor continues to increase.

The pressure relief valve **(4)** is then pushed to the left.

The springs **(8)** and **(15)** preloaded to the maximum admissible braking pressure for the trailer (Pb = 150 bar) are compressed.

If the trailer braking pressure Pb should increase due to external influences, the control spool **(2)** momentarily opens channel f between orifice B (supply towards the trailer brake junction) and the return line R.

In all operating positions of the trailer brake valve, the auxiliary spool valve and the lift valve are usable via orifice N (Fig. 8) without having any major effect on the trailer braking system. This has priority over the high-pressure hydraulic circuit.

Note: To prevent possible vibrations in the brake pedals, the following modifications have been introduced on tractors equipped with trailer braking.

1) **Temporary solution** :
   A damper valve and a new pilot hose have been introduced on 3000 tractors between serial numbers N 103023 and N 159018.

2) **Final solution :**
   A new trailer brake valve incorporating a damper valve has been introduced from serial number N159019 onwards.

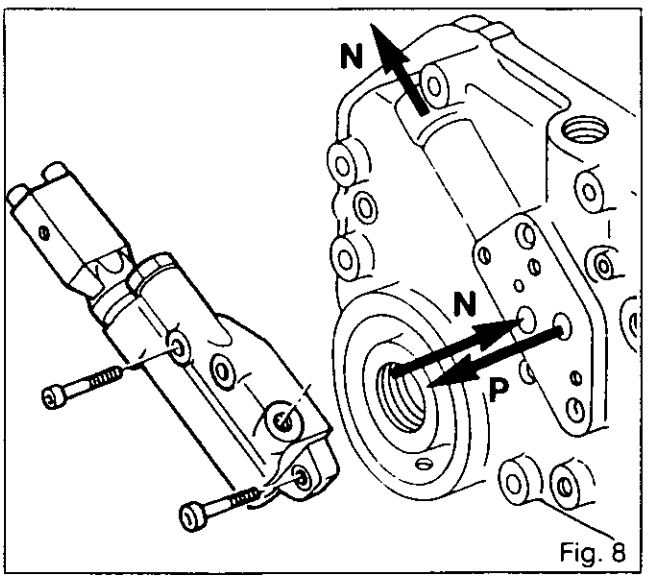


Fig. 8

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8 C01 "Rexroth" auxiliary spool valves

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Hydraulics - "Rexroth" auxiliary spool valves

General

The auxiliary spool valves are fitted on the high-pressure circuit. They are fed by the oil coming from the trailer brake valve or from the cover plate (depending on the option).

In the neutral position, the oil not used by the spool valves is available for the lift valve fitted downstream.

The auxiliary spool valves are fixed on a support which in turn is mounted on the rear of the lift cover. The quick couplings are mounted directly on the body of the spool. To obtain an adequate distance between the couplings, the spool valves contain blocks which serve as distance pieces. These blocks also permit the oil to continue to the next spool.

Rexroth and Bosch spool valves have the same characteristics and contain essentially the same features but are not interchangeable in part.

Characteristics

Each spool valve is activated by a lever in the cab, and has three phases:
- 35% slow flow
- 45% progressive increase in flow and pressure
- 20% full flow

The progressive increase in flow and pressure enables uniform control of implements.
This characteristic also enables two spool valves to be activated simultaneously, the overall flow being shared. The flow to each quick coupler is proportional to the position of the control lever.

Different types of spool valves

- 3 positions, convertible to single or double acting.
- 3 positions, convertible to single or double acting with kickout return to neutral.
- 3 positions, convertible to single or double acting with nonreturn valve and kickout return to neutral.
- 4 positions, double acting with kickout return and floating position.
- 3 positions with shock valves.

Assembly procedure (Fig. 1 and 2)

1. For correct assembly of the plates **(2)** and seals each spool valve must be disassembled and reassembled vertically with the end plate **(11)** at the bottom.
2. Screw on the nuts **(12)** until they touch the intake block **(1)**.
3. Place the spool valve assembly with the fastening surfaces "F" supported on a flat surface, ensuring that it is lying perfectly flat.
4. Tighten the nuts **(12)** to a torque of 17 - 20 Nm.
5. Fit the connectors **(13)** and the pipe **(3)**, then tighten them to a torque of 50 Nm.
   To improve the reliability of the spool valve assemblies, internal leakage has been reduced from 50 cm^3/min to 25 cm^3/min. See Service Bulletin n° 88/02, issue 1.

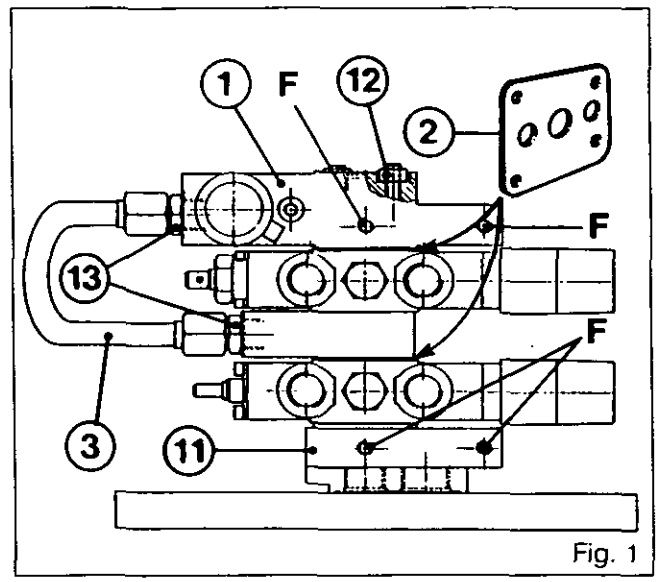


Fig. 1

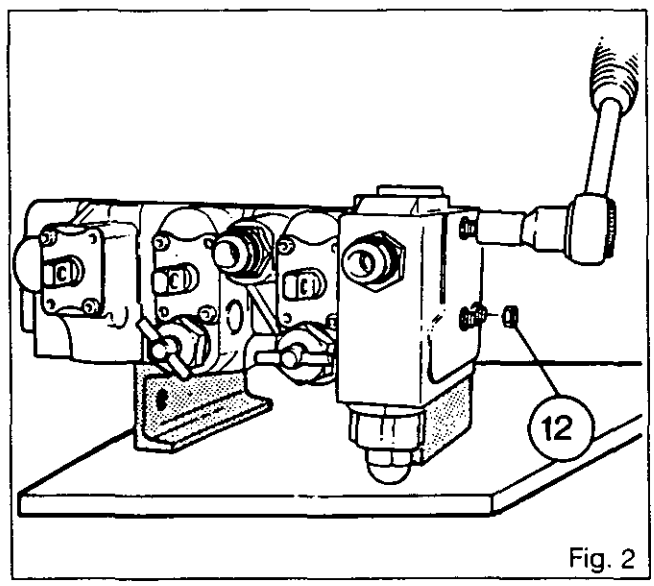


Fig. 2

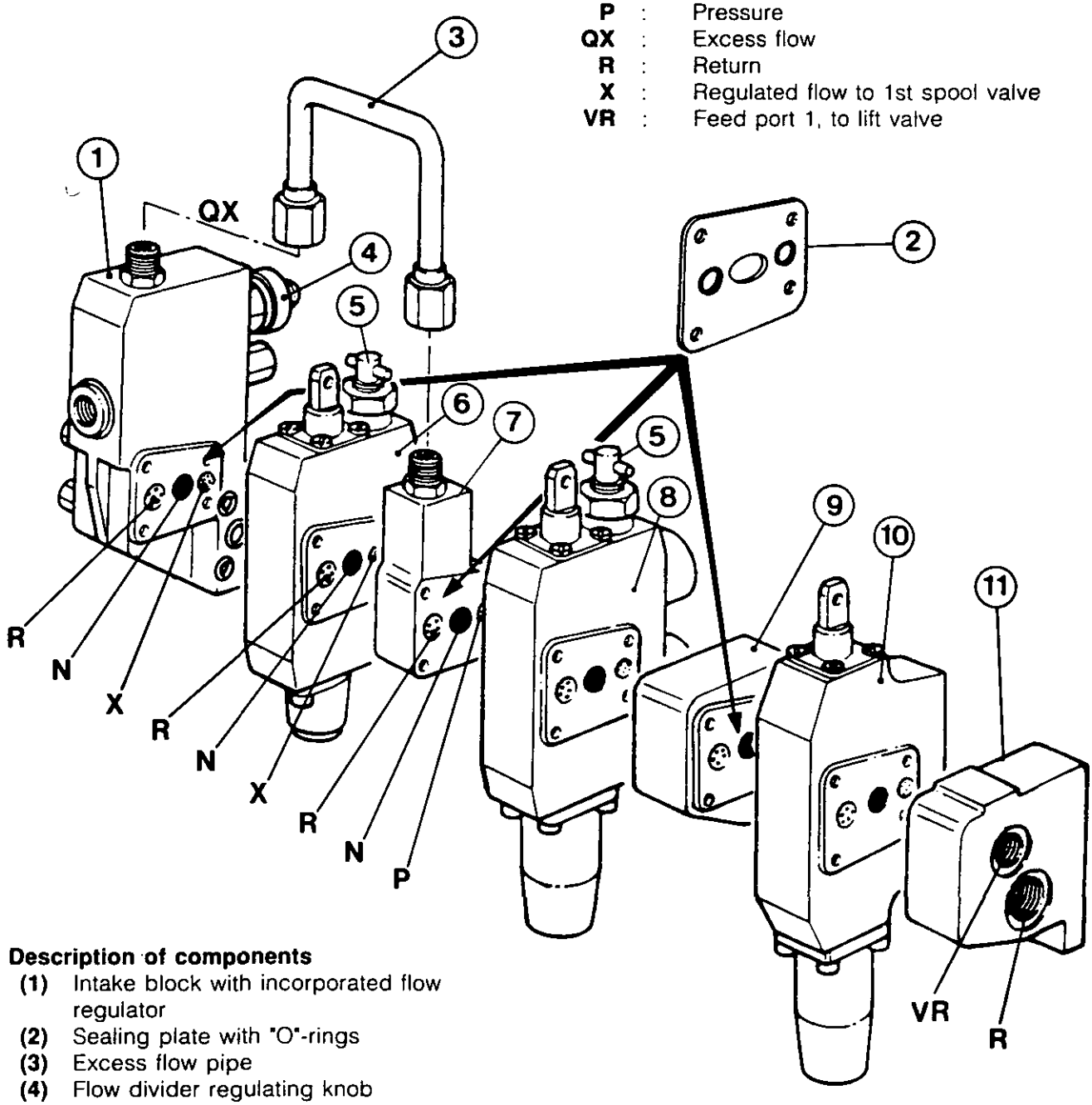
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Hydraulics - "Rexroth" auxiliary spool valves

Designation of ports

N	:	Continuity (to lift valve)
P	:	Pressure
QX	:	Excess flow
R	:	Return
X	:	Regulated flow to 1st spool valve
VR	:	Feed port 1, to lift valve



Description of components

(1) Intake block with incorporated flow regulator
(2) Sealing plate with "O"-rings
(3) Excess flow pipe
(4) Flow divider regulating knob
(5) Single/double change-over screw
(6) 3-position spool valve, convertible single/double acting, return to neutral by spring
(7) Intermediate block receiving excess flow
(8) 3-position spool valve, convertible single/double acting with kickout return to neutral
(9) Intermediate block
(10) 4-position spool valve with kickout return to neutral
(11) End-plate enabling continuity to lift and return to sump

Fig. 3

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Hydraulics - "Rexroth" auxiliary spool valves

A. Flow divider

For work requiring a regulated flow, the divider enables a variable flow to be obtained, by adjusting the knob **(4)** between the minimum and maximum positions (Fig. 4).

The divider is situated at the intake of the auxiliary spool valve assembly. It is fed by the oil from the high-pressure circuit passing through the brake valve or the cover plate (depending on the option).

Operation (Fig. 5)

The oil coming from port **N** is sent to port **X** and feeds the first spool valve. The flow is regulated according to the position of the knob **(4)**.
At the same time, the pressure existing in channel **N** enables the oil to pass through hole "**a**" and restrictor "**b**".
The piston **(7)** is then moved upwards, sending the oil through the port **QX** and the intermediate block, which receives the excess flow through the pipe **(3)**.

Adjustment (Fig. 6)

1. Remove the stop screw **(6)**, the lock nut **(1)** and the washer **(2)**.
2. Unscrew and remove the knob **(4)**.
3. Without forcing it, tighten the screw **(3)** so that the valve **(8)** is in contact with its seat.
4. Screw in the knob so that it is in contact with the cap **(5)**.
5. Unscrew the knob by two turns.
6. Screw in and tighten the stop screw **(6)** to a torque of 20 Nm.
7. Place the knob in the closed position (Fig. 4).
8. Fit the washer **(2)** and tighten the locknut **(1)** to a torque of 30-40 Nm.

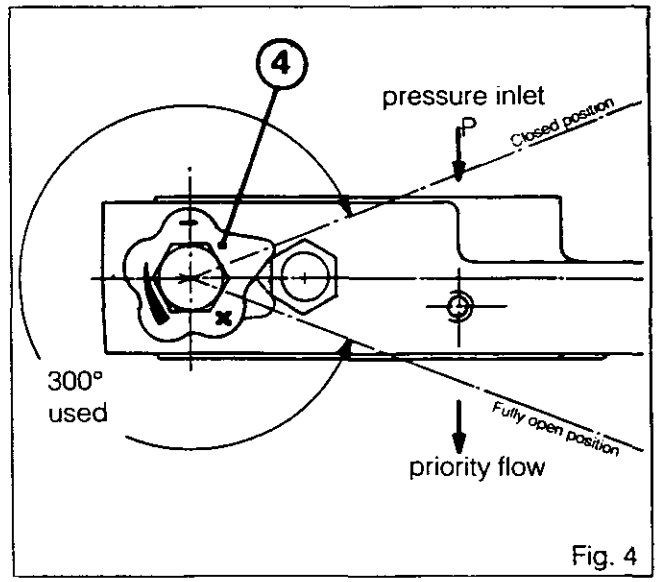


Fig. 4

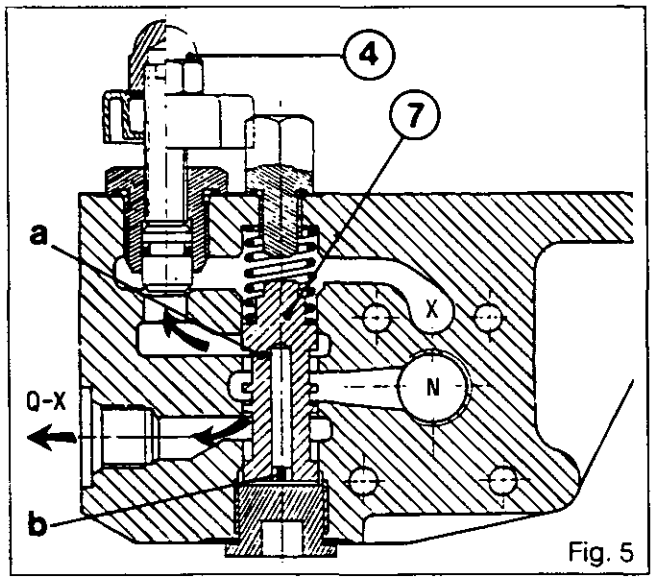


Fig. 5

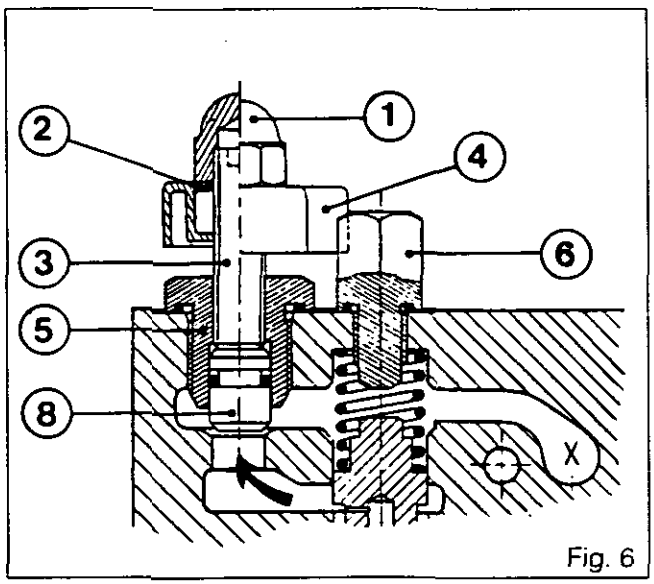


Fig. 6

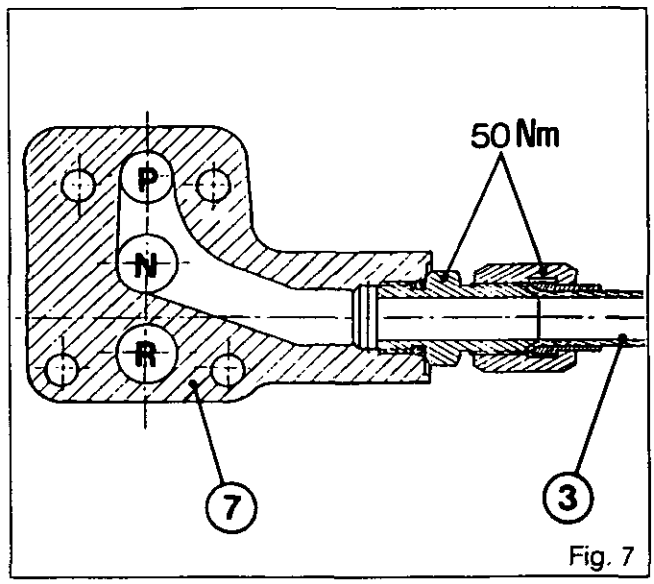


Fig. 7

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B. 3-position spool valve, single/ double acting

Operation (Fig. 8)

The oil from the high-pressure circuit passes through the brake valve (if fitted) or the cover plate fixed on the right hydraulic cover and feeds the various spool valves via the continuity channel **N**.

Neutral position

The oil is not available at outputs **S1** or **S2**. It is sent via the continuity line towards the lift valve and passes directly to the intake manifold of the pump when the lift is in the neutral position.

Channels **N** and **P** are connected in the intermediate block **7** (Fig. 7) to feed the following spool valves.

Intake - Discharge phase

When the spool **(2)** is moved to right or left, the pressure increases and lifts the valve **(1)**. The oil is sent to channel D or G, depending on the direction of movement of the spool, to feed the outputs **S1** or **S2** via grooves **g1** or **g2**. At the same time, the returning oil is sent from the ram to output S1 or S2, depending on the position of the spool, and comes back to the return channel **R**.

Note: To prevent oil flowing on to the rear of the tractor, oil catchers (1) with pipes have been fitted on to the quick couplers (Fig. 9). Introduced from serial number R178047.

Change-over single/double acting

For the single acting position, unscrew the valve **(4)**. Output **S1** is now connected to channel **R**. Output **S2** feeds the ram.
For the double acting position, screw in the valve **(4)**.

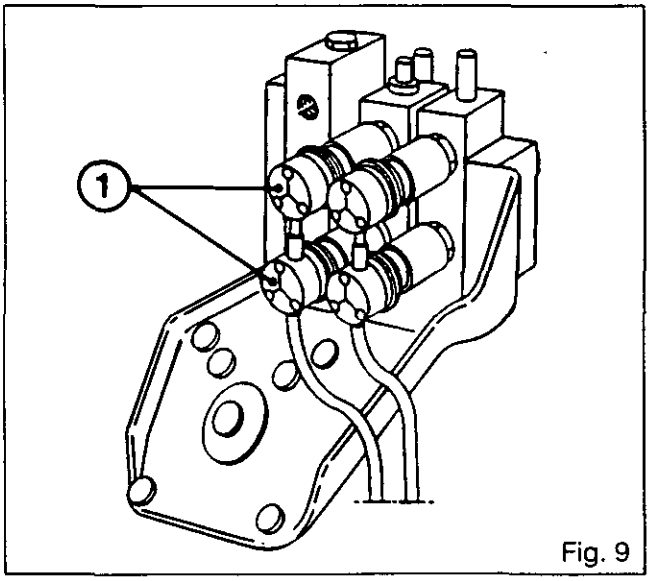


Fig. 9

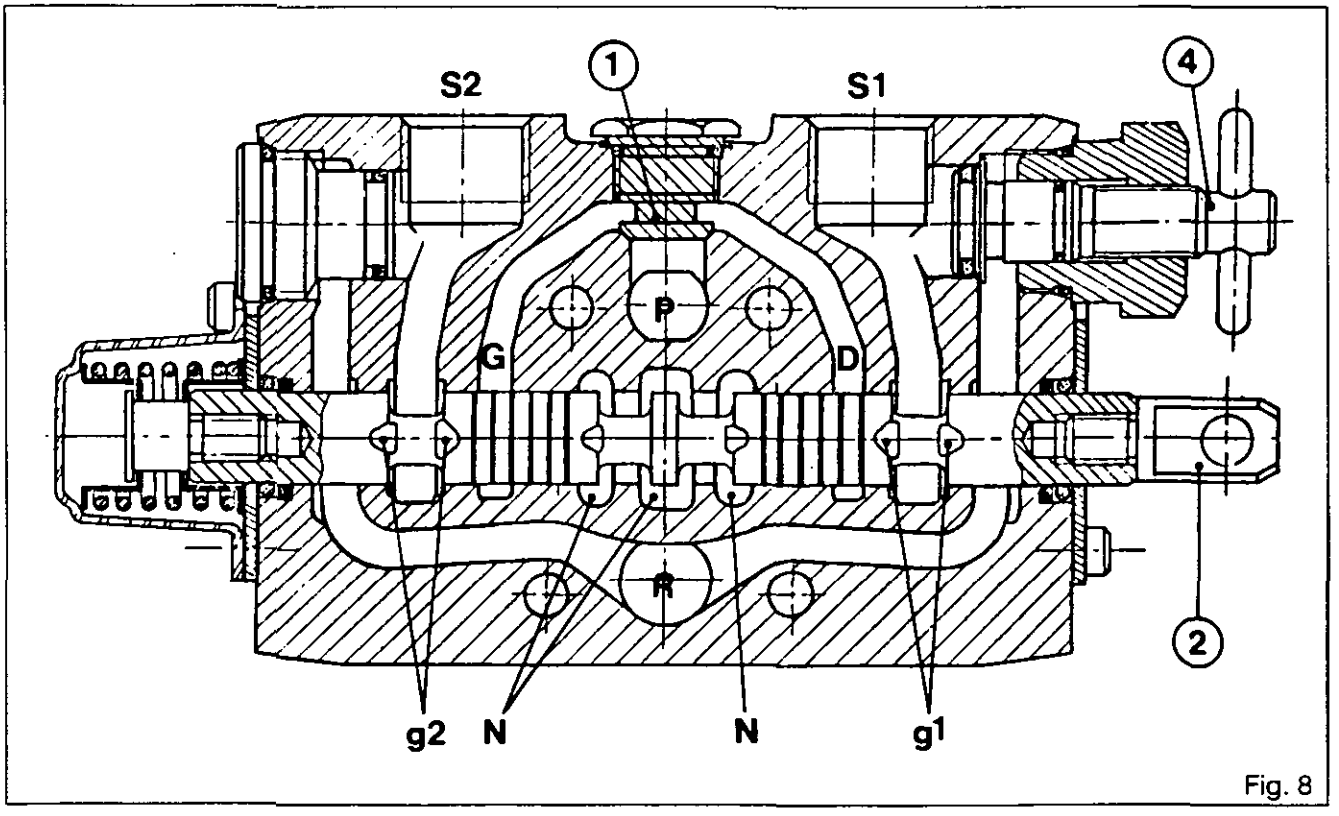


Fig. 8

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C. 3-position spool valve, single/ double acting with kickout return to neutral

Operation

Neutral position

The operating principle of the 3-position spool valve, single and double acting with kickout return to neutral, is the same as that of the previous spool valve.

Intake - discharge phase (Fig. 10)

Operation identical to the previous 3-position spool valve, plus the special characteristic that it automatically returns to the neutral point.

The system in the housing **(3)** locks when the spool **(2)** is actuated.
The spool automatically returns at a pressure of 140-160 bar.
The pressure passes through the holes **a** and **b**, releases the system, and enables automatic return of the spool to the neutral position.
The housing **(3)** is in communication with channel **R**.

Residual pressure in the housing (above 2 bar) may cause the spool to return to neutral.

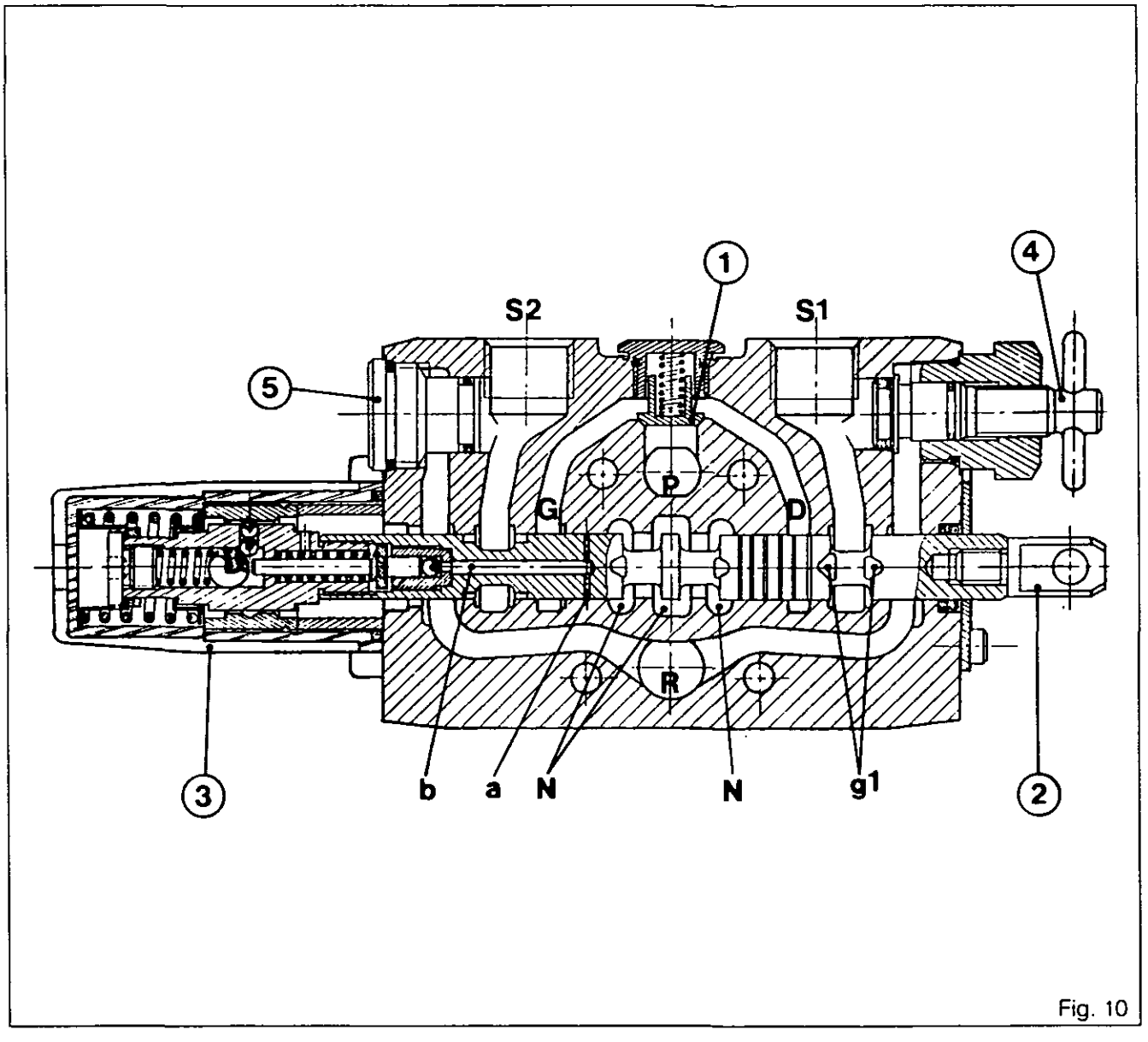


Fig. 10

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D. 3-position spool valve, single/ double acting, with nonreturn valve and kickout return

This spool valve operates in the same way as the previous ones.

Operation of check valve (Fig. 11)

When the spool **(2)** is moved to the right, the oil coming from channel **N** is sent to the output **S2**, lifting the check valve **(6)** to feed the service side.

In the neutral position, the check valve seals the circuit.

When the spool **(2)** is moved to the left, the oil coming from channels **N** and **P** lifts the valve **(1)** and is sent to channel **D** to feed the service side via grooves **g1** and output **S1**.

In its movement, the spool moves the needle **(5)** which lifts the ball and causes the pressure to drop on the service side, enabling the valve **(6)** to lift from its seat and oil to flow towards channel **R**.

Note: When dismantling the spool, it is essential to dismantle the checkvalve (6) and the needle (5) first.
The spool valve body is available as spare part paired with the spool (2), the needle (5) and the valve (6).

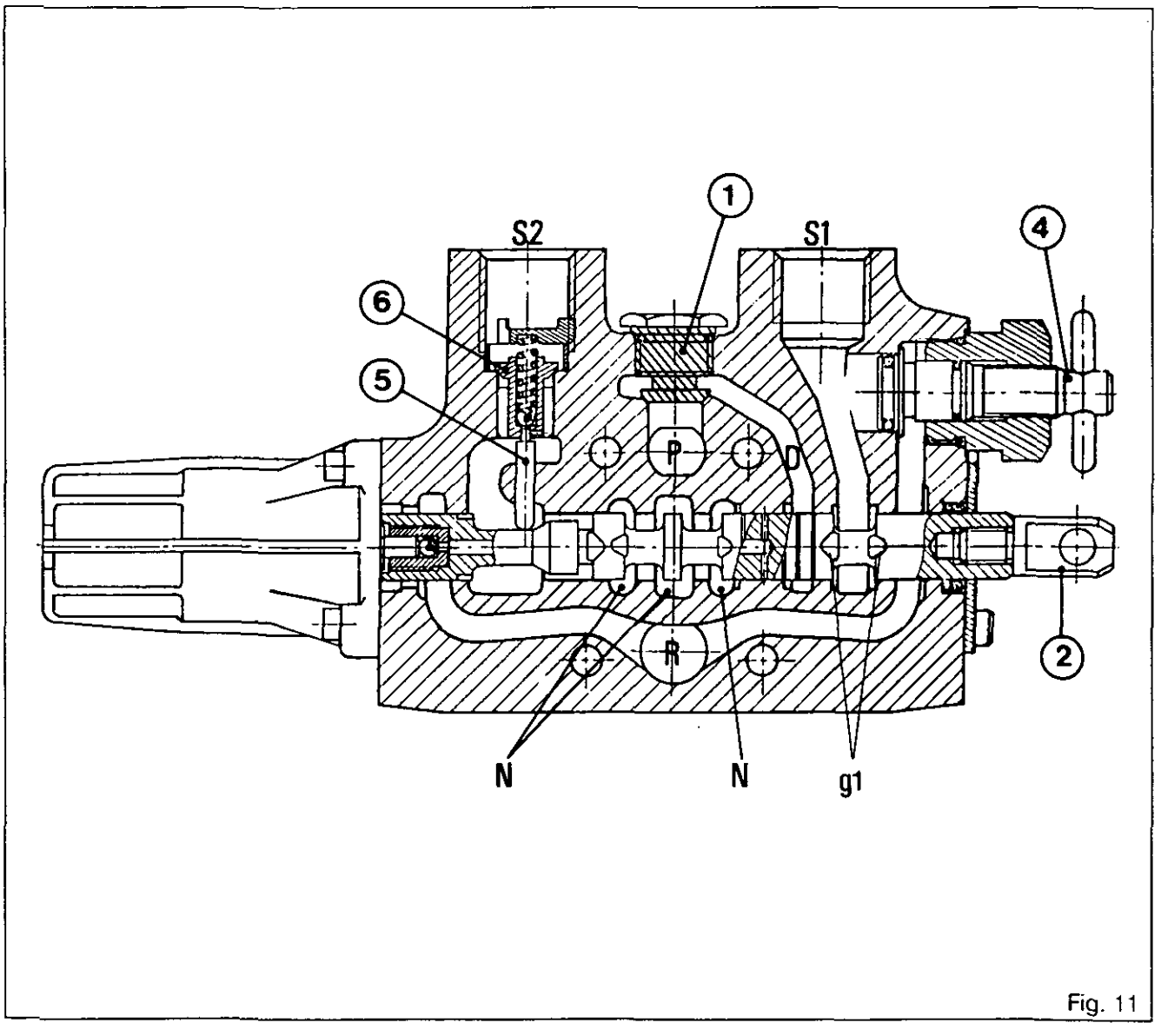


Fig. 11

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E. 4-position spool valve, double acting with kickout return to neutral and floating position

Operation (Fig. 12)

When the spool **(2)** is moved to right or left, the same positions are obtained as with the previous spool valves.

The special characteristic of this spool valve is that it has a floating position **F**, when the spool is withdrawn as far as possible, beyond the kickout return to neutral position.

In this **F** position, the channels of outputs **S1** and **S2** are connected with the return channel **R**. Therefore the oil can circulate freely.

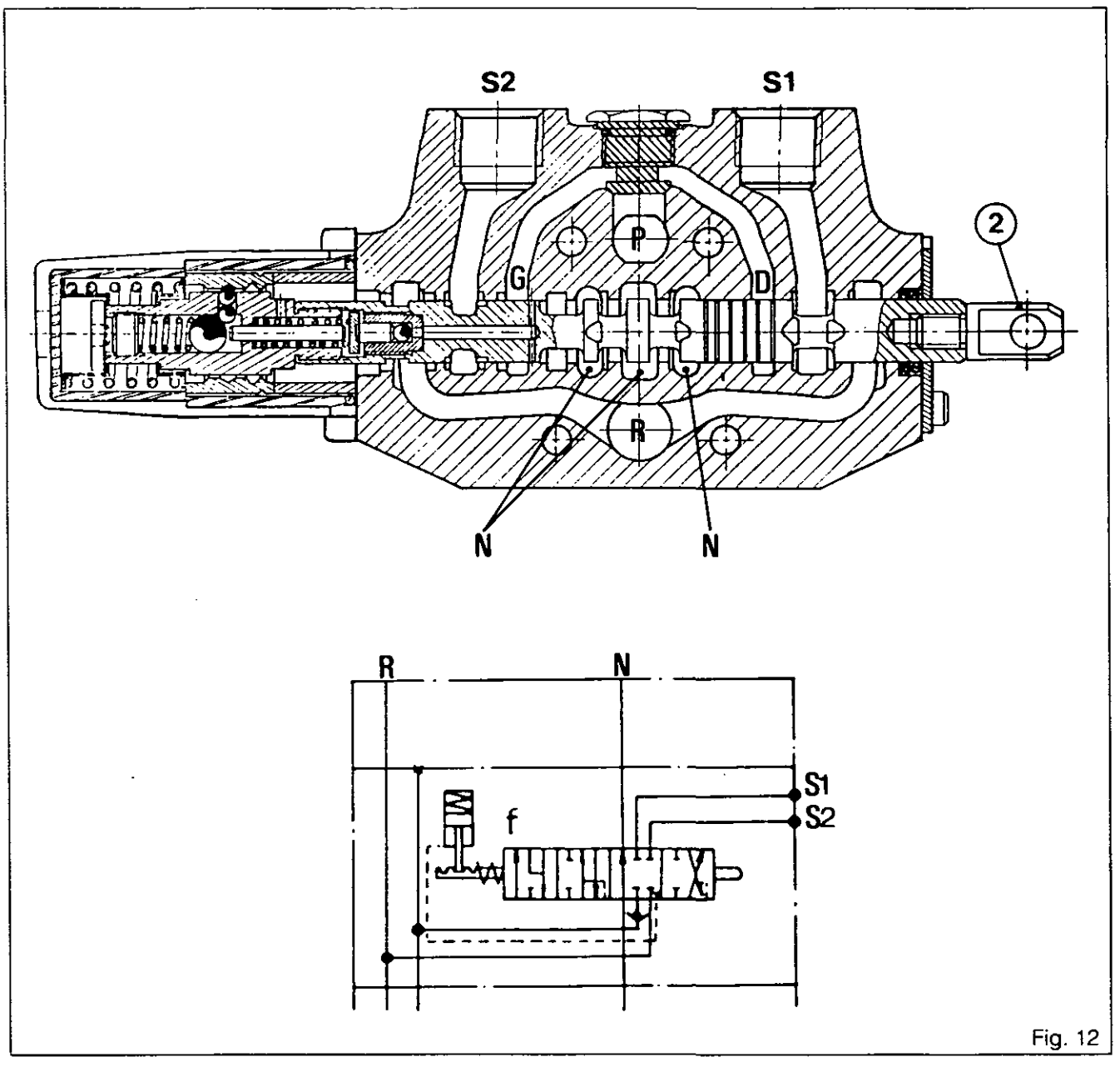


Fig. 12

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F. Diagrams

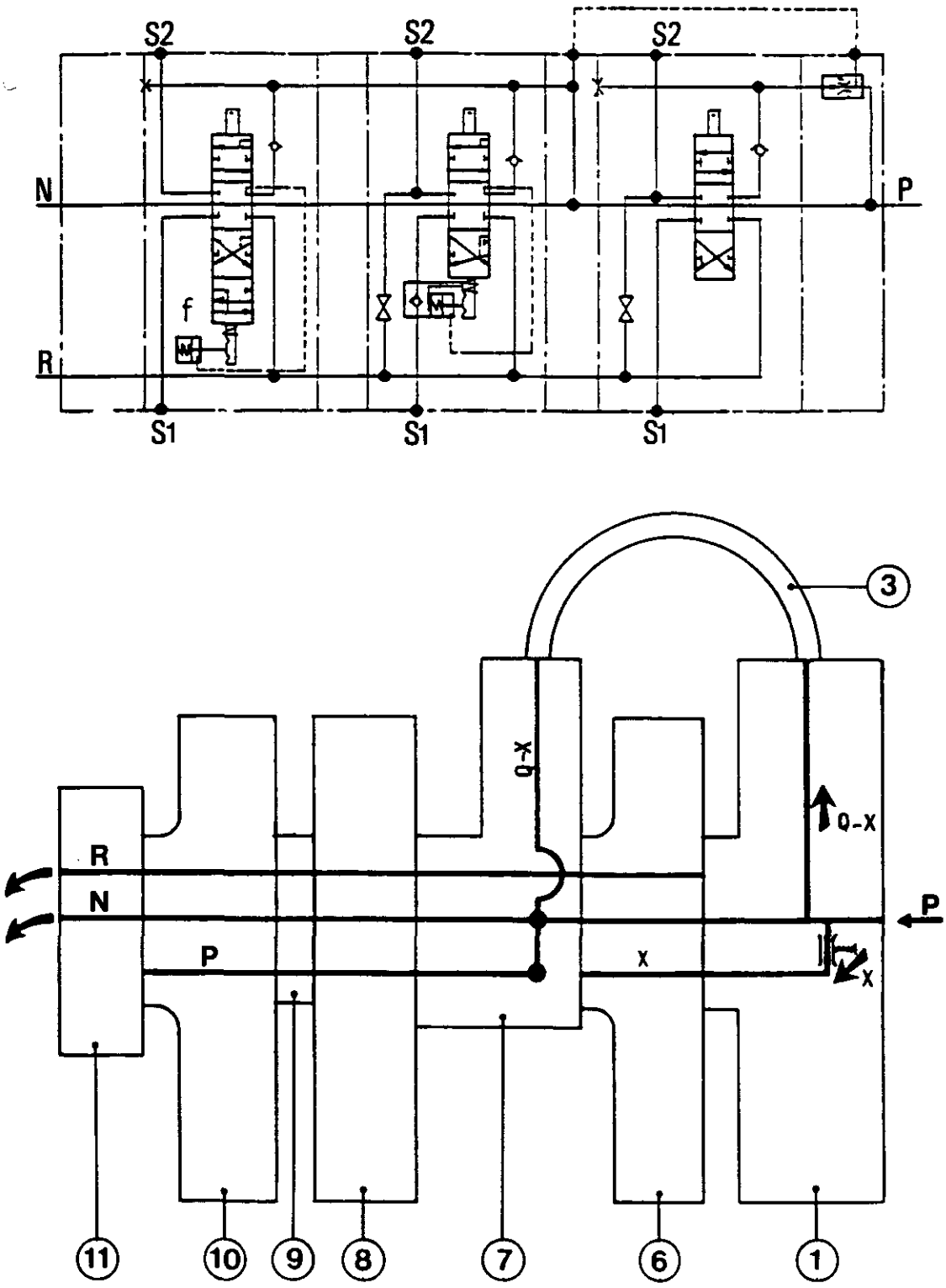


Fig. 13

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G. Assembly and adjustment of control cables

Note: Depending on the version of the support, operations 1 to 6 have to be carried out when replacing the cables.

On levers with old support (Fig. 14)

1. Pass the cable through the grommet **(10)** at the rear of the cab and through the fastening **(6)** on the support **(9)**.
2. Fit the pin **(5)**.
3. Screw the clevis **(1)** on to the threaded part of the cable **(2)** and fit it on the lever **L** with the clip **(7)**. Tighten the nut **(3)**.
   Note: Check that the cable is not constrained.

On levers with new support (Fig. 15)

4. Pass the cable through the grommet **(10)** at the rear of the cab.
5. Fit and tighten the fastening **(6)** on the support **(9)**.
6. Screw the clevis **(1)** on to the threaded part of the cable **(2)** and fit it on the lever **L** with the clip **(7)**. Tighten the nut **(3)**.
   Note: Check that the cable is not constrained.

On the spool valves (Fig. 16)

7. Check that the spools are in the neutral position.
8. Screw the clevis **(1)** on to the threaded part of the cables **(2)**.
   Tighten the nuts **(3)** and fit the pins **(4)**.
9. Partially screw on the sleeves **(5)** and fit the screws **(6)** without tightening them.
10. Adjust the sleeves so that the control levers are correctly positioned in relation to the "symbol" plates, according to the dimensions shown in Figs. 14 and 15.
11. Fix the screws **(6)** and tighten the nut **(7)** to a torque of 20 Nm.
12. Check the operation of the controls and the spool valves in the three or four positions, depending on the option.

Fig. 14

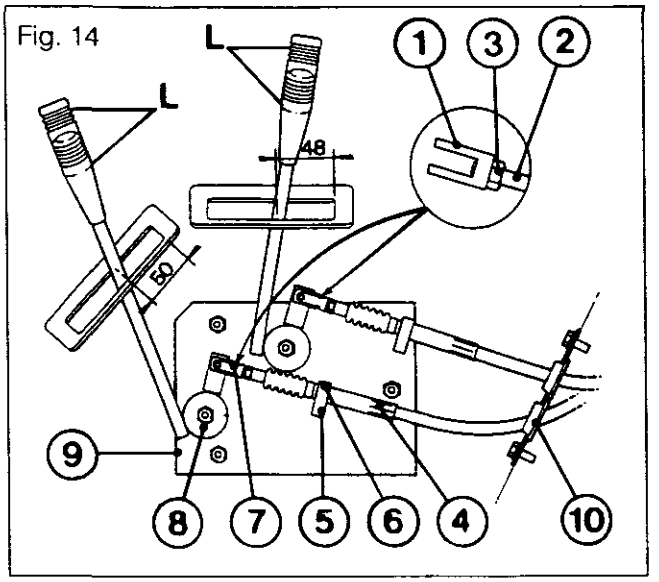
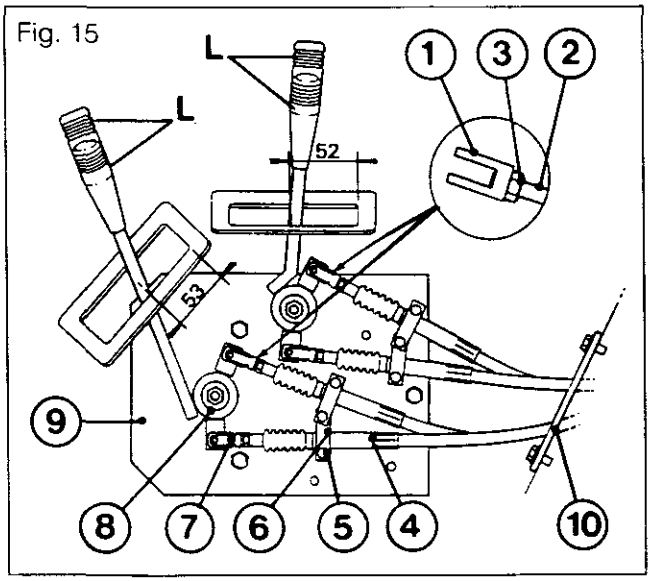


Fig. 15



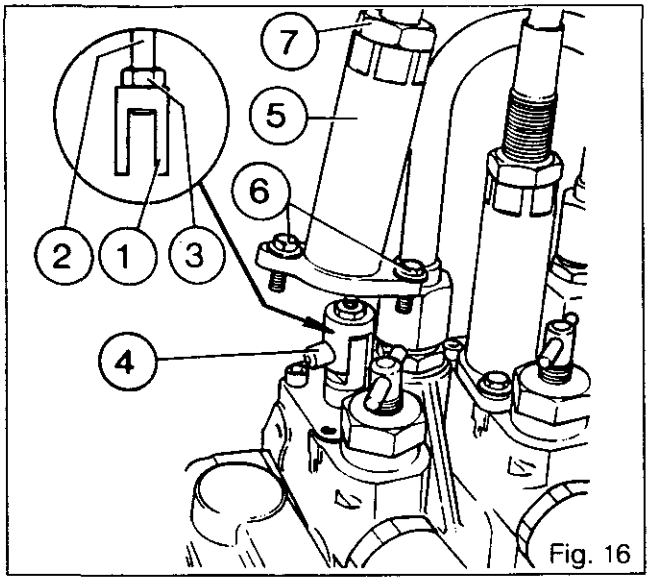


Fig. 16

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8 C02 "Bosch" auxiliary spool valves

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- **General** — 2

A. **3-position, spool valve, single double acting** — 3

B. **3-position spool valve, double acting with check valve** — 3

C. **3-position spool valve, double acting with shock valves** — 4

D. **4-position spool valve, double acting, kickout return to neutral and floating position** — 4

E. **3-position spool valve, single/double acting with flow divider** — 5

F. **Diagram** — 5

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Hydraulics - "Bosch" auxiliary spool valves

General

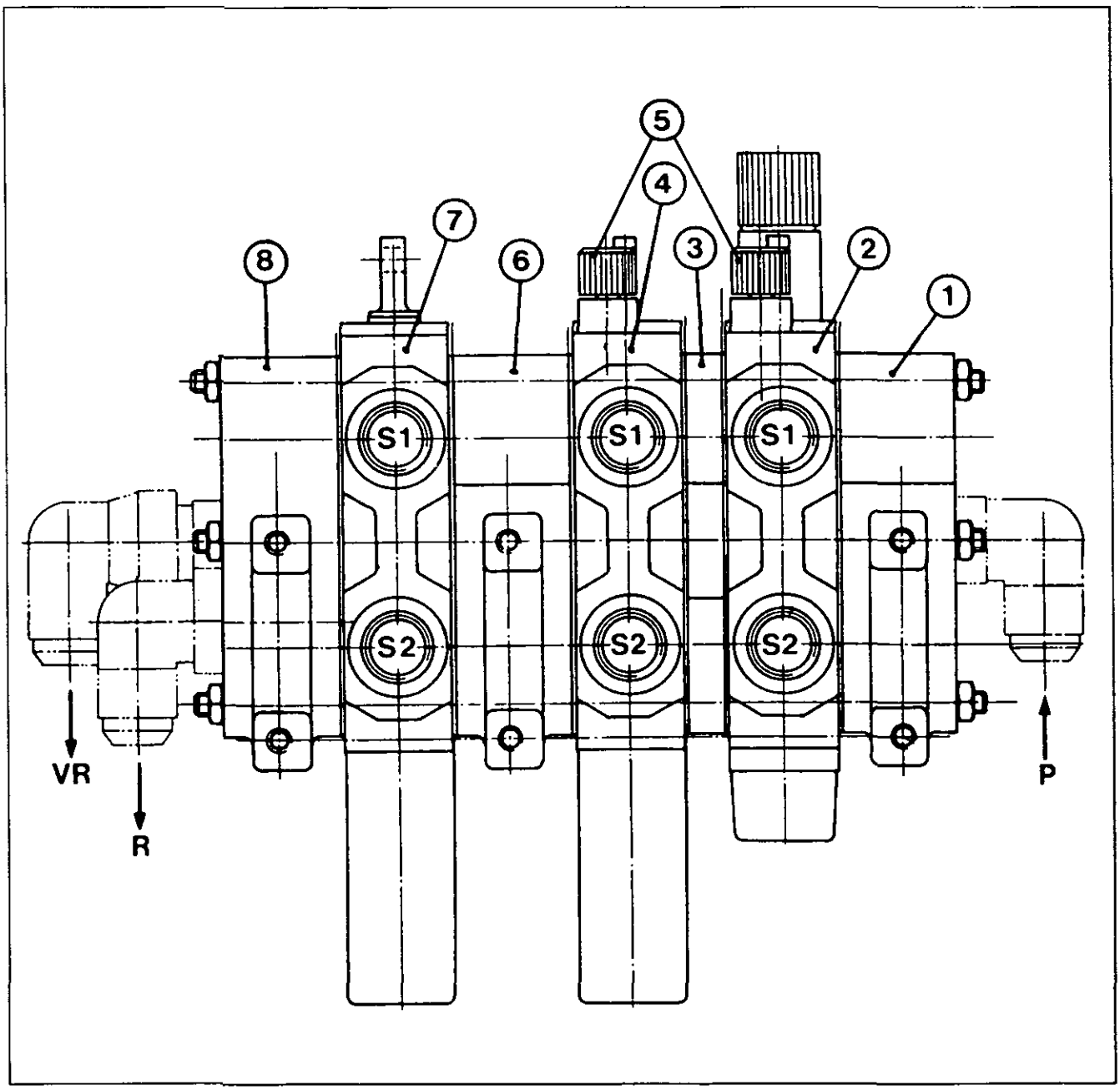
"Bosch" spool valve can be fitted instead of and in place of "Rexroth" spool valves. Their operation is identical and the different options are also the same.
For assembly and adjustment of control cables, refer to chapter 8C01, section G.

Parts list

(1) Intake block
(2) 3-position spool valve, single/double acting with flow divider, return to neutral by spring
(3) Spacer
(4) 3-position spool valve, single/double acting with kickout return to neutral
(5) Single/double acting change-over knobs
(6) Intermediate block
(7) 4-position spool valve, double acting, kickout return to neutral and floating position
(8) End plate enabling continuation to lift and return to casing

Designation of ports

VR Feed port, towards the lift valve
P Pressure
R Return
S1-S2 Outputs to quick couplers

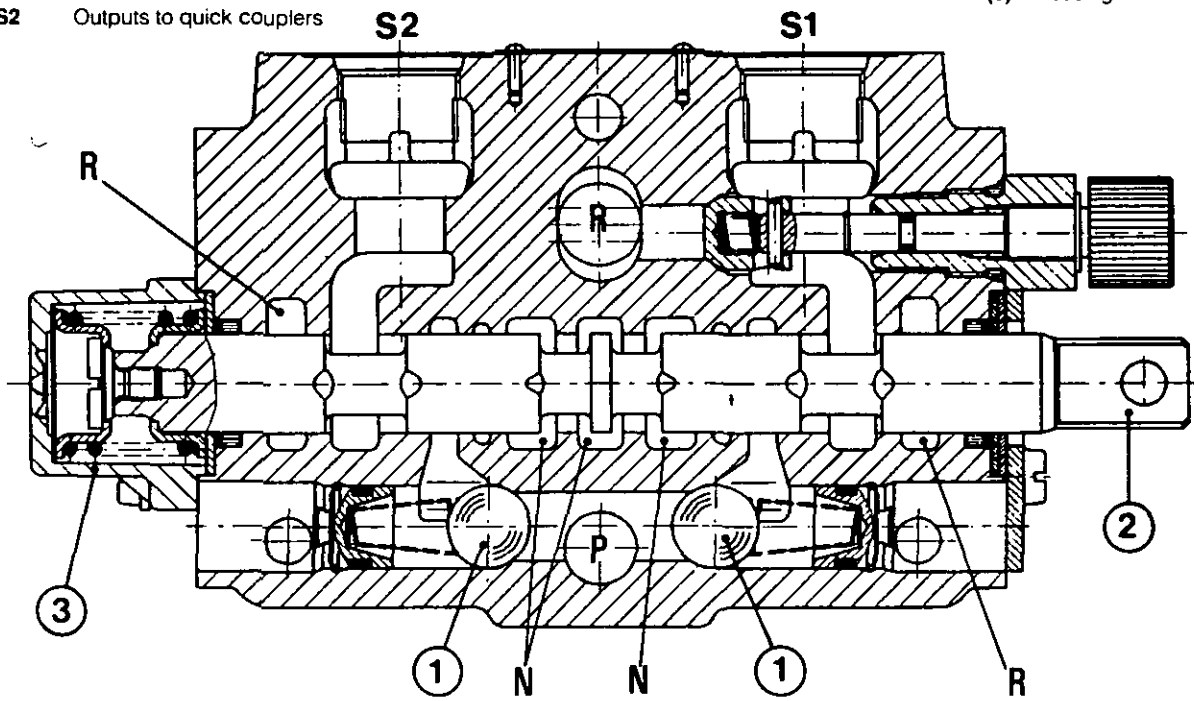


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A. 3-position spool valve, single/double acting

N Continuity to lift valve
P Pressure
R Return
S1-S2 Outputs to quick couplers

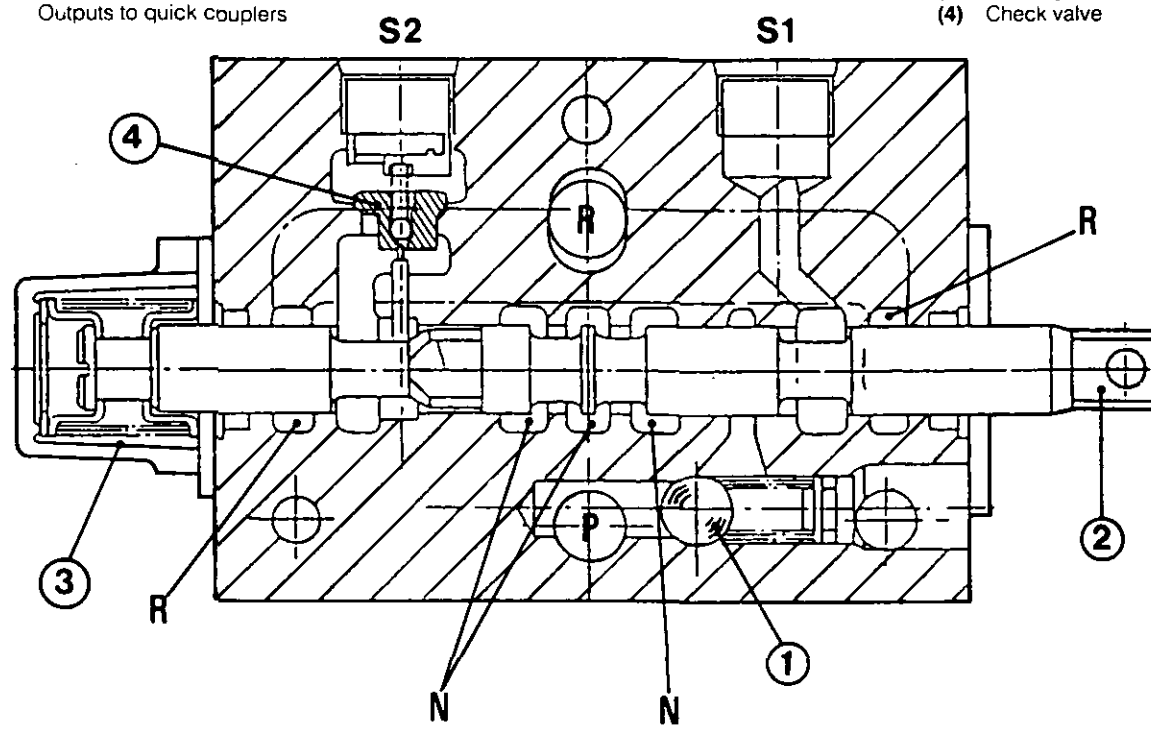
(1) Valves
(2) Spool
(3) Housing



B. 3-position spool valve, double acting with check valve

N Continuity to lift valve
P Pressure
R Return
S1-S2 Outputs to quick couplers

(1) Valve
(2) Spool
(3) Housing
(4) Check valve



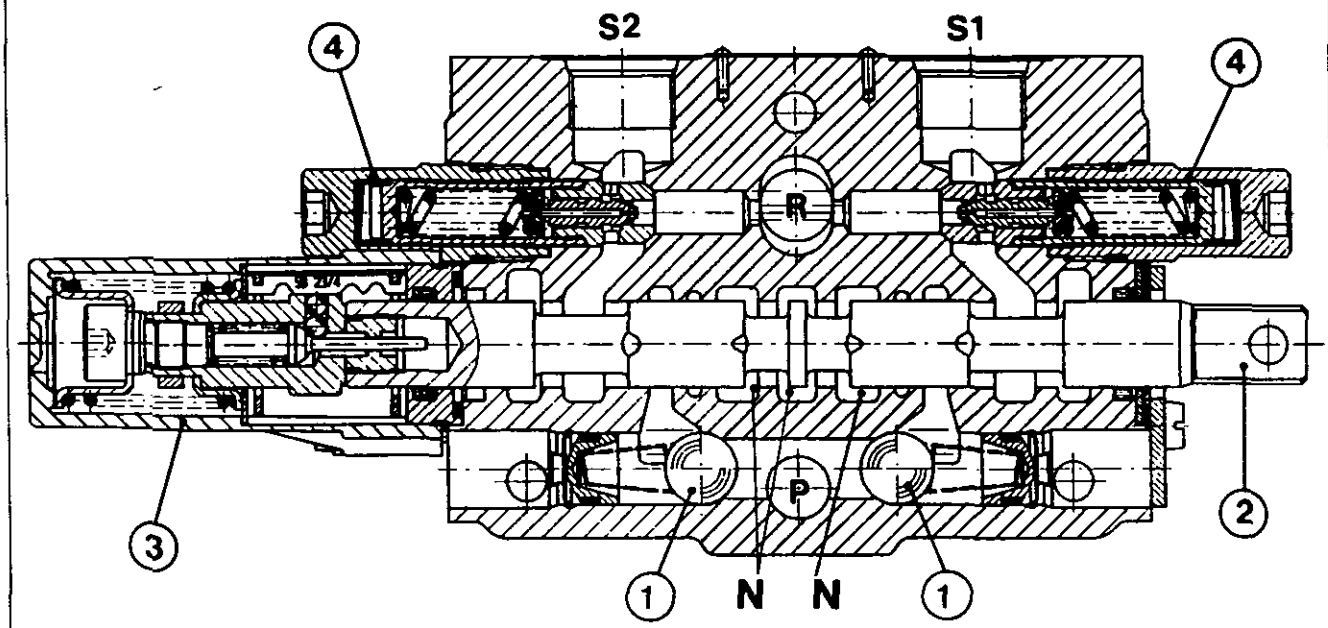
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C. 3-position spool valve, double acting with shock valves

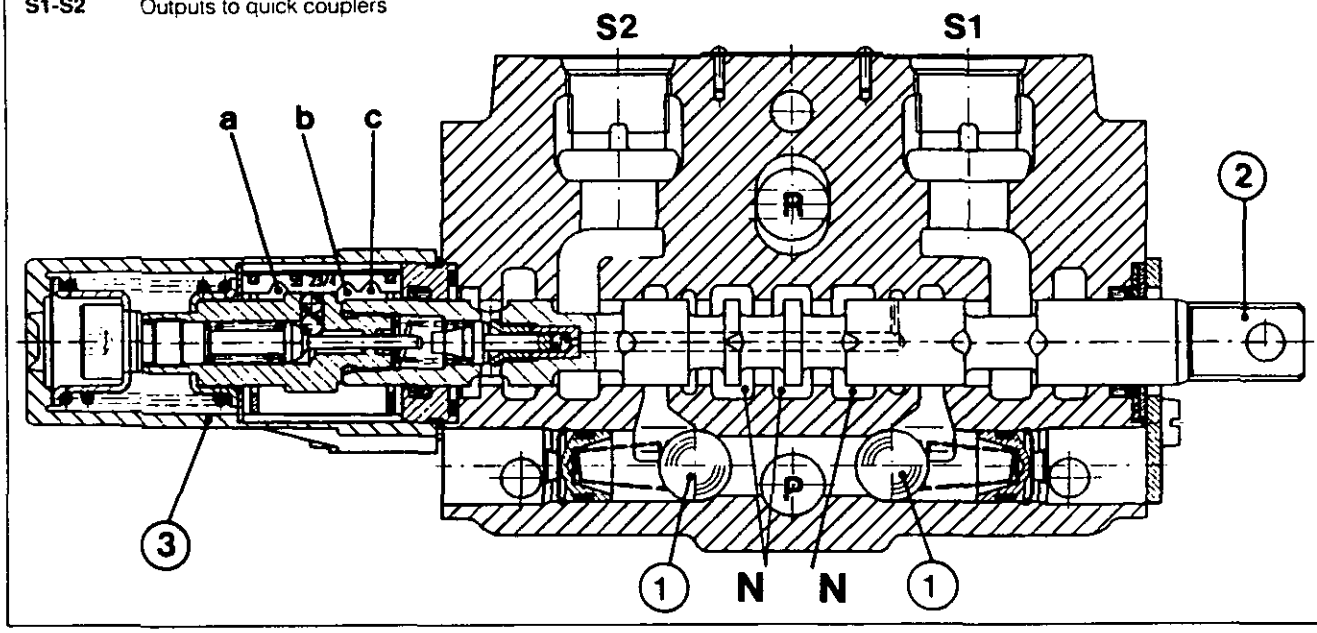
This type of spool valve is used with high-inertia hydraulic motors.

N	Continuity to lift valve	**(1)**	Valves	**(3)**	Housing
R	Return	**(2)**	Spool	**(4)**	Shock valves
S1-S2	Outputs to quick coupling				



D. 4-position spool valve, double acting, kickout return to neutral and floating position

(1)	Valves	**a-b**	Locking of kickout return to neutral position, depending on position of spool
(2)	Spool	**c**	Locking of floating position
(3)	Lock housing		
N	Continuity to lift valve		
R	Return		
S1-S2	Outputs to quick couplers		

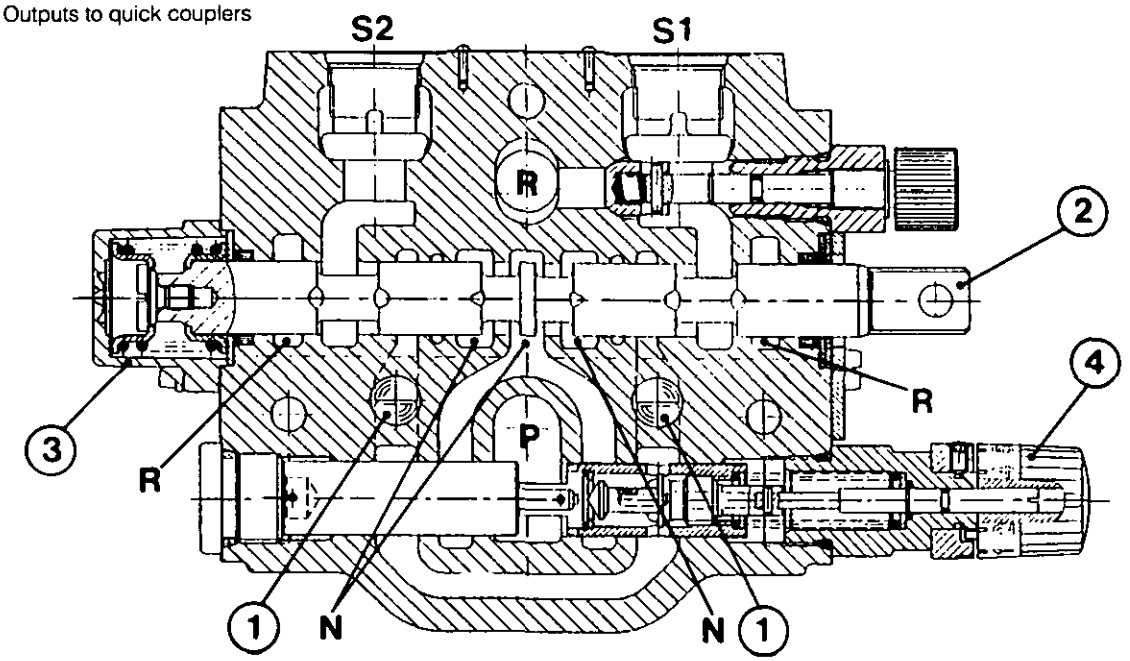


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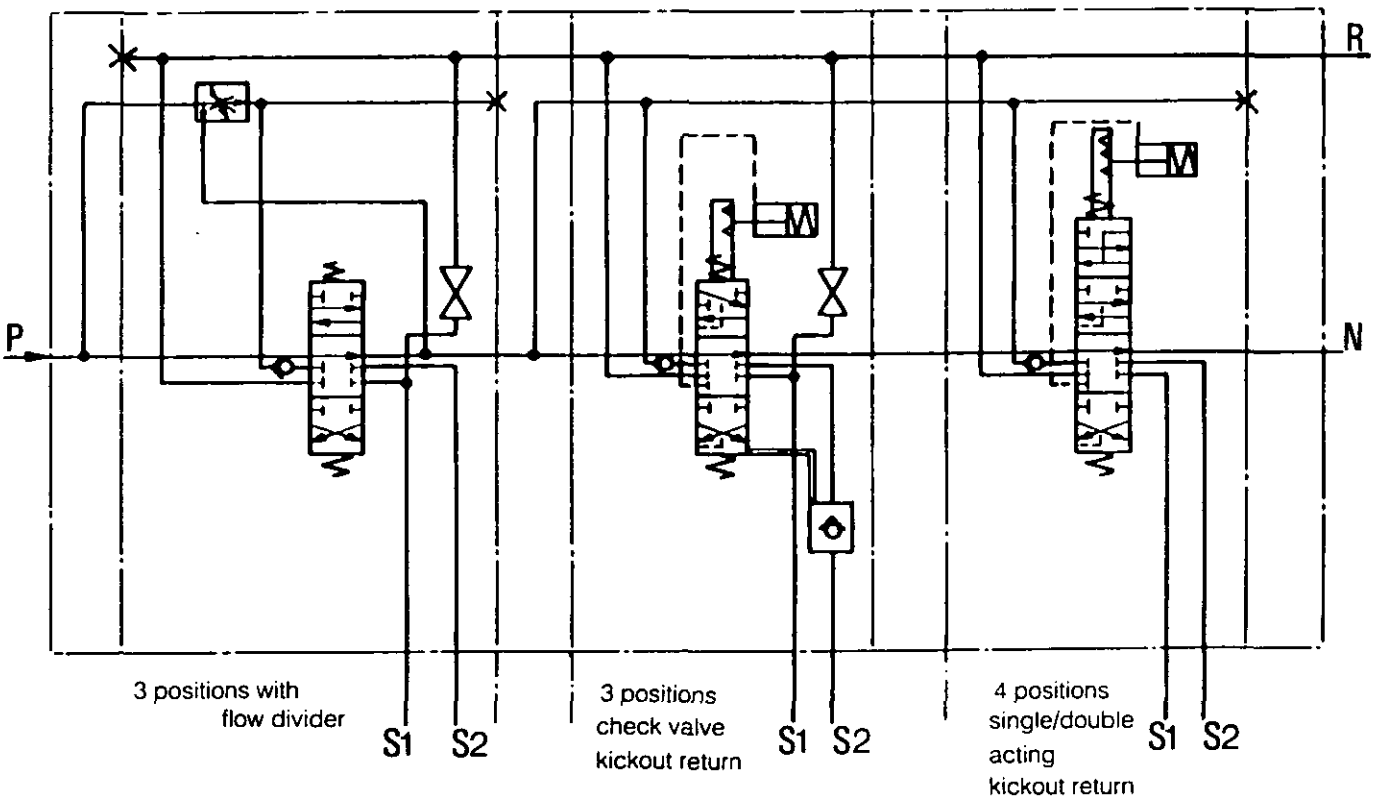
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E. 3-position spool valve, single/double acting with flow divider

N	Continuity to lift valve	**(1)**	Valves	**(3)**	Housing
P	Pressure	**(2)**	Spool	**(4)**	Flow divider
R	Return				
S1-S2	Outputs to quick couplers				



F. Diagram



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8 D01 Lift Control Valve

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- **General** ____ 2

A. **Removal and refitting of lift control valve** ____ 2

B. **Neutral position** ____ 3

C. **Lift phase** ____ 4

D. **Lower phase** ____ 5

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Hydraulics - Lift Control Valve

General

The lift valve is fixed on the left cover mounted on the centre housing. Its function is to regulate the flow of oil to and from the lift cylinders according to the signals transmitted to it by the computer of the electronic control system. This valve is composed of a series of spools and valves, most of which are not reparable as separate parts.

A. Removal and refitting of lift control valve (Fig. 1)

Removal

1. Mark and disconnect the harnesses of the lift **(1)** and lower **(2)** solenoid valves.
2. Disconnect and plug the supply hose **(3)** of the valve and the supply tube **(4)** to the lift cylinders.
3. Remove the screws **(7)**.

Refitting

4. Clean the joint faces of the cover and of the valve.
5. Change the seals **(1)**, refit the valve (Fig. 2).
6. Fit and tighten the screws **(7)** to a torque of 25-35 Nm.
7. Reconnect the hose **(3)** and the tube **(4)**.
8. Reconnect the lift **(1)** and lower **(2)** solenoid valves (yellow connector).
9. With a clip, fasten the cable on the valve supply hose.
10. Start the engine.
11. *Check the operation of the lift system and check* the seals and hydraulic connectors for leaks.

Description

The BOSCH hydraulic valve controls the supply to the lift cylinders and is composed of two sections:

Hydraulic section comprising the following parts:

(1) Nonreturn valve, maintaining oil in the cylinders.
(2) Servo piston used in the lower phase.
(3) Nonreturn valve used in the lower phase.
(4) Control spool valve.
(5) Flow regulator spool valve.
(6) Shock valve set at 200 bar.
(9) Spool valve spring, flow regulation.
(10) Control spool valve spring.
(11) Control spool valve spring.
(12) Nonreturn valve ball.
(13) Restrictor.

Electrical section comprising two electromagnetic coils:

(7) Lower solenoid.
(8) Lift solenoid.

Designation of ports:

N : Continuity port towards transfer tube and pump intake.
P : Pressure.
R : Return to housing.
V : Cylinders supply and return.

Note: To distinguish between a hydraulic fault and an electrical fault, simply operate the push-buttons at the ends of the solenoid valves, thereby eliminating the effect of the electronic lift system.

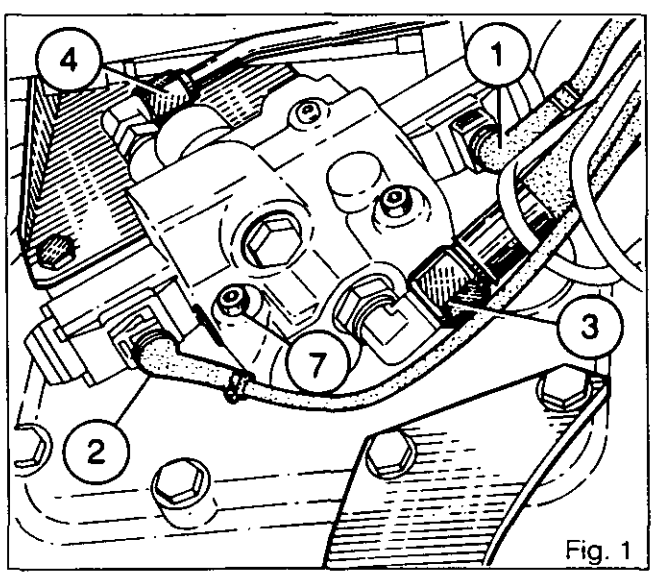


Fig. 1

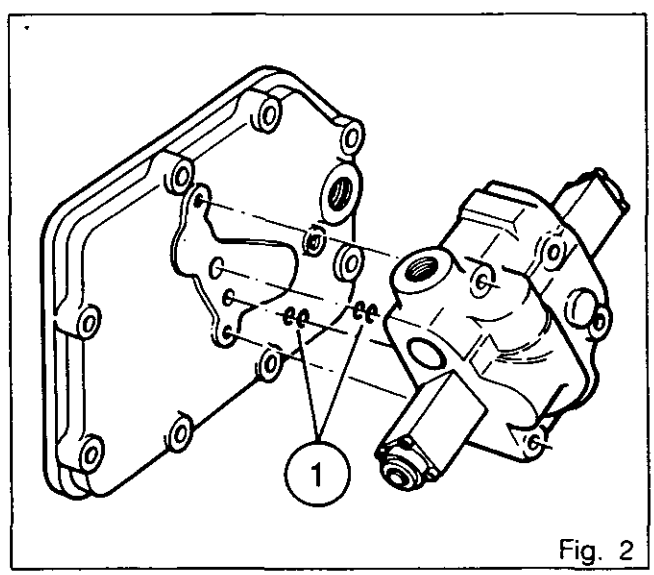


Fig. 2

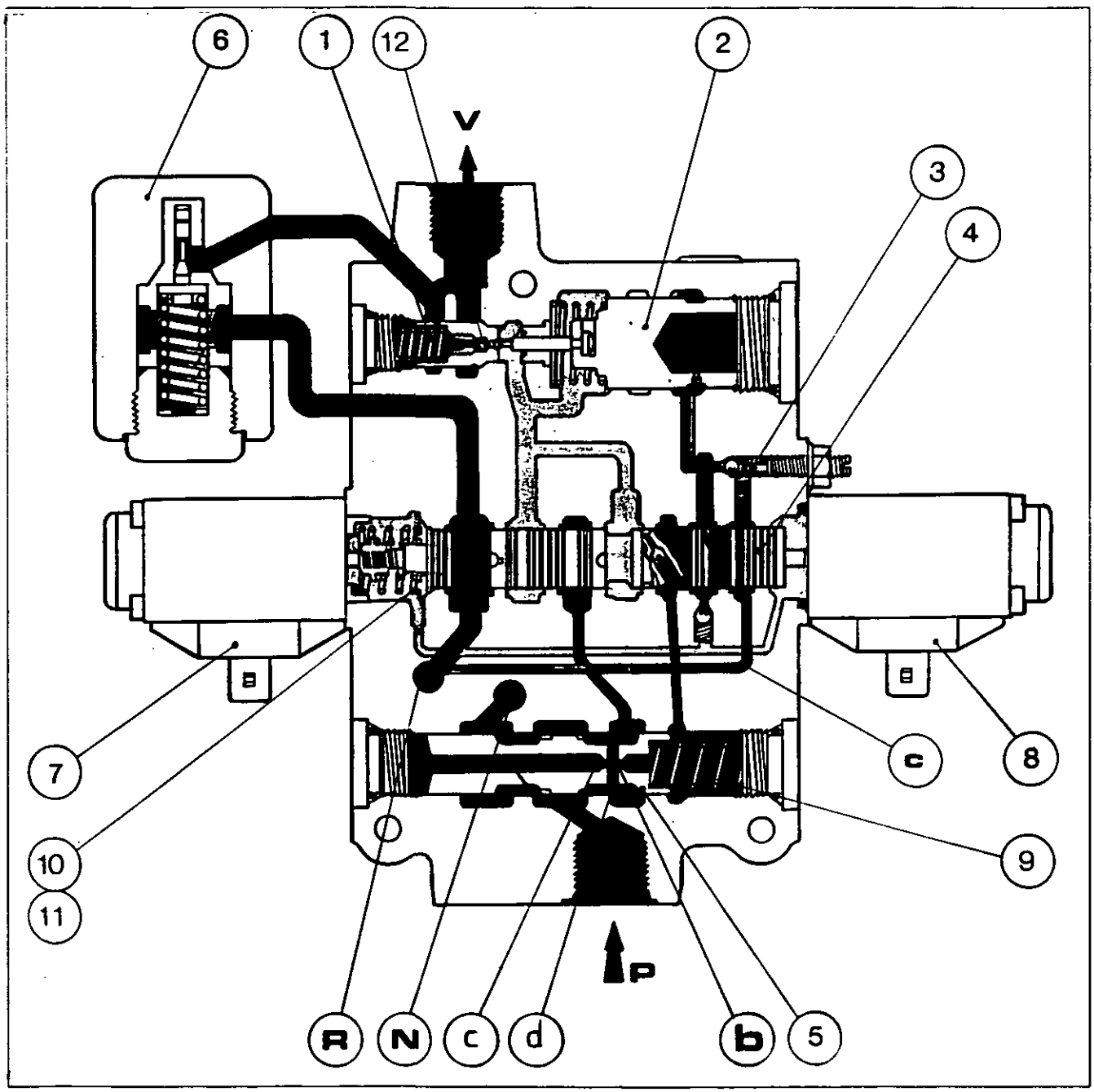
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B. Neutral position

When the engine is stopped, the control valve is in the neutral position. The spool valve **(4)** is held in position by the springs **(10)** and **(11)**.
The flow regulator spool valve **(5)** is pushed towards the left by the spring **(9)**.
When the engine is running, the hydraulic pump supplies the spool valve via the braking valve (if fitted) and the auxiliary spool valves. Pressure is delivered via orifice P. The oil flows initially through hole «a» and orifice «b». Because orifice «b» is smaller than hole «a», there is a pressure drop on the spring **(9)** side.

This action causes a control flow to be established which passes to the spool valve **(4)** and then to the return orifice R on the casing.
Once the control flow is established, the spool valve **(5)** moves to the right to a position which maintains the control flow and thus enables the oil to be directed towards the intake of the pump via the continuity orifice N and the transfer tube.
When the spool valve is brought back to the neutral position from the lower position, a channel from behind the piston to the return port C is still open.



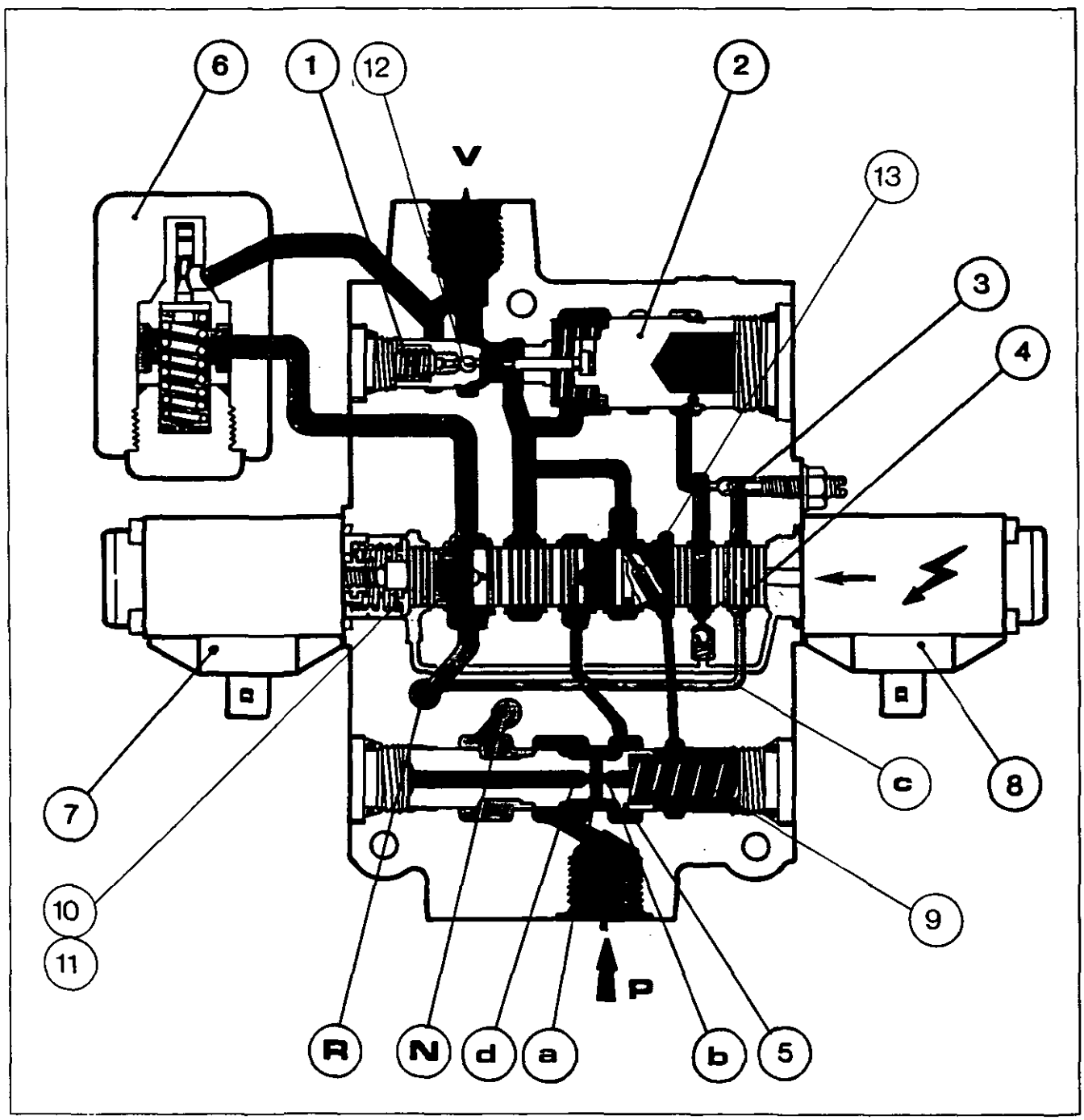
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C. Lift phase

The lift solenoid **(8)** is actuated to raise the tractor linkage.
The control spool valve **(4)** moves to the left and stops the control flow, placing the chamber of the spring **(9)** under pressure and pushing the spool valve **(5)** to the left.
The movement is dampened by the volume of oil flowing through orifice d.

The spool valve **(5)**, having moved to the left, enables the main flow to be directed to the spool valve **(4)** and to the nonreturn valve **(1)**.
As soon as the pressure on the nonreturn valve is greater than the pressure in the channels of the cylinders, the valve opens and linkage rises.



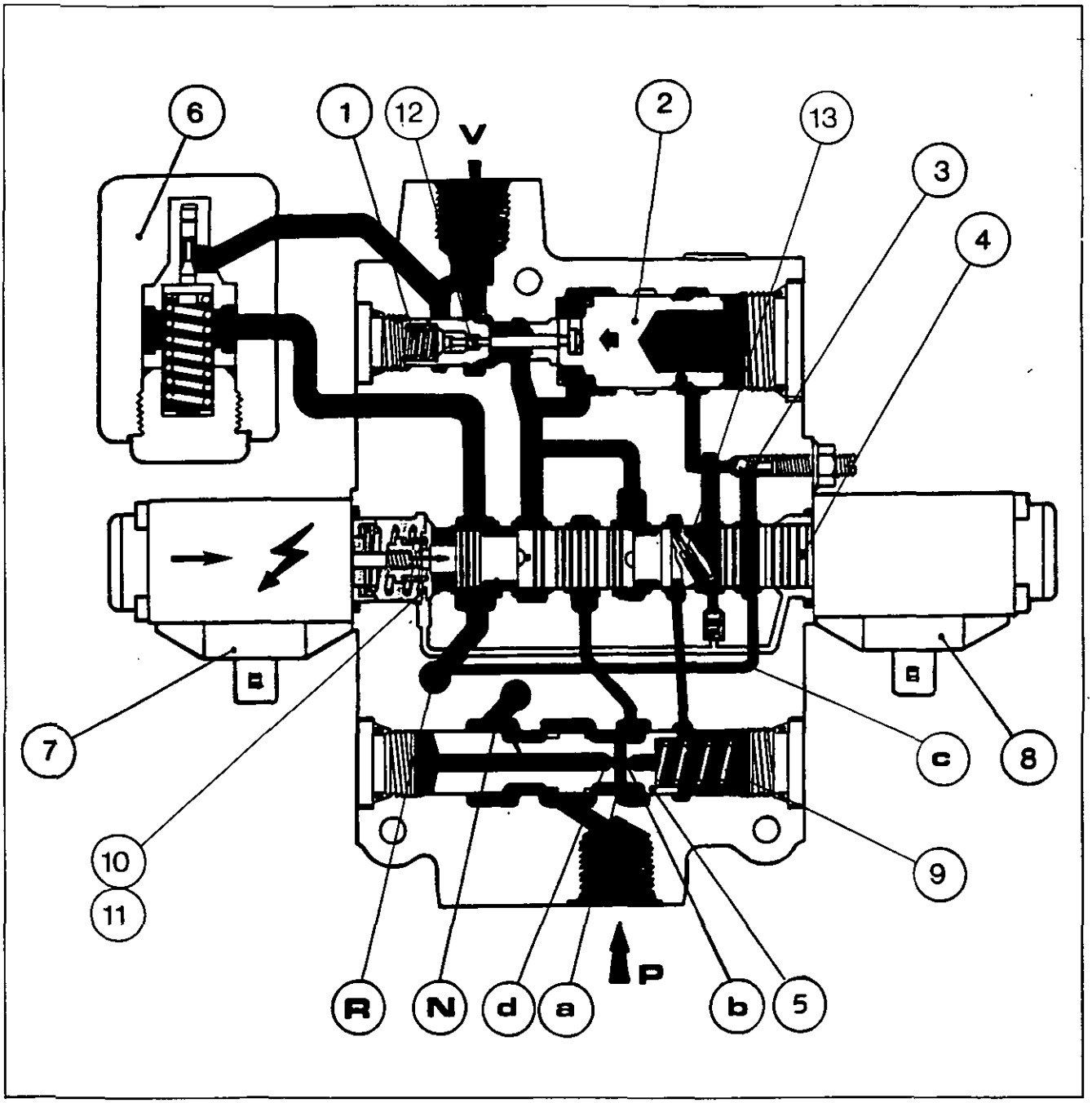
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D. Lower phase

The lower solenoid **(7)** is actuated to lower the tractor linkage. The control spool valve **(4)** moves to the right. The control flow stops and the return channel from the piston **(2)** is closed. Oil is directed under pressure via the hole a, the orifice b and the restrictor **(13)** towards the piston **(2)** which is moved to the left.

The rod at the end of the piston **(2)** lifts the ball **(12)** of the nonreturn valve **(1)** from its seat, firstly causing a pressure drop in the lift cylinders circuit. Secondly, the piston **(2)** opens the valve **(1)**, enabling the oil returning from the cylinders to be directed towards the return port R to the housing. As the movement of the piston **(2)** is limited, the control flow is reestablished, and is directed towards the nonreturn valve **(3)**, the return port C and the return port R to the housing. The lower phase has no effect on the spool valve **(5)** which is in a floating position. It enables the minimal flow required for control purposes and ensures that the main flow is able to pass to the pump intake via the continuity port N and the transfer tube.



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8 E01 Hydrostatic steering

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B. Wheel turning (engine running) ____ 5

C. Manual steering (engine stopped) ____ 6

D. Disassembly and reassembly of the steering unit (Orbitrol) ____ 8

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Hydraulics - Hydrostatic steering

General

The steering system used on 3000/3100 series tractors is a hydrostatic system with no mechanical linkage between the steering wheel and the steering cylinder. The main components of the system are as follows :
- A pressurised oil feed supplied by the low-flow stage of the hydraulic pump.
- A hydrostatic steering unit (Orbitrol).
- A double acting steering cylinder fitted on the 4WD front axle or the 2WD axle.

The Orbitrol is supplied by the low-flow system as a matter of priority. When the steering wheel is turned, the required flow of oil is sent to the relevant side of the steering cylinder. The excess flow not required for steering, combined with the oil returning from the cylinder is then directed on to the distribution valve situated under the hood, which then goes on to satisfy the needs of the transmission, brakes and clutch..

If the engine breaks down or the hydraulic pump fails, the Orbitrol acts as a manual pump, so that steering control is maintained at all times.

Operation

The Orbitrol unit consists of spool and sleeve with neutralising springs and a drive pin which connects to the cardan shaft. The cardan shaft is in turn connected to the metering unit. The Orbitrol unit has 4 hydraulic connections, pressure,returns (to distribution valve) and 2 service ports for the steering ram. The steering system is protected by a relief valve and 2 shock valves with suction valves.
The spool and sleeve act as a valve which has a neutral and 2 operating positions, the latter relate to left and right hand turns. When no movement of the steering ram is required the sleeve and spool are maintained in a neutral position by a set of leaf type neutralising springs. There is also a pin which passes through holes in the sleeve and spool.
The pin has 2 functions :
-1 to limit the maximum travel between the sleeve and spool to fully select the left or right turn mode
- 2 drive the metering unit via the cardan shaft

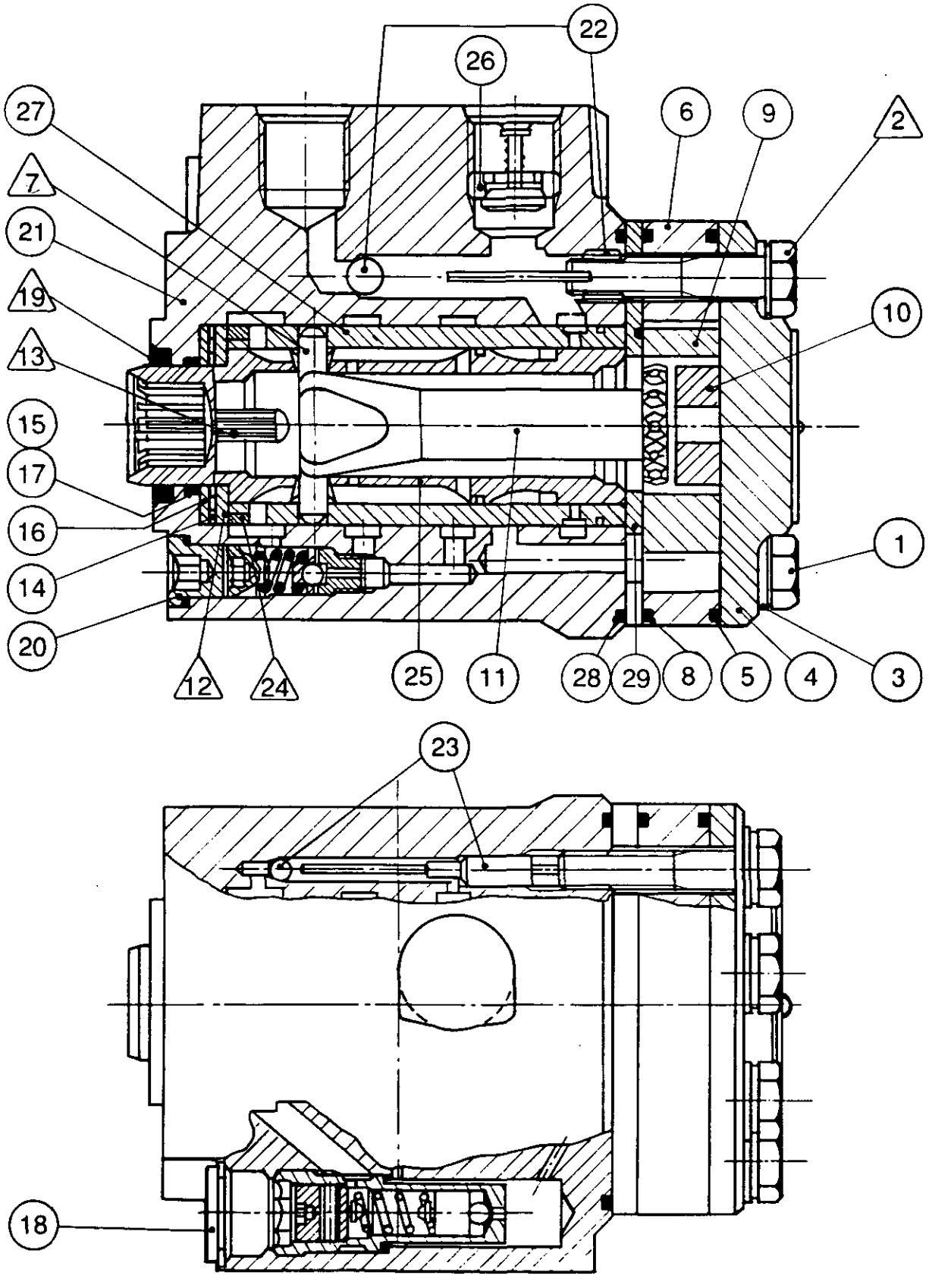
Parts list

(1) Screw
/2 Screw
(3) Seal
(4) Cover plate
(5) O-ring
(6) Stator
/7 Pin
(8) O-ring
(9) Rotor (metering valve)
(10) Spacer
(11) Cardan shaft
/12 Washer
/13 Centring springs
(14) Needle roller bearing
(15) Kin-ring
(16) Washer
(17) O-ring
(18) Relief valve
/19 Seal
(20) Shock valves
(21) Orbitrol
(22) Non return valve
(23) Suction valves
/24 Ring
(25) Spool valve
(26) Check valve
(27) Sleeve
(28) O-ring
(29) Distributor plate

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General arrangement

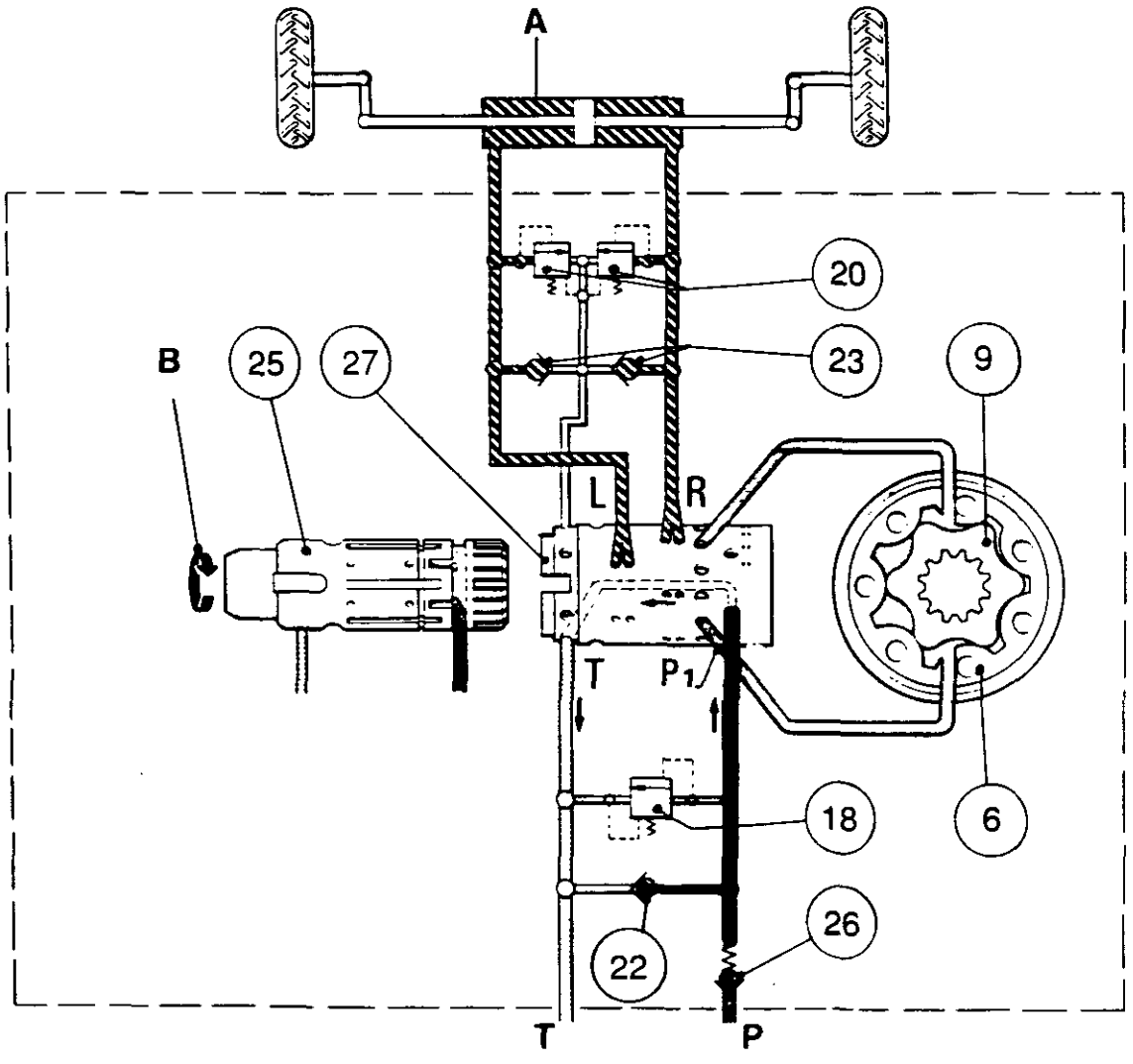


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A. Neutral position (engine running)

In the neutral position, holes in the spool **(25)** line up with holes in the sleeve **(27)**. Oil from the low flow pump is directed through the open centre of the valve to the returns port and to the distribution valve. There is no oil supply to ports P1 - L and R.
The hydraulic lines to the ram cylinder are isolated. Two shock valves **(20)** and two suction valves **(23)** are fitted internally to the left and right outlet ports. The shock valves protect the system between the steering ram and the orbitrol unit from excessive pressure, such as when the wheels hit an obstruction when the steering is in neutral. The suction valves allow the other side of the system to compensate for any oil that is released by the shock valves.
A check valves **(26)** is fitted in the oil feed port of the orbitrol unit. This is a one-way valve to prevent peak induced pressures that can be generated by the road wheels bearing passed to pump when steering.



A Steering cylinder
B Position of steering wheel, left or right
L Supply to the left hand side of the steering cylinder
P Low-flow supply coming from the hydraulic pump
P1 Supply to the metering valve (stator **(6)** and rotor **(9)**)
R Supply to the right hand side of the steering cylinder
T Supply to the distribution valve

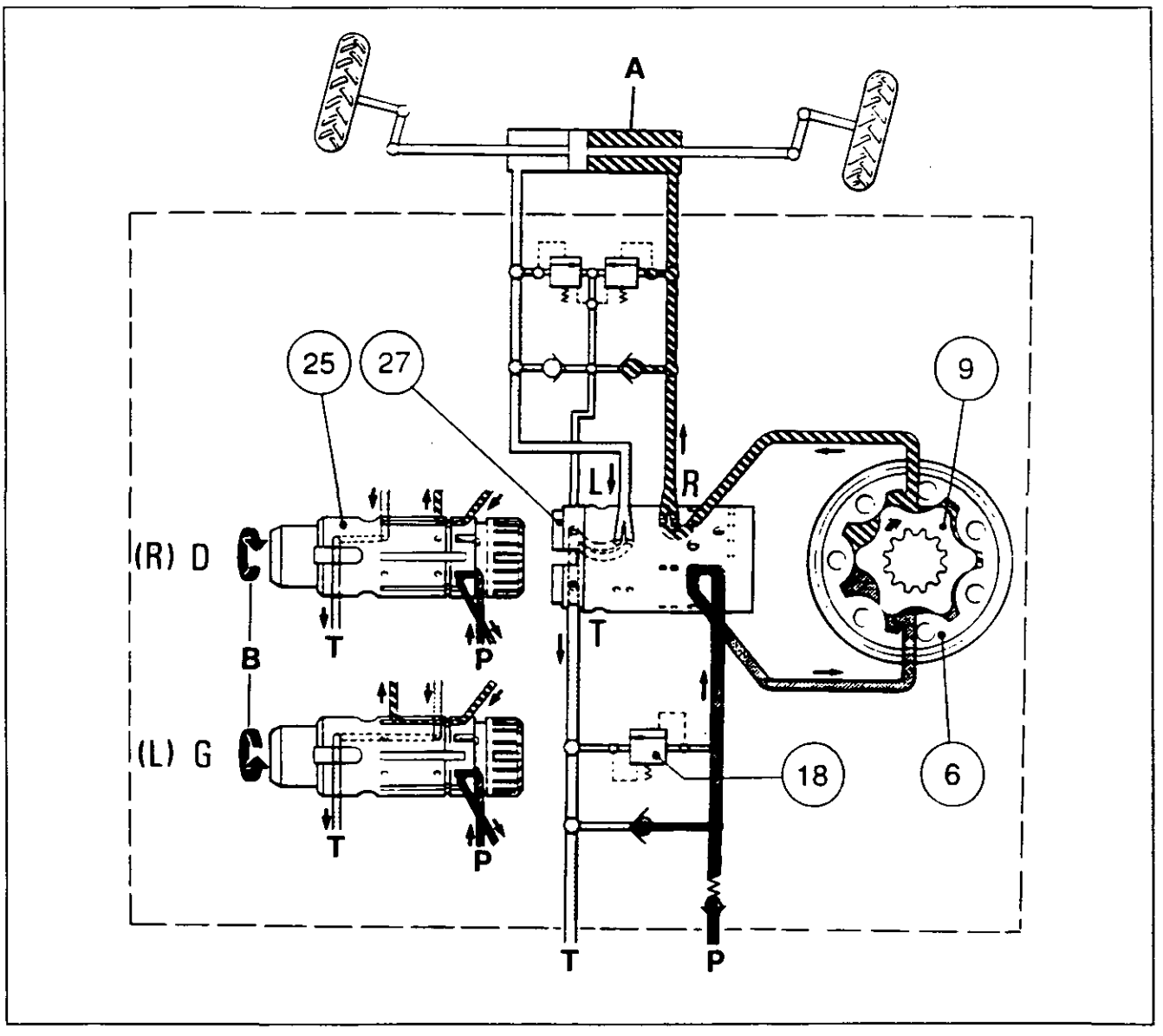
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B. Wheel turning (engine running)

The first movement of the steering wheel moves the spool **(25)** against the leaf springs **(13)**. This closes the neutral ports and aligns slots in the spool with holes in the sleeve allowing oil to pass to the metering unit (stator **(6)** and rotor **(9)**). Further movement of the steering wheel continues to turn spool, sleeve and metering unit. Simultaneously the metering unit controls the oil flow and directs it back into the sleeve and spool. The oil re-entering is then directed by slots in the spool which align with holes in the sleeve to direct the oil to the left or right side of the «balanced action» steering ram. The oil returning from the steering ram is directed, by the slots in the spool valve which align with the holes in the sleeve, to the returns port which leads to the distribution valve.

Should the pressure within the steering system exceed 160 bar (2322 lbf/in²), the relief valve **(18)** situated in the Orbitrol unit will relieve the excess pressure. When the relief valve is actuated for example when the steering wheels are at full lock or against an obstruction, the oil which is released goes out to the returns port.



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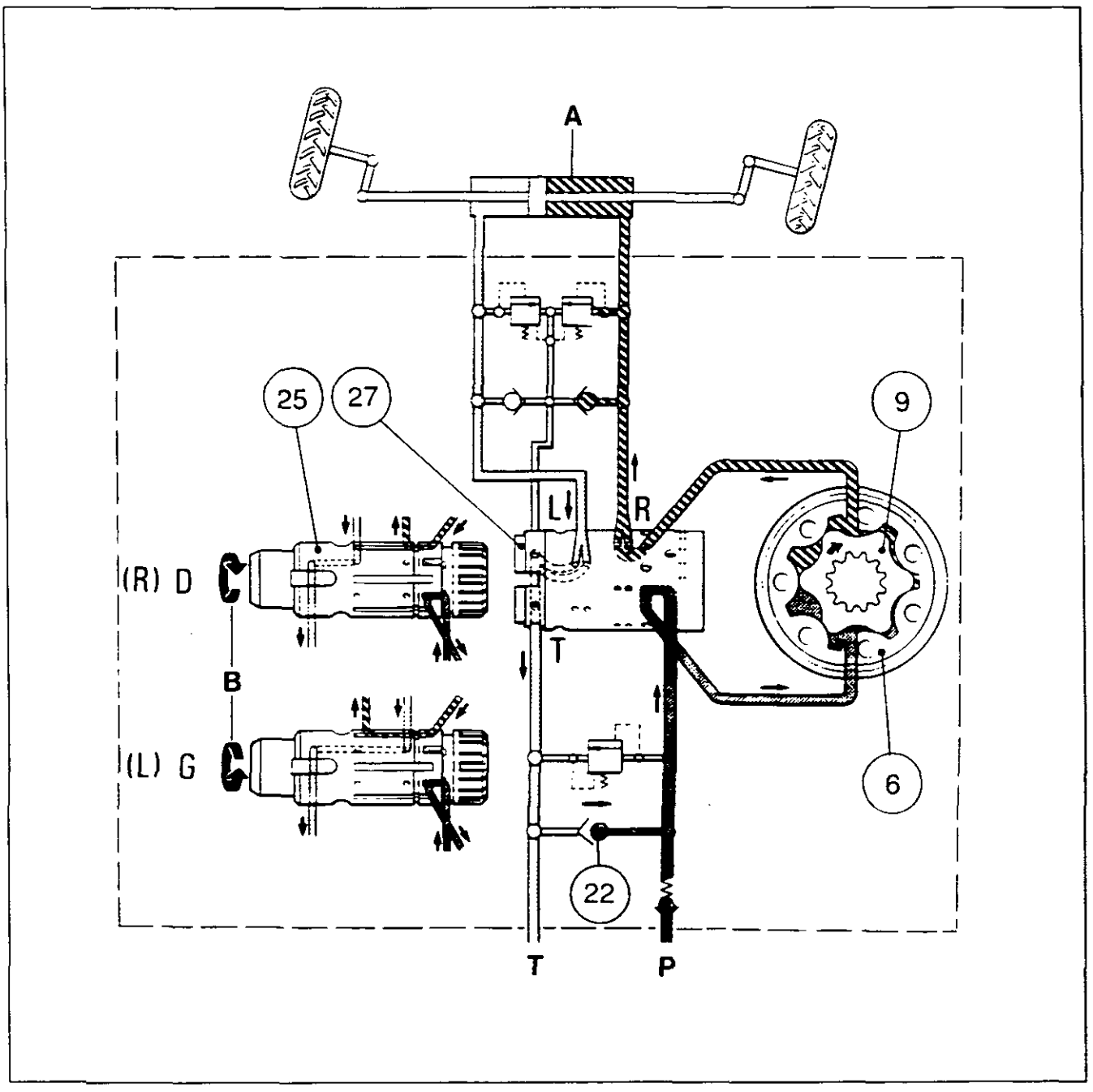
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C. Manual steering (engine stopped)

Should the pressure from the hydraulic pump cease, it is important that steering should still be maintained. For this reason, a non-return valve **(22)** is situated between the inlet and return galleries inside the orbitrol assembly.

When the hydraulic pump is functioning normally, the non-return valve is held on its seat by the oil pressure, allowing the oil to pass into the spool and sleeve valves.

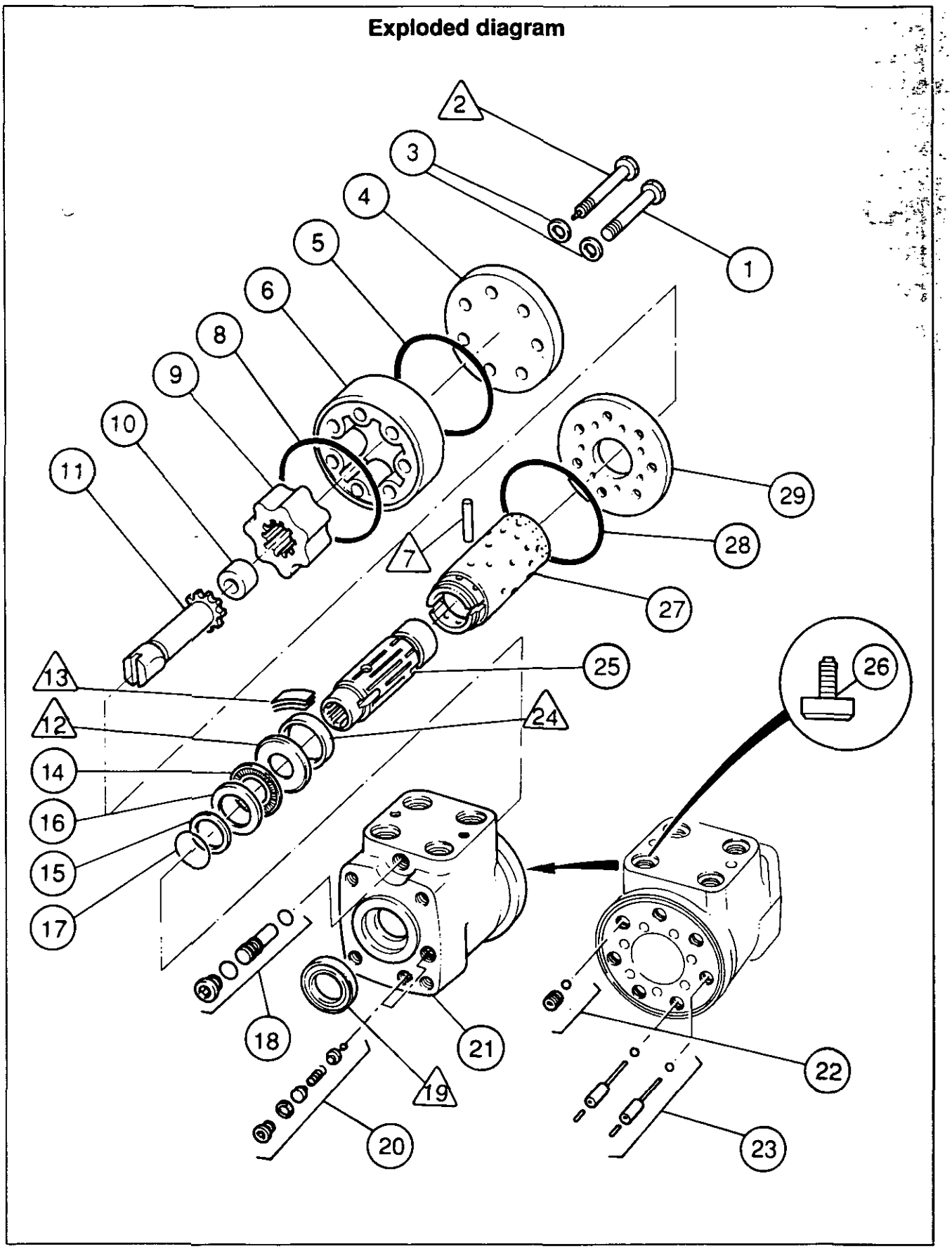
When the pressure from the hydraulic pump drops, the oil returning from the steering cylinder «A» is allowed to pass through the non-return valve to the inlet side of the spool valve, enabling oil to be passed from one side of the steering cylinder to the other. In this way steering control is maintained at all times. The pressure generated is proportional to the torque exerted on the steering wheel.



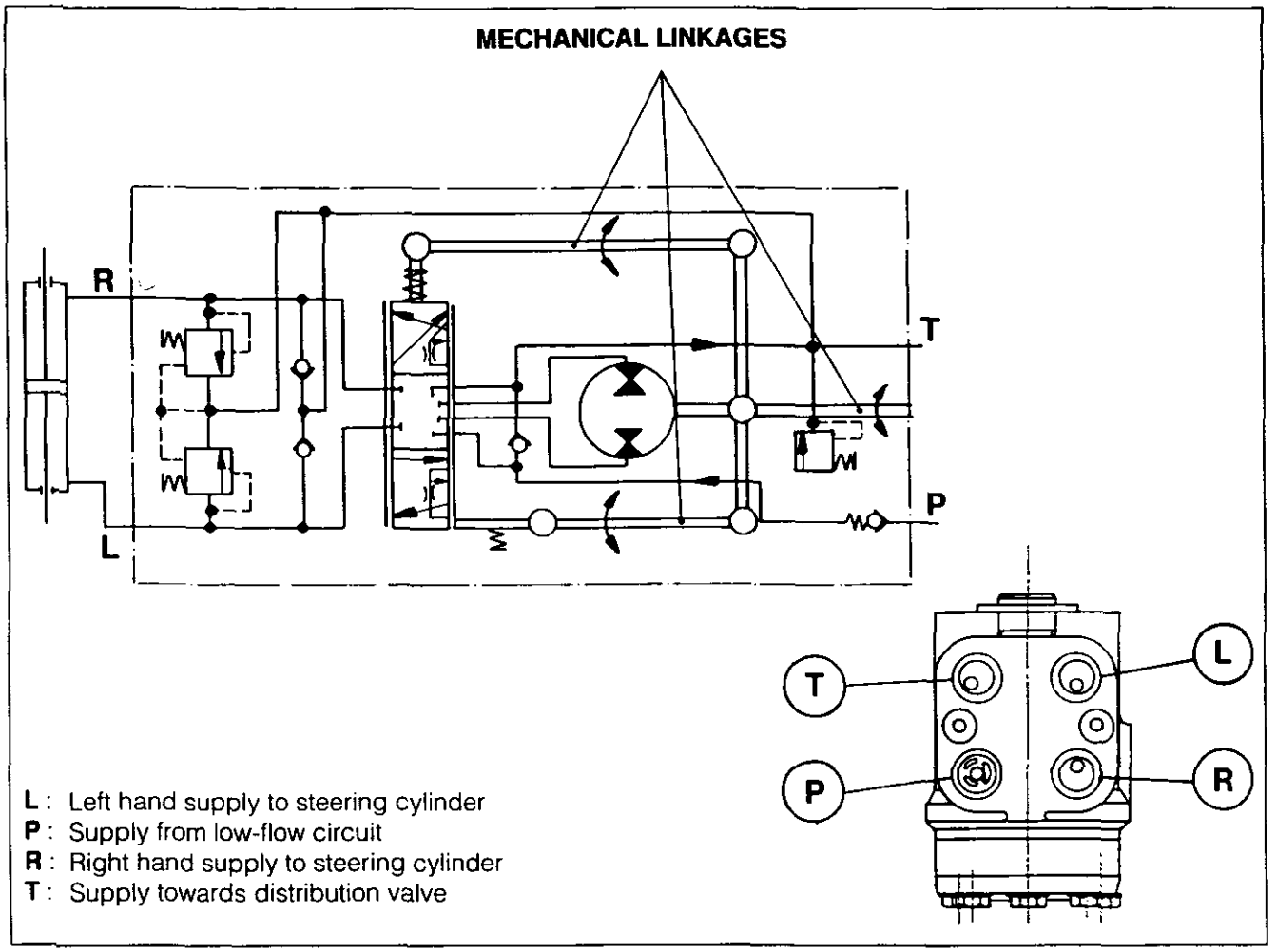
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Exploded diagram



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L : Left hand supply to steering cylinder
P : Supply from low-flow circuit
R : Right hand supply to steering cylinder
T : Supply towards distribution valve

D. Disassembly and reassembly of the steering unit (Orbitrol)

Disassembly

1. Remove the unit from the tractor.
2. Place the unit in a vice with plastic grips.
3. Remove the screws **(1)**. Mark the position of screw /**2**\ and remove it.
4. Remove the cover plate **(4)**, the O-ring **(5)**, the stator **(6)** and the O– ring **(8)**.
5. Remove the spacer **(10)**, the rotor **(9)**, the distributor plate **(29)** and the O-ring **(28)**.
6. Withdraw the connecting shaft **(11)**.
7. Unscrew the threaded bush and recover the ball of the nonreturn valve **(22)**.
8. Withdraw the two pins and the two balls of the suction valves **(23)**.
9. Extract the sleeve **(27)** and spool valve **(25)** assembly by pushing it, making sure that the pin /**7**\ *is horizontal.*
10. Remove the washers /**12**\ and **(16)**, the needle roller bearing **(14)** and the ring /**24**\ of the sleeve/spool valve assembly.
    Remove the pin /**7**\ and the centring springs /**13**\ by pressing on one of their ends. Separate the sleeve **(27)** from the spool valve **(25)**.
11. Unscrew the cap of the relief valve **(18)**. Using an 8mm Allen key, remove the threaded ring and take out the seal, the spring and the valve (the crimped *seat is not removable*).
12. Unscrew the two caps of the shock valves **(20)**. Remove the seals. Using a 6mm Allen key, remove the threaded rings and take out the springs, the balls and their seats (the crimped seats are not removable).
13. Take out the seal /**19**\, the kin-ring **(15)** and the O-ring **(17)**.
14. Remove the check valve **(26)**.

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Reassembly

15. Check and clean the parts, replacing any which are defective. Lubricate with suitable transmission oil before reassembling.
16. Refit the check valve **(26)**.
17. Using special tool MS62A, fit the seal /**19**\, the O-ring **(17)** and the kin-ring **(15)**.
18. In the holes for the shock valves **(20)** place the balls and the springs. Screw in the threaded rings. Fit the seals and tighten the caps.
19. In the hole for the relief valve **(18)** place the valve and the spring. Screw in the threaded ring. Fit the seal and tighten the cap to a torque of 40-60 Nm.
20. Fit the spool valve **(25)** into the sleeve **(27)**. Position the centring springs /**13**\ as shown in Fig. 1 and fit the pin /**7**\ using special tool MS63..
21. Position the ring /**24**\ on the sleeve and spool valve assembly so that the chamfer facilitates assembly in the unit.
22. Fit the washers /**12**\ and **(16)** with the chamfer of the washer /**12**\ facing towards the centring springs /**13**\, and with the needle roller bearing **(14)** between them.
23. Fit the sleeve and spool valve assembly in the unit, applying a slight oscillating movement. Ensure that the pin /**7**\ is held horizontally.
24. In the receptacles of the suction valves **(23)** place the two balls and the two pins.
25. In the receptacle of the non -return valve **(22)** place the ball and screw on the threaded ring.
26. Position the connecting shaft **(11)**.
27. Fit the O-ring **(28)** and the distributor plate **(29)**.
28. Fit the rotor **(9)** in such a way that two of the «C» shaped hollows are in the axis of the aperture of the shaft **(11)** (Fig. 2). Refit the spacer **(10)**.
29. Place the O-rings **(5)** and **(8)** on the stator **(6)**.
30. Whilst taking care not to move the rotor **(9)**, fit the stator **(6)**. Then move the stator so that its fastening holes coincide with those of the distributor.
    Note: The rotor (9) and the pin /7\ must be in the position shown in Fig. 3.
31. Refit the cover plate **(4)**.
32. Refit the screw /**2**\ (in the position marked upon disassembly) and the screws **(1)** with their seals **(3)**. Tighten alternately to a torque of 30– 35 Nm.
33. Using a test bench or an appropriate equipment, check the adjustment and operation of the Orbitrol.
34. Refit the unit on the tractor.

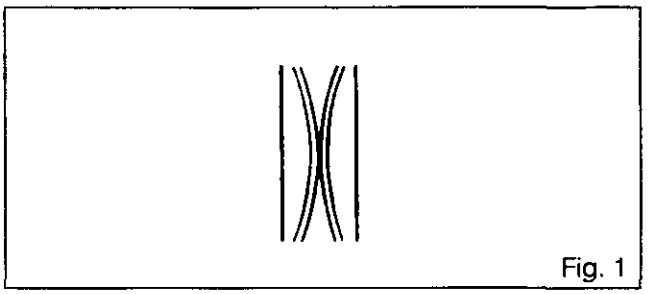


Fig. 1

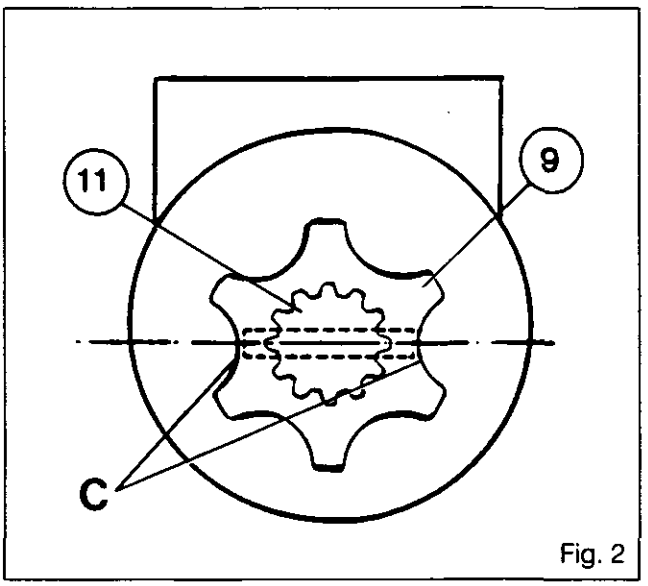


Fig. 2

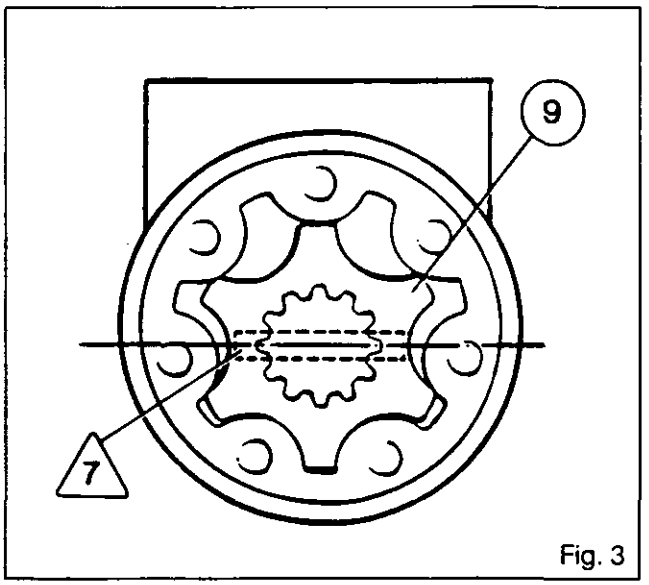


Fig. 3

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8 F01 Low-pressure components

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- **General** ____ 2

A. Lubrication and cooling system ____ 2

B. 1.5 bar valve ____ 2

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General

Functions or mechanisms supplied by the low-pressure system	For operation refer to section
. The hydrostatic steering unit (Orbitrol)	8E01
. The Speedshift situated in front of the gearbox	5E02
. The A/B range device situated in the gearbox selection cover	5K01
. The Hi/Lo (Hare/Tortoise) device fitted at the rear of the gearbox	5K01
. The front axle clutch (4WD) fitted, in the lower part of the rear axle	7A01
. The front and rear differential lock	7C01 - 6J01
. The p.t.o. clutch located at the front of the centre housing	6G01
. The p.t.o. brake fitted at the rear of the centre housing	6D01
. *The lubrication and cooling system*	5A01 (p.3)

A. Lubrication and cooling system

When the main functions of the low-pressure system have been satisfied, the oil flows through the 17 bar distribution valve **(3)** and travels towards the oil cooler **(13)**. It enters the oil cooler and passes into the lubrication line **L**, connected by a T-fitting to the 17 bar distribution valve (Fig. 2).
When the oil is cold, the 5 bar valve opens in the 17 bar distribution valve and enables a quantity of oil to pass directly into the lubrication line **L** (Fig. 3).

Legend (Fig. 2/3)
(3) 17 bar distribution valve
(13) Oil cooler
(36) 1.5 bar valve
A Front PTO lubrication (if fitted)
B Lubrication hose coming from the 17 bar distribution valve
C Lubrication of front cover PTO shaft and gearbox
D Lubrication of PTO clutch
E Lubrication of driving pinion of PTO and coupler as well as compound pinion (4-speed version)
L Lubrication line

B. 1.5 bar valve

The lubrication line has a valve situated at the front left of the gearbox which maintains a pressure of 1.5 bar in the circuit.

Operation

The flow of oil coming from the 17 bar distribution valve lubricates the front cover and the gearbox as well as the PTO shaft which traverses it.
An external pipe also brings the oil to the PTO clutch. A small-bore pipe directs the oil towards the driving pinion of the PTO upper shaft and the coupler as well as the compound pinion of the 4-speed PTO (if fitted).
If the pressure is greater than 1.5 bar, the spring **(2)** is compressed, the valve **(1)** lifts up and the oil flows into the gearbox housing (Fig. 1).

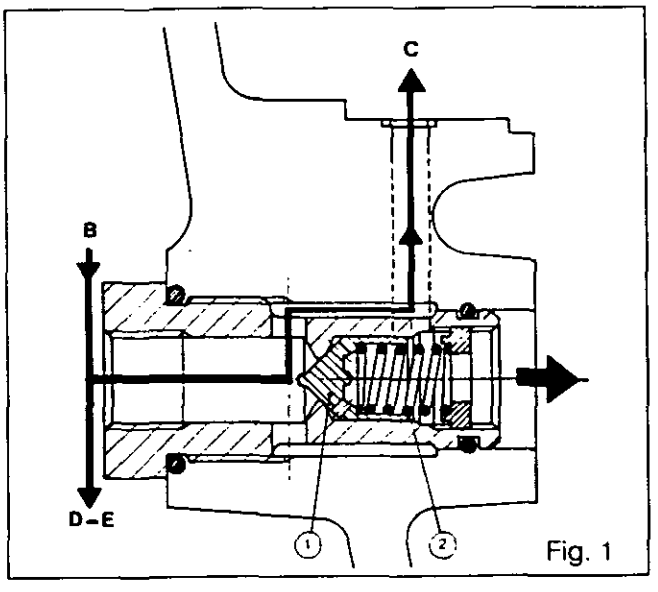


Fig. 1

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Lubrication and cooling system, 5 bar valve closed (oil hot)

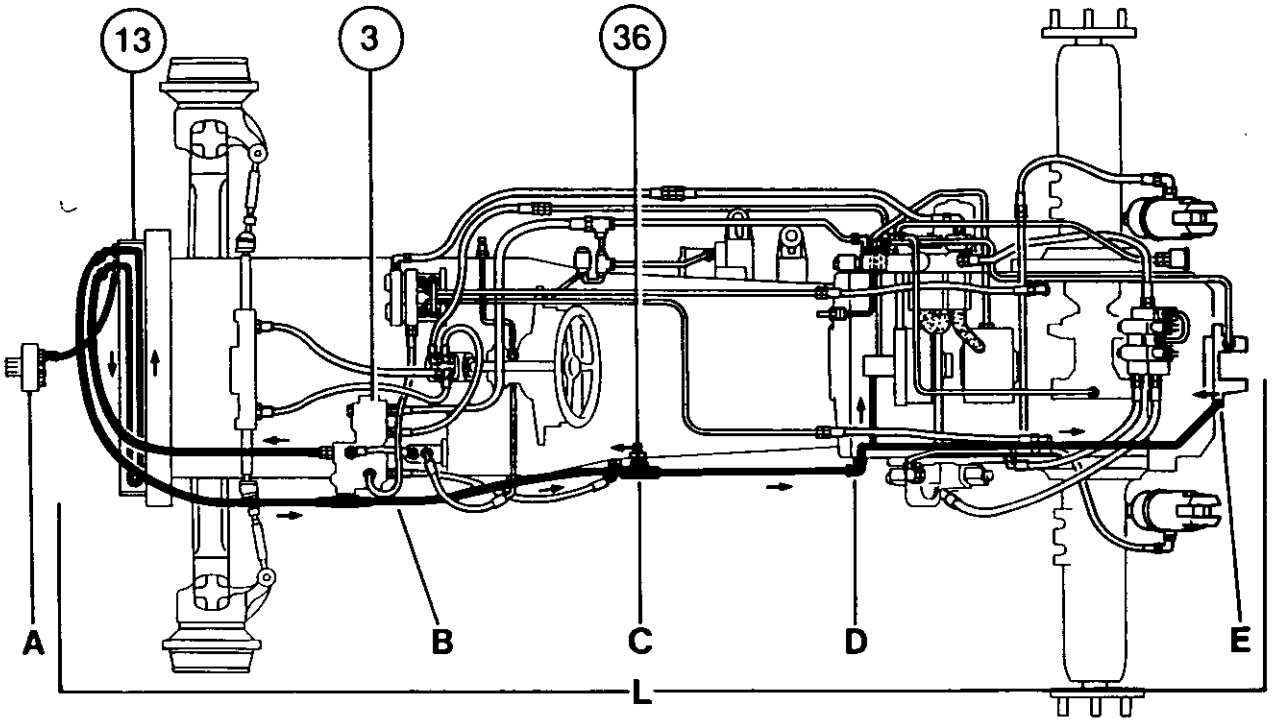


Fig. 2

Lubrication system, 5 bar valve opened (oil cold)

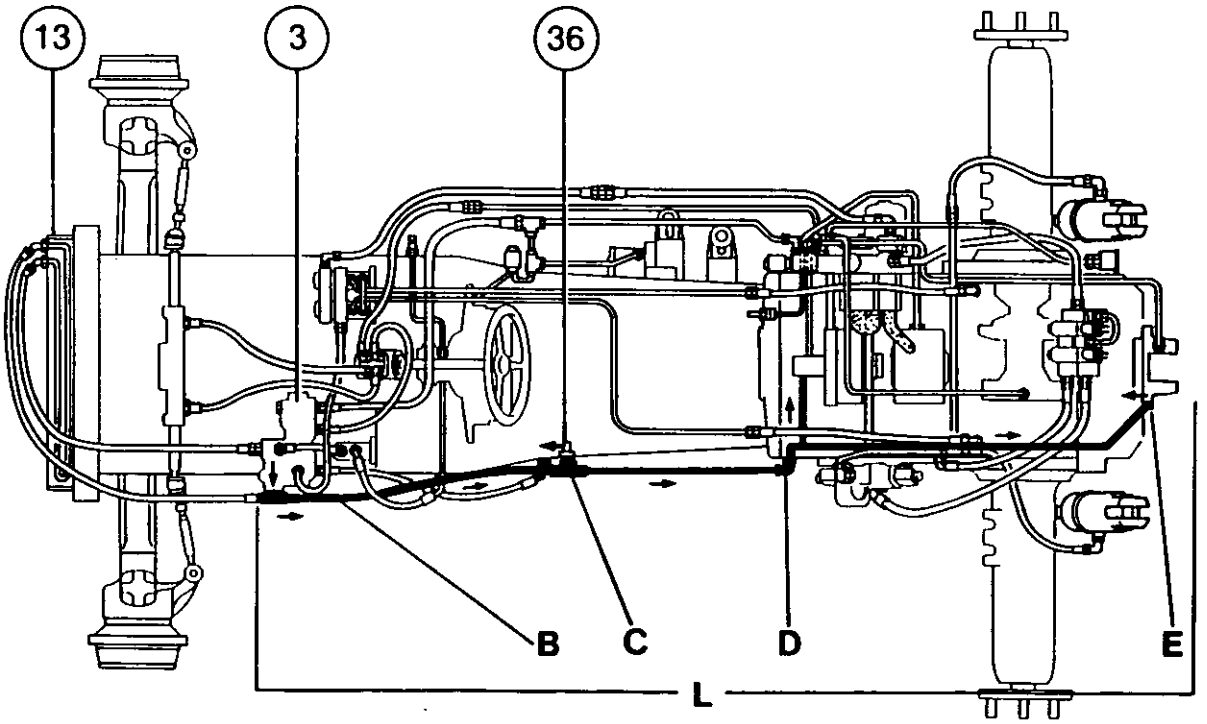


Fig. 3

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8 G01 Brake and clutch master cylinder circuit

CONTENTS

A. Working on the master cylinders ____ 2

B. Master cylinders with trailer brake ____ 2

C. Master cylinders without trailer brake ____ 4

D. Brake pedal adjustment ____ 5

E. Clutch master cylinder ____ 6

F. Clutch pedal adjustment ____ 6

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Hydraulics - Master cylinders

A. Working on the brake and clutch master cylinders

If it should prove necessary to dismantle the master cylinders, clean all parts carefully. Replace those which are scratched or deformed.
Brake and clutch master cylinder repair kits can be found in the spare parts catalogue.
After disassembly or replacement of the brake master cylinders, bleed the main brake circuit and the trailer brake circuit (if fitted). Refer to chapter 6K01 (sections C and D). Check pedal adjustment (section D).
After disassembly or replacement of the clutch master cylinder, bleed the circuit, refer to chapter 5C01.G. Check pedal adjustment (section F).

B. Master cylinders with trailer brake (dual circuit) (Fig. 2)

Pedals unlatched (Fig. 1):

The effort applied to a pedal, transmitted by the rod **(5)**, moves the piston **(4)** in the bore of the active master cylinder. The valve **(1)** closes the feed port, the balancing valve **(3)** is opened by the piston **(4)** and the ball **(2)** and oil is fed under pressure to the ports of the main brake C and of the pressure balancing junction D.
Through the junction, the pressure closes the valve **(3)** of the passive master cylinder.
The action on the piston **(4)** likewise causes the movement of the piston **(6)** and the closure of the valve F. The oil contained in the chamber E is channelled via the connecting bar to the chamber E' and to the orifice B' through the open valve F' of the passive master cylinder.
The assembly comprising the valve F and the piston **(6)** rapidly meets the end of the active master cylinder.
In this position, only the tractor brake is activated.
The trailer is not braked.

Pedals latched

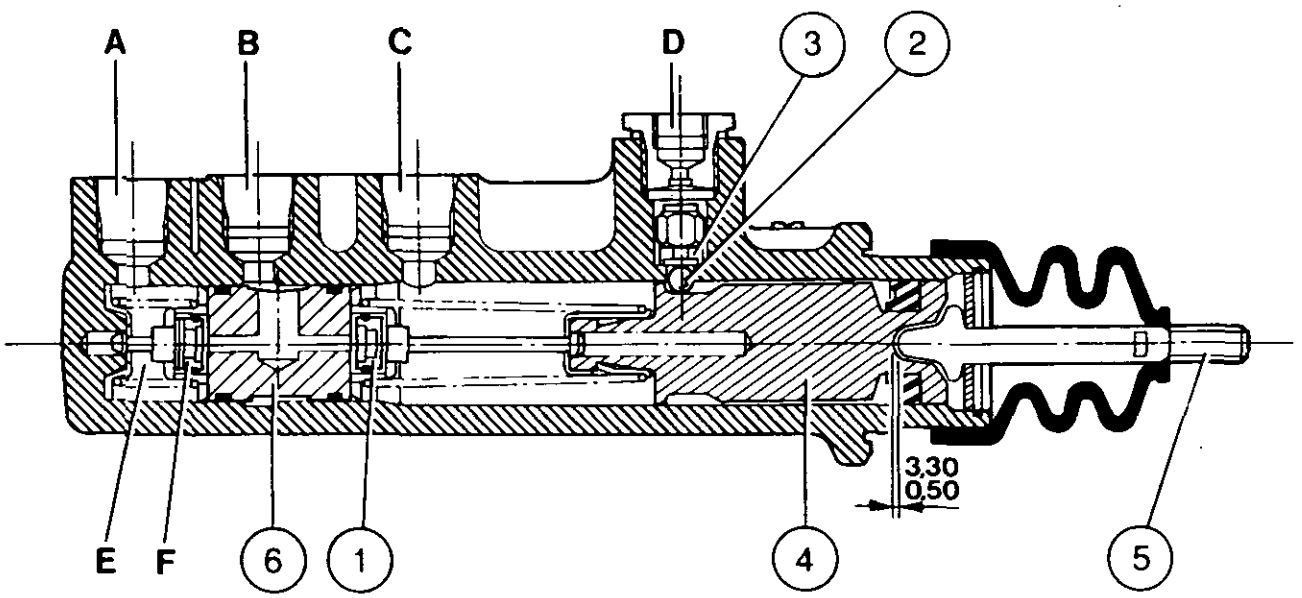
Braking and balancing of pressure

The effort applied to both pedals, transmitted by the push rods **(5)**, moves the pistons **(4)** in the bores of the two master cylinders. The two valves **(1)** close the feed ports, the two balancing valves **(3)** are opened by the pistons **(4)** and the balls **(2)**. The pressure equalizes in the two master cylinders by the balancing junction D. The oil is likewise fed under pressure to the ports C and C' of the main brake circuit.

Trailer braking

The continuous action of the pistons **(4)** and **(6)** closes the valves F and F'. The chambers E and E' which are pressured feed the control valve of the trailer brake via the ports A and A'.

Fig. 1



A Control of trailer brake valve (dual circuit).
B Supply of master cylinders via the distribution valve.
C Supply to main brake
D Pressure balancing junction
E Trailer brake pressure chamber (dual circuit)
F Valve (dual circuit)

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Brake master cylinders with trailer braking (dual circuit)

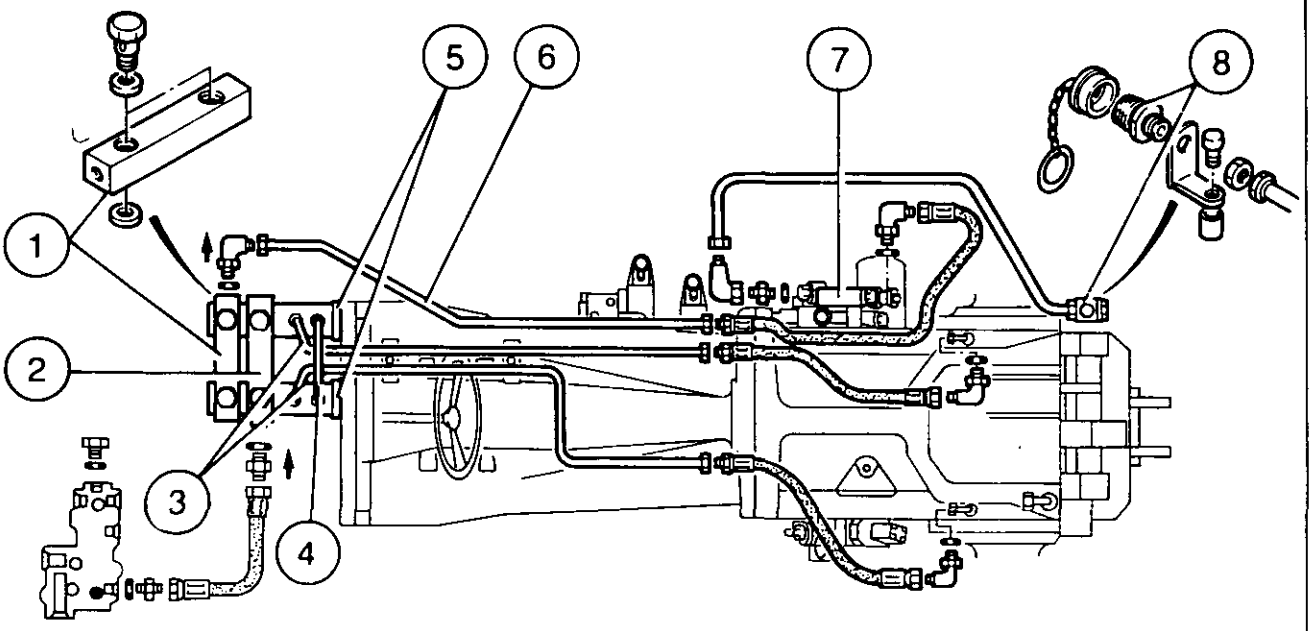
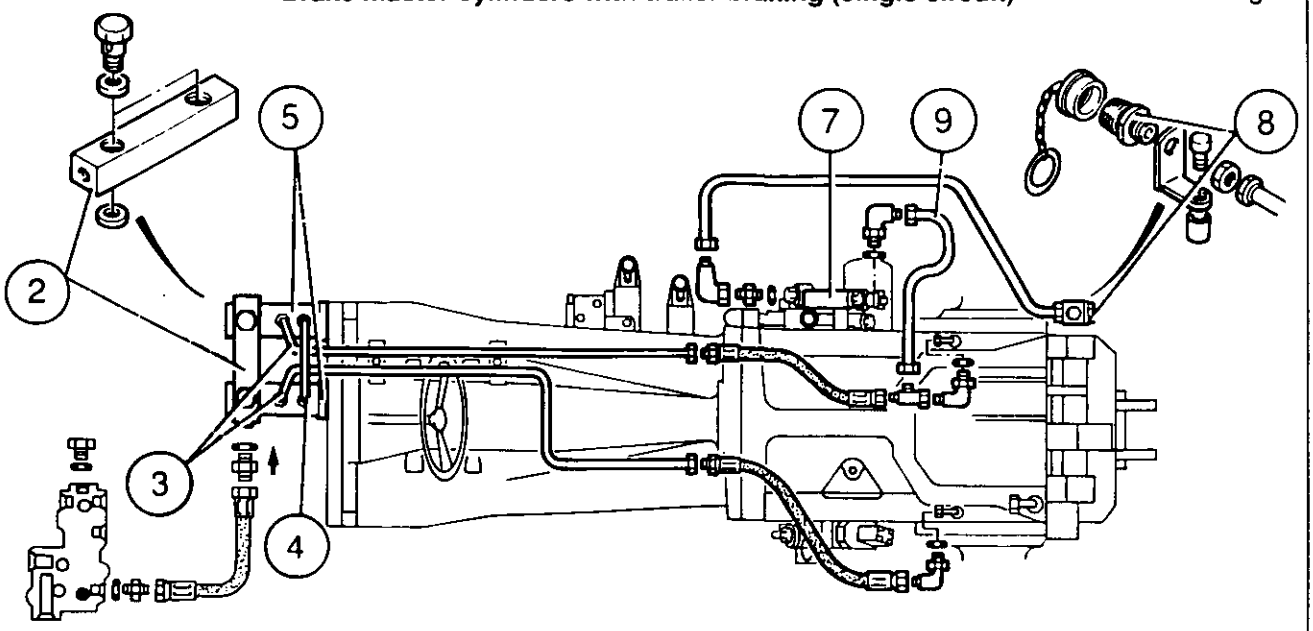


Fig. 2

Brake master cylinders with trailer braking (single circuit) Fig. 3



(1) Bar (control of trailer brake valve)
(2) Bar (supply of master cylinders, coming from the distribution valve)
(3) Main brake supply
(4) Pressure balancing junction pipe
(5) Brake master cylinders
(6) Trailer brake sensing pipe
(7) Trailer brake valve
(8) Trailer brake junction
(9) Sensing pipe (single-circuit version with trailer brake)

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C . Master cylinders without trailer brake (single circuit) (Fig. 6)

Pedals unlatched (Fig. 4):

The effort applied to a pedal, transmitted by the rod **(5)**, moves the piston **(4)** in the bore of the active master cylinder. The valve **(1)** closes the feed port, the balancing valve **(3)** is opened by the piston **(4)** and the ball **(2)** and the oil is fed under pressure to the ports of the main brake C and of the pressure balancing junction D. Through the balancing junction, the pressure closes the valve **(3)** of the passive master cylinder.

Pedals latched

Braking and balancing of pressure

The effort applied to the two pedals, transmitted by the rods **(5)**, moves the pistons **(4)** in the bores of the two master cylinders. The two valves **(1)** close the feed ports, the two balancing valves **(3)** are opened by the pistons **(4)** and the balls **(2)**.

The pressures equalize in the two master cylinders by the balancing junction D. The oil is likewise fed under pressure to the ports C and C' of the main brake circuit.

Note: There is a version with trailer brake (Fig. 3) for tractors equipped with a single-circuit assembly. The trailer brake valve (7) is controlled by a pipe (9) connected to the feed hose (3) of the right hand-brake, on the upper part of the rear axle housing (Fig. 5).

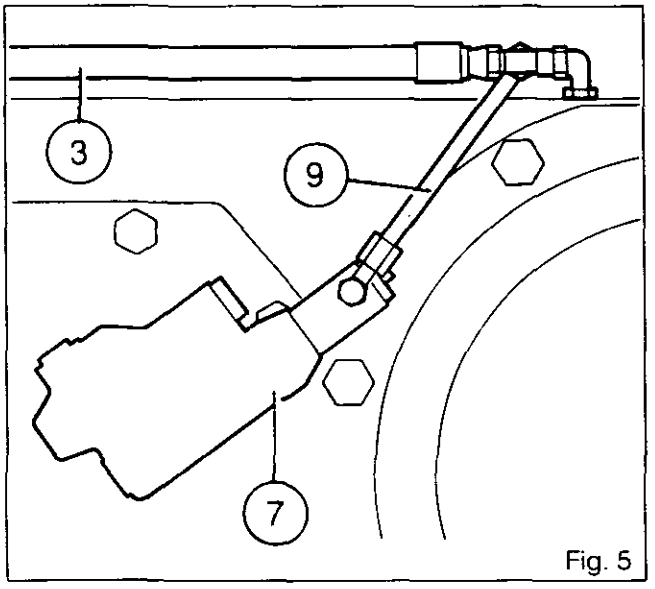


Fig. 5

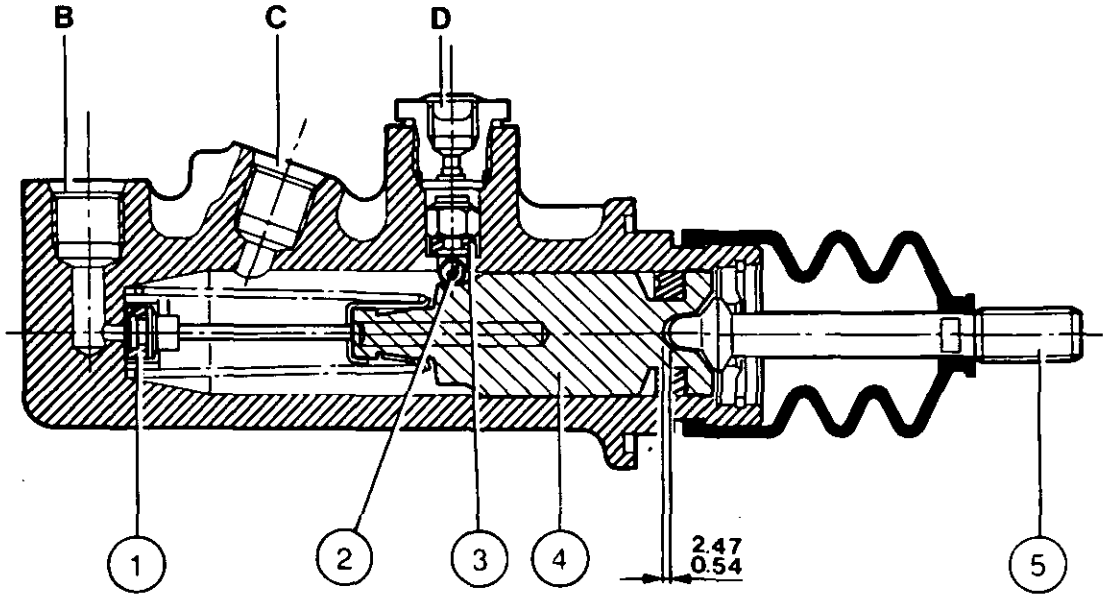


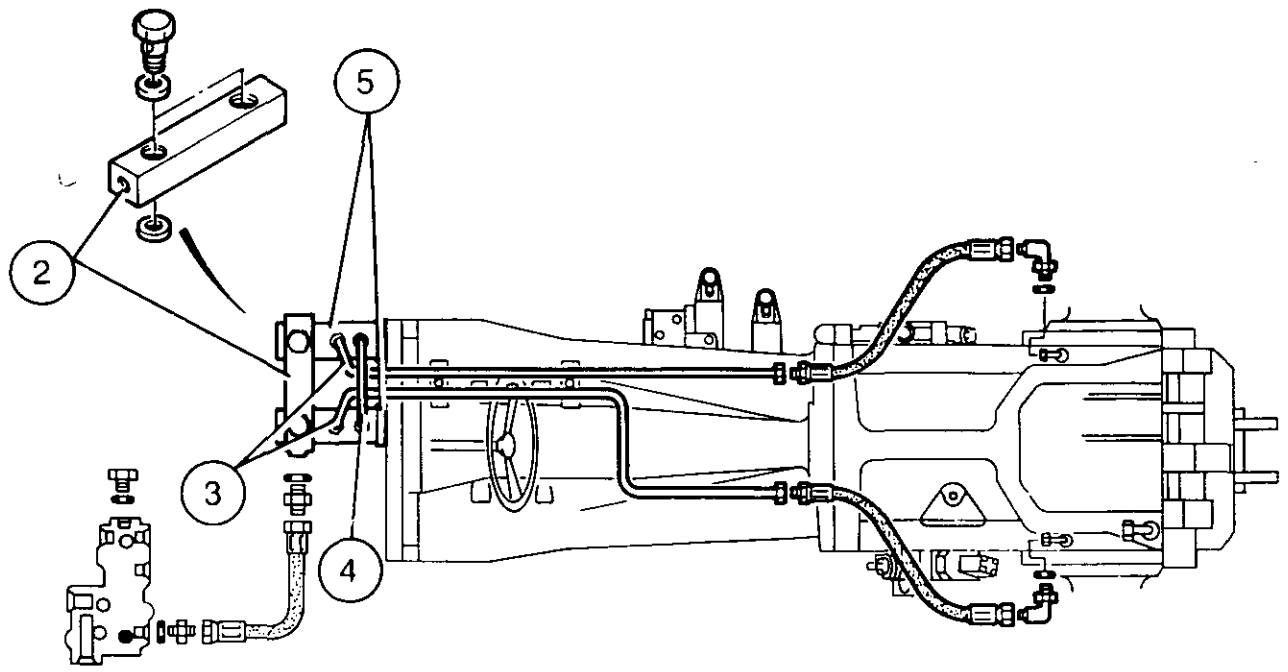
Fig. 4

B Supply of the master cylinders via the distribution valve
C Supply to the main brake
D Pressure balancing junction

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Brake master cylinders without trailer braking (single circuit) Fig. 6



(2) Bar (supply of master cylinders, coming from the distribution valve)
(3) Main brake supply
(4) Pressure balancing junction pipe
(5) Brake master cylinders

D. Brake pedal adjustment

1. Smear the pins **(5)** and **(6)** with molybdenum disulphide (Fig. 7).
2. Smear the clevis **(1)** with Loctite 542 and screw it on to the rod **(2)**.
3. Fit the return spring **(3)**.
4. Adjust the clevis so as to obtain a distance X of 115 mm ± 0.5 between the support **(4)** and the clevis fastening pin.
5. Do the same for the second clevis and check that the twinning mechanism operates smoothly.
6. Manually check the operation of each pedal to ensure that they operate freely.

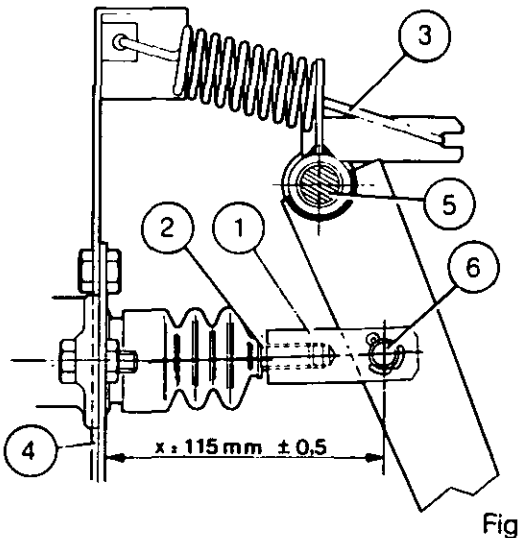


Fig. 7

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Hydraulics - Master cylinders

E. Clutch master cylinder

Operation (Fig. 10)

The effort applied to the pedal, transmitted by the rod **(1)**, moves the piston **(2)** in the bore of the master cylinder. The valve **(3)** closes the feed port **A** and the oil is fed under pressure to the port **B** and the supply channel of the clutch slave cylinder.

Note : For sealing improvement two guide rings have been added to the piston from serial n° R334024.

Only complete master cylinder are interchangeable, not the repair kits.

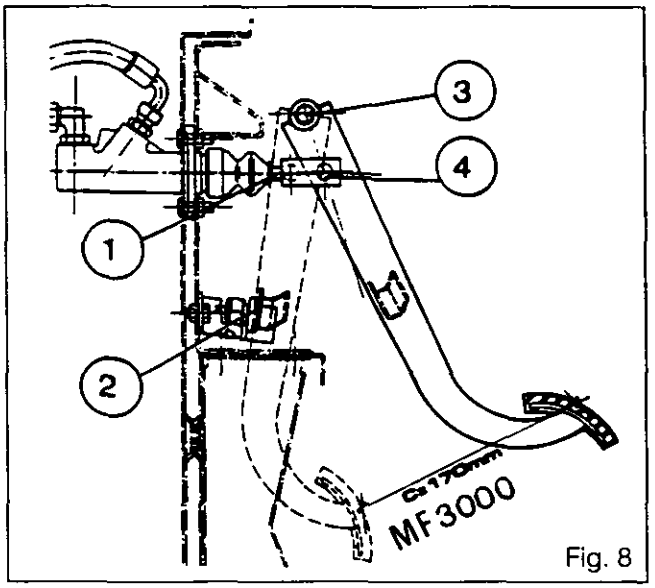


Fig. 8

F. Clutch pedal adjustment

1. Coat the pins **(3)** and **(4)** with molybdenum disulphide.
2. Apply Loctite 542 on thread of the rod **(1)**.
3. Adjust the rod so as to obtain travel of:
   - 170 mm (3000 tractors) (Fig. 8)
   - 200 mm (3100 tractors) (Fig. 9)

   between the declutched position (pedal in contact with the stop **(2)**) and the engaged position.
4. Manually check the operation of the pedal to ensure that it operates freely.

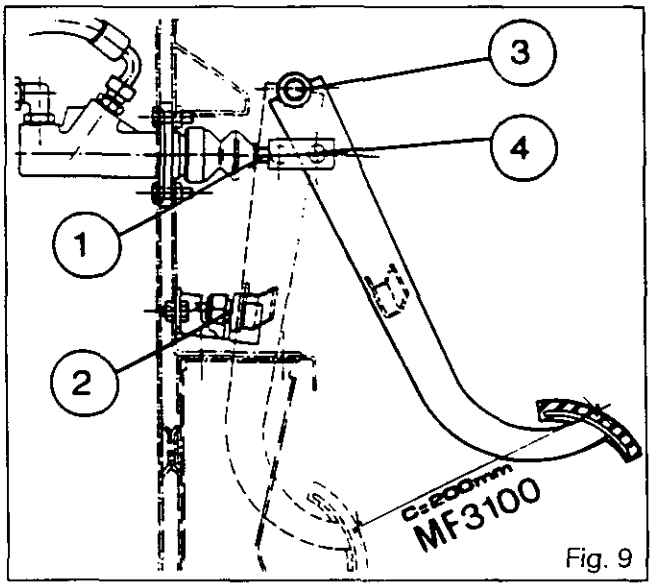
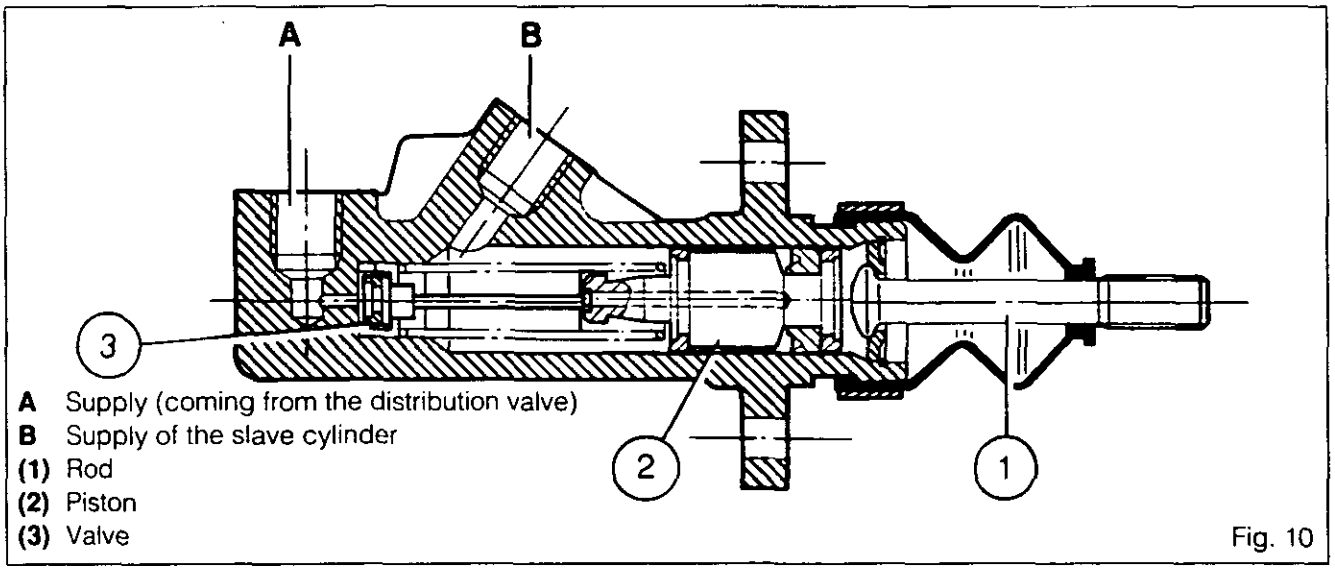


Fig. 9



A Supply (coming from the distribution valve)
B Supply of the slave cylinder
(1) Rod
(2) Piston
(3) Valve

Fig. 10

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8 H01 Distribution valve

CONTENTS

- **General** ——— 2

A. Operation ——— 2

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Hydraulics - Distribution valve

General

The distribution valve is fitted on the rear bonnet support. Its function is:

- To supply oil and keep the low pressure circuit to 17 bar.
- To supply the lubrication and cooling system.
- To ensure a constant level in the brake and clutch master cylinders.

A. Operation (Fig. 2)

When the engine is started, the oil coming from the steering control valve (Orbitrol) enters through port 1 and flows out through port 5 towards the low pressure circuit of the right hand hydraulic cover to feed:

- the speedshift
- the A/B range
- the Hare/Tortoise range
- the 4WD clutch
- the differential lock
- the p.t.o. clutch
- the p.t.o. brake
- the front p.t.o. (if fitted)

A back pressure is then created in the circuit, forcing the ball **(20)** to lift from its seat, compressing the spring **(21)**. The oil passes to the back of the spool **(19)**, creating a pressure which gradually moves it, compressing the spring **(17)**, resting against the shims **[18]**.

The spool **(19)** enables the oil to pass towards the port 6 and towards the oil cooler. It emerges cooled and travels towards the channels **(14)** and **(13)** of the lubrication system. When the oil is cool, the 5 bar valve **(15)** opens and allows a quantity of oil to pass directly to the channel **(13)** of the lubrication system without passing through the cooler.

When one of the low-pressure functions is required, the momentary pressure drop causes the ball **(20)** to return to its seat due to the action of the spring **(21)**, and the spool **(19)** attempts to move, being pushed back by its own spring **(17)**. The oil in the end chamber escapes through the drain hole V, enabling the spool to move back slowly.

When the needs of the low-pressure circuit are satisfied, the oil finally passes through the feed ports **8** and **10** (Fig. 1). Flow and residual pressure are regulated by a pipe **11** and a restrictor **A**, thereby maintaining a constant level in the brake and clutch master cylinders.

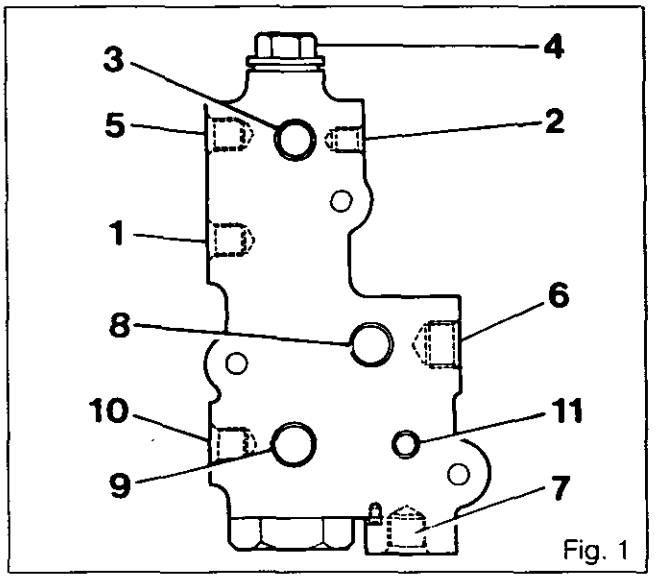


Fig. 1

Leakages return to the gearbox via port 9.

Note: After dismantling or replacement of the valve, tighten it to a torque of 40 to 55 Nm.

Designation of ports (Fig. 1).

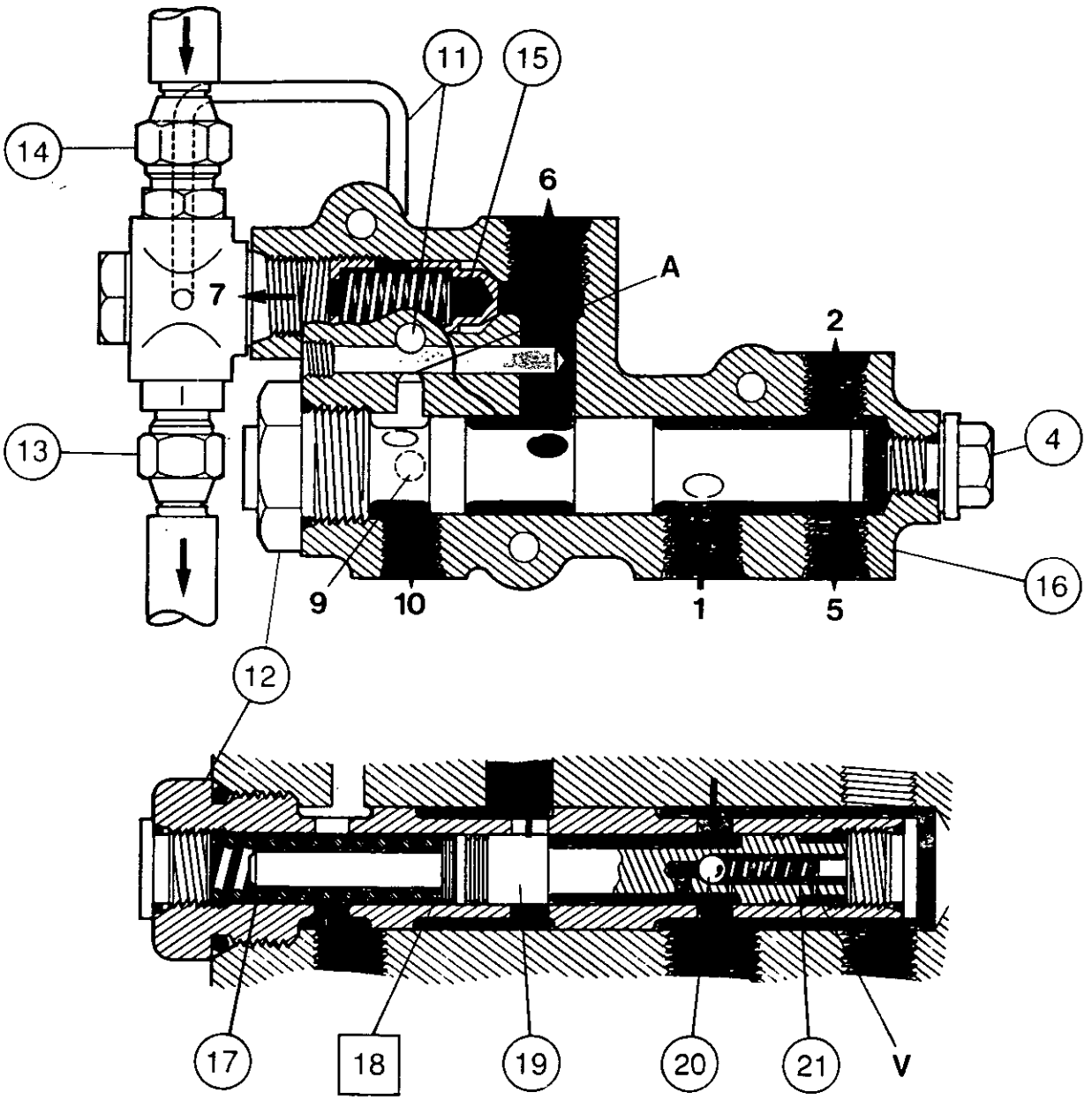
Each port is numbered on the valve body.

1 Supply coming from the Orbitrol unit.
2 Outlet to the front p.t.o. (if fitted).
3 Not used (plug)
4 Not used (plug)
5 Outlet (17 bar) to the Speedshift, the A/B range (if fitted) and the solenoids fastened on the right hand cover.
6 Outlet to the oil cooler (5 bar valve closed).
7 Outlet to the lubrication line (5 bar valve open).
8 Clutch master cylinder supply (residual flow).
9 Return to front left hand of gearbox.
10 Brake master cylinder supply (residual flow).
11 Outlet with external pipe connecting the supply channels of the brake and clutch master cylinders and the T-piece mounted on the outlet of the lubrication line.

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Fig. 2



(12) Distribution valve
(13) Lubrication towards the front cover, the p.t.o. shaft, the p.t.o clutch and the driving gear 2 or 4-speed p.t.o.
(14) Lubrication coming from the oil cooler (5 bar valve closed)
(15) 5 bar valve
(16) Valve body
(17) Spring
[18] Shims
(19) Spool
(20) Ball
(21) Spring
A Restrictor
V Drain hole

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8I01 Right-hand hydraulic cover

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B. Refitting of cover ____ 8

C. Disassembly and reassembly of high-pressure valve ____ 9

D. Disassembly of cover ____ 9

E. Removal and disassembly of Bosch pump ____ 11

F. Reassembly and refitting of Bosch pump ____ 12

G. Reassembly of cover ____ 14

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Hydraulics - RH hydraulic cover

General

The right-hand cover fitted on the rear axle housing has two main functions:
- It serves as a support for numerous components of the hydraulic system.
- It comprises various intake and delivery channels of the high- and low-flow (high- and low-pressure) circuits.

The internal face of the cover accommodates:
- The dual element hydraulic pump and its driving gear.
- The suction pipe.
- The intake manifold.
- The transfer pipe from the left cover.

Its external faces accommodate:
- The five solenoids controlling the low-pressure functions (depending on option).
- The safety valve of the high-pressure circuit.
- The trailer brake valve (if fitted) or a cover plate.
- The pressure test coupler.
- The oil filter.
- The low oil pressure switch.
- The filter vacuum switch.
- The engine speed sensor.

Parts list

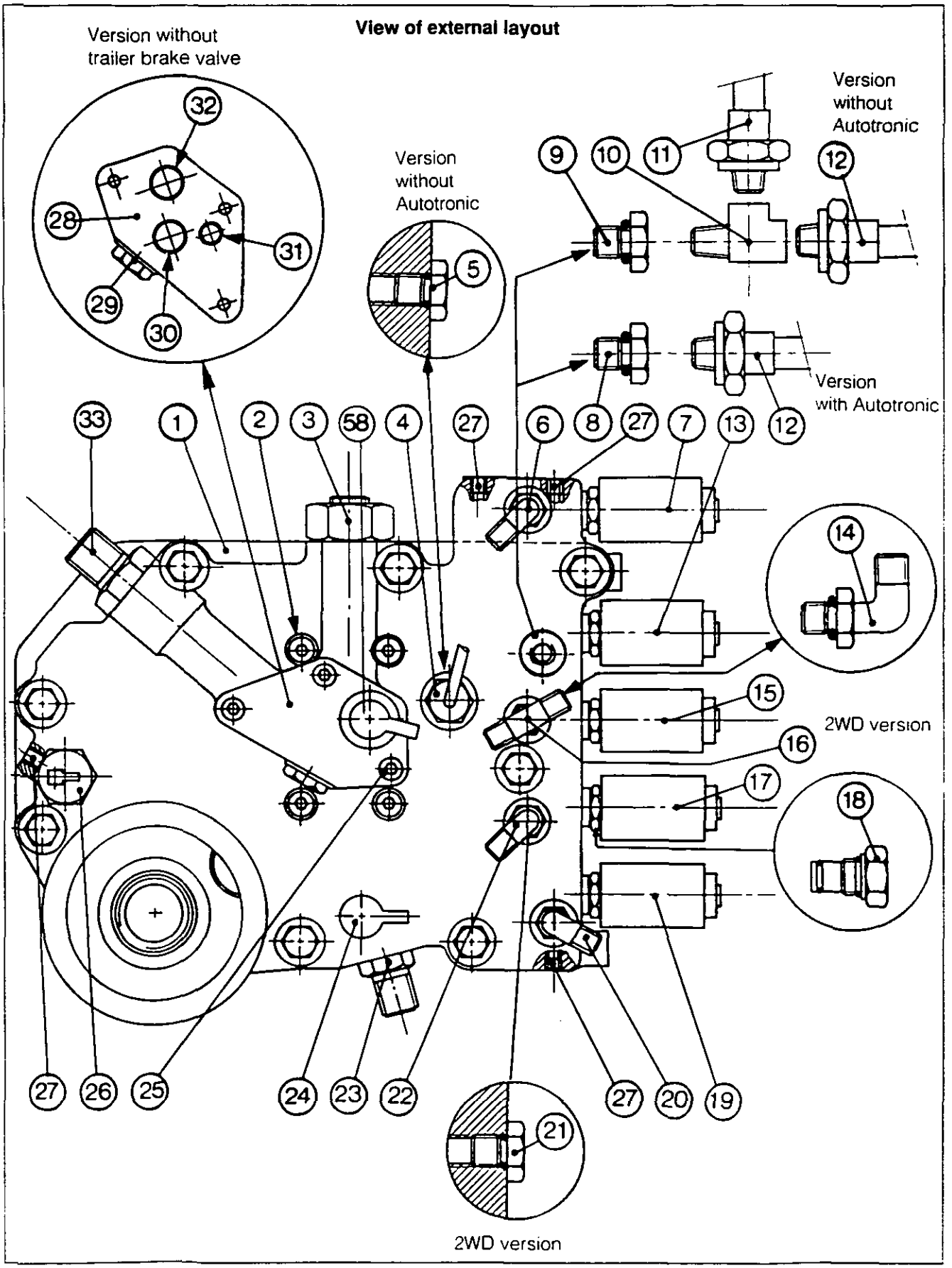
(1) Cover
(2) Screw
(3) High-pressure (high-flow) valve
(4) Engine speed sensor
(5) Plug (version without Autotronic)
(6) P.T.O. brake supply connector
(7) P.T.O brake solenoid
(8) Reducer (version with Autotronic)
(9) Reducer (version without Autotronic)
(10) Fitting (version without Autotronic)
(11) Low-pressure switch (see table)
(12) Low-pressure switch (see table)
(13) Solenoid valve (p.t.o. clutch)
(14) Fitting (2WD version)
(15) Differential lock solenoid
(16) Differential lock supply connector
(17) 4WD solenoid
(18) Plug (2WD version)
(19) Hare/tortoise solenoid
(20) 17 bar supply connector
(21) Plug (2WD version)
(22) 4WD clutch supply connector
(23) Low-pressure output connector (to Orbitrol steering valve)
(24) Low pressure test coupler
(25) Screw
(26) Filter vacuum switch
(27) Plugs
(28) Cover plate (version without trailer brake)
(29) Plug
(30) O-ring
(31) O-ring
(32) O-ring
(33) High-pressure output connector (to auxiliary spool valves)
(34) Seal
(35) O-ring
(36) O-ring
(37) Dowels
(38) O-rings
(39) Transfer pipe
(40) Pin
(41) Collar
(42) Screw
(43) Screw
(44) Deflector
(45) Suction pipe
(46) Seal
(47) Intake manifold
(48) Pipe
(49) O-rings
(50) Oil filter
(51) Nut
(52) Washer
(53) Pump gear
(54) Key
(55) Screw
(56) Pump
(57) Trailer brake valve
(58) High pressure test coupler

Different fittings for low-pressure switch		
Version	Switch **(12)** Red mark	Switch **(11)** Green mark
With Autotronic	1	
Without Autotronic	1	1
With Autotronic With super-creeper	2	

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Hydraulics - RH hydraulic cover

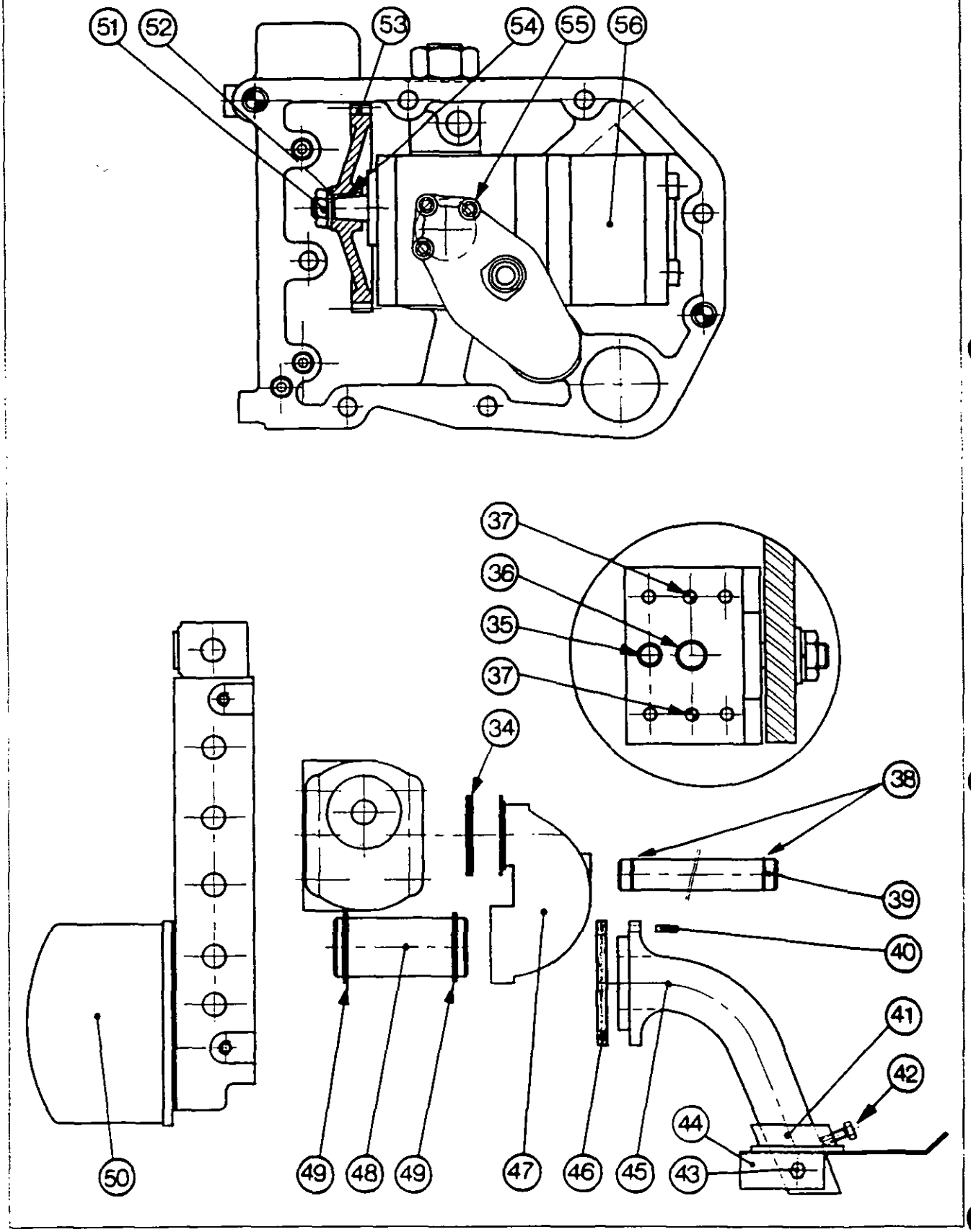


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Hydraulics - RH hydraulic cover

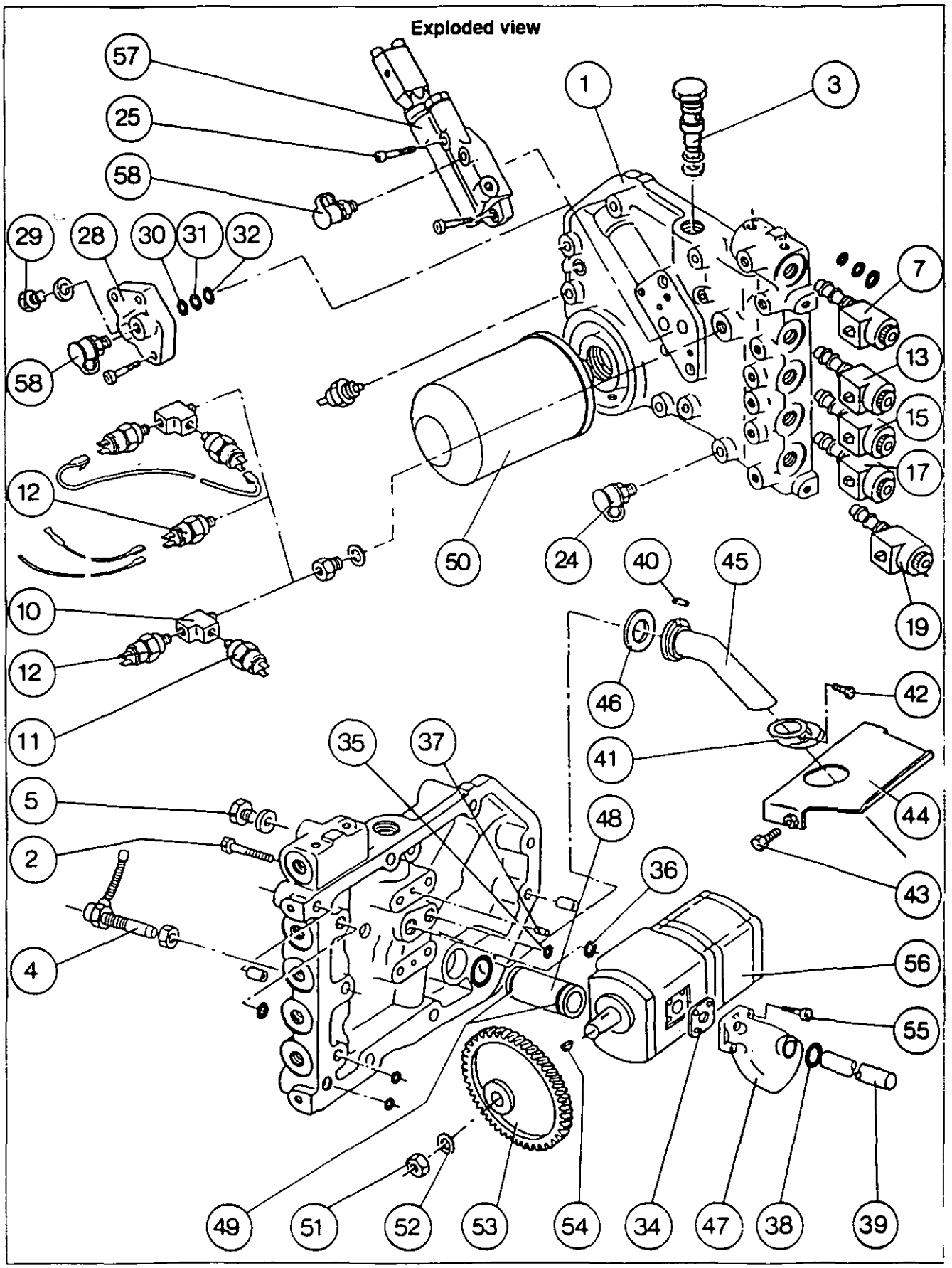
View of internal layout



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Hydraulics - RH hydraulic cover

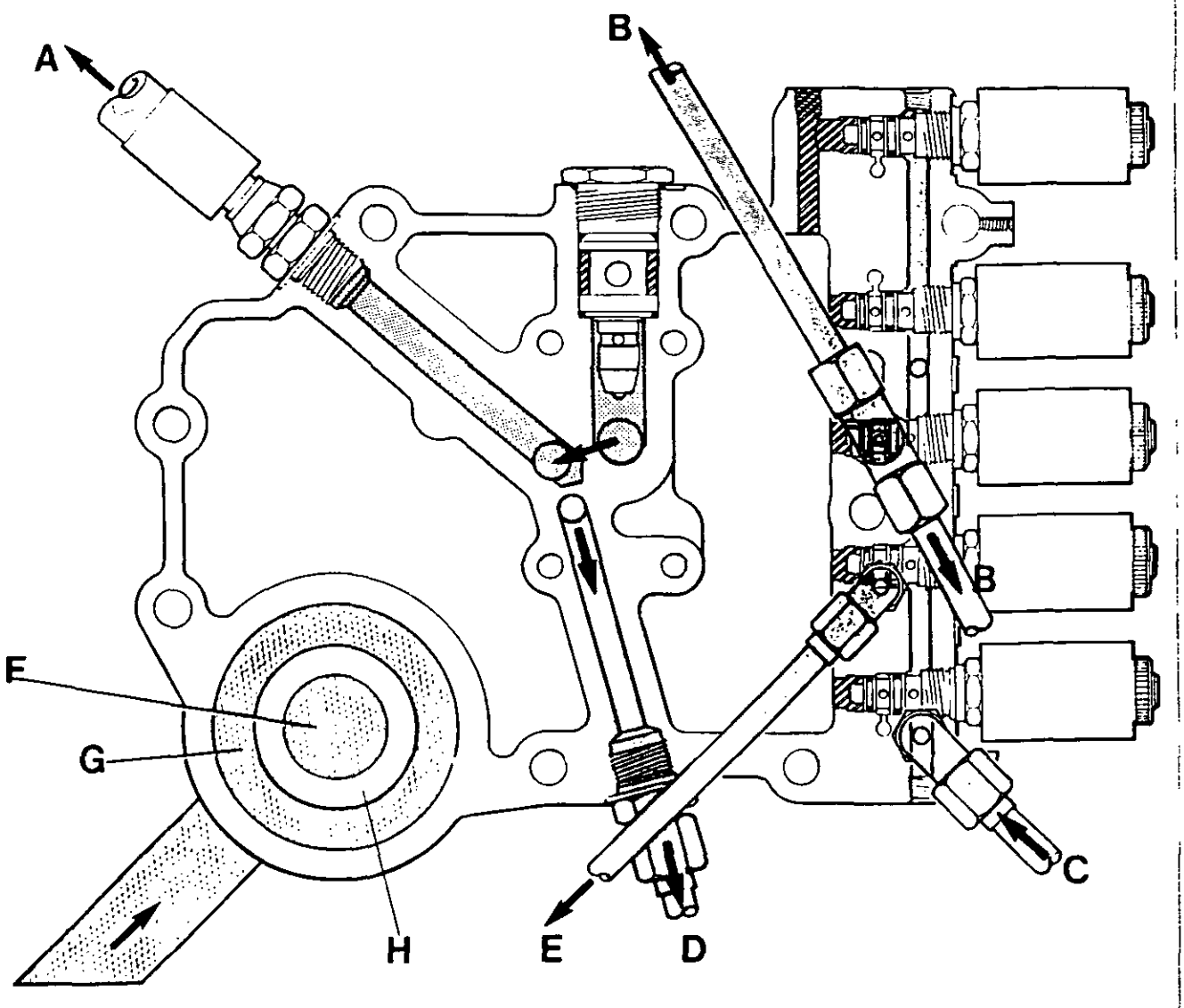


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Hydraulics - RH hydraulic cover

Identification of ports and lines



Low-pressure circuit

High-pressure circuit

Return to housing

Suction

A : Line to auxiliary spool valves
B : Front and rear differential lock (4WD)
C : 17 bar line coming from distribution valve
D : Low-pressure line to Orbitrol distributor
E : Line to 4WD clutch (if fitted)
F : Suction
G : Suction (Output from filter to two-stage pump)
H : Filter

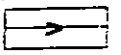
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Hydraulics - RH hydraulic cover

A. Removal of cover

1. Carry out operations 1 to 7 (Chapter 5K01).
   For operations 2 to 12 refer to Fig. 1.
2. Remove the oil filter **(1)** to gain access to screw **(2)**.
3. Remove the trailer brake socket feed pipe **(3)** (if fitted).
4. Remove the screws **(5)**.
5. Remove the valve **(6)**.
   Note: Do not disconnect the hose (7) on the pilot head, to avoid having to bleed the trailer brake circuit.
6. Disconnect and block:
   - the hose **(8)** towards the auxiliary circuit
   - the pipe **(10)** and hose **(12)** of the differential lock control (4WD)

   Note: Hose (12) must be disconnected from the connector at the protector end.
   On 2WD tractors, disconnect hose (10) only.
   - the supply pipe **(16)** of the 4WD clutch **at both ends**
   - the supply pipe **(11)** of the p.t.o. brake **at both ends**
   - the supply pipe **(17)** of the Orbitrol steering valve
   - the pipe **(15)** coming from the distribution valve.
7. Disconnect the harness **(9)** of the engine speed sensor.
8. Disconnect the harness **(13)** of the low-pressure switch and the wire **(4)** of the filter vacuum switch.
9. Remove the cover plate **(14)**.
10. Disconnect the solenoids (mark the connections).
11. Remove the p.t.o. brake solenoid in order to avoid interference with the cab (low cab).
    Note: The p.t.o. solenoid is equipped with a diode. It is marked with the symbol 
12. Remove the screws **(2)**.
13. Remove the cover.
14. Remove the transfer pipe **(1)** (Fig. 2)

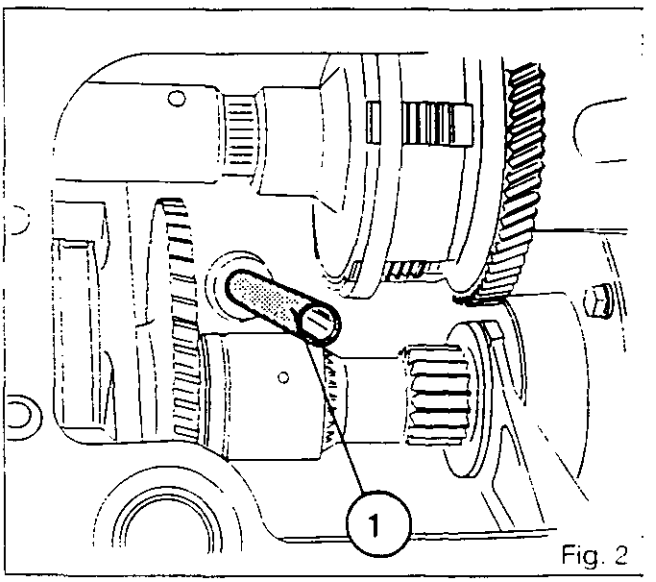


Fig. 2

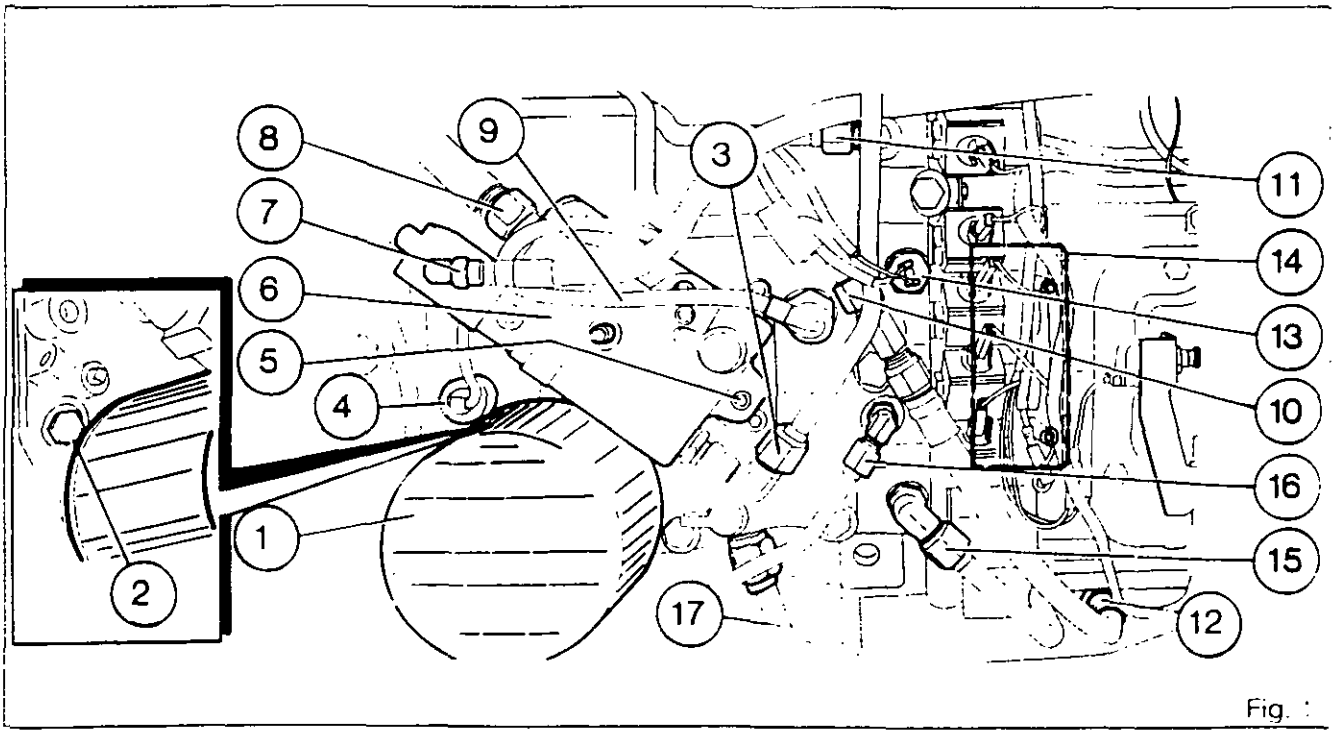


Fig. 1

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B. Refitting of cover

15. Clean the housing and cover joint faces .
16. Check the presence of the two dowels **(1)** on the cover (Fig. 3).
17. **Fit new seals on the cover:**
    - for the Hare/Tortoise lines **(2)** (Fig. 3)
    - for the p.t.o. clutch line **(3)** (Fig. 3)
    - for the suction pipe **(4)** (Fig. 4) (ensure the pipe is the right way round: the pin on the housing must be in the notch (Fig. 4)).
18. Screw two guide studs, manufactured locally, in diametrically opposite positions on the housing.
19. Refit the transfer pipe.
20. Smear the cover joint face. with a sealing compound (Loctite 510 or equivalent).
    Note: Take care not to obstruct the Hare/Tortoise lines.
21. Refit the cover and screws **(2)** (Fig. 1).
    Note: Remove the two guide studs. Tighten to a torque of 72-96 Nm.
22. Refit the PTO brake solenoid and tighten to a torque of 18-20 Nm. Reverse operations 7 to 10.
23. Fix the harnesses with a clip.
24. Reverse operation 6.
25. Refit valve **(6)** (if fitted) (Fig. 1).
    Note: Replace the O-rings.
26. Refit the screws **(5)** (Fig. 1) and tighten them to a torque of 25-35 Nm.
27. Reverse operations 2 and 3.
28. Jack up the tractor. Refit the wheel.
29. Remove the jack and tighten the wheel nuts to a torque of 400-450 Nm.
30. Take away the chocks.
31. Top up the oil. Start the engine.
32. Check the operation of the electrical circuits, low-pressure switch, solenoids and filter vacuum switch.
33. If the pump has had to be removed or replaced (see sections E and F) repeat hydraulic tests. Check the cover joint face and hydraulic connectors for leaks.

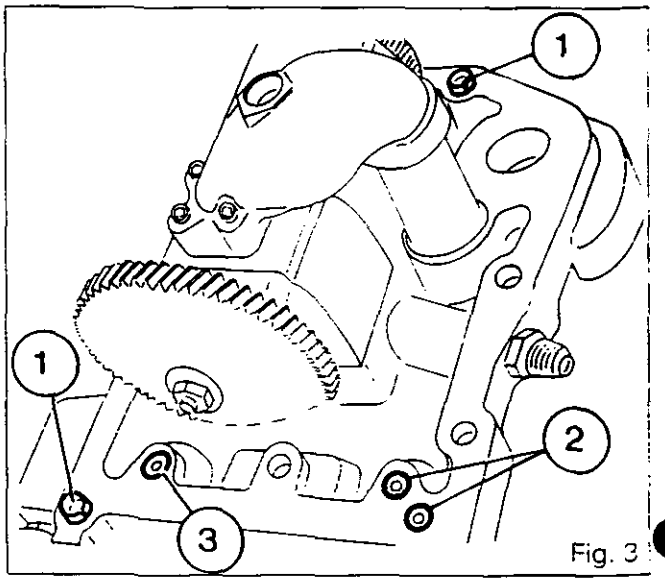


Fig. 3

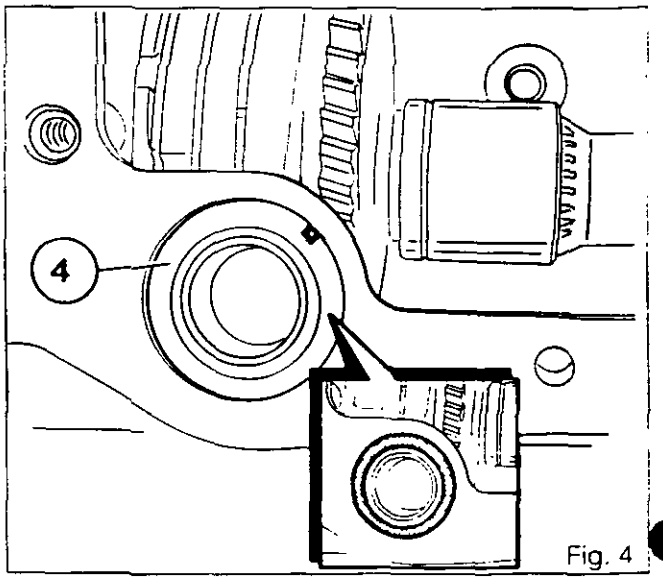


Fig. 4

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C. Disassembly and reassembly of high-pressure valve

Operation (Fig. 5)

If the pressure **P** exceeds 188 bar, spring **(4)** is compressed and valve **(7)** moves allowing oil to pass to the housing via port **C**.

Disassembly

34. Unscrew the plug **(1)**. Retrieve the shims **[2]**, withdraw the spring **(4)**.
35. Remove the O-ring **(5)**, withdraw the body **(6)** complete with valve **(7)** and washer **(8)** from the RH cover.
    Note: Ball (9) is fitted in the valve body.

Reassembly

36. Check that the valve **(7)** slides freely in the valve body **(6)**.
37. Fit washer **(8)**, mount the body **(6)** complete with valve **(7)** in the cover. Position the O-ring **(5)**.
38. Fit the spring **(4)** and shims **[2]** and tighten the plug **(1)** to a torque of 50 - 60 Nm.

D. Disassembly of cover

39. Remove the cover. Carry out operations 1 to 14.
40. Place the cover **(1)** in a vice with soft plastic jaws.
41. Remove the solenoids and plug **(18)** (2WD version).
42. Remove the low-pressure switch **(12)** (see table, page 2) and the reducer **(8)**.
43. Remove the switches **(11)** and **(12)** (see table, page 2), the fitting **(10)** and the reducer **(9)**.
44. Remove connector **(16)**, then fitting **(22)**,(or fitting **(14)** and a plug **(21)** on 2WD version).

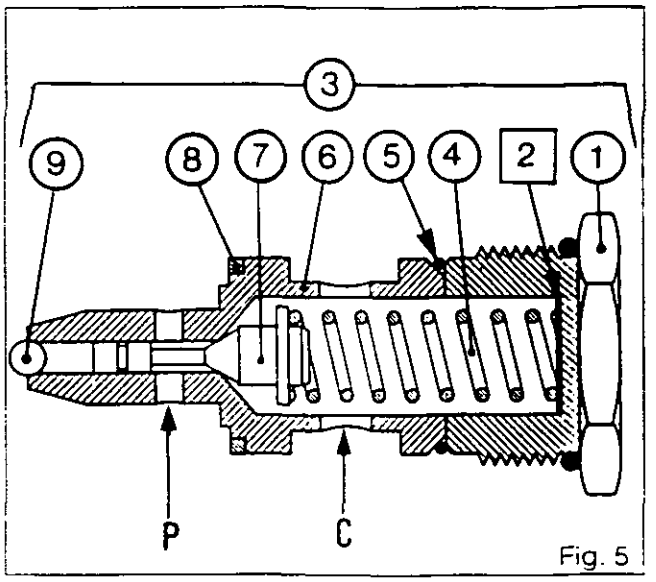


Fig. 5

45. Remove connectors **(6)**, **(20)**, **(23)**, **(33)**.
46. Remove the screws **(25)** and the cover plate **(28)** (version without trailer brake). Remove the O-rings **(30)**, **(31)** and **(32)**.
47. Unscrew the engine speed sensor **(4)** or the plug **(5)** (version without Autotronic).
48. Remove the filter vacuum switch **(26)** and the test coupler **(24)**.
49. Remove the screws **(55)**, the intake manifold **(47)**, the seal **(34)** and the pipe **(48)**. Remove the seals **(49)**.
50. If necessary, unscrew the plugs **(27)**.

Removal of driving gear

51. Unscrew the nut **(51)**. Remove the washer **(52)**, the gear **(53)** and the key **(54)**.

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Hydraulics - RH hydraulic cover

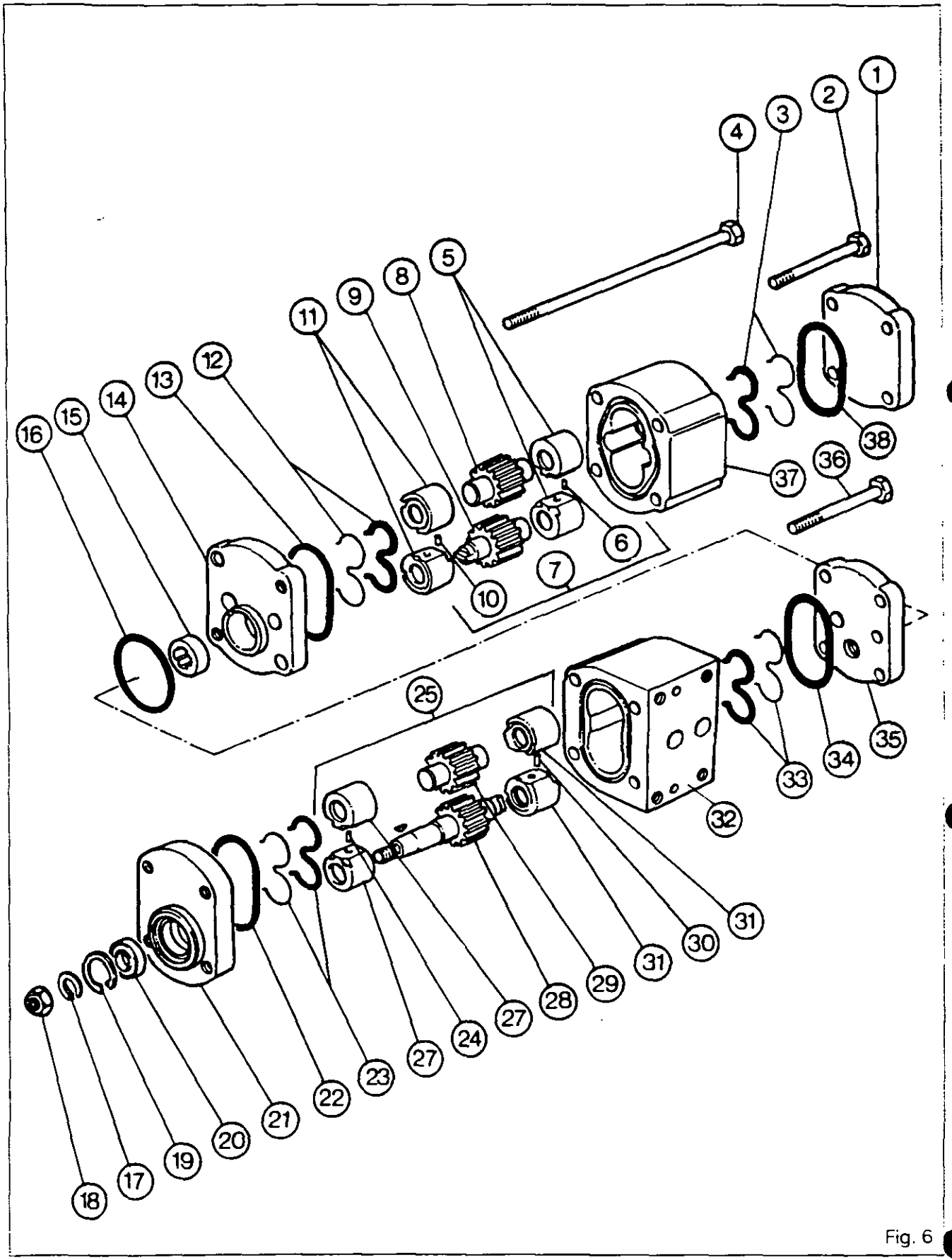


Fig. 6

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E. Removal and disassembly of Bosch pump

Removal (Fig. 7)

52. Remove the screws **(2)**, and pump **(56)**. Remove the O-rings **(35)** and **(36)**.
Note: The dowels (37) are force-fitted in the cover.

Disassembly (Fig. 6)

53. Place the pump in a vice (Fig. 8).
54. Mark the position of: the stages, the intermediate plate and the plates.
55. Remove the screws **(2)** and **(4)**.
56. Remove the cover plate **(1)**.
57. Remove the composite seal **(3)** and seal **(38)**. Separate the low-pressure stage **(37)** from the intermediate plate **(14)**.
58. Remove the stage and the bearing/pinions assembly **(7)**.
59. Remove the pinions **(8)** and **(9)** from the bearing assemblies **(5)** and **(11)**.
Note: Keep the bearing assemblies paired. Each bearing is linked by a dowel «P» (Fig. 9).
60. Remove the composite seal **(12)** and seal **(13)**.
61. Remove the intermediate plate **(14)**, the driver **(15)** and the seal **(16)**.
62. Untighten and remove the screws **(36)**.
63. Remove the intermediate plate **(35)**.
64. Remove the composite seal **(33)** and seal **(34)**.
65. Separate the high-pressure stage **(32)** from the flange **(21)**.
66. Remove the bearing/pinions assembly **(25)**.
67. Remove the pinions **(28)** and **(29)** from the bearing assemblies **(27)** and **(31)**.
Note: Keep the bearing assemblies paired.
68. Remove the composite seal **(23)**.
69. Remove the seal **(22)**.
70. Remove the circlip **(19)** and drive out the bush **(20)**.

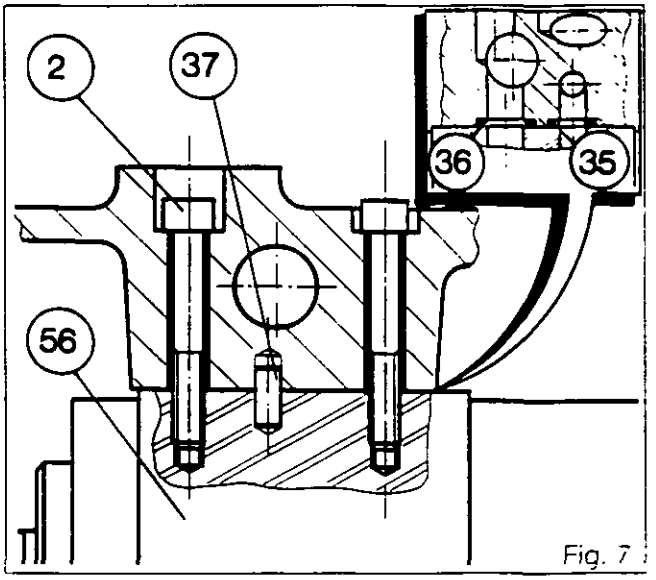
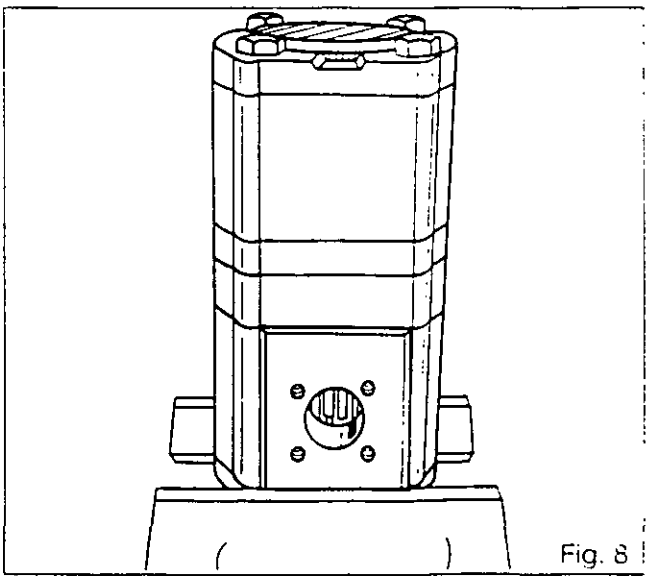


Fig. 7


Fig. 8

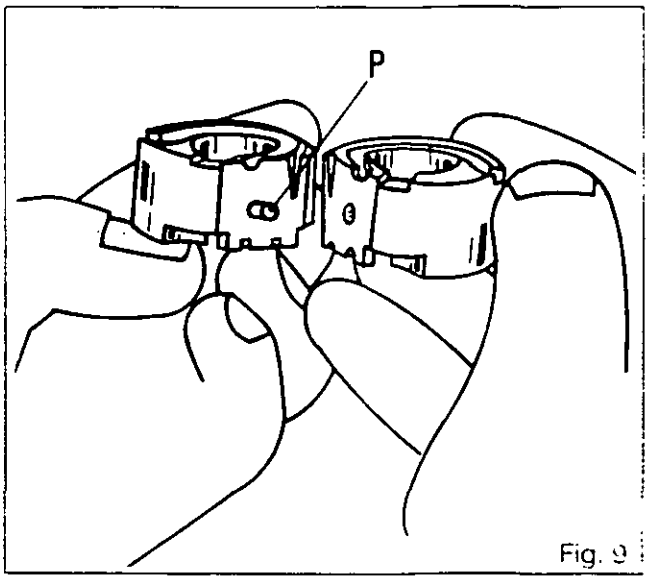


Fig. 9

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F. Reassembly and refitting of Bosch pump

Reassembly (Fig. 6)

71. Clean and check the parts. Replace any which are defective.
Note: The seals and the bush must always be replaced and fitted in the lubricated state.
72. Push the seal ring **(20)** in the plate **(21)** and fit the circlip **(19)**.
Note: The bearing assemblies have different forms. The intermediate bearing assemblies (11) and (31) have a recess «E» (Fig. 10) for oil to pass to the low-pressure stage (37).
73. Fit the bearing assembly **(27)** (without recess), located by the pin **(24)**, in the high-pressure stage **(32)**. *Position the lubrication channels «G» towards the intake orifice «O», and the groove «R» of the composite seal* **(23)** towards the plate **(21)** *(Fig. 11).*
74. Place the pinions **(28)** and **(29)** of the high-pressure stage in the bearing assembly **(27)**.
Note: The pinions of the high-pressure stage are wider.
75. Position the composite seal **(23)** and seal **(22)** (Fig. 12).
76. Assemble the high-pressure stage **(32)** on the flange **(21)** according to the marks made at the time of disassembly.
77. Fit the bearing assembly **(31)** (with recess), located by the pin **(30)**, in the high-pressure stage **(32)**. Position the lubrication channels «G» and the recess «E» towards the intake orifice «O», and the groove «R» of the composite seal **(33)** towards the top (Fig. 13).

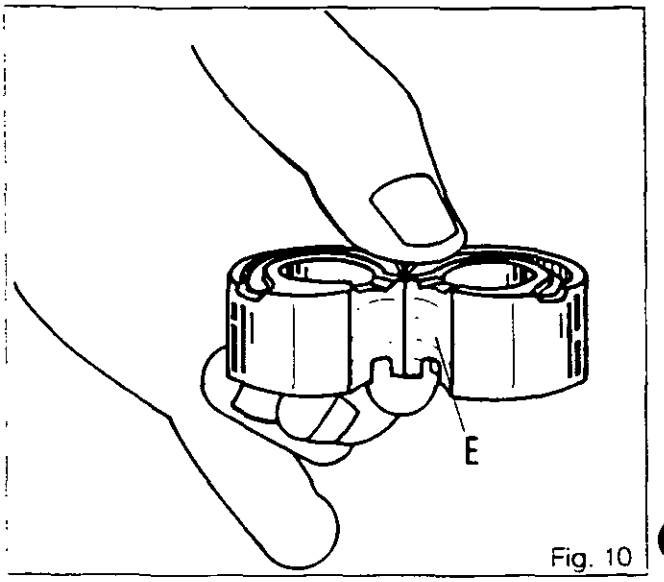


Fig. 10

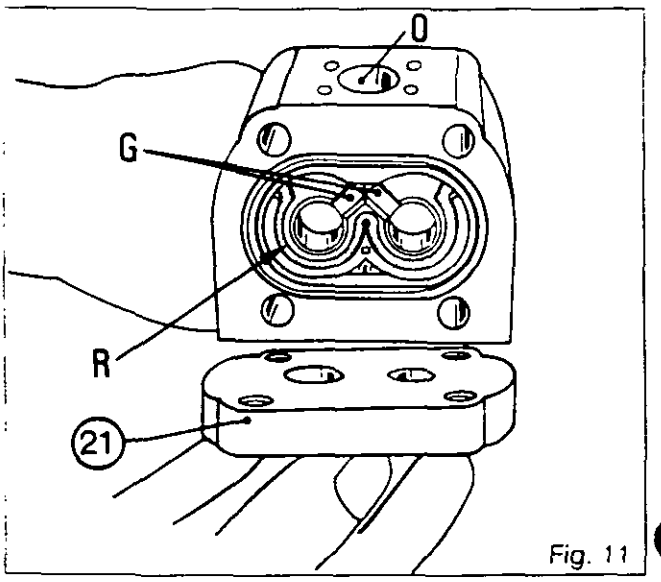


Fig. 11

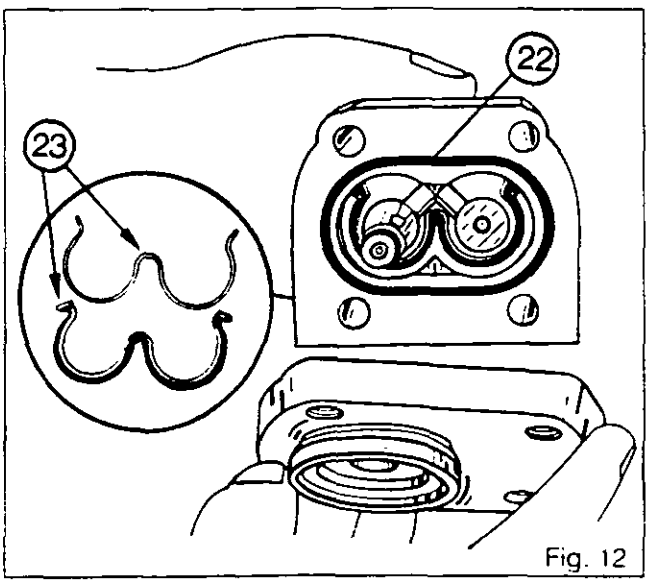


Fig. 12

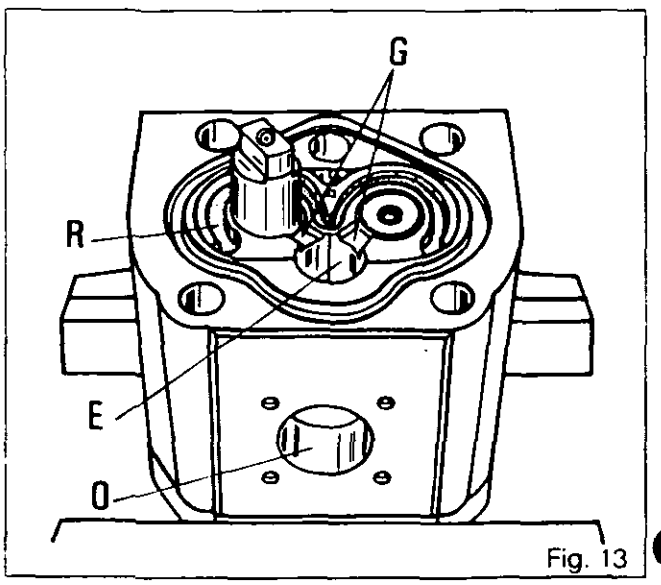


Fig. 13

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78. Position the composite seal **(33)** and seal **(34)**. Assemble the flange **(35)** on the high-pressure stage **(32)** (Fig. 14) according to the marks made at the time of disassembly.
79. Centre the flange **(35)**. Fit and tighten the screws **(36)** to a torque of 40-47 Nm.
80. Refit the driver **(15)** against the flat surface of the driving pinion **(28)**. Position the seal **(16)**.
81. Fit the intermediate plate **(14)** according to the marks made at the time of disassembly.
82. Fit the bearing assembly **(11)** (with recess), located by the pin **(10)**, in the low-pressure stage **(37)**. Position the lubrication channels «G» and the recess «E» towards the intake orifice «O», and the groove «R» of the composite seal **(12)** towards the intermediate plate **(14)** (Fig. 15).
83. Position the composite seal **(12)** and seal **(13)** (Fig. 15).
84. Assemble the low-pressure stage **(37)** on the intermediate plate **(14)** according to the marks made at the time of disassembly.
85. Place the pinions **(8)** and **(9)** in the low-pressure stage, ensuring that the flat surface of the driving pinion **(9)** enters the driver **(15)**.
86. Fit the bearing assembly **(5)** (without recess), located by the pin **(6)**, in the low-pressure stage **(37)**. Position the lubrication channels «G» towards the intake orifice «O», and the groove «R» of the composite seal **(3)** towards the cover plate **(1)** (Fig. 16).
87. Position the composite seal **(3)** and seal **(38)** (Fig. 17).

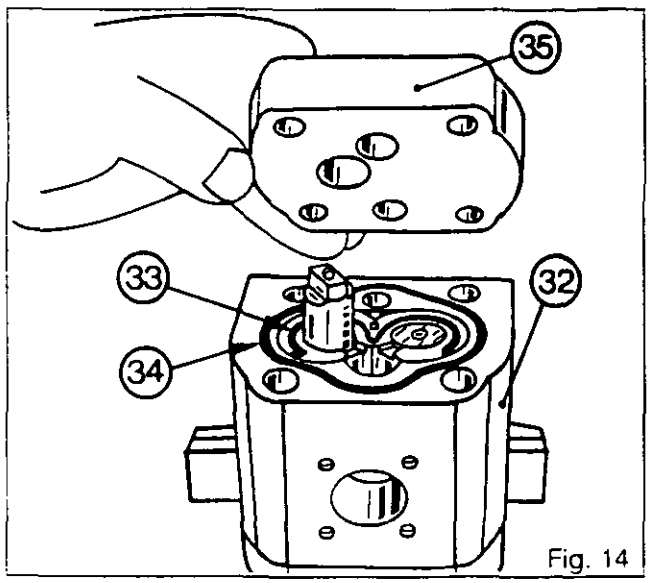


Fig. 14

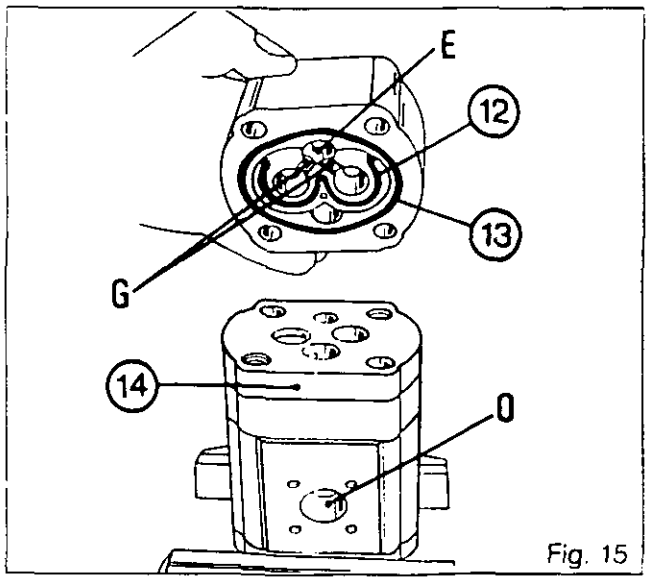


Fig. 15

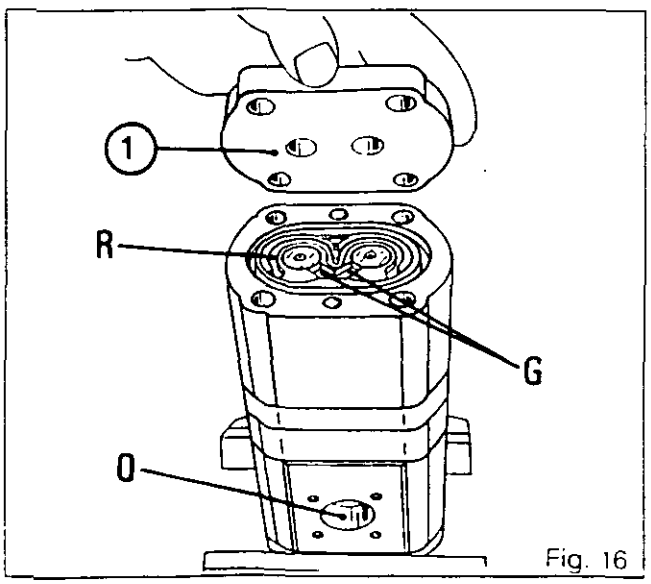


Fig. 16

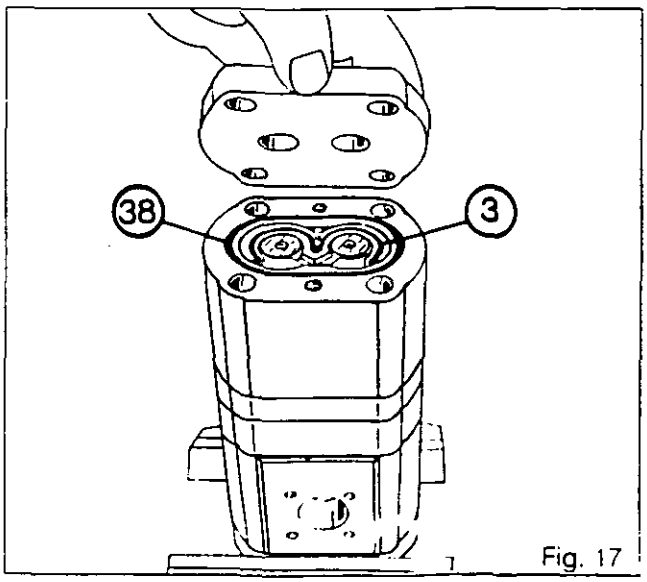


Fig. 17

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88. Centre the low-pressure stage **(37)** and assemble the cover plate **(1)** according to the marks made at the time of disassembly.
89. Fit and tighten the screws **(2)** and **(4)** to a torque of 40-47 Nm.
90. Manually check the rotation of the pump.

Refitting

91. Clean and check the parts. Replace any which are defective. Check that none of the channels of the cover are blocked.
92. Push the dowels **(37)** (if removed) into the cover (Fig. 18).
93. On the cover, fit new O-rings **(35)** and **(36)** in the counterbores of the high- and low-pressure channels (Fig. 18).
94. Inside the cover, apply a bead C of Loctite 575 around the four screw holes (Fig. 18).
95. Refit the pump on the dowels **(37)** (Fig. 7).
96. Smear the screws **(2)** with Loctite 221 and tighten them to a torque of 10 - 12 Nm (Fig. 7).

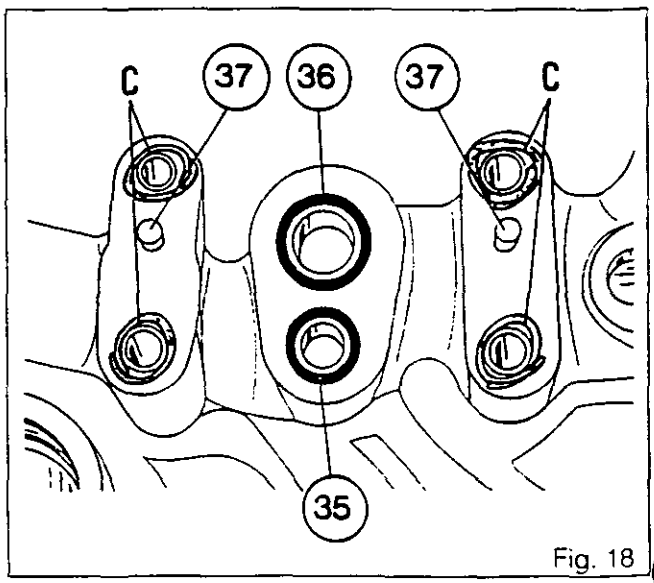


Fig. 18

G. Reassembly of cover

Refitting of driving gear

97. Position the key **(54)**. Fit the driving gear **(53)**, ensuring that it is correctly engaged on the key. Fit the washer **(52)**.
98. Smear the nut **(51)** with Loctite 241 and tighten to a torque of 50 - 60 Nm.
99. Refit the plugs **(27)** smeared with Loctite 542 (if removed).
100. Replace the O-rings **(49)** on the pipe **(48)**.
101. Replace the seal **(34)**, refit the pipe and intake manifold **(47)**. Refit the screws **(55)**.
102. Fit the filter vacuum switch **(26)**.
103. Fit and tighten the test coupler **(24)** with its O-ring.
104. Fit the sensor **(4)** (Autotronic, Datatronic) with "Loctite 577 Sensor Sealing" or equivalent.
105. Screw in the sensor, without forcing it, until it is in contact with the pump gear.
106. Unscrew the sensor 3/4 of a turn to provide clearance of approx. 1 mm between the sensor **(4)** and the gear **(53)**. Tighten the nut **(1)** to a torque of 10-12 Nm (Fig. 19).
107. Fit the O-rings **(30)** **(31)** **(32)** in their respective locations on the cover plate **(28)** (version without trailer brake).

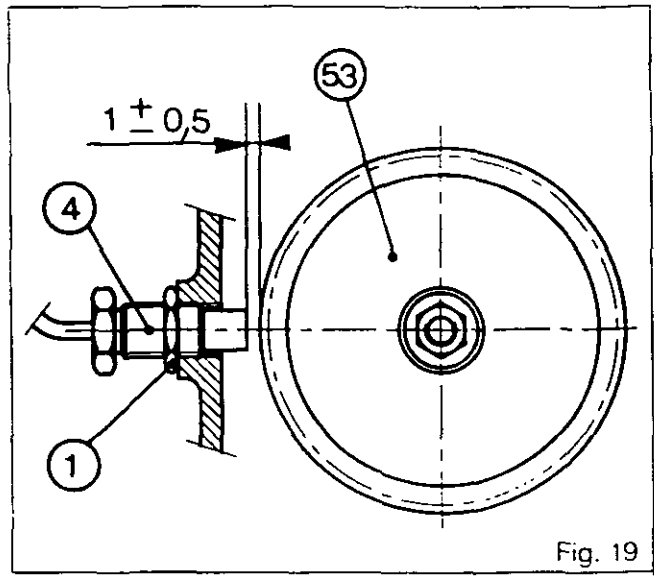
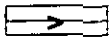


Fig. 19

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108. Refit the plate, fit the screws **(25)** and tighten them to a torque of 25 - 35 Nm.
109. Refit the connectors **(6)**, **(20)**, **(23)** and **(33)**.
110. Fit the plug **(21)** and connector **(14)** (2WD version), connectors **(16)** and **(22)** (4WD version).
111. Refit the reducer **(8)** with its O-ring and low-pressure switch **(12)**, lightly smeared with Loctite 221 (version with Autotronic, see table on page 2).
112. Refit the reducer **(9)** with its O-ring, the connector **(10)** and the two low-pressure switches smeared with Loctite 221.
Note: The low-pressure switches are marked with a spot of paint between the two terminals. It is important to fit them according to the table on page 2.
For tractors without Autotronic or with Autotronic and super-creeper, fit the switches as shown in Fig. 20.
113. Refit the solenoid and plug **(18)** (2WD version).
Note: To avoid interference with the cab, do not refit the p.t.o. brake solenoid on tractors with a low cab. The p.t.o. brake solenoid is equipped with a diode. It is marked with the symbol 
Tighten the solenoid to a torque of 18-20 Nm.
114. Refit the high-pressure valve. Carry out operations 36 to 38.
115. Refit the cover. Carry out operations 15 to 33.

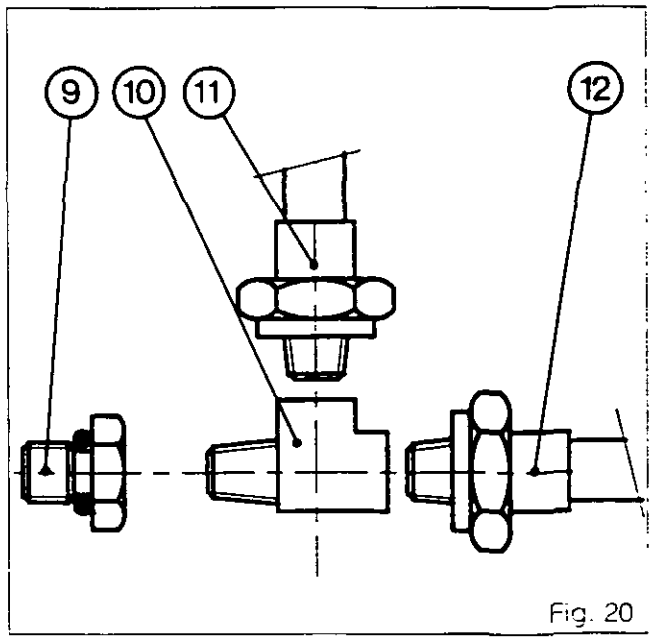


Fig. 20

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8 I02 Left-hand hydraulic cover

CONTENTS

A. Removal ____ 2

B. Refitting ____ 2

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Hydraulics - LH cover

A. Removal

1. Immobilise the tractor and lift the rear with a trolley jack. Slacken the left rear wheel and put a stand in place. Remove the wheel.
2. Drain the gearbox (only).
3. Mark and disconnect the cables of the lift **(1)** and lowering **(2)** solenoid (Fig. 1).
4. Disconnect and block the lift valve supply hose **(3)** and the ram supply tube **(4)** (Fig. 1).
   Note: On tractors with a low cab, remove the bolts (7) and take away the valve to facilitate access to the upper bolts (5) of the cover.
5. Remove the bolts **(5)** and take away the support **(6)** of the of the hand brake control.
   Note: On tractors equipped with GSPTO, disconnect the control (8) and remove the support (9) (Fig. 1).
6. Remove the cover and the transfer tube.

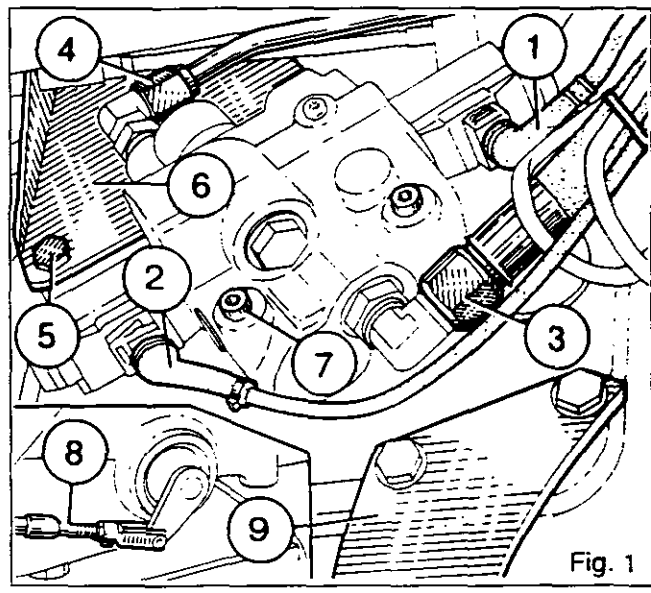


Fig. 1

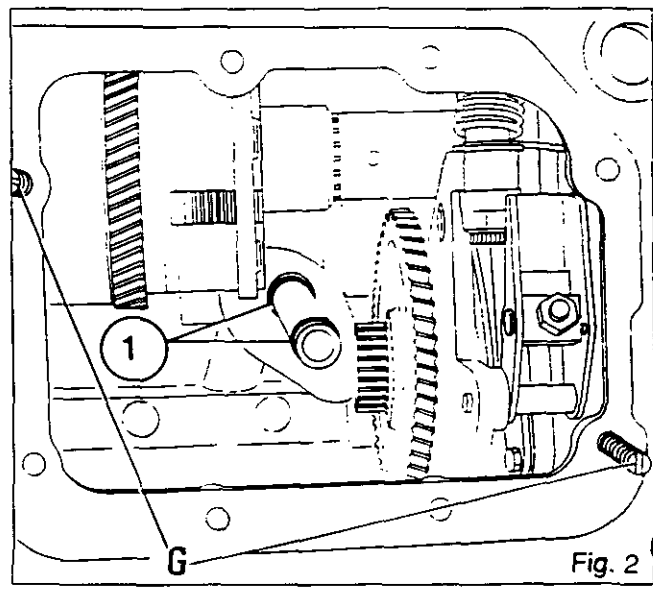


Fig. 2

B. Refitting

7. Clean the cover and housing joint surfaces .
8. Check that the O-rings **(1)** of the transfer tube are not damaged and refit the tube (Fig. 2).
9. Coat the housing joint surface with a sealant (Master Joint or equivalent).
10. Screw in two opposing guide studs **G** (Fig. 2).
11. Refit the cover.
12. Mount the handbrake control support **(6)**, the GSPTO support **(9)** (if fitted) (Fig. 1). Remove the guide studs. Fit and tighten the bolts to a torque of 72 - 96 Nm. Connect the controls.
    Note: On tractors with a low cab, check that the O-rings of the lift control valve are not damaged and refit the valve.
    Fit and tighten the bolts (7) to a torque of 25 - 35 Nm (Fig. 1).
13. Check the adjustment of the control:
    - of the handbrake; carry out operations 71 to 75, chapter 6 I01.
    - of the GSPTO (if fitted) : carry out operations 99 to 105, chapter 6 F01.
14. Reconnect the supply hose **(3)** of the lift valve and the feed tube **(4)** of the lift rams (Fig. 1).
15. Reconnect the lift **(1)** and lowering **(2)** solenoid (yellow connector) (Fig. 1).
16. Fasten the cable to the valve supply hose with a clip.
17. Refit the wheel. Take away the stand and the trolley jack. Tighten the nuts to a torque of 400 - 450 Nm.
18. Top up the housing oil level.
19. Start the engine.
20. Check the operation of the lift system and check for leaks at the joint faces of the cover and the hydraulic connectors.

Version without lift

The cover (valve support) is replaced by a plate with a hydraulic sleeve.

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8 J01 Hydraulic tests

CONTENTS

- **Preparation** ____ 2

A. High flow circuit ____ 2

B. Low flow circuit ____ 4

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Preparation

Before beginning the tests, the engine should be run to bring the oil temperature up to minimum 60°C (140°F).
The following equipment is recommended for the tests shown in this section. It is available through the MF dealer network.

- MF3001 : Pressure gauge kit
- MF3002 : Hoses and unions kit
- MF3003 : Flowmeter assembly
- 3582045 M1 : *Hydraulic coupler*

Otherwise, use suitable equivalent equipment.

In all cases, make sure of the direction of flow of the oil to avoid damaging the flowmeter. Also choose pressure gauges, hoses and unions of sufficient capacity and strength.

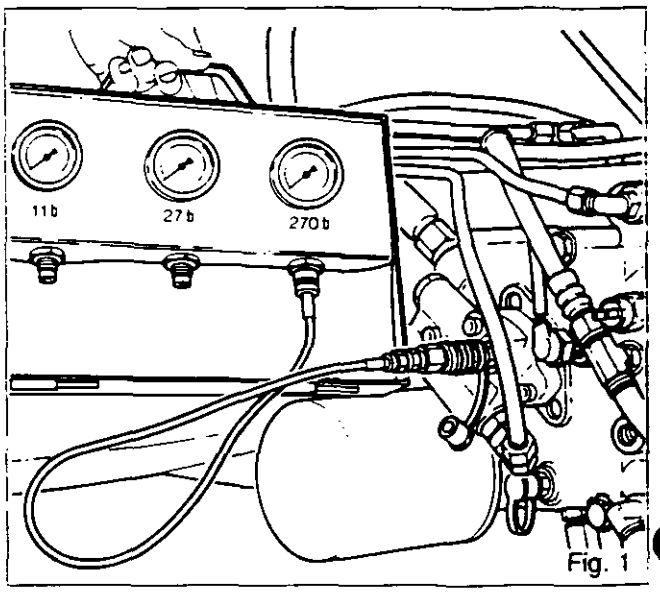
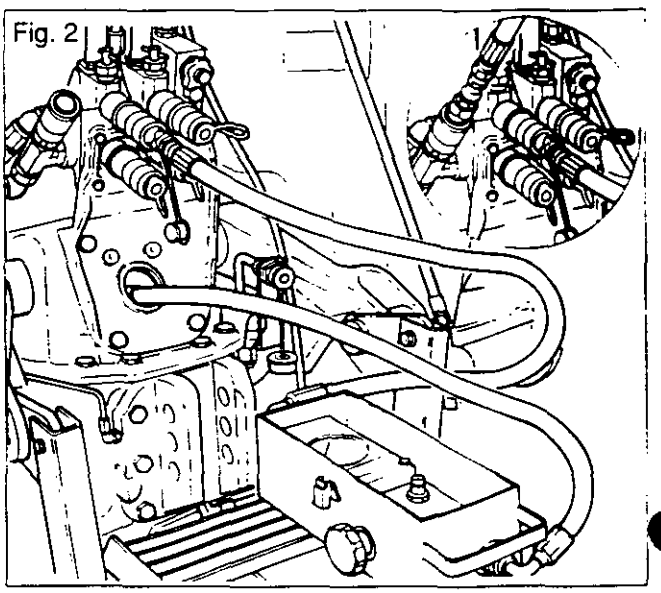


Fig. 1


Fig. 2

A. High flow circuit

1. HP safety valve

Fit a pressure gauge with coupler 3582045 M1 (Fig. 1) on the diagnostic point located on the trailer brake valve (if fitted), or on the cover plate fitted on the right-hand cover. Run the engine at 2000 rpm. Operate an auxiliary spool valve so as to open the valve. Read :
P1 = 185 bar (+15 bar - 5 bar)
At 1000 rpm, the pressure should not fall.
If necessary, adjust the valve by the use of shims (See Section C 8I01).

2. Pump flow

Connect the inlet pressure port of the flowmeter to a spool valve quick coupler other than the one fed by the flow divider.
Connect the return directly to the centre housing via the transmission filler orifice. The return can also be connected to Accessory No. 3467953M91, giving a direct *connection with the centre housing (Fig. 2).*
Operate the spool valve concerned and check that the following minimum readings are obtained :

Engine speed rpm	Q1 : l/min	P2 : bar
2000	40	0
2000	38.5	100

3. Trailer brake valve (if fitted)

Connect a pressure gauge to the trailer brake socket.
Run the engine at 2000 rpm.
Apply a progressive force to the brake pedals, which should be locked together. The pressure reading should gradually increase and reach :
P3 = 130 - 150 bar max.

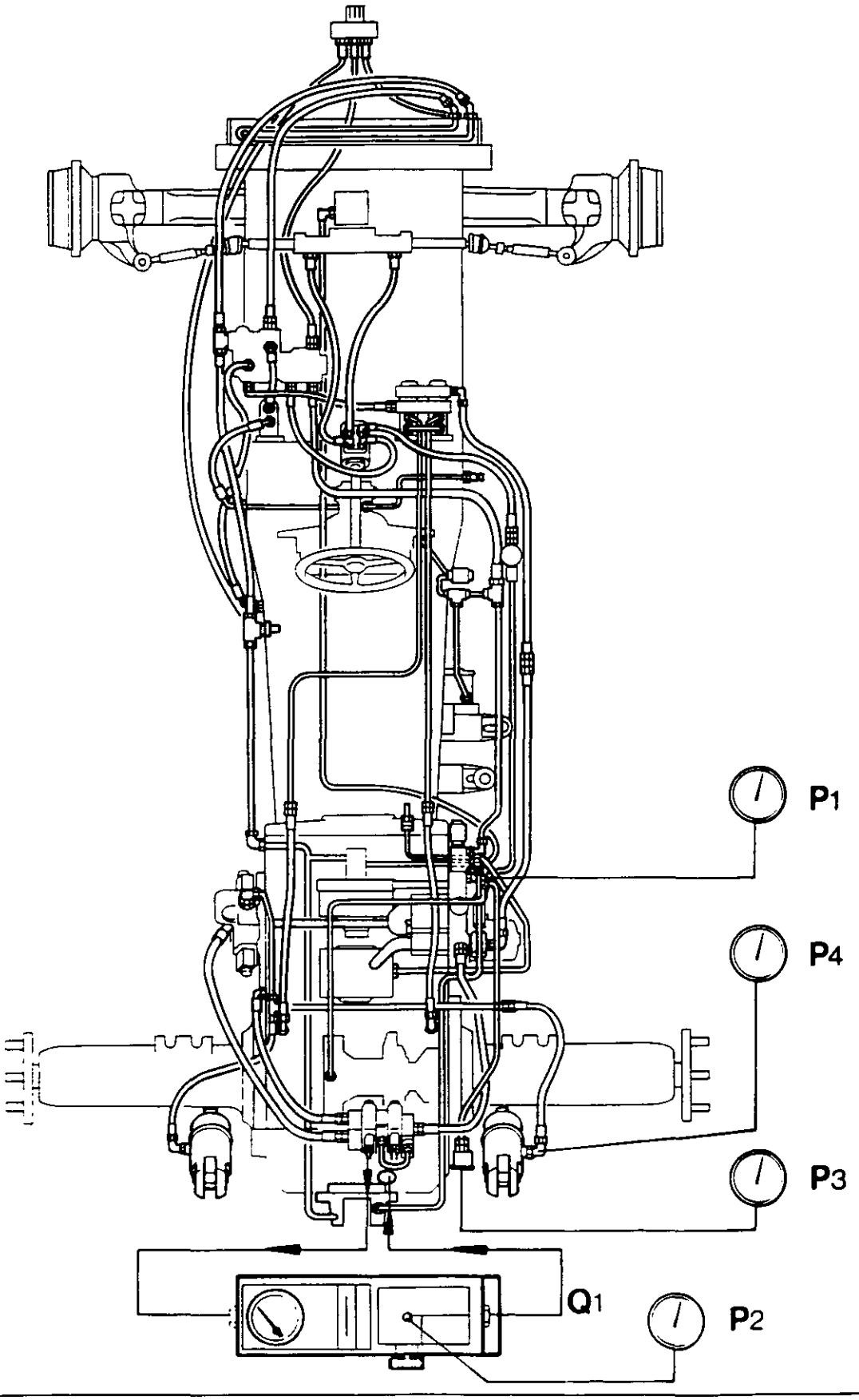
4. Anti-shock lift valve

Disconnect the cylinder inlet hoses and connect them to a manual adjustment pump.
With the engine shut down and the lift valve in neutral position, apply pressure to the system. Note the opening pressure :
P4 = 200 - 210 bar.

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High flow



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B. Low flow circuit

1. Pump flow

As shown in Fig. 3, connect the flowmeter between the distribution valve and the 1.5 bar valve hose.

Caution : Check that the flowmeter valve is completely open.

Also connect a pressure gauge to the distribution valve (Port 4 with plug).

The following minimum readings should be found :

Engine speed rpm	Q2 : l/mn	P5 : bar	Rem.
2000	23	17	Steering at rest
1000	11.5	17	Steering at rest

During these tests, the rear axle must not be put on blocks with the front axle (4 WD) engaged.

2. Checking leaks at clutches and receiving components

To check the reference point flow at Q2, the front axle should be **engaged** (no flow to clutch, warning light «on»), the range lever in Tortoise position, the A/B control lever at position B.

Remain connected as at B1. Note the reference point Flow Q2 at 1000 rpm.

Operate each function separately and note flow Q3. The difference Q2 - Q3 represents the leak, which must not exceed the values shown in the guide table :

Example : PTO Clutch

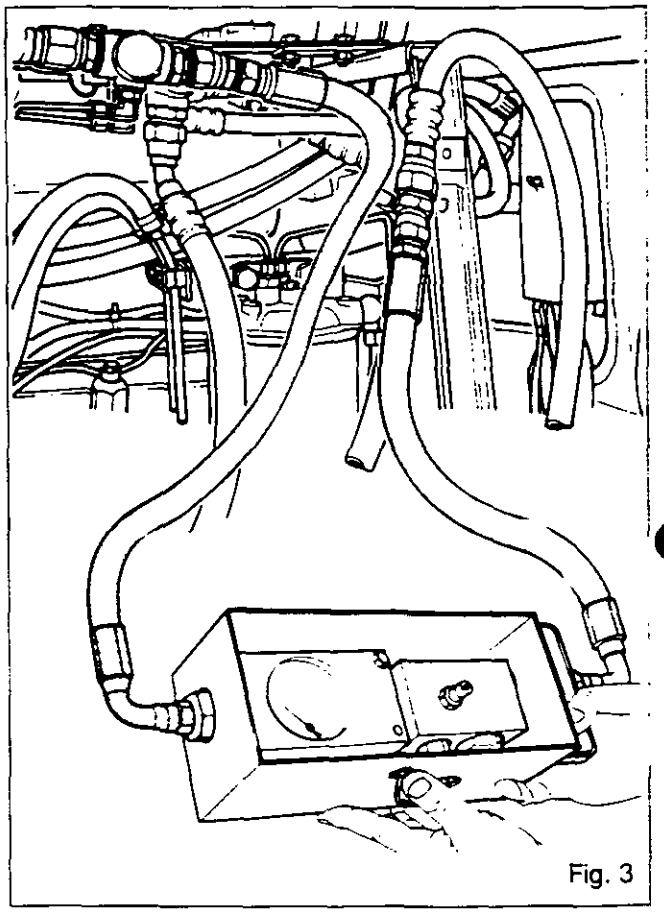


Fig. 3

Q2 = 13 l/min. Q3 = 11.5 l/min. Leak = 1.5 l/min. OK

Q2 = 13 l/min. Q3 = 10.8 l/min. Leak = 2.2 l/min. higher than acceptable leak.

Note: Before checking the following function and so that flow Q3 is not falsified, move the lever of the function under test to the neutral position or to the range position shown below.

When all clutches and other components are fed, pressure P5 should stay at 17 bar.

	PTO Clutch	PTO Brake	Diff. Lock	Front PTO	Speed-shift	A Range	Hare Range	Front Axle	
Reference point flow Q2									*
Flow read at Q3									*
Leak registered Q2 - Q3 l/mn									
Acceptable leak l/mn	2	2	2	3	3	1.5	2	2	
Pressure at P5	17 bar								

* Q2 = With front axle engaged (no flow to clutch)

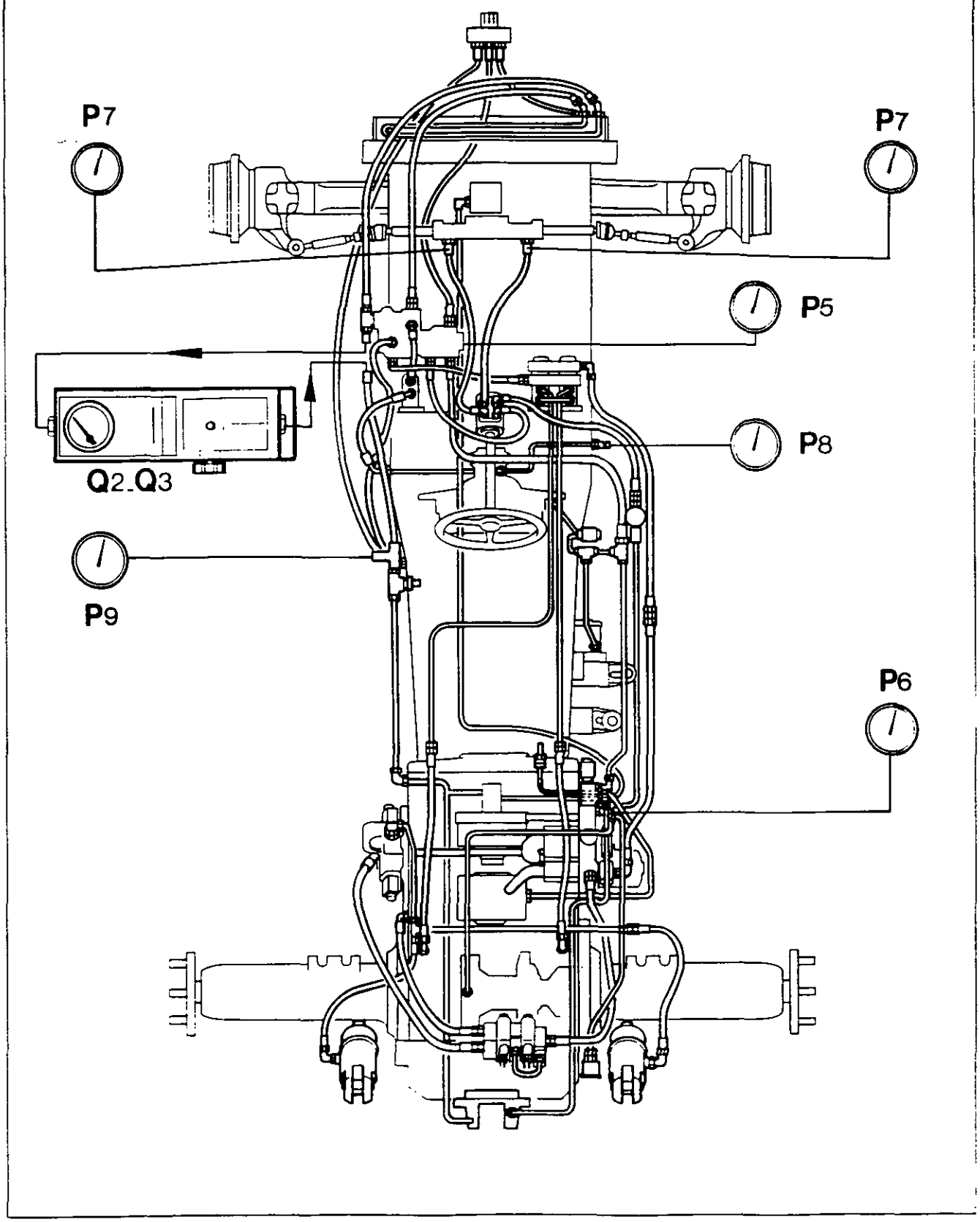
* Q3 = With front axle disengaged (flow to clutch)

As from tractor No. N047049, to disengage the front axle when the tractor is stopped the solenoid has to be connected directly from the positive terminal of the battery.

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Low flow



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Hydraulics - Hydraulic tests

3. Supply to steering valve (Orbitrol)

Connect a pressure gauge to the diagnostic point on the right-hand hydraulic cover, as shown in Fig. 4.
Turn the steering to full lock and read :
P6 = 170 bar at 1000 rpm and at 2000 rpm

4. Supply to steering cylinder

Connect a pressure gauge to a bypass on each steering cylinder hose.
With the steering at rest, read :
P7 = 17 bar
Turn the steering wheel. The pressure should reach between 17 and 170 bar on the inlet end of the cylinder.
The pressure on the return line should be 17 bar.

5. Clutch release bearing

Connect a pressure gauge with a 3582045 M1 coupler to the bleed point located on the right-hand side of the gearbox (Fig. 5).
Caution: Since the pressure can reach 30 bar when the pedal is depressed, it is essential to connect the pressure gauge after starting the engine.
Note pressure **P8 = 1.5 bar max.**

6. Lubricating pressure

Connect a pressure gauge to the tee-union on the valve on the left of the gearbox. Note **P9 = 1.5 bar max.**

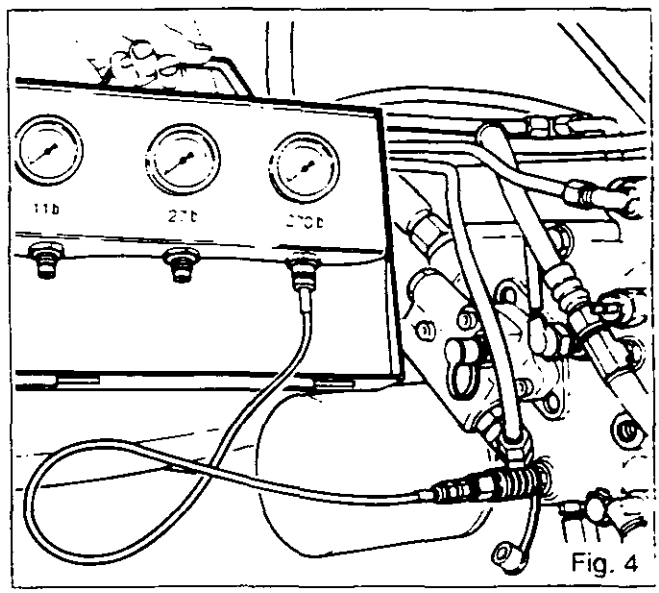


Fig. 4

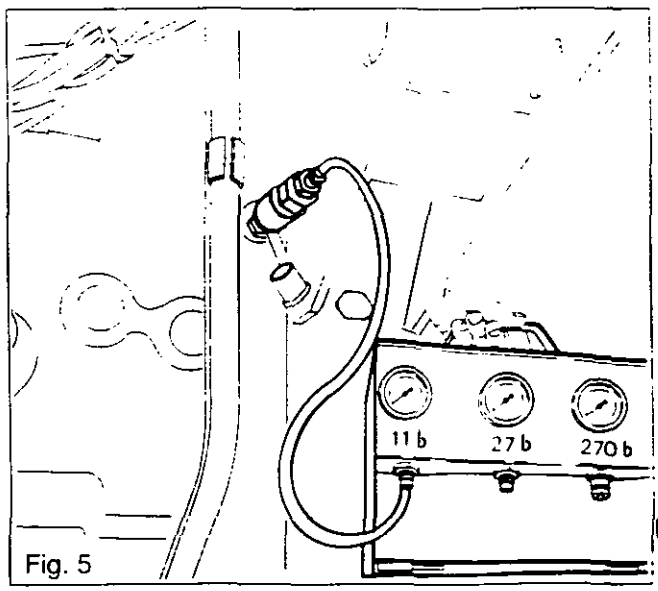


Fig. 5

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8 K01 Dynashift control

CONTENTS

- **General** ____ 2

A. **Ratios explanation** ____ 4

B. **Dynashift piston pressure check** ____ 5

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Hydraulics - Dynashift

General

The system control assembly comprises of the three main parts (Fig. 1) :

- **The distribution unit (1)** mounted on the right side of the gearbox, it has two internal oilways A and B (Fig. 2) allowing the oil to circulate from one solenoid valve to the other.

- **The solenoid valves (2)** are screwed into the distribution unit, they include:
  . the lower solenoid valve EV1 with four ports and two positions.
  . the upper solenoid valve EV2 with three ports and two positions.

- **The accumulator (3)** mounted on the distribution unit, on the inlet line, enhances the oil flow to fill the Dynashift unit piston chambers when necessary. Thus piston reaction is maintained.

Make	:	Olaer
Type	:	1/20
Capacity	:	1 litre
Gas	:	Nitrogen
Pressure	:	9 ± 1 bar (must be checked every 6 month, with engine stopped)

Note: When the engine is stopped, the accumulator maintains a pressure of 17 bars for a short period. If immediate maintenance action is necessary on the system, proceed with caution.

Two test couplers may be fitted to check the pressure in the piston chambers (Fig. 7).
The distribution unit oil is supplied by pipe. The return oil, from the piston chambers goes to the gearbox housing selector cover via the pipe **(4)** (Fig. 7).

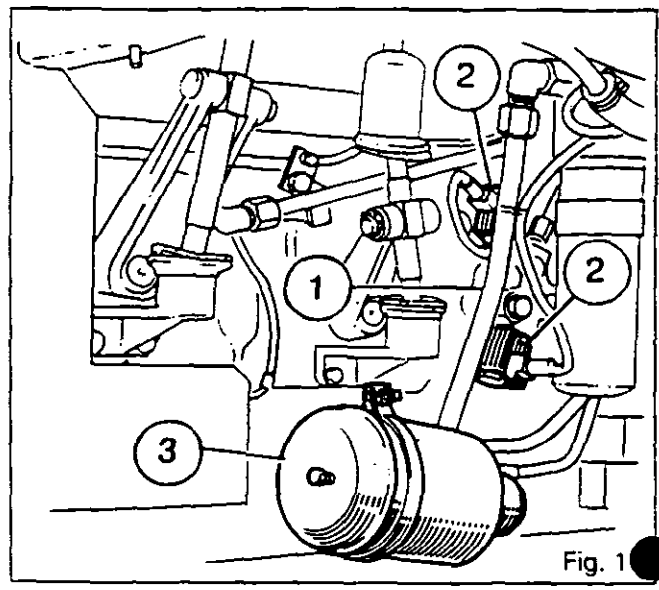
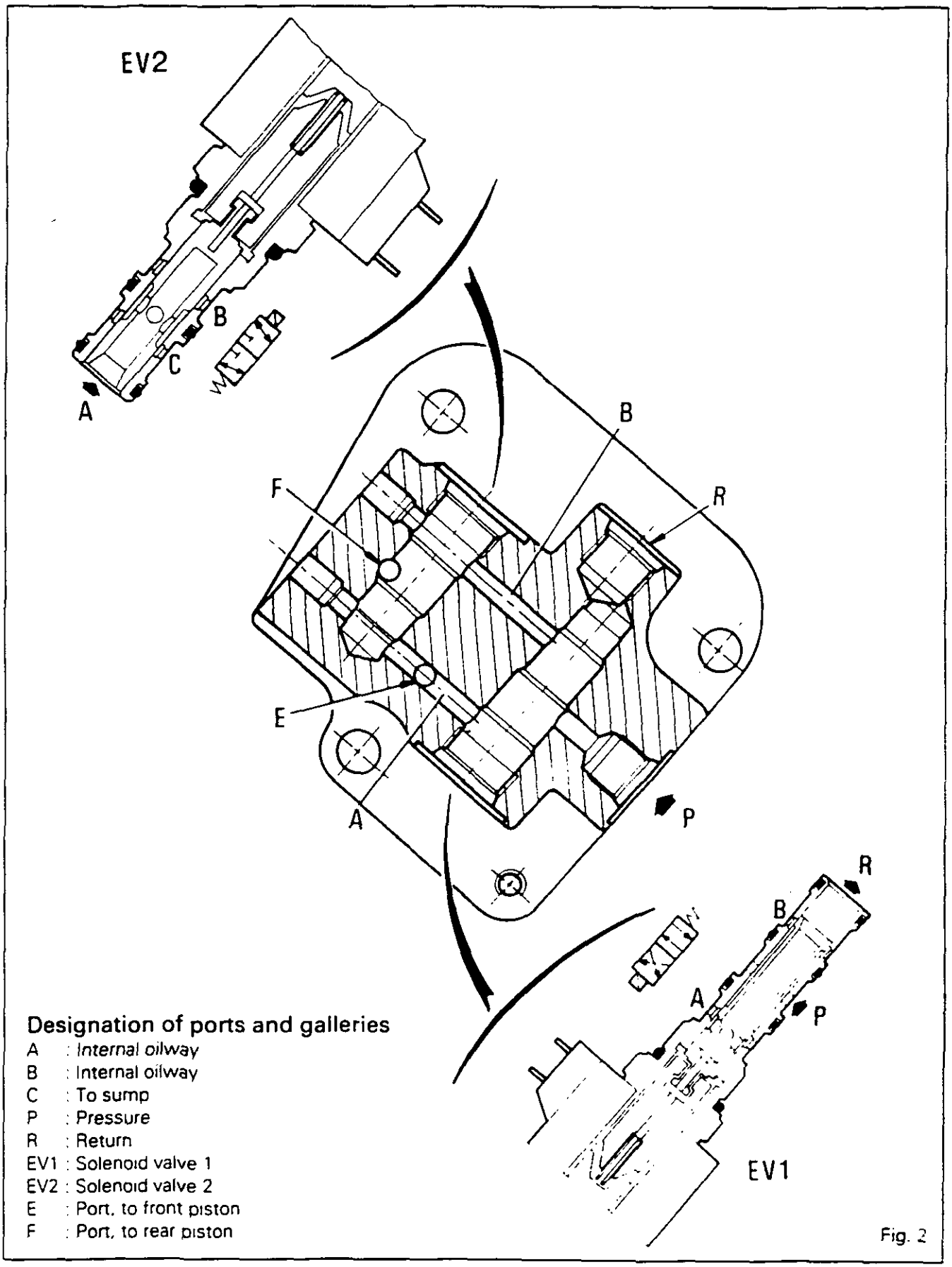


Fig. 1

Lubrication

The oil flow coming from the cooler lubricates the mechanical elements of the Dynashift, reverse shuttle unit, gearbox and P.T.O. shaft which pass through the transmission (see chapter 5 N01).

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Designation of ports and galleries

A : Internal oilway
B : Internal oilway
C : To sump
P : Pressure
R : Return
EV1 : Solenoid valve 1
EV2 : Solenoid valve 2
E : Port, to front piston
F : Port, to rear piston

Fig. 2

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A . Ratios explanation

Refer to chapter 5 R02 for the theoretical operation and the mechanical explanation of the ratios (refer also to page 8K01-3 - Fig. 2).

Ratio A (Fig. 3)

Solenoid valve EV1 is supplied, thus allowing oil under pressure to reach gallery A. This gallery directs the oil to the front piston via orifice E, and also, to solenoid valve EV2. Since EV2 is in neutral position, the oil can circulate through the spool valve and orifice F to the rear piston chamber. Both pistons are thus under pressure.

Ratio B (Fig. 4)

A gear change from A to B is obtained when both solenoid valves are supplied. The oil flow to the rear piston is thus interrupted. The rear piston is pushed back by springs which send oil back into gallery B. This gallery communicates with the sump via solenoid valve EV1.

Ratio C (Fig. 5)

A gear change from B to C is obtained by interrupting the electrical supply to solenoid valve EV1, solenoid valve EV2 remains energized. Gallery A is no longer under pressure but is connected to the sump. Consequently, the front piston can return to neutral position.
Gallery B is under pressure. The oil circulates to the rear piston through solenoid valve EV2.

Ratio D (Fig. 6)

Ratio D is obtained by cutting the electrical supply to EV2. The two pistons are connected to the sump by gallery A.

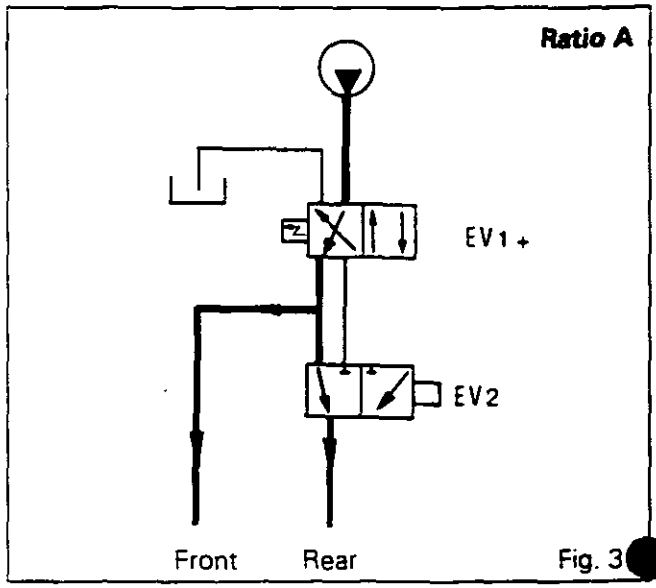


Fig. 3

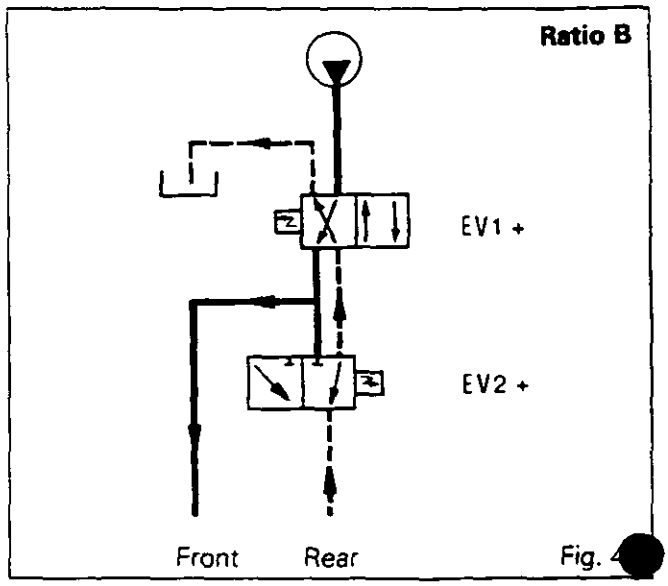


Fig. 4

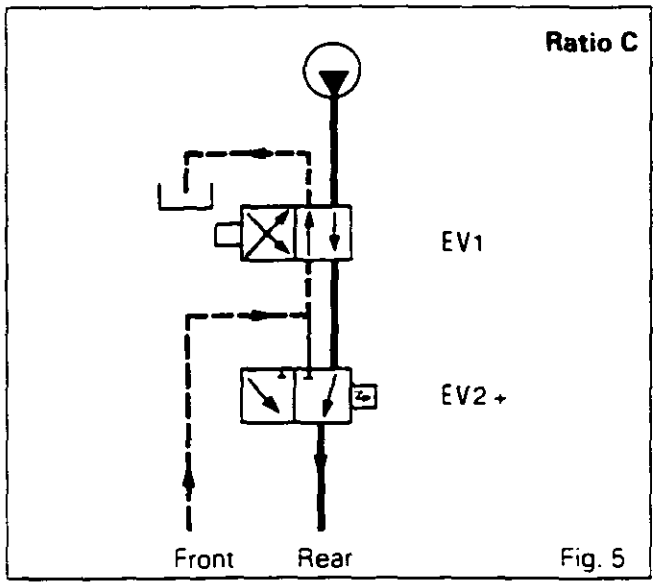


Fig. 5

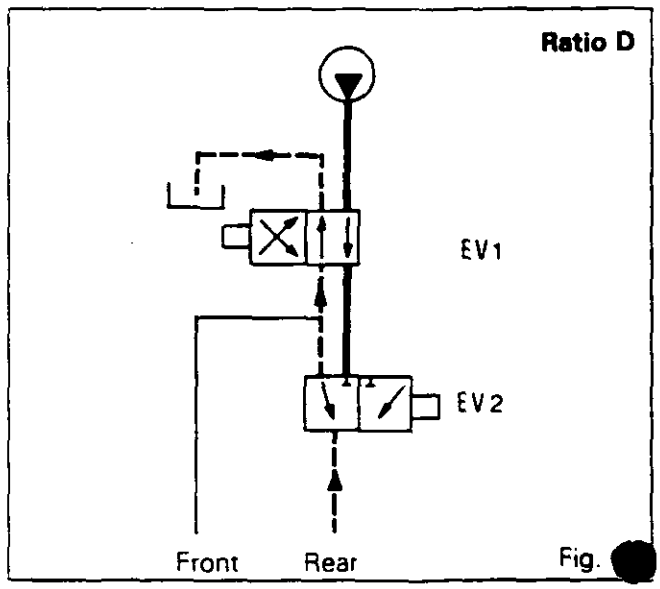


Fig. 6

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B . Dynashift piston pressure check (Fig. 7)

1. Remove plugs **(1)** from the distribution unit.
2. Screw on two male couplers **(2)** and **(3)**, ref. 3384387 M1, and connect them to couplers ref. 3582045 M1, connected to pressure gauges with a capacity of 27 bar approx.
3. Start the engine.
4. Operate the lever under the steering wheel to select each ratio (A, B, C, D).
5. Check that the pressures are correct in accordance with the following table.

Ratio	Front piston coupler (2)	Rear piston coupler (3)
A	17 bar	17 bar
B	17 bar	0
C	0	17 bar
D	0	0

6. If the pressures are not correct, check the displacement of the solenoid spool valve or refer to the electrical tests (chapter 10 C01 p. 4).

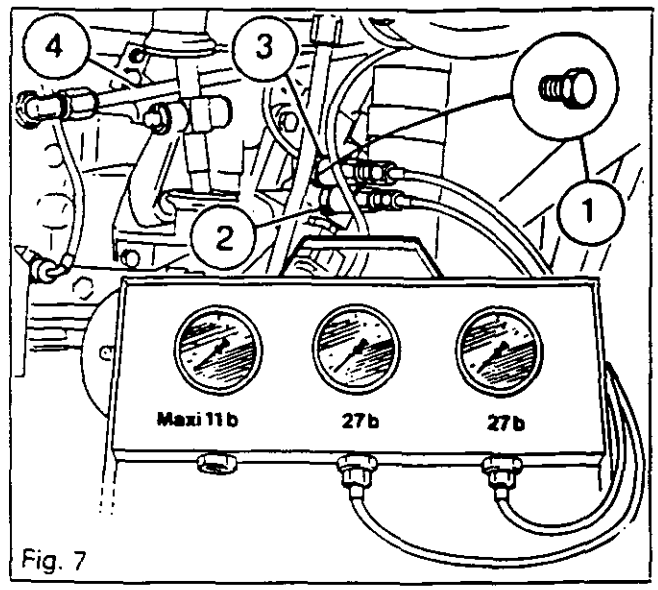


Fig. 7

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9A01 Electrical system

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A. General ____ 2

B. Instrument panel and engine area wiring (with thermostart) ____ 3

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F. Lighting system - USA type ____ 11

G. Fuses ____ 13

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Electrical equipment

A . General

The electrical arrangements in MF 3000/3100 Series tractors comprise a 12 volt negative system, charged by a 70 ampere alternator. The alternator has an integral rectifier and regulator and the charging control is machine sensed. An additional terminal is provided to power the electronic engine tachometer . The alternator is fitted on the right hand side of the engine and is driven by a V-belt from the crankshaft pulley.
The starter motor is of the pre-engaged type mounted on the right hand side of the 1000 series engine and on the left hand side of other engines.
A safety start switch is fitted below the clutch pedal. This renders the starter motor inoperative until the clutch pedal is pressed.

Specifications

Battery

MF 3050-3060-3065

Number	1
Make	CEAC
Type	Maintenance free
Model	FCM 125388
Cold start performance	505 A (-18°C)
Reserve capacity at 25 A	120 min
Voltage	12 V
Acid capacity	8,2 l

MF 3050-3060-3065 (cold climates)
MF 3080-3095-3115-3125

Number	2
Make	CEAC
Type	Maintenance free
Model	FCM 066431
Cold start performance	420 A (-18°C)
Reserve capacity at 25 A	120 min
Voltage	12 V
Acid capacity	4,3 l

Alternator

Make	Valeo
Type	NG
Max. output	70 A
Regulator	Machine sensed
Regulator voltage 1	4,2 V

Starter motor

Make	Magnetti-Marelli
Model	M127 (2.8 Kw)
Voltage	12 V
Type	Pre-engaged

Connector identification

	Colour	Way	Location
C1	Black (circular)	9	Beneath hood
C2	Black (circular) red band	9	Beneath hood
C3	Black	6	Instrument panel
C4	White	5	Instrument panel
C5	Black	7	Instrument panel
C6	White	6	Instrument panel
C7	White	4	Instrument panel
C8	Black	2	Beneath hood
C9	Black (circular)	3	Beneath hood
C10	Black	1	Beneath cab - Front RH
C11	Black	1	Engine - RH side
C12	White	3	Beneath lift console
C13	Black	3	RH cab pillar
C14	White	5	Beneath lift console
C15	Black	1	Beneath cab - Front RH
C16	Black	6	Roof - Front RH
C17	Black	3	Roof - Front RH
C18	Black	6	Roof - Front RH
C19	Black	2	Roof - Front RH
C21	Black	2	Instrument panel
C22	Black	2	Beneath lift console
C23	Black	1	Roof - Front RH
C24	Black	4	Roof - Front RH
C25	Black	1	Instrument panel
C26	Black	1	Beneath hood
C27	Black	1	Instrument panel
C30	Black	2	Instrument panel
C31	White	7	Instrument panel
C33	Black	2	Autotronic box
C34	Black	2	Autotronic box
C45	Black	1	Instrument panel
C60	Black	6	Instrument panel

Identification of harnesses

(a) Instrument panel main harness
(b) Engine harness
(c) Engine harness extension
(d) Control panel harness
(e) Thermostart wire (or harness)
(f) Instrument panel / roof harness
(g) Roof harness
(i) Rear wiper / washer harness
(j) Washer pump harness
(l) Harness - Door switch for interior light
(m) Instrument panel electronic harness
(o) Battery harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(y) Main switch harness
(z) Wire for radio, digital clock, interior light (for main switch)

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B . Instrument panel and engine area wiring (with thermostart)

Key to diagram

1 . Starter switch
2 . Safety switch
3 . Alternator warning light
4 . Rev. counter
5 . Engine oil pressure warning light
6 . Water temperature gauge
7 . Air filter vacuum warning light
8 . Brake oil pressure warning light
9 . Parking brake warning light
10 . Oil filter vacuum warning light
11 . Fuel gauge indicator
12 . Hare warning light (instrument panel)
13 . Hare warning light (console)
14 . Switch illumination
15 . Cigar lighter
16 . Fuel gauge
17 . Oil filter vacuum switch
18 . Parking brake switch
19 . Air filter vacuum switch
20 . Temperature sender unit
21 . Engine oil pressure sensor
23 . Alternator
24 . Starter motor
25 . Battery
26 . Main switch (if fitted)
27 . Fuse 5 A (if fitted)
28 . Thermostart
30 . Pressure switch
31 . Air conditioning compressor
32 . Injection pump solenoid *
33 . Front windscreen washer pump
34 . Rear windscreen washer pump (if fitted)
35 . Switch (if fitted)
36 . Water circulating pump (if fitted)
37 . Front windscreen washer switch
38 . Air conditioning thermostat
39 . Console illumination
40 . Blower switch
41 . Blower motor
42 . Front windscreen wiper switch
43 . Windscreen wiper motor
44 . Interior light
45 . Door switch
46 . Digital clock
47 . Radio (except NA)
48 . Radio (NA only)
49 . Relay

Colour code

A = Silver
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark
C = Light

Abbreviations, symbols

AD : Connector AD (= C14) connected to AC (section 13 B01.C) or N
V : connected to connector V, section 13B01.C
AH : Connector AH, section 12B01.E
AP : Connector Ap, section 12B01.E
HB : Hand brake buzzer (if fitted)
PB : Pneumatic brake (if fitted)
PS : Pneumatic seat (if fitted)
WM : Rear windscreen wiper motor
WR : Rear washer switch
WS : Rear windscreen wiper / washer switch

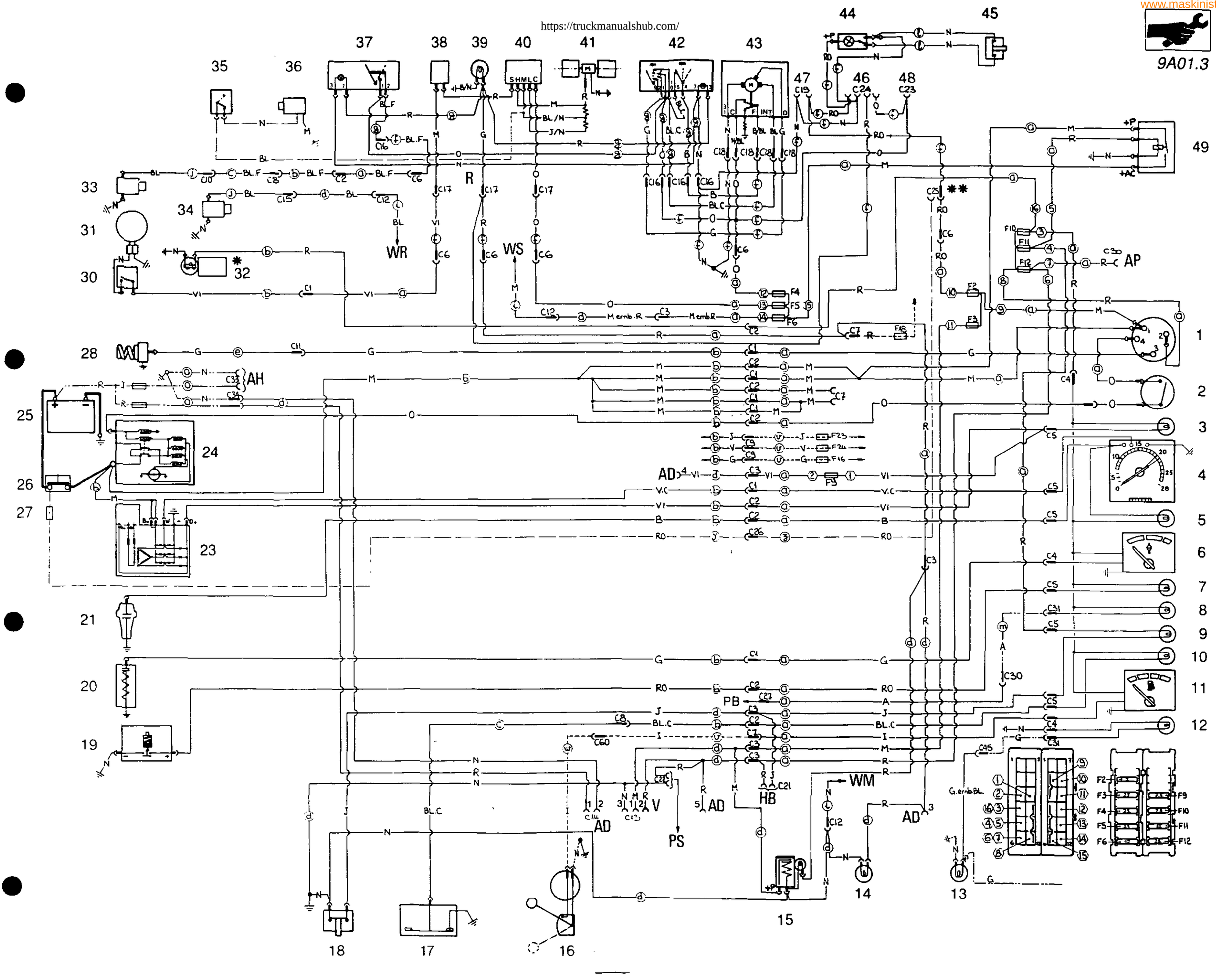
— — — = Wiring forming part of lighting harnesses
— – – — = Wiring forming part of electronic harnesses

+P = + Permanently live
+AC = + live when ignition is on
* Tractors equipped with series 1000 engines
** On tractors fitted with main switch disconnect connector C25 of harness (f) and connect its terminal to the female terminal of wire (Z). The unused female connector should be insulated carefully and attached to the harness using adhesive tape

Note : If the alternator warning light (3) does not illuminate at position 2 of the starter switch check that bulb is not burnt out. If the bulb is burnt out the excitation will not occur and the alternator will not charge rendering the electronic lift control inoperative.

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C . Instrument panel and engine area wiring (with etherstart)

Key to diagram

1 . Starter switch
2 . Safety switch
3 . Alternator warning light
4 . Rev. counter
5 . Engine oil pressure warning light
6 . Water temperature gauge
7 . Air filter vacuum warning light
8 . Brake oil pressure warning light
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10 . Oil filter vacuum warning light
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22 . Engine oil pressure sensor
23 . Alternator
24 . Starter motor
25 . Battery
26 . Main switch (if fitted)
27 . Fuse 5 A (if fitted)
29 . Ether solenoid
30 . Pressure switch
31 . Air conditioning compressor
32 . Injection pump solenoid *
33 . Front windscreen washer pump
34 . Rear windscreen washer pump (if fitted)
35 . Switch (if fitted)
36 . Water circulating pump (if fitted)
37 . Front windscreen washer switch
38 . Air conditioning thermostat
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44 . Interior light
45 . Door switch
46 . Digital clock
47 . Radio (except NA)
48 . Radio (NA only)
49 . Relay
50 . Ether switch
51 . Relay

Colour code

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Abbreviations, symbols

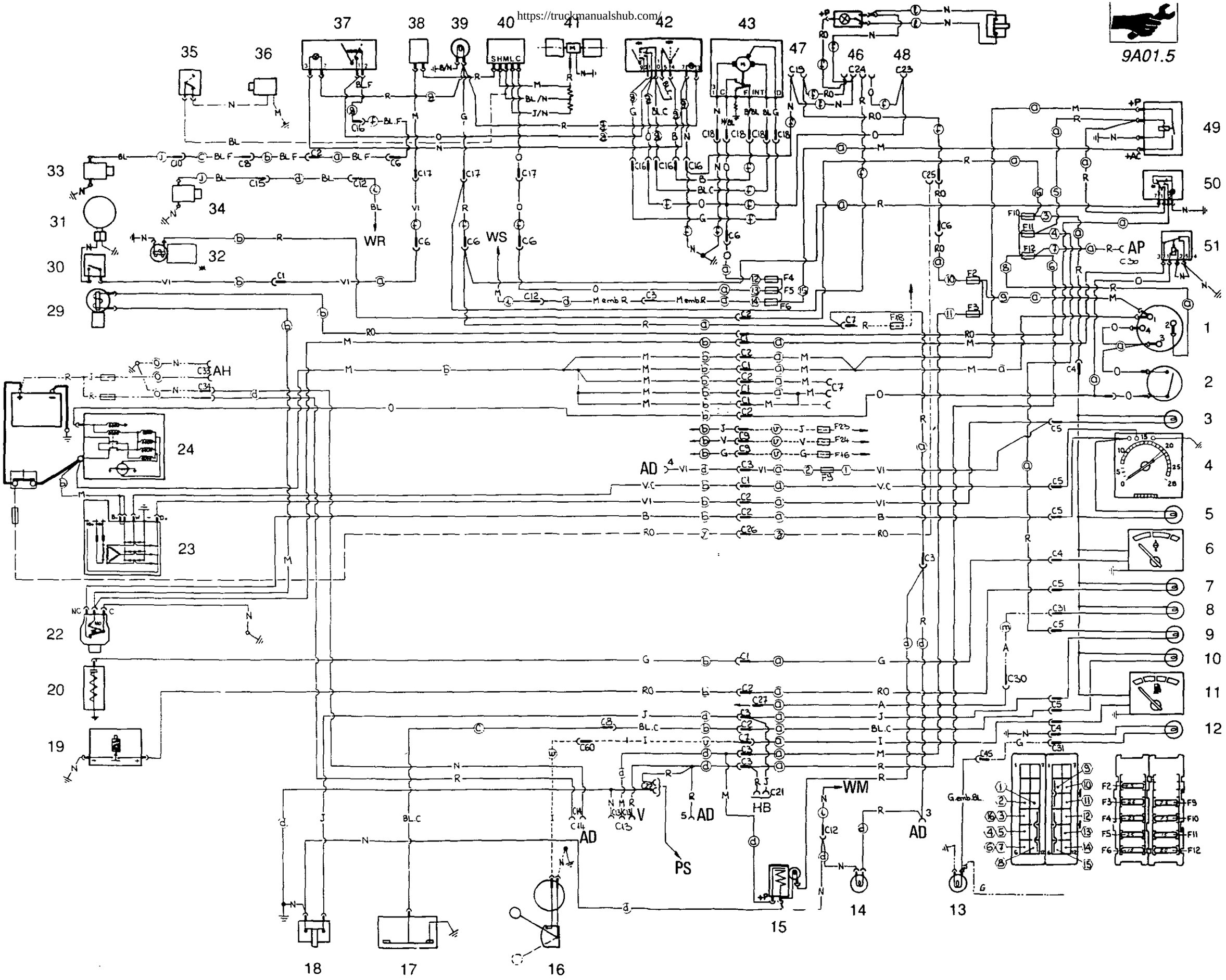
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PB : Pneumatic brake (if fitted)
PS : Pneumatic seat (if fitted)
WM : Rear windscreen wiper motor
WR : Rear washer switch
WS : Rear windscreen wiper / washer switch

— — —= Wiring forming part of lighting harnesses
— - - —= Wiring forming part of electronic harnesses

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+AC = + live when ignition is on
* Tractors equipped with series 1000 engines
** On tractors fitted with main switch disconnect connector C25 of harness (f) and connect its terminal to the female terminal of wire (Z). The unused female connector should be insulated carefully and attached to the harness using adhesive tape

Note : If the alternator warning light (3) does not illuminate at position 2 of the starter switch check that bulb is not burnt out. If the bulb is burnt out the excitation will not occur and the alternator will not charge rendering the electronic lift control inoperative.

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D . Lighting system - Europe type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
7 . Power socket
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
12 . Front LH side light
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
18 . Front RH side light
19 . Front RH direction indicator
20 . Flashing beacon
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
26 . Flashing beacon switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

A = Silver
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark

Abbreviations, symbols

Emb = Sleeve (band)
+P = +Permanently live
+AC = + Live when ignition is on

— — — = wiring forming part of engine harnesses
— - - — = wiring for platform tractors without pillar only
• wire non present on platform tractors without pillar

Connector identification

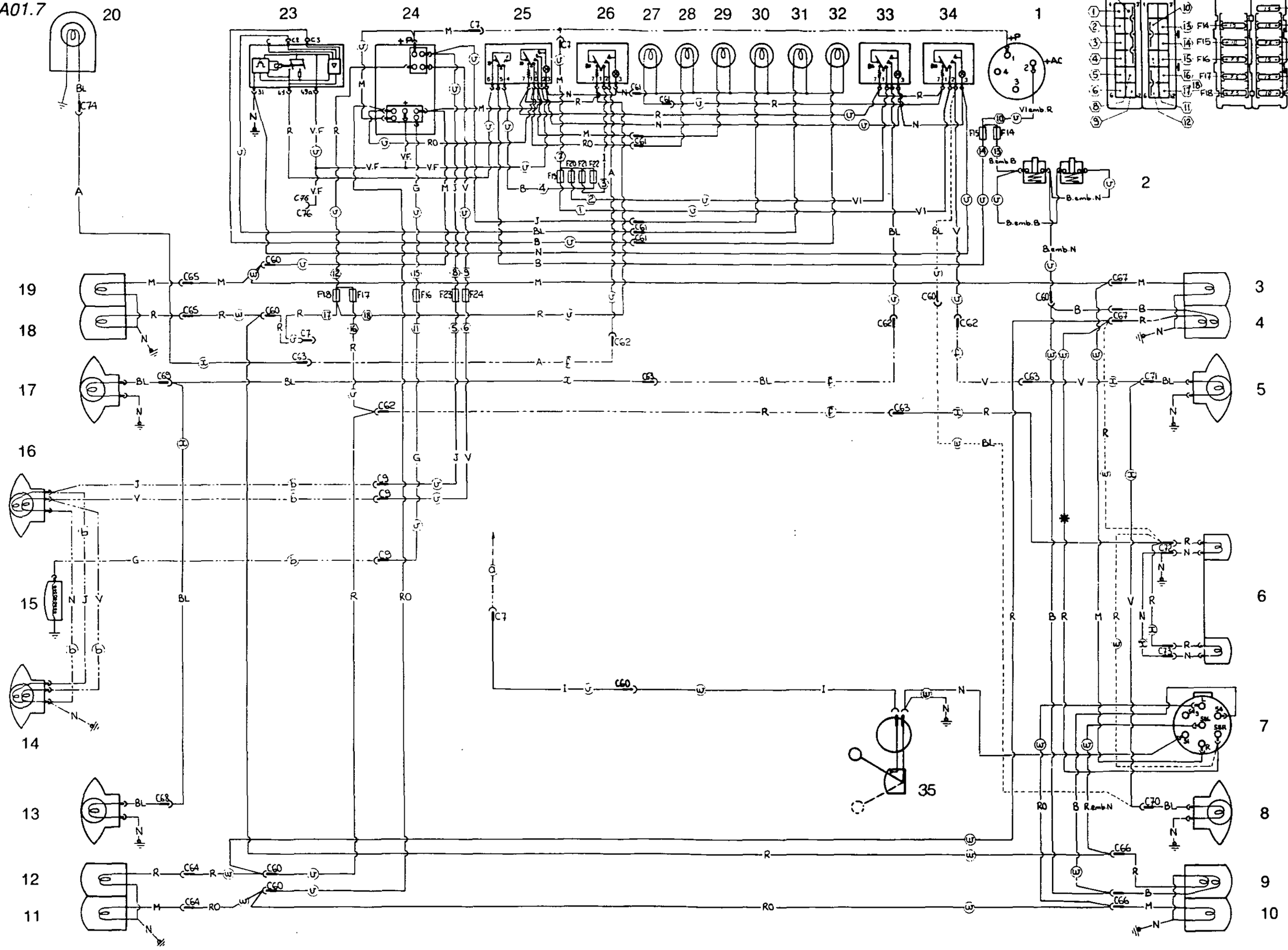
C7 = White, 4 way connector
C9 = Black, 3 way connector
C60 = Black, 6 way connector (8 way on plateform tractors without pillar)
C61 = Green, 7 way connector (instrument panel)
C62 = Black, 4 way connector
C63 = Black, 4 way connector
C64 = Black, 2 way connector
C65 = Black, 2 way connector
C66 = Black, 3 way connector
C67 = Black, 3 way connector
C68 = Black, 1 way connector
C69 = Black, 1 way connector
C70 = Black, 1 way connector
C71 = Black, 1 way connector
C72 = Black, 2 way connector
C73 = Black, 2 way connector
C74 = Circular, 1 way connector
C76 = Black, 1 way connector

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) Instrument panel / roof harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(x) Roof lighting harness

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E . Lighting system - Germany type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
7 . Power socket
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
12 . Front LH side light
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
18 . Front RH side light
19 . Front RH direction indicator
20 . Flashing beacon
22 . Work lamp relay
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
26 . Flashing beacon switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

A = Silver
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark

Abbreviations, symbols

Emb = Sleeve (band)
+P = +Permanently live
+AC = + Live when ignition is on
— — — = wiring forming part of engine harnesses

Connector identification

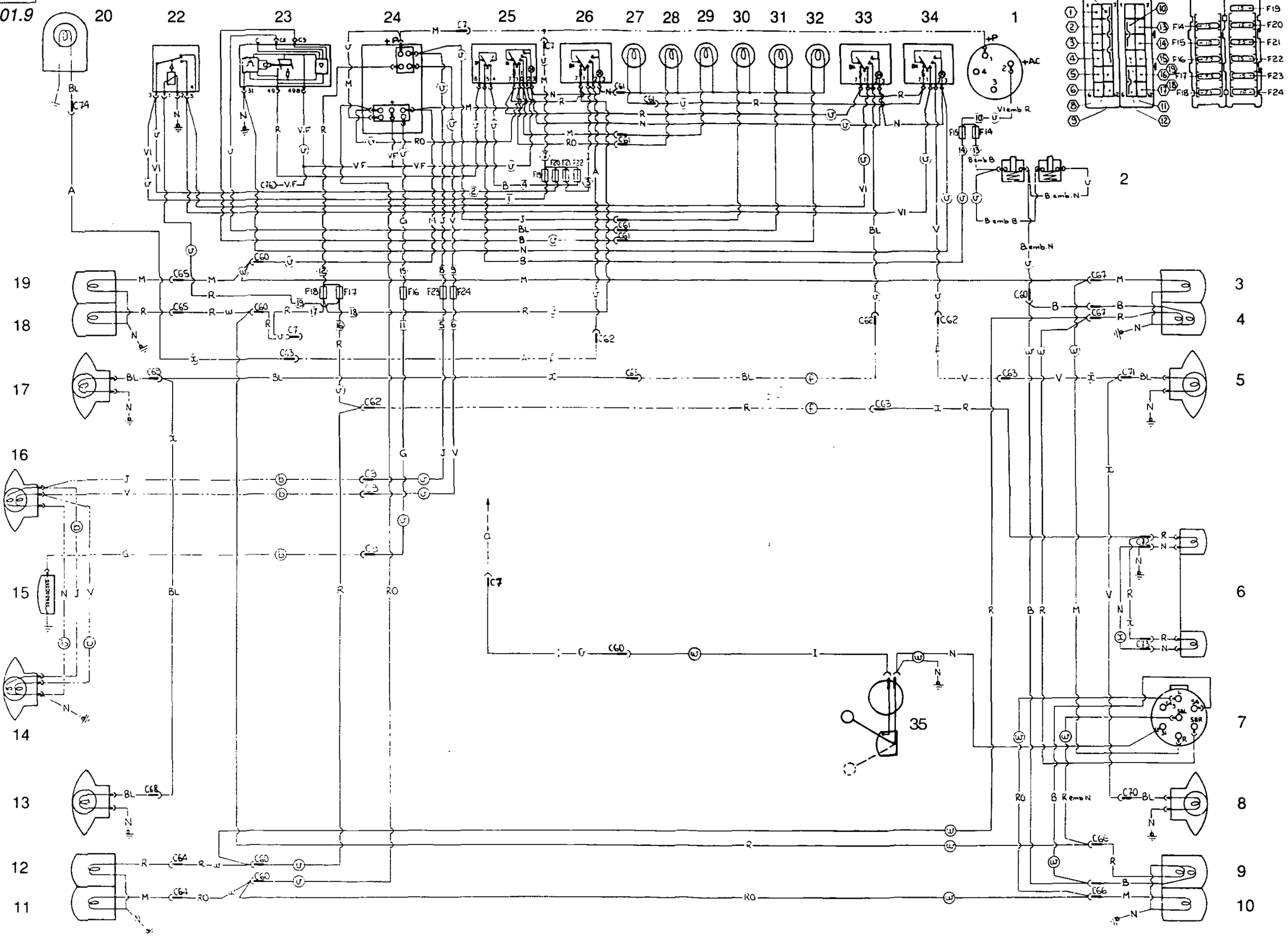
C7 = White, 4 way connector
C9 = Black, 3 way connector
C60 = Black, 6 way connector
C61 = Green, 7 way connector (instrument panel)
C62 = Black, 4 way connector
C63 = Black, 4 way connector
C64 = Black, 2 way connector
C65 = Black, 2 way connector
C66 = Black, 3 way connector
C67 = Black, 3 way connector
C68 = Black, 1 way connector
C69 = Black, 1 way connector
C70 = Black, 1 way connector
C71 = Black, 1 way connector
C72 = Black, 2 way connector
C73 = Black, 2 way connector
C74 = Circular, 1 way connector
C76 = Black, 1 way connector, junction with creeper gear harness

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) Instrument panel / roof harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(x) Roof lighting harness

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F . Lighting system - USA type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
19 . Front RH direction indicator
21 . Relay
22 . Relay
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

A = Silver
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark

Abbreviations, symbols

Emb = Sleeve (band)
+P = +Permanently live
+AC = + Live when ignition is on
— — — = wiring forming part of engine harnesses
* = not used

Connector identification

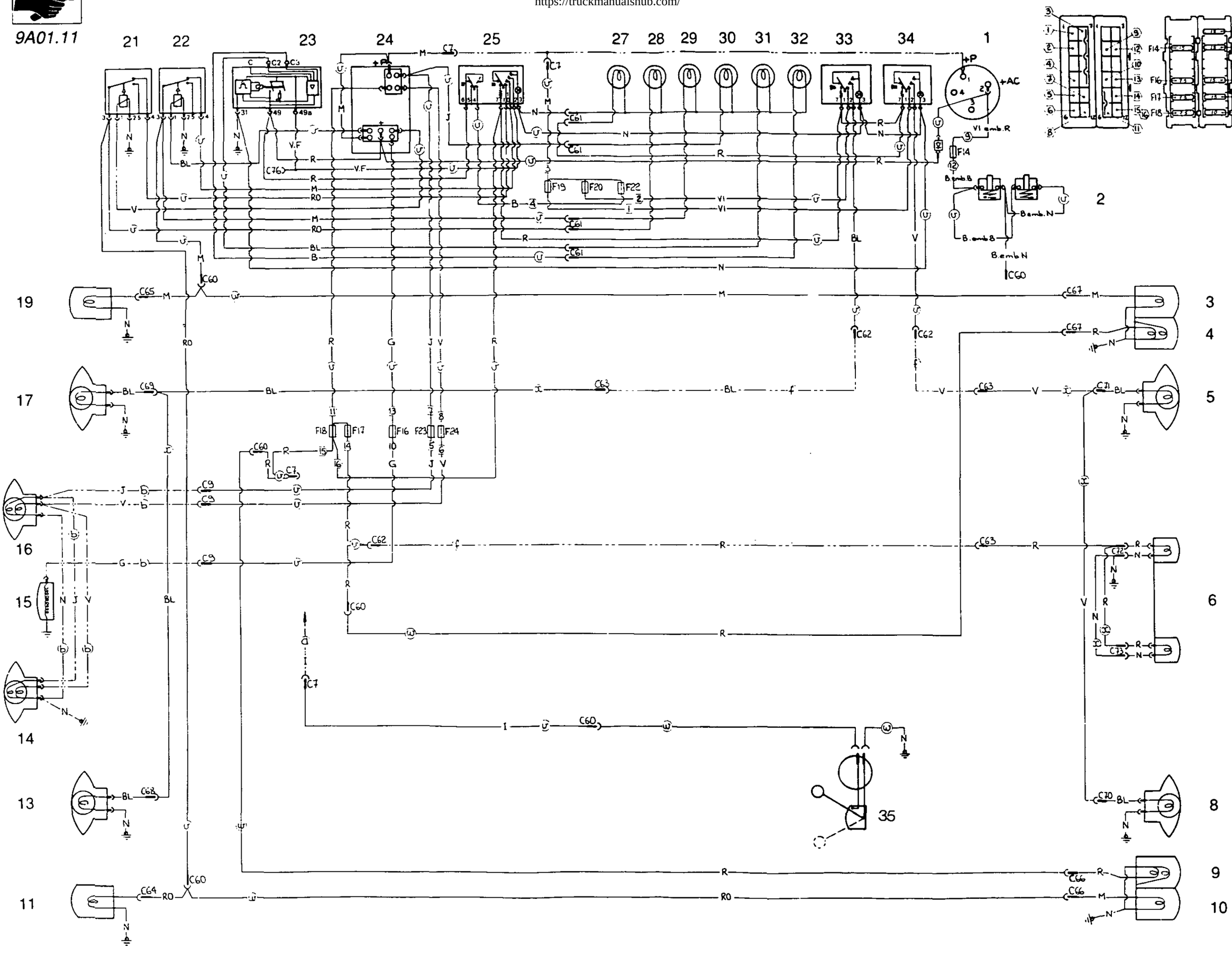
C7 = White, 4-way connector
C9 = Black, 3-way connector
C60 = Black, 6-way connector
C61 = Green, 7-way connector (instrument panel)
C62 = Black, 4-way connector
C63 = Black, 4-way connector
C64 = Black, 2-way connector
C65 = Black, 2-way connector
C66 = Black, 2-way connector
C67 = Black, 2-way connector
C68 = Black, 1-way connector
C69 = Black, 1-way connector
C70 = Black, 1-way connector
C71 = Black, 1-way connector
C72 = Black, 2-way connector
C73 = Black, 2-way connector
C76 = Black, 1-way connector, junction with MF 3000 creeper gear harness

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) Instrument panel / roof harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(x) Roof lighting harness

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Electrical equipment

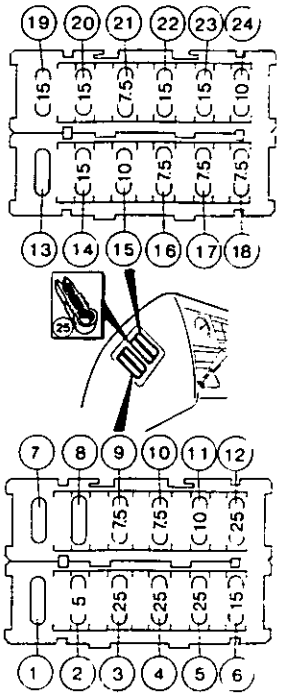
G . Fuses

Fuses are fitted in a box located on the left hand side of the instrument panel.
The box is divided into two parts. The upper part contains the fuses for the lighting system and the lower part the fuses which protect the engine and electronic functions.
A special tool (25) located in the box enables fuses to be replaced easily.

Note : Fuse box should always be kept very clean. Fuses must not be replaced with ones of higher rating, since this may cause damage to the electrical equipment. If any of the fuses blow, the fault must be traced and remedied.

In addition to those fitted in the fuse box, there are also three fuses situated at the front RH side, beneath the hood.
- a 7,5 amp (brown) protects the electronic lift.
- a 10 amp (red) protects the Autotronic transmission control unit.
- a 5 amp (yellow) protects the front PTO (if fitted).

A 3 amp in Datatronic tractor performance monitor wiring harness in console (if fitted).



Fuse n°	Rating (Amp)	Colour	Applications
1 - 7 - 8	Spares		
2	5	Yellow	(+P) Interior light - Radio
3	25	White	(+P) Cigar lighter and internal power socket
4	25	White	(+AC) Front windscreen wiper and washer
5	25	White	(+AC) Air conditioning blower and compressor
6	15	Blue	(+AC) Rear screen wiper and washer
9	7.5	Brown	(+ ER) Electronic lift
10	7.5	Brown	(+AC) Instrument panel unit and injection pump solenoid
11	10	Red	(+AC) Cab relay solenoid and parking brake warning light
12	25	White	(+AC) Hare/Tortoise range control 4 WD control Differential lock control PTO and PTO brake control 4 speed PTO control (economy PTO) Creeper gear control Low pressure warning light (tractors without Autotronic) Linkage raised position switch (tractors with Autotronic) Speedshift control Internal power socket Tractor performance monitor Pneumatic suspension seat (if fitted)
13	Spare		
14	15	Blue	Brake lights (within rear lights)
15	10	Red	Direction indicators
16	7.5	Brown	Horn
17	7.5	Brown	Front left, rear RH side lights and number plate lights
18	7.5	Brown	Front RH and rear LH side lights Instrument panel lighting Illumination of instrument panel Switches roof panel and front windscreen wiper / washer switches Cigar lighter and electronic console switches Electronic linkage console
19	15	Blue	Rear work lamps
20	15	Blue	Front work lamps
21	7.5	Brown	Rotating light (if fitted)
22	15	Blue	Hazard warning lights
23	15	Blue	Headlights (main beam)
24	10	Red	Headlights (dipped beam)

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10 . ACCESSORIES

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10 B02 FITTING A GROUND SPEED PTO ON 4WD TRACTORS

10 C01 FITTING THE FRONT PTO

10 C02 REPAIRING THE FRONT PTO

10 D01 FRONT LIFT POSITION INDICATOR

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10 A01 Auxiliary spool valve kit

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Accessories - Auxiliary spool valve kit

A. Removing the factory- fitted 2-spool valve assembly

Note: To make a correct installation, remove the «two-spool valves» as an assembly.

1. Remove the oil collectors (if fitted).
2. Disconnect hoses **(1)**, **(2)** and **(3)**(Fig.1).
   Unscrew nuts **(7)**, screws **(6)** and couplers **(5)**. On each spool valve, take out pin **(4)** linking the clevis to the spool (Fig.2).
3. Remove unions **(4)**, **(6)** and **(7)**, quick fit couplings **(5)** and screws **(8)**(Fig.1). Remove the spool valve assembly and place upright on a bench.
4. Remove hose **(3)**. Unscrew nuts **(12)**(Fig.3).
   Remove the flow divider, the spool valves and the intermediate blocks separately.

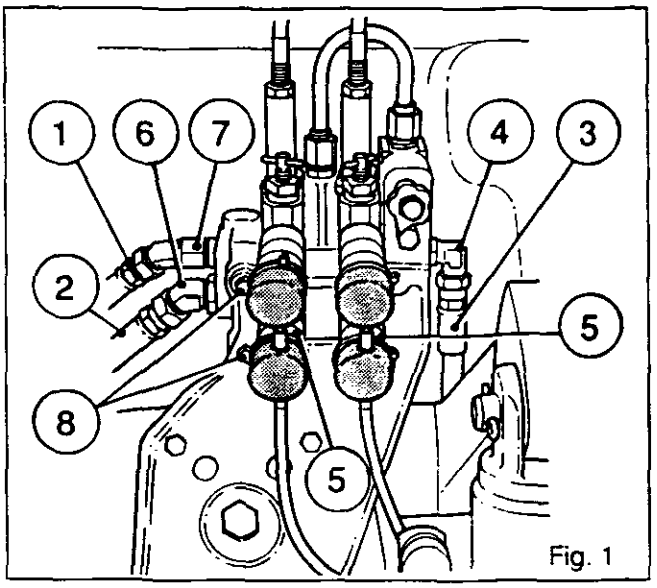


Fig. 1

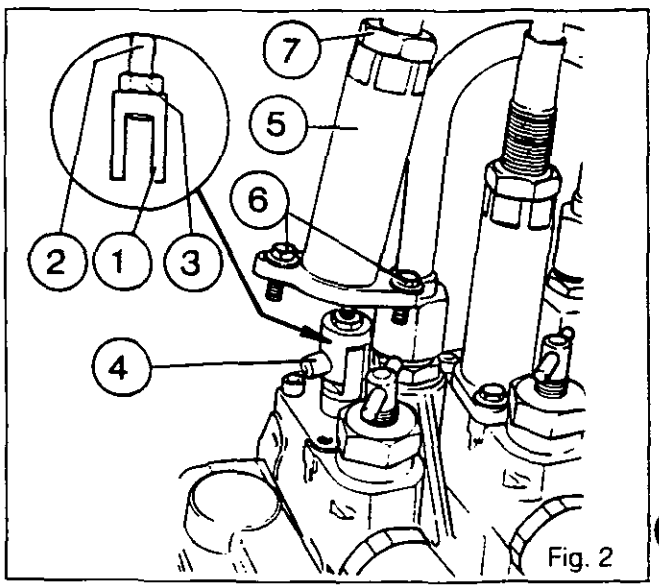


Fig. 2

B. Fitting the three-spool valve assembly

5. Clean the seal surfaces on each spool valve, replace the plates and seals.
6. Replace threaded rods **(1)**(Fig.4).
   Note: The length of the threaded rods differs according to the number of spool valves.
7. Put the end plate with its threaded rods on a bench.

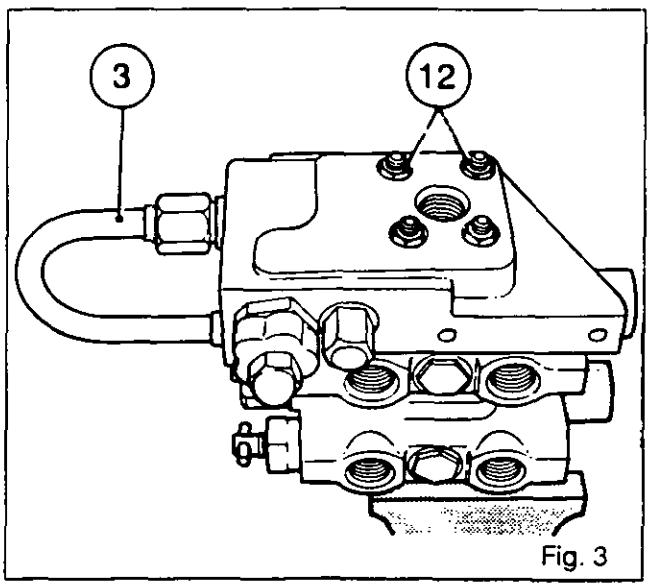


Fig. 3

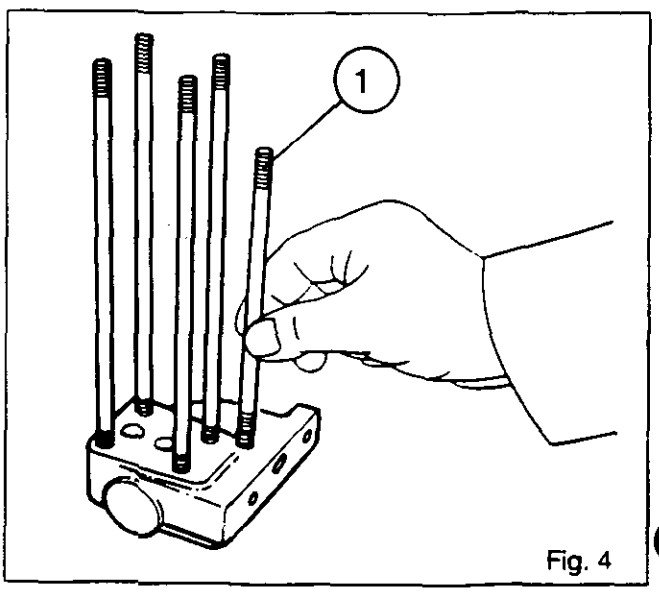


Fig. 4

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Accessories - Auxiliary spool valve kit

8. In order, assemble the sealing plates with their seals, the intermediate blocks, the spool valves and the flow divider (Fig.5).
9. Position the spool valve unit, with fixing faces **F** (Fig.5) resting on a flat surface (Fig.6) to ensure that the spool valves are properly fitted onto their bracket.
   Tighten nuts **(12)** to torque 17 - 20 Nm.
10. Fit and tighten unions **(13)**(Fig.6) and hose **(3)**(Fig.3) to torque 50 Nm.
11. Refit the spool valve assembly (Fig.7). Tighten screws **(8)**. Refit quick couplers **(5)** and connectors **(4)**, **(6)** and **(7)**.
    Note : Replace the 45° union on the lift control valve inlet with a 90° union.
12. Position unions **(4)**, **(6)** and **(7)**. Reconnect and tighten hoses **(1)**, **(2)** and **(3)**(Fig.7).
13. Slide pin **(4)** into each clevis **(1)**(Fig.2).
    Note: Check that the valve spools are in neutral position. Partially screw couplers (5) on the first and second spool valves and fit screws (6) without tightening.

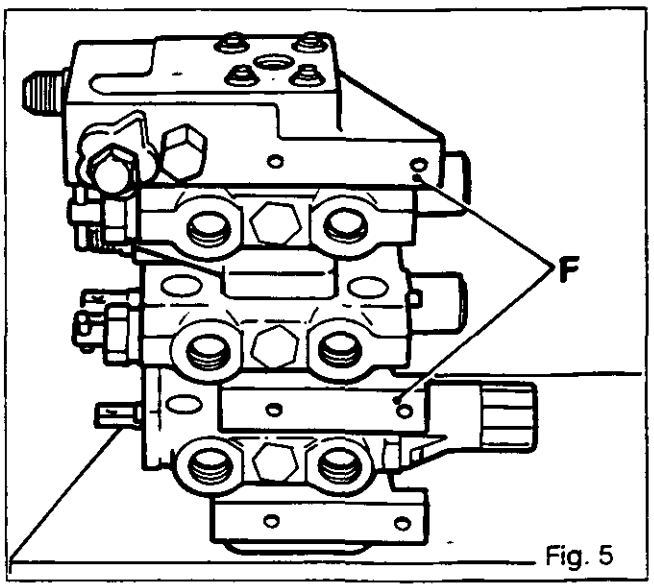


Fig. 5

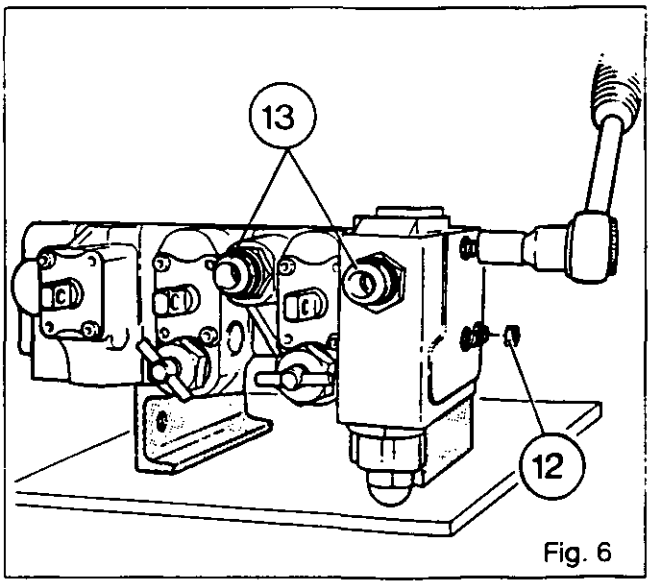


Fig. 6

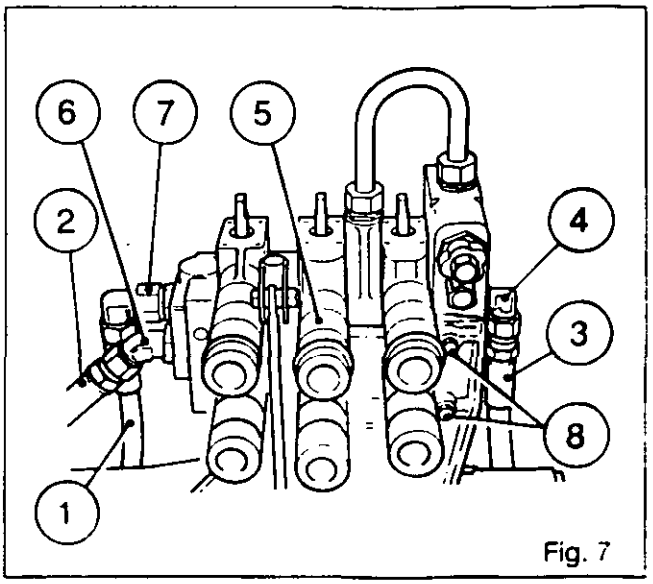
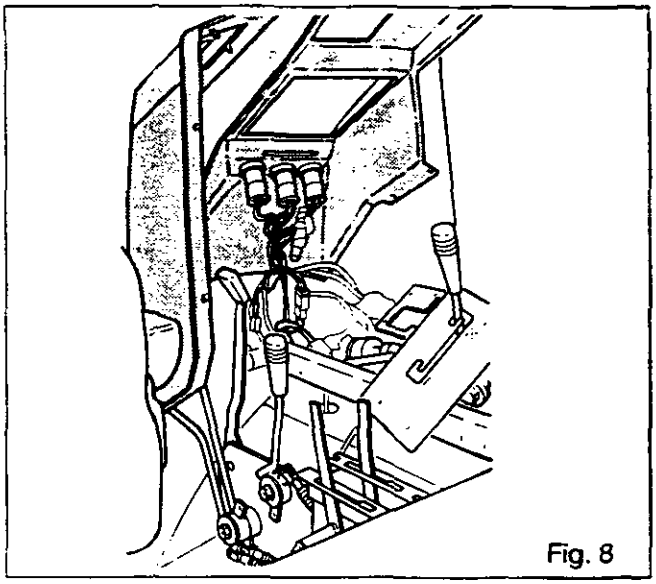


Fig. 7

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C. Removing the consoles in the cab

14. Disconnect the batteries (only the earth cable).
15. Disconnect one end of the right-hand door gas strut and open it to its maximum extent (Protect the fender from any contact with the door).
16. Remove the retaining screws on the lift console and disconnect the connector.
17. Remove the indicator plate retainers from the PTO and auxiliary spool valve controls. If necessary, remove the rubber knobs from the control levers. Remove the hand throttle control adjustment stop (if fitted).
18. Remove the mouldings around the trim.
19. Remove the screws, lift up and push the two consoles forward (Fig. 8), taking care not to disconnect the harnesses.


Fig. 8

Fitting the auxiliary spool valve control lever

Early-type bracket without automatic hook control (Fig. 9)

Note: To facilitate installation on tractors fitted with creeper gears, remove only the bracket for the control, inside the cab.

20. Fit the lever **(1)** with bearing **(2)** and friction washer, coated with molybdenum bisulphide grease.
21. Fit spacer **(5)**, washer **(7)** and tighten nut **(4)** so that the lever moves freely, without any axial play.
22. Fit and adjust the control cable. Carry out operations 44 and 45

    Note: Tractors with creeper gears: Refit the control lever bracket.

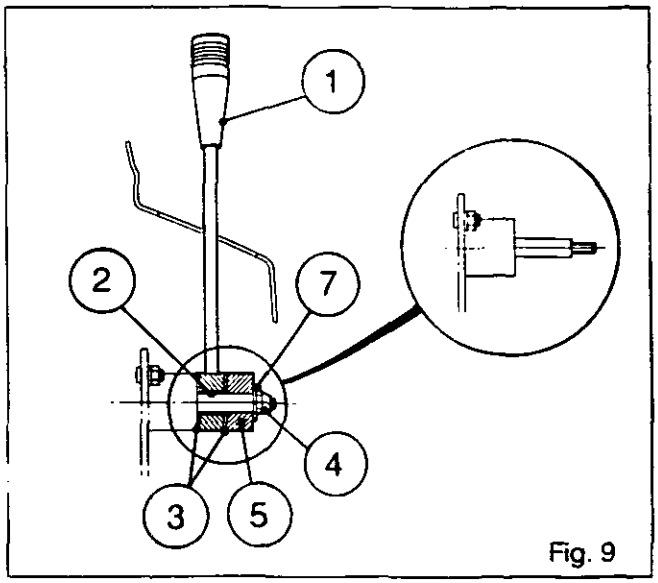


Fig. 9

Early-type bracket with automatic hook control (Fig. 10)

Note: To facilitate installation on tractors with creeper gears, remove only the bracket for the control, inside the cab.

23. Remove the clip attaching the clevis to the lever **(6)**.
24. Unscrew the nut **(4)**. Remove washers **(7)** and **(8)**. Remove control lever **(6)** with bearing **(2)**, friction washers **(3)** and spacer **(5)**.
25. Fit auxiliary spool valve control lever **(1)** and automatic hook lever **(6)** with bearings **(2)** and friction washers **(3)** coated with molybdenum bisulphide grease.
26. Refit washers **(8)** and **(7)**. Tighten nut **(4)** so that the levers move freely with no axial play.

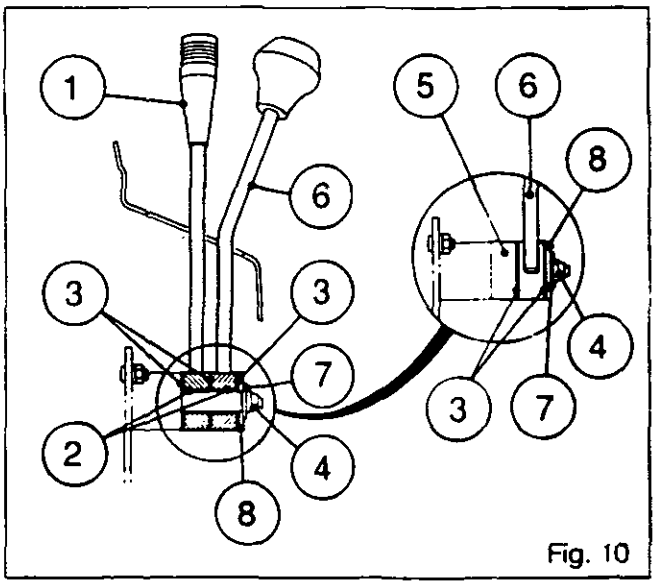


Fig. 10

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27. Fit and adjust the control. Carry out operations 44 and 45.

Note: Tractors with creeper gears, refit the control bracket.

New bracket (Fig.11)

28. Coat the thread of pin **(9)** with Loctite 241 and screw into bracket **(11)**. Tighten nut **(10)**.
29. Fit lever **(1)** with pad **(2)** and friction washers **(3)** coated with molybdenum bisulphide grease.
30. Place washers **(8)** and **(7)**. Tighten nut **(4)** so that the lever operates with no axial play.
31. Fit and adjust the control, carry out operations 50 to 52.

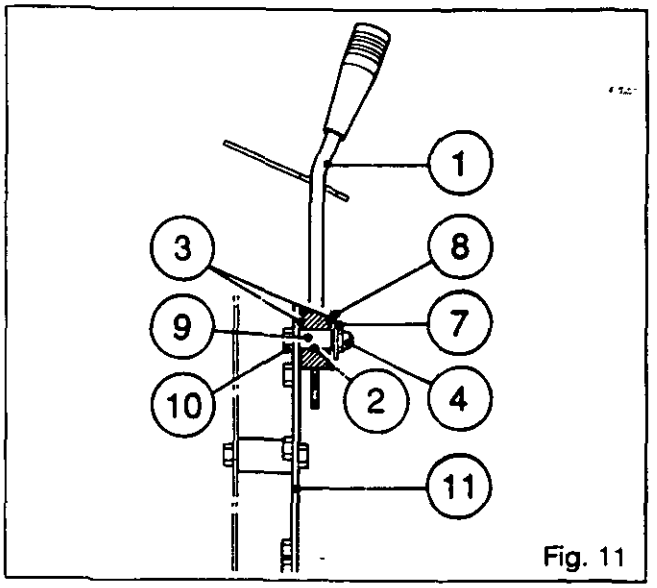


Fig. 11

D. Refitting the consoles in the cab

32. Refit the two consoles. Check that the wiring harnesses are connected. Tighten the screws.
33. Refit the indicator plates, rubber knobs (if removed) and hand throttle control adjustment stop (if fitted).
34. Connect the lifting console connector and refit the console.
35. Connect the battery earth cables.
36. Reconnect the door gas strut.
37. Check that the lifting console and electronic and electric controls work.
38. Apply a bead of silicomet in the angle between the fender and the moulding.
39. Using housing **(5)**(Fig.12), adjust the control cables for the first and second spool valves, making sure that levers C are positioned within tolerances. According to the type of fitting, refer to figures 13 and 14 (early and later type bracket). Tighten screws **(6)** and lock nut **(7)** to torque 20 Nm.
40. Fit and adjust the auxiliary spool valve cable. Early bracket : perform operations 46 to 48. Later bracket : perform operations 53 to 55.
41. Connect a pressure gauge to the quick couplers and check that the three or four positions (depending on option) on each spool valve work.
42. Using several clips, refix the oil collectors (if fitted).
43. Check that the controls work, and check for leaks at the sealing faces of each spool valve, at the quick couplers and at the hydraulic unions.

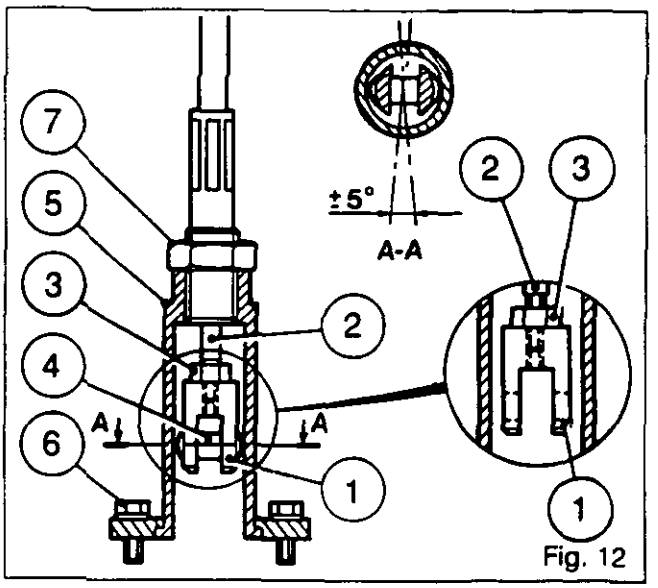


Fig. 12

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E. Fitting and adjusting the auxiliary spool valve cable - Old bracket

On lever (Fig. 13)

44. Put the control cable in the grommet-plate **(10)** at the rear of the cab. Slide cable housing stop **(4)** in slotted bracket **(6)** and fix pin **(5)**.
45. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)** and fit on lever **L** with clip **(7)**. Tighten nut **(3)**.
Note: Check that the cable is not restricted.

On spool valves (Fig. 12)

46. Check that the valve spools are in neutral position. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)**. Tighten nut **(3)**. Fit pin **(4)** in clevis **(1)**.
47. Partially screw housing **(5)** and fit screws **(6)** but do not tighten.
48. Screw housing **(5)** fully home so as to position lever **L** as shown in Fig. 13. Lock screws **(6)** and tighten nut **(7)** to torque 20 Nm.
49. Make sure the control works in all three or four positions (depending on option).

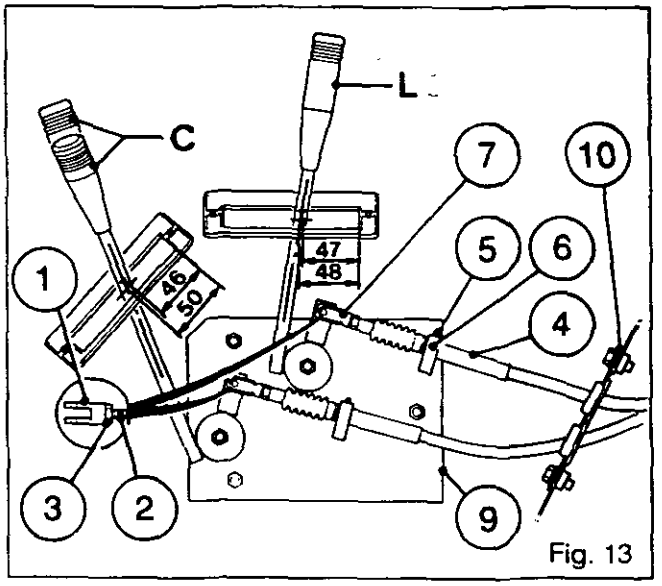


Fig. 13

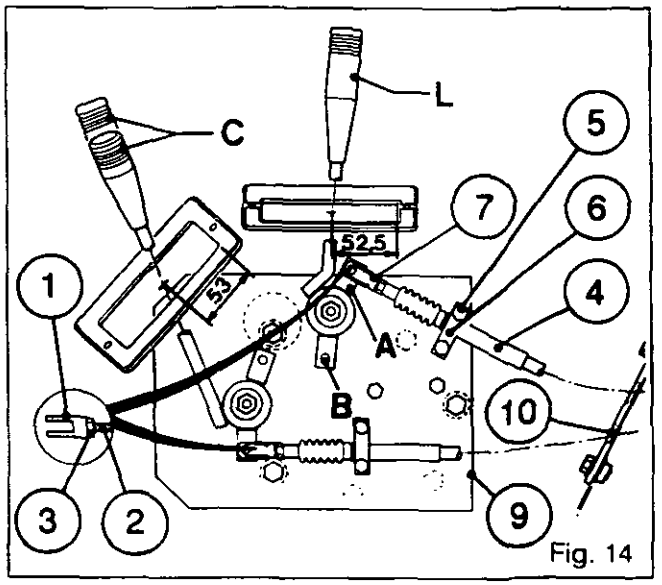


Fig. 14

F. Fitting and adjusting the auxiliary spool valve cable - New bracket

On lever (Fig. 14)

50. Put the control cable through the grommet-plate **(10)** at the rear of the cab.
51. Fit and tighten cable clamp **(6)** on bracket **(9)** on the console.
Note: The attachment of clevis (1) to lever L differs, depending on the type of spool valve.
Attachment A : Four position spool valve, one floating.
Attachment B : Three position spool valve.
Depending on the attachment required on lever L, fix clamp (6) for cable housing end (4) in the correct position.
52. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)** and fit it to lever **L** with clip **(7)**. Tighten nut **(3)**.
Note: Check that the cable is not restricted.

On spool valves (Fig. 12)

53. Check that the spool valve spool is in neutral position. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)**. Tighten nut **(3)**. Fit pin **(4)** in clevis **(1)**.
54. Partially screw clevis housing **(5)** and fit screws **(6)** but do not tighten.
55. Screw clevis housing **(5)** down so as to position lever **L** as shown in figure 14. Lock screws **(6)** and tighten nut **(7)** to torque 20 Nm.
56. Check that the control works in all three or four positions (depending on option).

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41. Fit the shaft assembly **(8)** (Fig.10) and circlip **(4)** in the housing.
42. Place gear **(3)** and fit circlip **(2)**(Fig.11).
43. Check the movement of coupler **(10)** through the access panel in the cover **(12)**.
44. Replace and clean plug **(1)** (Fig.2), apply Loctite 542, and then fix it slightly behind the face of the housing.
45. Fit link **(7)** (fitted with a new O-ring **(5)**) with the dog **(1)** in the groove of coupler **(10)**(Fig.12).
46. Clean and degrease the seal surfaces on the cover and housing.
47. Apply sealing compound (Master joint 510 or *equivalent) to the surface of the cover seal.*
48. Screw two studs into the housing in opposing positions.
49. Fit the control link retainer tube **(4)**, locking plunger **(2)** and spring **(3)** (Fig.12).
50. Refit cover **(12)**. Remove the guide studs. Fit and tighten the bolts to torque 130 - 170 Nm. Check operation of link **(7)** (Fig.12).
51. On the left-hand cover, fit bracket **(1)** for cable (Fig.13).
52. Jack up the tractor.
53. Refit the wheel. Remove the axle stand and the jack.
54. Tighten the wheel nuts to torque 400 - 450 Nm.
55. Fill oil to level in the rear axle.
56. Refit the tow hook.

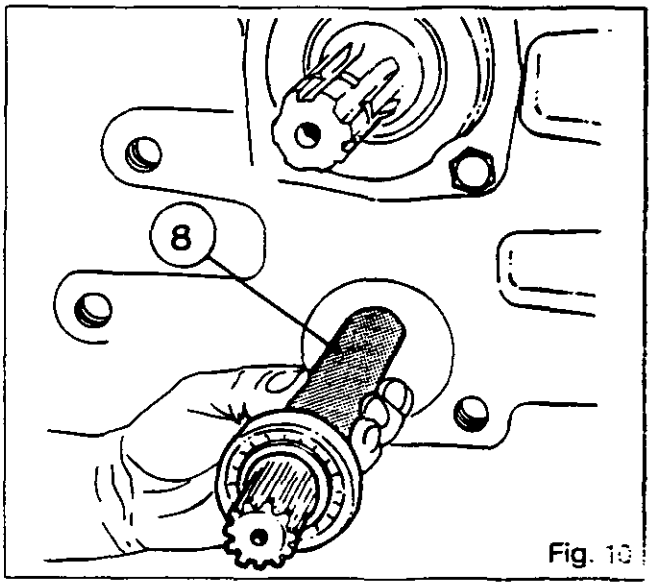


Fig. 10

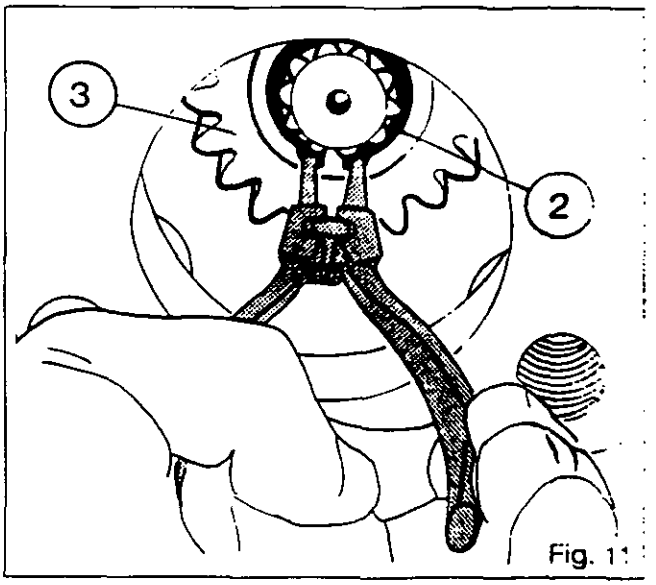


Fig. 11

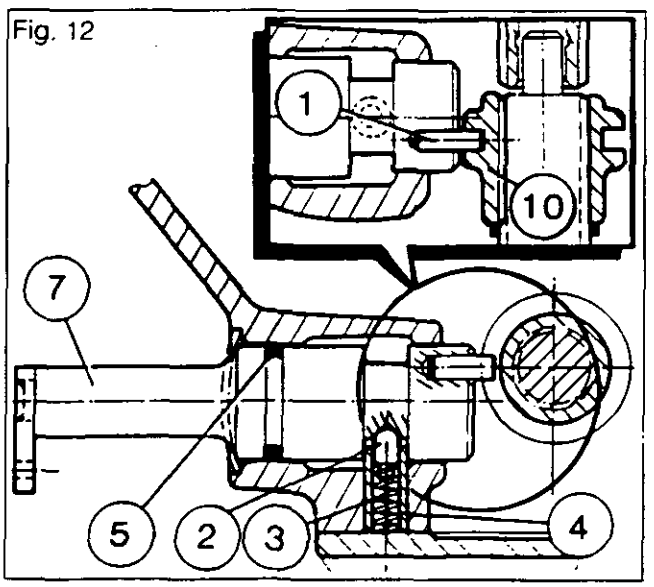


Fig. 12

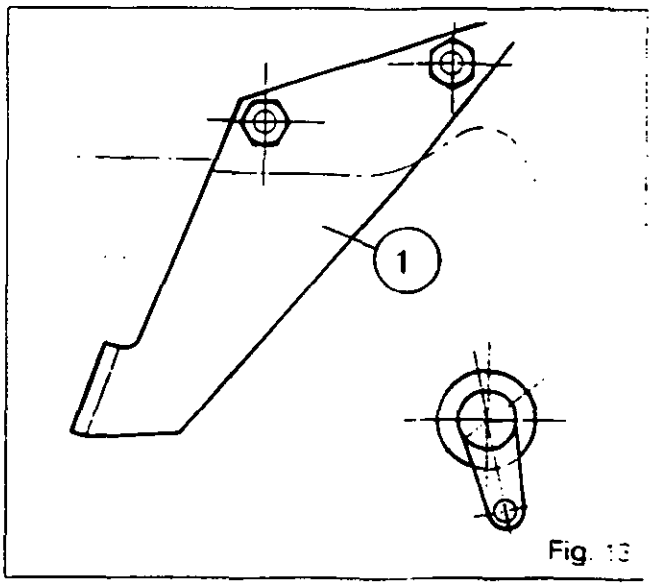


Fig. 13

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C. Removing the lift console

57. Disconnect the batteries (earth cable only).
58. Disconnect one end of the right-hand door gas strut and open fully (protect the fender from any contact with the door).
59. Remove the retaining screws on the lift console and disconnect the connector.
60. Remove the upper mouldings around the fender trim.
61. Remove the screws, lift and push the console forward, making sure not to disconnect the wiring harness.

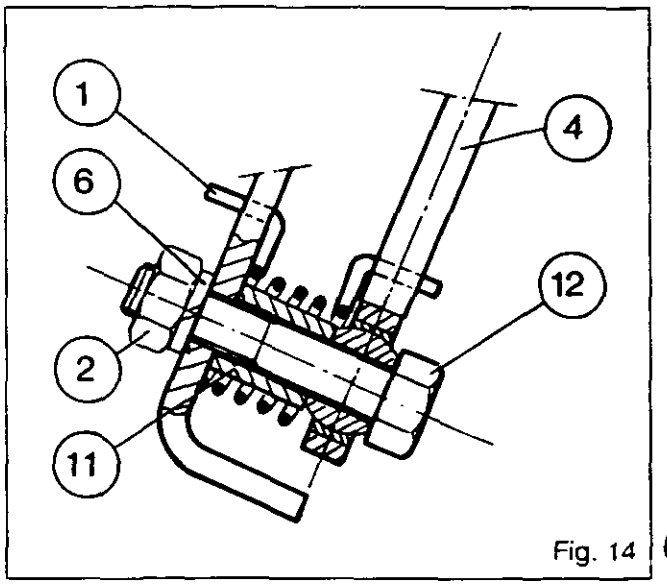


Fig. 14

D. Fitting the control lever (Figs. 14 and 15)

62. Remove nut **(2)** and washer (6). Separate screw **(12)** from lever **(4)** spacer **(11)** and spring **(1)**.
63. Fit pin **(5)** and washer **(6)** on the console and tighten nut **(2)**.
64. Position spring **(1)**, lever **(4)** and link **(7)** with bearings **(3)** and spring **(8)**.
65. Put on washer **(9)** and fit retaining ring **(10)**.
66. Fit and adjust the control. Carry out operations 76 to 80.

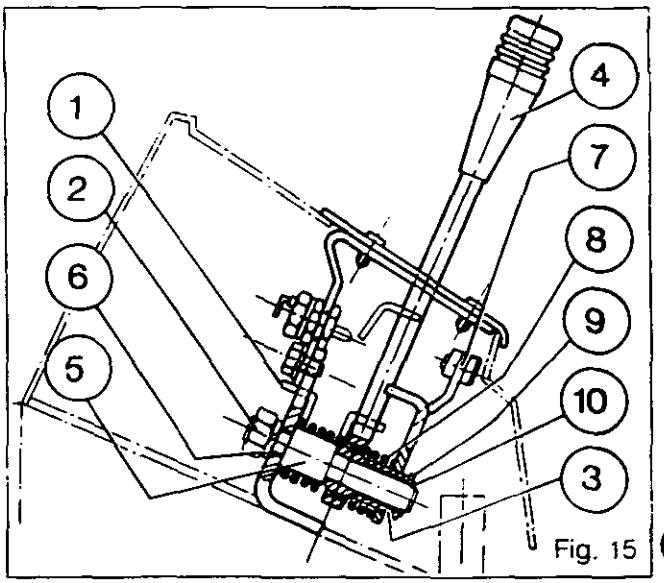


Fig. 15

E. Refitting the lift console

67. Refit the console. Check that the wiring harnesses are connected. Tighten the screws.
68. Refit the "symbol" plate, the rubber knob (if removed), and the adjustable stop on the hand throttle (if fitted).
69. Connect the lift console connector and refit.
70. Connect the battery earth cables.
71. Reconnect the door gas strut.
72. Apply a bead of silicomet in the angle between the fender and the moulding.
73. Fit and adjust the cable on the link located to the left of the rear axle housing. Carry out operations 81 to 87.
74. Check the working of :
    - the lift console and the electronic and electric controls.
    - the ground speed PTO.
    - the automatic hook (if fitted). If it needs adjusting, carry out operations 1 and 6 to 9, chapter 6M01.
75. Check sealing of the seal surfaces :
    - on the cover under the rear axle housing.
    - on the right-hand hydraulic cover and fittings.

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B. Fitting

16. Clean and check the parts and replace any faulty parts. Remove all traces of Loctite from the angles of the plug housing recesses **(1)** and **(24)**(Figs. 3 and 4).
17. Fit gear **(31)** and circlip **(30)**.

Tractors without creeper gears

18. Refit the coupling shaft and sleeve unit and position coupling sleeves **(27)** and **(28)** on shaft **(29)**.
19. Fit double pins **(25)** and **(26)** on the coupling sleeves.
Note: Direct the groove end of sleeve (28) towards the rear of the tractor (Fig.5). Replace the pins (the long pin is fitted on sleeve (27)).

Tractors with creeper gears

20. Refit the shifter fork, coupling shaft and coupler. Carry out operations 22 to 31, chapter 5D01.A.

Tractors with or without creeper gears

21. Replace the right-hand hydraulic cover. Carry out operations 15 to 27, chapter 8101.
22. If needle bearing **(13)** is not fitted in shaft **(18)**, position it 2.5mm back from face "F" (Fig.6).
23. Fix bearing cup **(14)** right up against the shoulder of the housing.
24. Fix bearing cone **(19)** right up against the shoulder of shaft **(18)**, using a suitable press and driver, and then position circlip **(17)**.
25. In order to be able to turn the shaft for J1 shimming, do not fit gear **(16)**. Position bearing cone **(15)**, fit shaft **(18)** assembled with bearing cone **(19)** and circlip **(17)**.
26. Refit bearing cup **(20)**, spacer **(22)** and circlip **(23)**.
Note : For correct shimming, make sure the spacer moves freely in the housing bore.
27. Shim shaft **(18)** to : **J1 = 0 to +0.10**

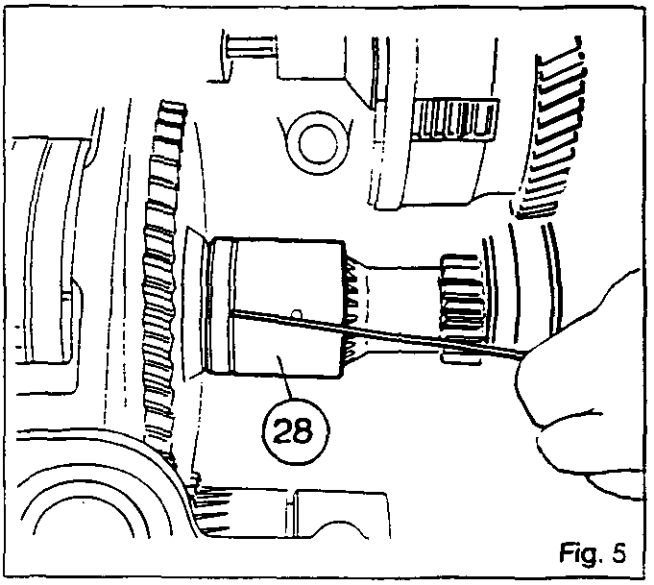


Fig. 5

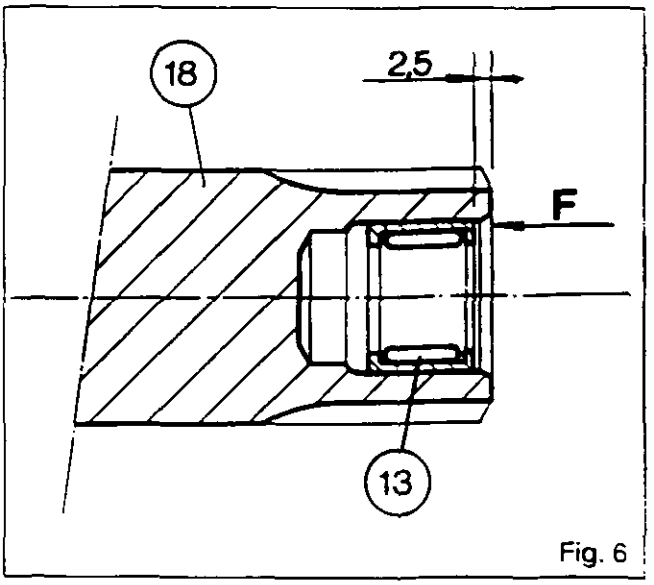


Fig. 6

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Accessories - GSPTO

28. Place a dial indicator on the end of spacer **(22)**(Fig.7).
29. Through the panel in cover **(12)** pull on the shaft, spring **(3)**(Fig.12).
30. Reset the dial indicator to zero.
31. Repeat the operation, this time pushing.
32. Select shims of the right thickness, depending on the amount of play shown on the dial indicator.
33. Remove circlip **(23)** and spacer **(22)**, take out shaft **(18)** assembled with bearing cone **(19)** and circlip **(17)**, keeping circlip **(15)** in place. Refit gear **(16)**, shaft **(18)** and bearing cup **(20)**.
34. Apply two spots of grease on adjusting shims **[21]** selected at step 32, and place them against bearing cup **(20)**.
35. Fit spacer **(22)** and circlip **(23)**.
36. Replace and clean plug **(24)**, apply Loctite 542 to the rim of its housing and fix in place.
37. Place coupler **(10)** on shaft **(18)**.
Note : Put short shoulder "E" facing towards shaft (8)(Fig.8).
38. Fit circlips **(6)** and **(9)** on shaft **(8)**.
39. Using a suitable driver, press bearing **(5)** onto the shaft in contact with circlip (6).
40. Fit circlip **(7)** using long-nose pliers (Fig.9).

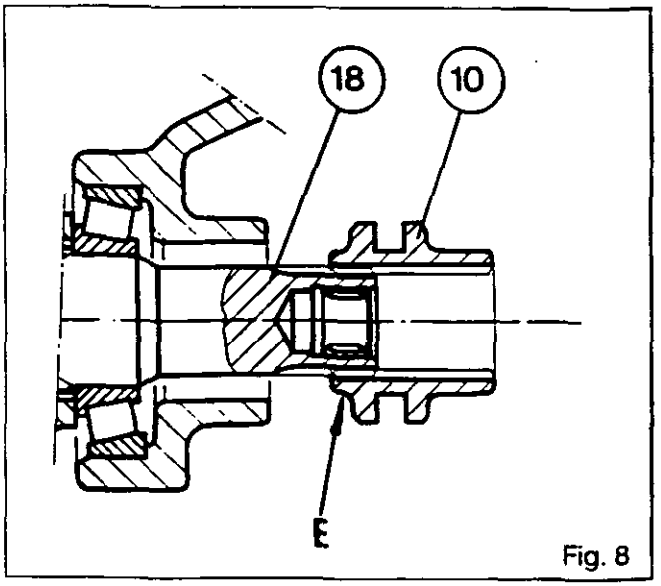


Fig. 8

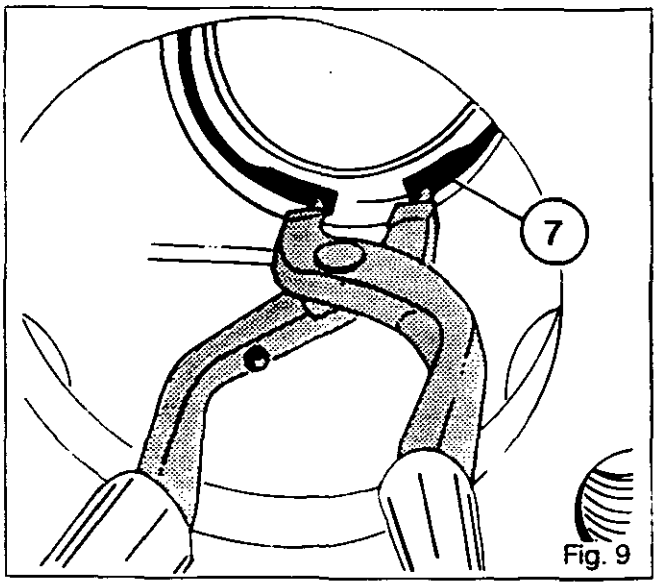


Fig. 9

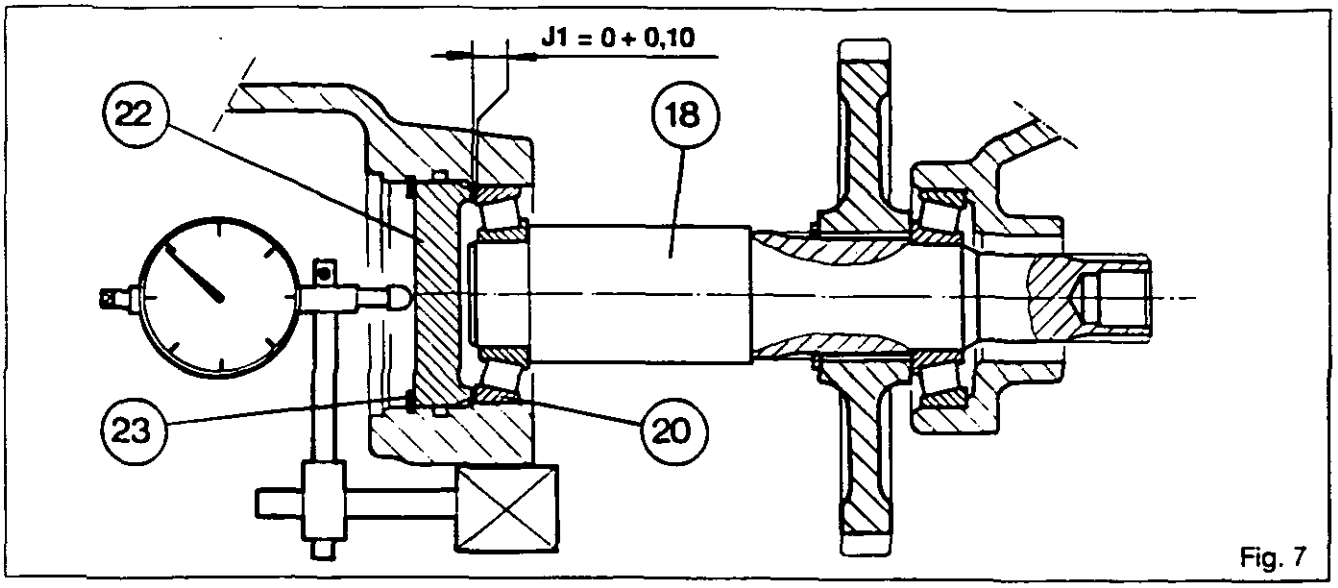


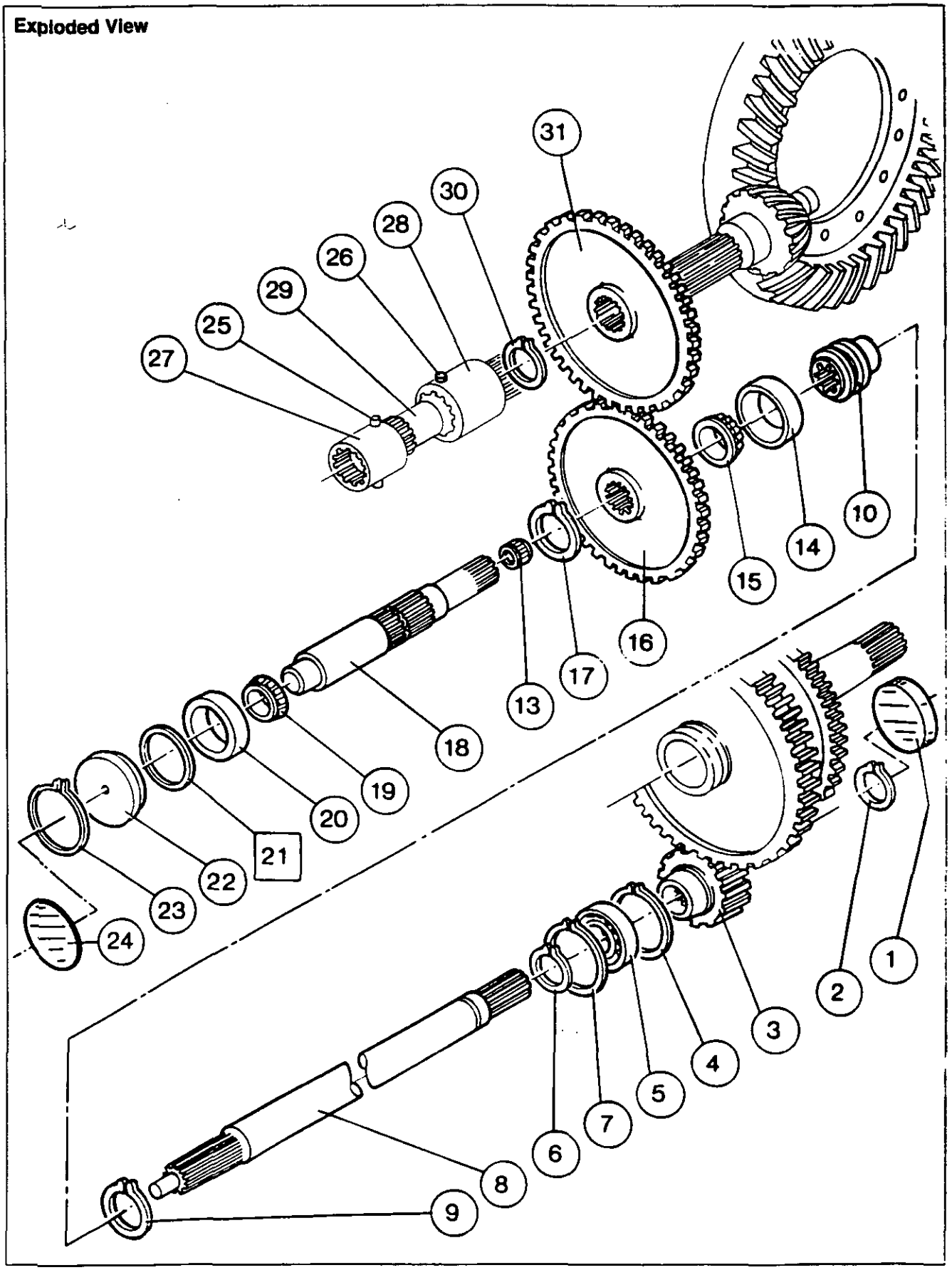
Fig. 7

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Exploded View



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Accessories - GSPTO

A. Preliminary operations

1. Immobilise the tractor and block the left-hand rear wheel.
2. Place a wedge between the frame and the front axle (Fig.1).
3. Drain the rear axle housing.
4. Remove the tow hook.
5. Extract the rear plug **(1)**(Fig.2).
6. Jack up the right-hand rear side of the tractor.
7. Install an axle stand and remove the wheel.
8. Remove bolts **(11)** and cover **(12)**.
9. Remove the right-hand hydraulic cover. Carry out operations 2 to 14, chapter 81.01.

Tractors without creeper gears

10. Take out double pins **(25)** and **(26)** from coupling sleeves **(27)** and **(28)**.
11. Slide the sleeves towards each other along shaft **(29)**.
12. Remove the shaft and sleeve assembly.

Tractors with creeper gears

13. Remove the shifter fork, the sleeve unit, the coupling shaft and the coupler. Carry out operations 3 to 8 and 13 to 16, chapter 5D.01A.

Tractors with or without creeper gears

14. Remove circlip **(30)**.
15. Remove plugs **(1)** and **(24)**(Figs.3 and 4).

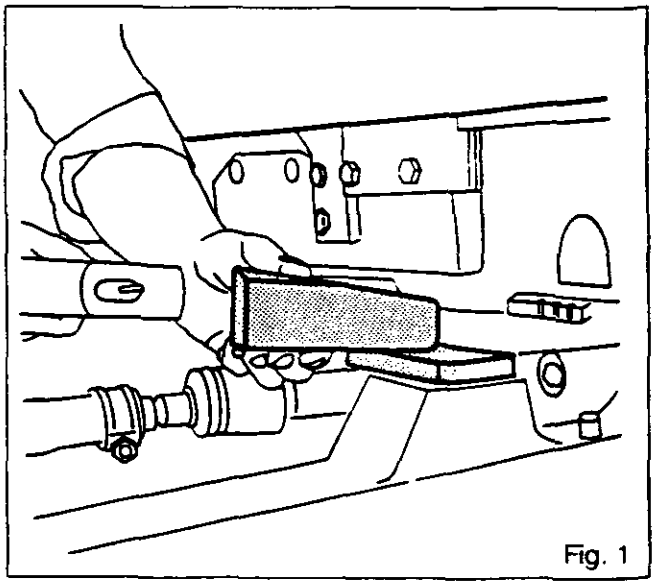


Fig. 1

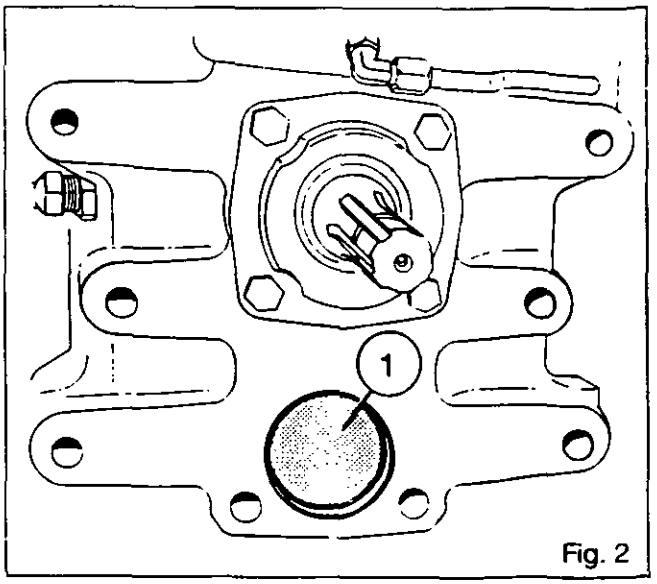


Fig. 2

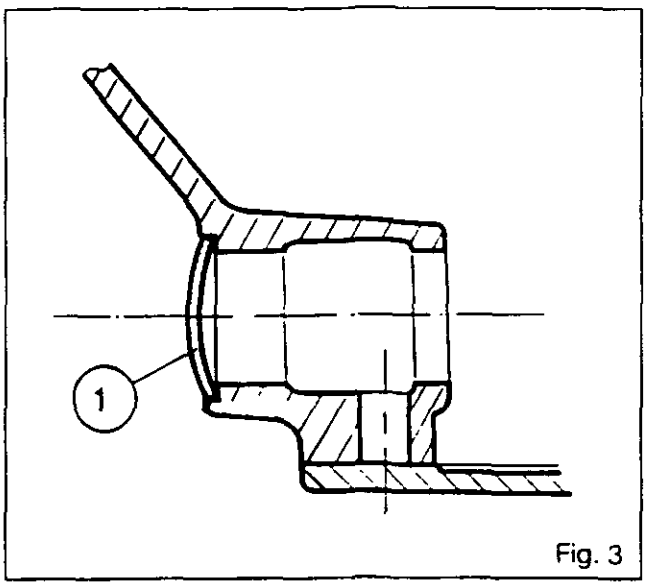


Fig. 3

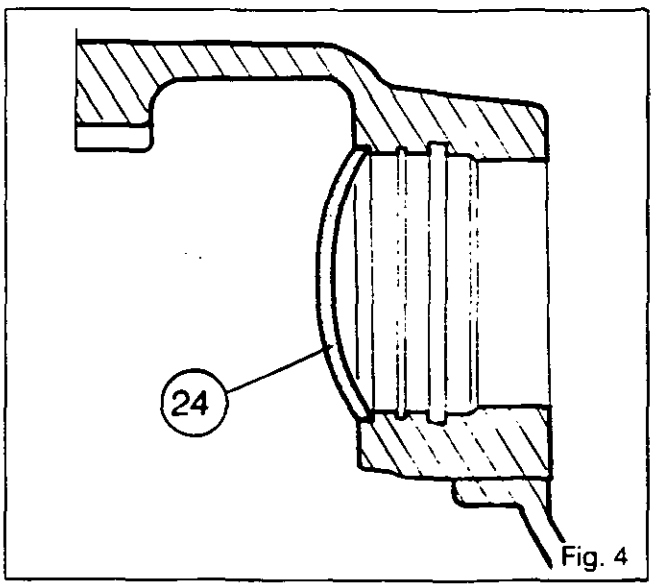


Fig. 4

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10 B01 Fitting a ground speed PTO on 2 WD tractors

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A. **Preliminary operations** ____ 4

B. **Fitting** ____ 5

C. **Removing the lift console** ____ 8

D. **Fitting the control lever** ____ 8

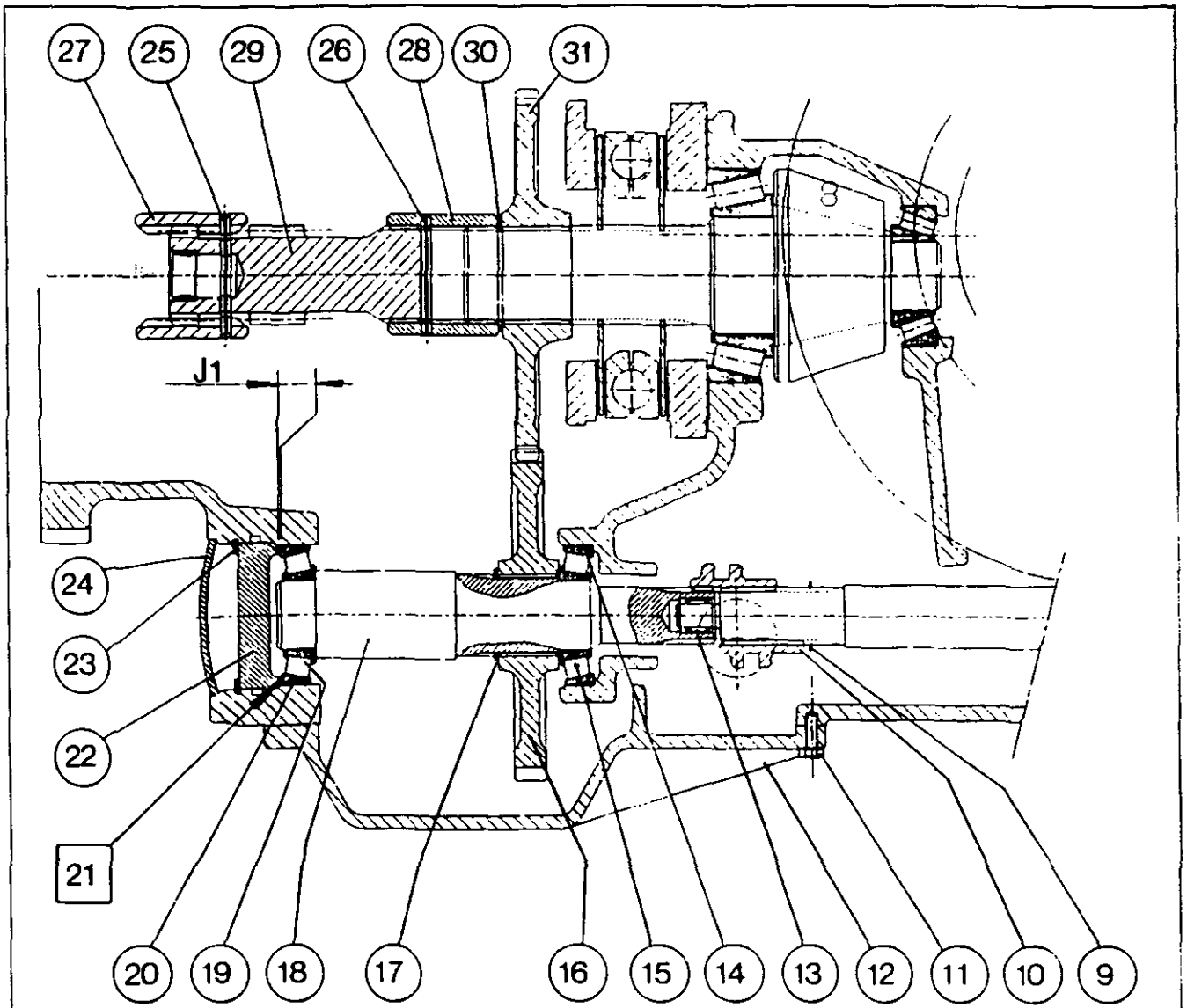
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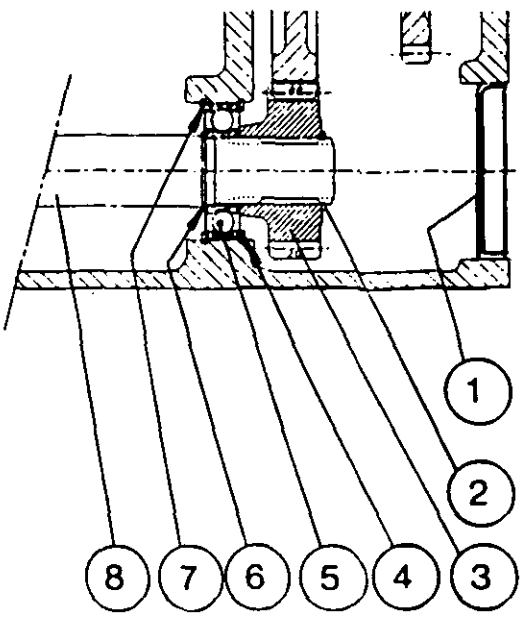
F. **Fitting and adjusting the control cable** ____ 9

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Accessories - GSPTO





Key to illustration

(1) Cap
(2) Circlip
(3) Pinion
(4) Circlip
(5) Bearing
(6) Circlip
(7) Circlip
(8) Shaft
(9) Circlip
(10) Coupler
(11) Bolt
(12) Cover
(13) Needle bearing
(14) Bearing cup
(15) Bearing cone
(16) Transfer gear
(17) Circlip
(18) 2WD shaft
(19) Bearing cone
(20) Bearing cup
[21] Shim(s)
(22) Spacer
(23) Circlip
(24) Plug
(25) Double pin
(26) Double pin
(27) Sleeve
(28) Sleeve
(29) Shaft
(30) Circlip
(31) Gear

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F. Fitting and adjusting the control cable

76. Put the cable into the grommet at the rear of the cab.
77. Slide cable housing end stop **(5)** into bracket **(6)** (Fig.16).
78. Screw the clevis to the edge of the threaded part of cable **(7)** (Fig.16).
79. Fit clevis **(1)** to link **U** with clip (8) and tighten nut **(2)** (Fig.16).
80. Adjust cable end stop **(5)** to obtain a measurement of 105mm between bracket **(6)** and the clevis pin **(1)** (Fig.16).
Note: Make sure the cable can move freely.
81. Put link **U** in "engaged" position (Fig.17).
82. Put rod **V** in "clutch engaged" position (Fig.18).
Note: Make sure that link V is properly locked in place.
83. Screw clevis **(6)** to the edge of the threaded part of cable **(4)**(Fig.18).
84. Fit clevis **(6)** on link **V** with clip **(5)** and tighten nut **(7)**.
85. Adjust cable end stop **(1)** using nut **(3)**, making sure that link **V** is still in "clutch engaged" position.
86. Tighten nut **(2)**.
Note: After tightening, check that there is no drag on the cable in "clutch disengaged" and "clutch engaged" positions (Fig.18).
87. Check that the control works properly in "clutch disengaged" position.

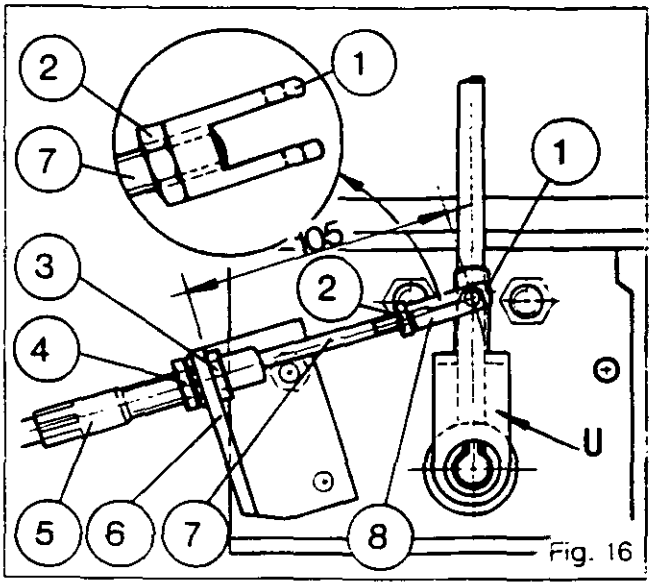


Fig. 16

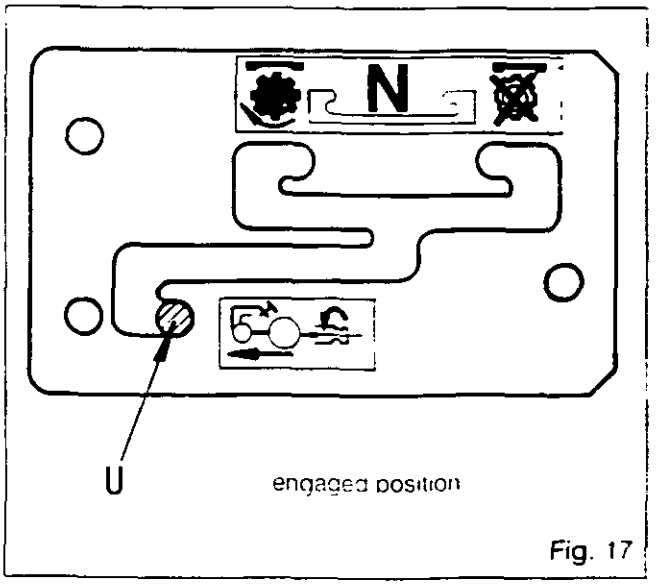
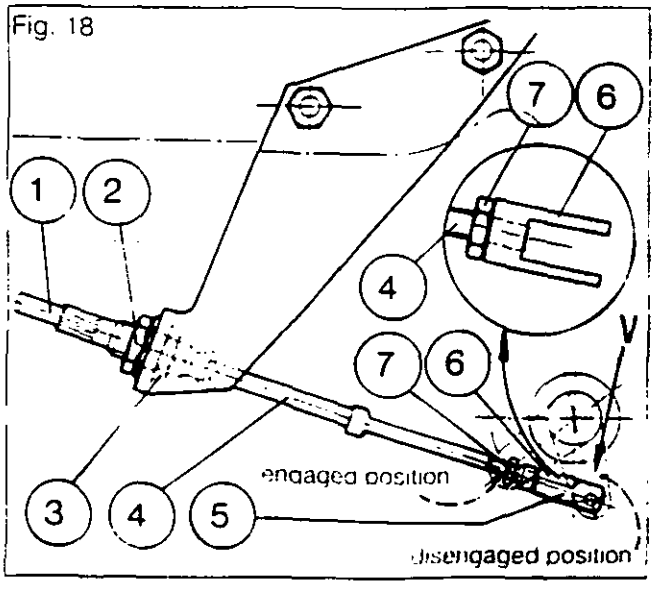


Fig. 17

Fig. 18



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10 B02 Fitting a ground speed PTO on 4 WD tractors

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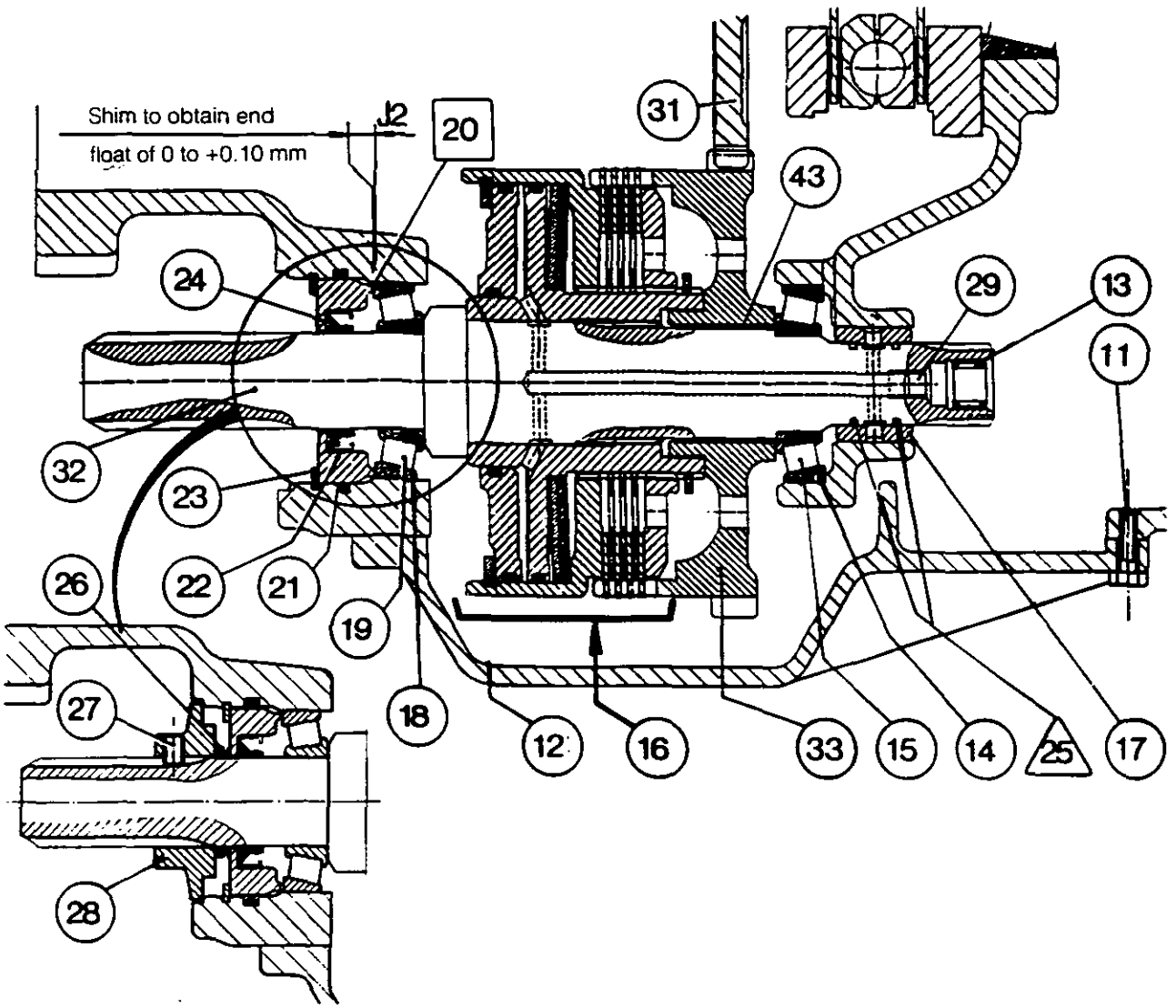
B. **Fitting** ____ 4

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Accessories - GSPTO

Fig. 1



Rice field version

Key to illustration

(11) Bolt
(12) Cover
(13) Needle bearing
(14) Bearing cup
(15) Bearing cone
(16) Clutch unit
(17) Bush
(18) Bearing cup
(19) Bearing cone
[20] Shim(s)
(21) O-ring
(22) Retainer - bearing
(23) Circlip
(24) Seal
/25\ Sealing rings
(26) Seal
(27) Setscrew
(28) Flange
(29) Cap
(31) Transfer gear
(32) 4 WD shaft
(33) Drum
(43) Bush

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Accessories - GSPTO

A. Preliminary operations

1. Immobilise the tractor and block the rear wheels.
2. Drain the axle housing
3. Remove the tow hook.
4. Extract rear plug **(1)**(Fig.2).
5. Remove bolts **(11)** and cover **(12)**.
6. Extract plug **(1)** (Fig.3).

Note : To stop the 4 WD clutch from slipping in certain working conditions, where the front axle and the ground speed PTO are used simultaneously, a five-disc clutch has been fitted on the 3000 tractor range as from serial number N309034 (see service bulletin 88/027, issue 2, December 1988). All 3100 tractors are fitted with a 4WD five-disc clutch.

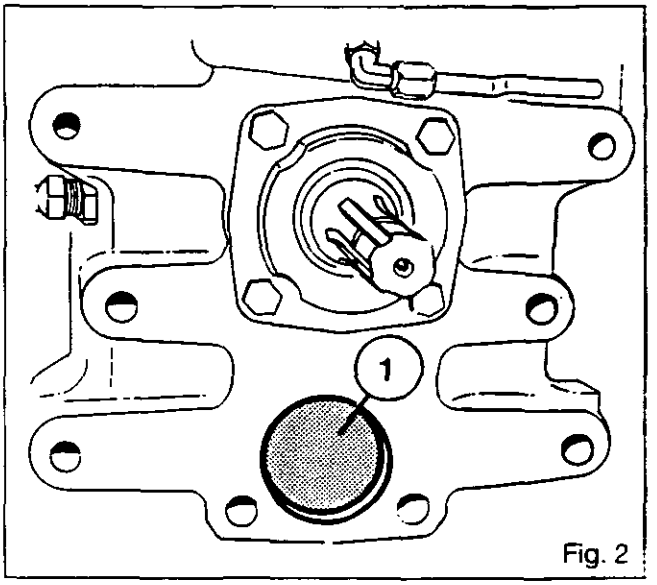


Fig. 2

For 3000 tractors prior to this number

- Remove and refit the clutch unit (see Fig.1) and carry out operations 7 to 23.
- Remove and refit the clutch (see chapter 7A01, sections B and C.
- Continue assembling the ground speed PTO. Carry out operations 24 to 33.

For 3000 tractors after this number and for 3100 tractors

- If the bearing is fitted, continue assembling the GS PTO. Carry out operations 24 to 33.
- Check that needle bearing **(13)** is in place. If the needle bearing is not fitted, refer to Figure 1 and carry out operations 7 to 33.

7. Disconnect the two front differential locking control hoses (plug the pipes). Remove the shield and transmission shaft.
8. On tractors fitted with a reinforced seal protector, remove screw **(27)**, flange **(28)** and seal **(26)**.
9. Remove circlip **(23)**.
10. Protect the splined part of shaft **(32)**. Pull out bearing retainer **(22)** with seal **(24)** using the locally manufactured tool (see section E, chapter 7A01).
11. Remove O-ring **(21)**, adjusting shim(s) **[20]** and bearing cup **(18)**.
12. Take out shaft **(32)** and bearing cone **(19)** but retain clutch **(16)** and drum **(33)** assembly.
13. Remove clutch **(16)** with drum **(33)** and bearing cone **(15)**.

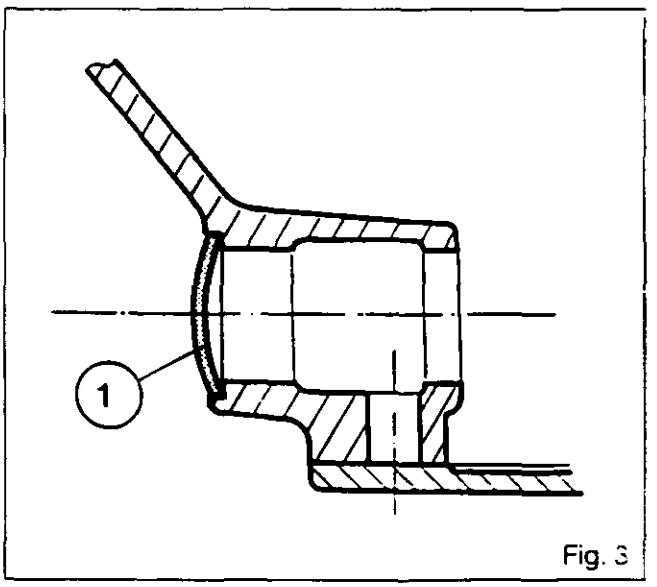


Fig. 3

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B. Fitting

14. If needle bearing **(13)** is not fitted on shaft **(32)**, fit it 2.5mm back from side "F" (Fig.4).
15. Check that sealing rings **/25** are not damaged and that they turn freely.
16. Place bearing cone **(15)** in bearing cup **(14)**, push in shaft **(32)** after positioning clutch **(16)** and drum **(33)** assembly in the housing.
17. Put bearing cup **(18)** and adjusting shim(s) **[20]** coated with grease, in place.
18. Fit O-ring **(21)** in the housing groove.
19. Fit bearing retainer **(22)** with seal **(24)** and circlip **(23)**. Remove the shaft splines protector.
20. *On tractors with rice field version, grease and place* seal **(26)**, with the lip facing bearing retainer **(22)**. Remove the protector.
21. Fit flange **(28)** leaving some play relative to the housing.
22. Tighten screw **(27)** coated with Loctite 241.
23. Refit the drive shaft and shield. Reconnect the two front differential locking control hoses.
24. Put coupler **(10)** on shaft **(32)**.
    Note: Put short shoulder "E" facing towards shaft (32)(Fig.5).
25. Fit the ground speed PTO shaft and carry out operations 38 to 51, chapter 10B01.
26. Refill the rear axle with oil to level.
27. Refit the tow hook.
28. Remove the lift console. Carry out operations 57 to 61, chapter 10B01.
29. Fit and adjust the control lever and cable and carry out operations 62 to 65 and 76 to 80, chapter 10B01.
30. Refit the lift console and carry out operations 67 to 72, chapter 10B01.
31. Fit and adjust the cable on the link located on the left of the rear axle housing. Carry out operations 81 to 87, chapter 10B01.
32. Check that the following function correctly :
    - the lift console. and electronic and electric controls
    - the ground speed PTO
    - the automatic hook (if fitted). If adjustment is required. carry out operations 1 and 6 to 9, *chapter 6M01*.
33. Check the sealing of the cover seal surface under the rear axle housing and of the front differential locking control hose connectors.

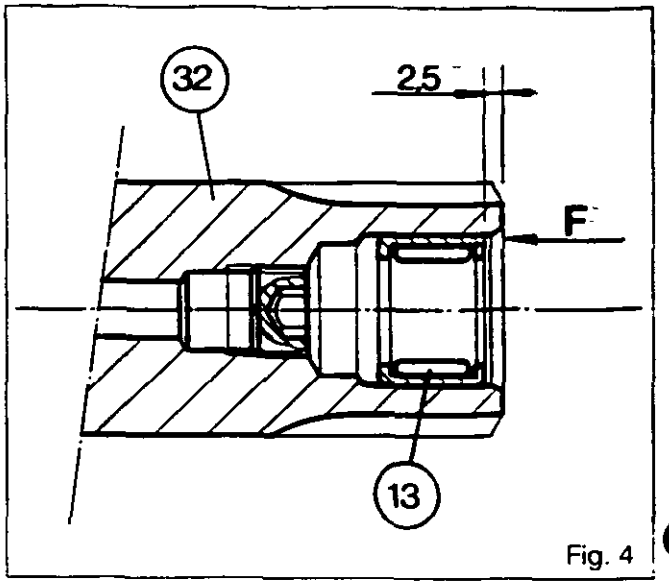


Fig. 4

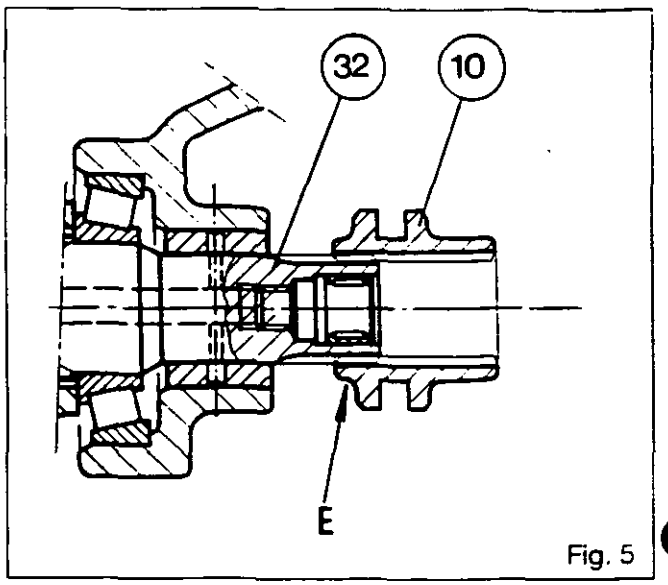


Fig. 5

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10 C01 Fitting the front PTO

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C. **Fitting the PTO unit assembly** ____ 4

D. **Fitting the electrical installation** ____ 5

E. **Wiring diagram** ____ 6

F. **Final reassembly** ____ 7

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10C01.2

Accessories - Fitting the front PTO

General (Fig. 1)

The whole power take-off unit, installed on the front axle bearing, is driven via a coupling sleeve connected to the engine pulley.

The power take-off is started by operating a knob (contactor) **(2)** in the cab.
For details on its operation, see section 10 C02, page 2.

(1) PTO unit assembly
(2) Contactor
(3) Contactor harness
(4) Power supply harness
(5) Solenoid valve and electromagnetic brake harness

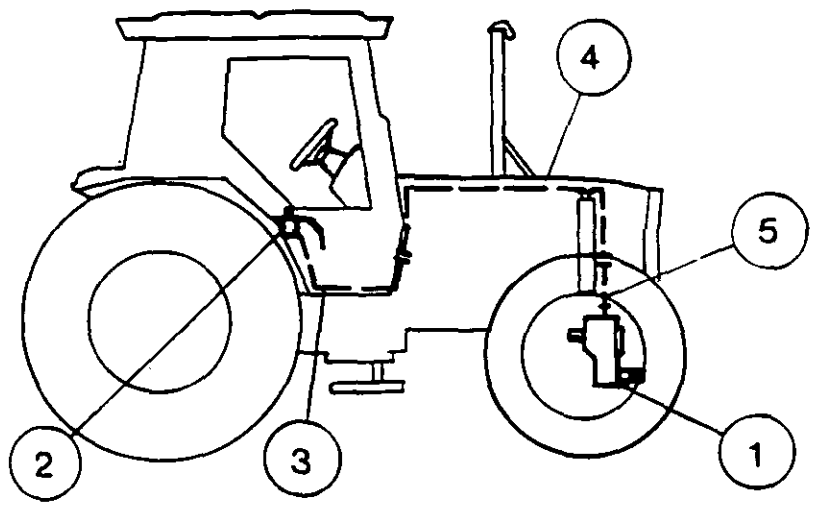


Fig. 1

A. Preliminary operations (Fig. 2)

Note: Before disassembly, apply the handbrake and immobilise the front wheels with blocks.

1. Remove the front weights.
2. Remove the sheet metal panels.
3. Disconnect the vacuum switch, the horn, the headlights, the battery cables and the fuse.
4. Remove the batteries.
5. Unscrew the air-conditioning condenser and take it out of the grille.
6. Remove the grille.
7. Remove the weight supporting frame.
8. Remove the air-conditioning drier support.
9. Position an adjustable stand under the engine to allow the removal of the front axle bearing. Free the front axle.

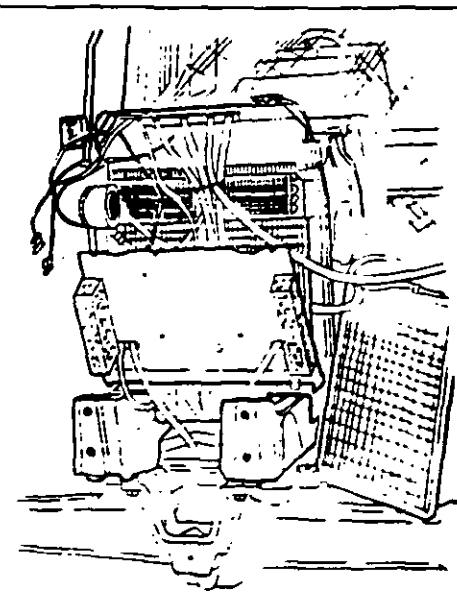


Fig.

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B. Fitting the hydraulic installation

Left-hand side of gearbox

10. Remove hose **A** (Fig. 3) which comes from the 17 bar valve.
11. Remove the union **(1)** and install a union tee **(2)** in its place. Reinstall the elbow union **(1)**.
12. Reinstall hose **A** on the union tee **(2)**.
13. Fit the power take-off return hose **(3)** (Fig. 3 and 4).

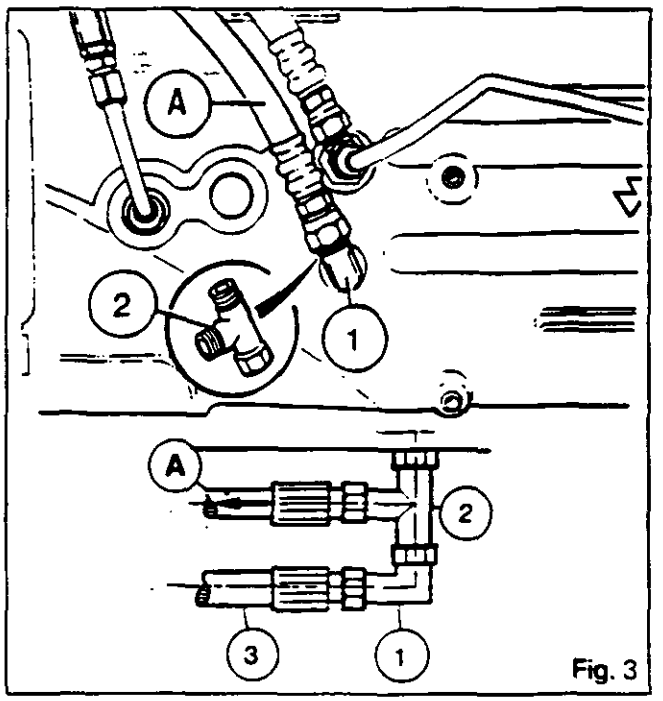


Fig. 3

Different types of installation
A - B - C : Clockwise PTO version
D : High-visibility version

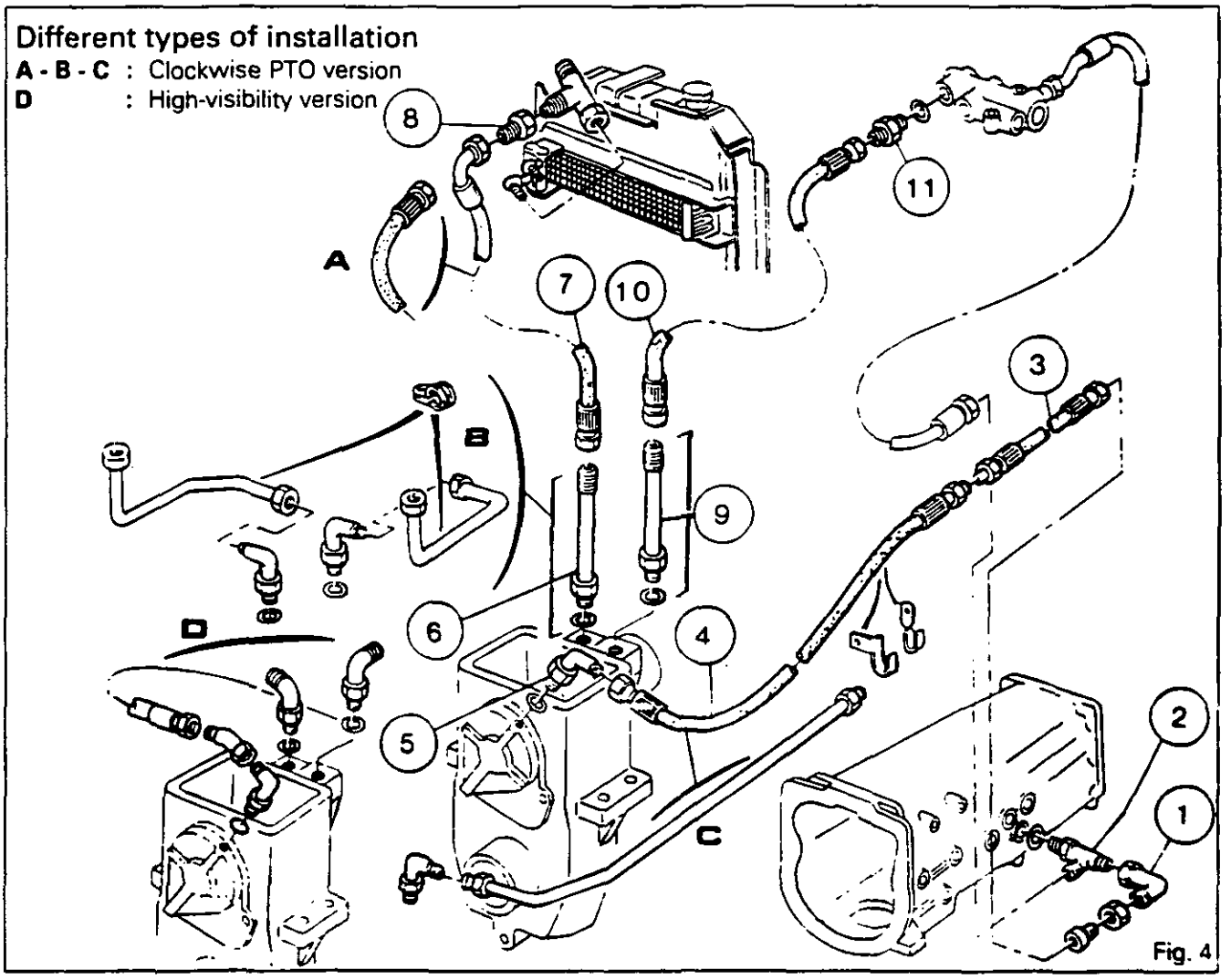


Fig. 4

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C. Fitting the PTO unit assembly

Coupling sleeve (Fig. 5)

1st section : Engine side

14. Unscrew the engine pulley, fit the hub **(1)** with the new bolts supplied with the kit. Tighten the bolts to a torque of:
    - 4 cyl. engine: 51 - 69 Nm,
    - 6 cyl. engine: 52 - 75 Nm.
15. Install the bush **(2)**, coupling **(3)** (tighten to a torque of 36 - 46 Nm), vibration damper **(4)** and coupling **(5)**.

2nd section : PTO side

16. Assemble the hub **(8)**, bush **(9)** and shaft **(7)** (tighten the hub to a torque of 36 - 46 Nm.)
17. Position the vibration damper **(10)** and coupling **(11)**.
18. Fit the coupling sleeve **(6)**, positioning it away from the end of the shaft **(7)**.
19. Fit the elbow unions on the PTO unit (Fig. 4).
20. Engage the PTO unit assembly in the pivot on the front axle. Fit the attaching bolts coated with Loctite 270 and tighten to a torque of 520 - 640 Nm.
21. Connect up and position the coupling sleeve **(6)**, complying with the dimension of 15 mm as per Fig. 6. Tighten the sleeve to 36 - 46 Nm.
22. Fit the connecting pipes and hoses onto the gearbox cover and secure them with attaching lugs **B** (Fig. 7) on the engine side.
23. Connect up the hose to the oil cooler on the lower outlet. Fit the jet **(8)** (Fig. 4).
24. Connect the hose to the 17 bar valve on the free outlet.

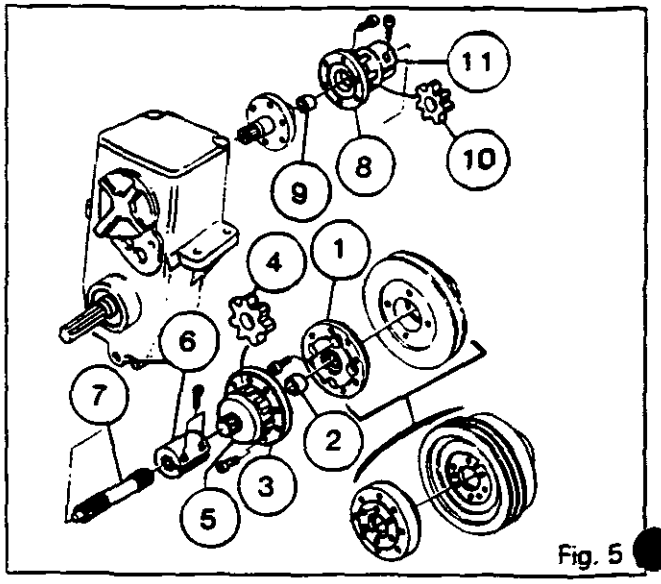


Fig. 5

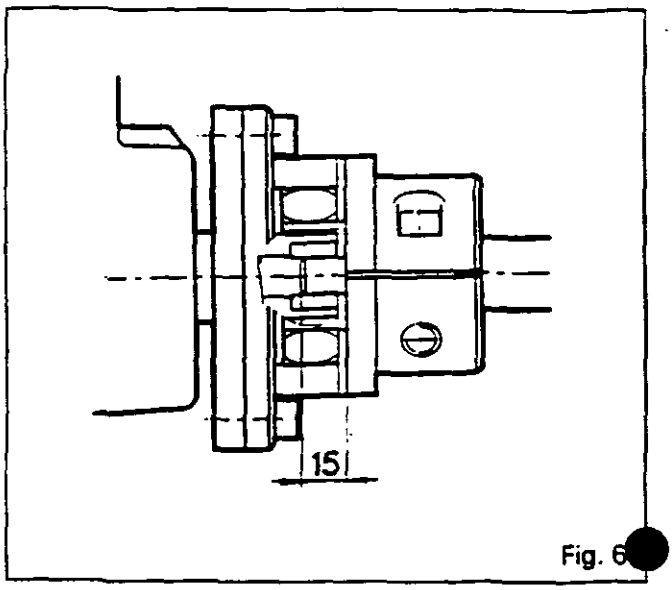


Fig. 6

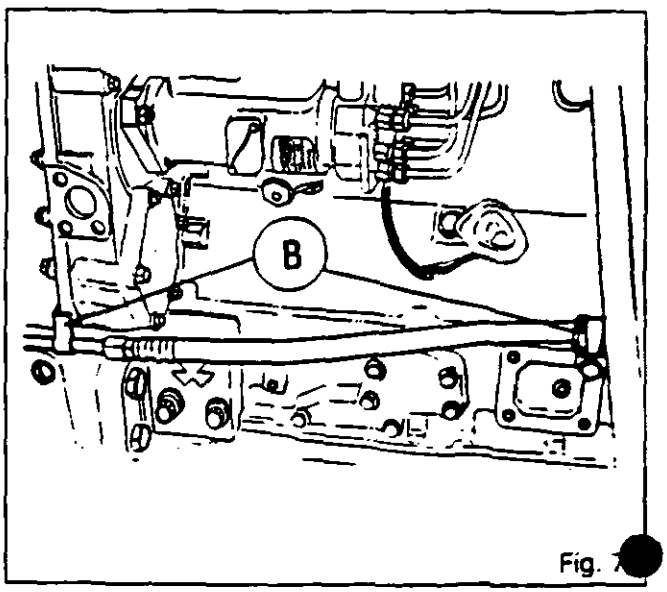


Fig. 7

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D . Fitting the electrical installation (Fig. 8 - 9)

Preparing the contactor assembly

25. Fit the plate **(11)** onto the console in the cab and secure it with four rivets after removing the blanking part.
26. Assemble the relay **(6)** on the mounting plate **(13)**.
27. Place the prepared assembly on the contactor **(2)** after unscrewing parts **(14)** and **(15)**.
28. Connect the harness **(3)** to the relay **(6)** and the knob (contactor) **(2)**.
29. Free the bellow from the gear levers. Install the contactor assembly in position through the opening. Do not forget to fit the Grower washer **(12)**. Screw the bushes **(14)** and **(15)**.
30. Connect the solenoid valve **(10)** onto the power take-off. Feed the wire through the battery support.
31. Connect up the PTO brake wires by means of the connecting strip.

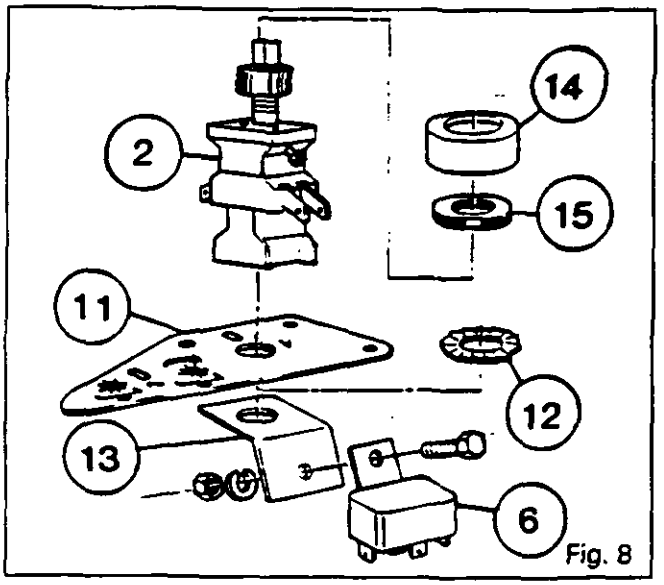


Fig. 8

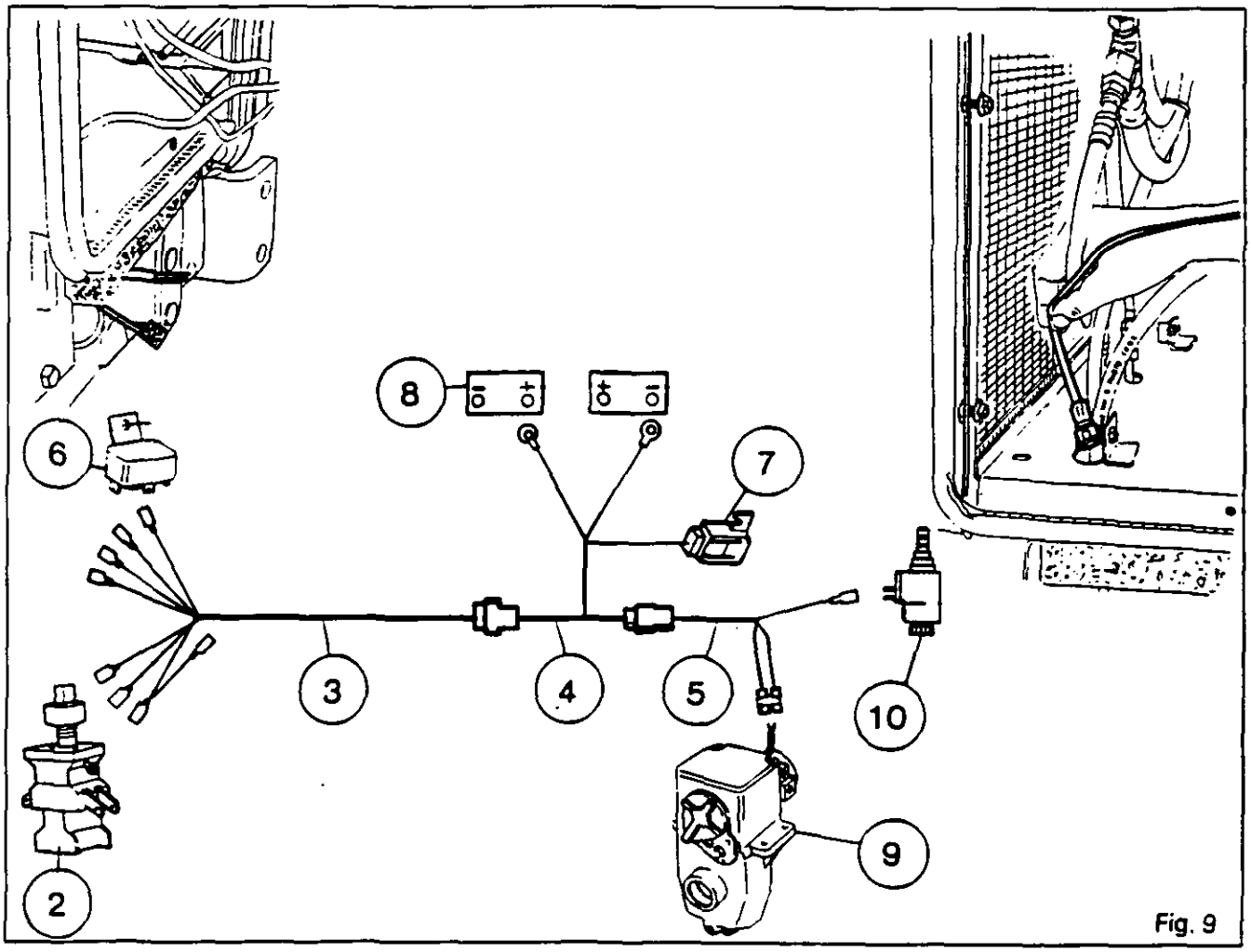
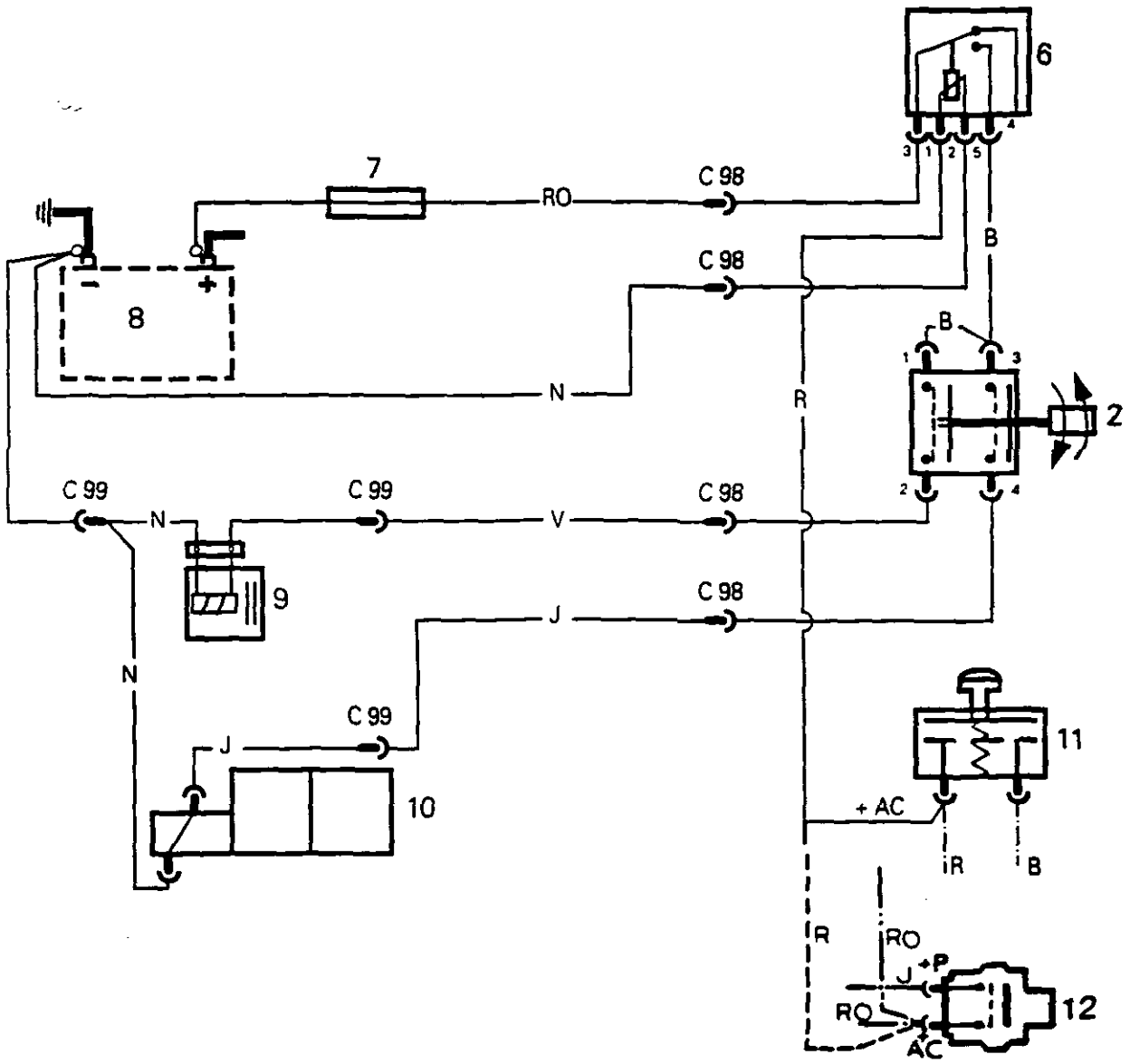


Fig. 9

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E. Wiring diagram



List of parts

2 Front PTO contactor
6 Relay
7 Fuse 5 A
8 Battery
9 Front PTO brake
10 PTO solenoid valve
11 Hare/Tortoise (Hi-Lo) range contactor (tractors with Autotronic system)
12 Low-pressure contactor (tractors without Autotronic system)

Colour

B White
J Yellow
N Black
R Red
RO Pink
V Green

Connectors

C98 4-way
C99 3-way

Fig. 1

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F. Final reassembly

Note: Before proceeding with final reassembly, it is advisable to check that the system operates correctly and that there are no leaks.

Important: Before starting up the engine, check the oil level in the power take-off. When switching on, allow the engine to idle for a few minutes, check for leaks, stop the engine and retighten components, if necessary.

Carry out procedures 1 to 9 in reverse order.
Precautions: Install and secure the battery attaching clamps before closing the supporting sheet metal.

Operation

Engine speed of 1,000 to 2,040 rpm.
To engage the power take-off, press and turn the knob (Fig. 11).
Important: The tractor must be stopped with the ignition switched off before engaging the front power take-off.

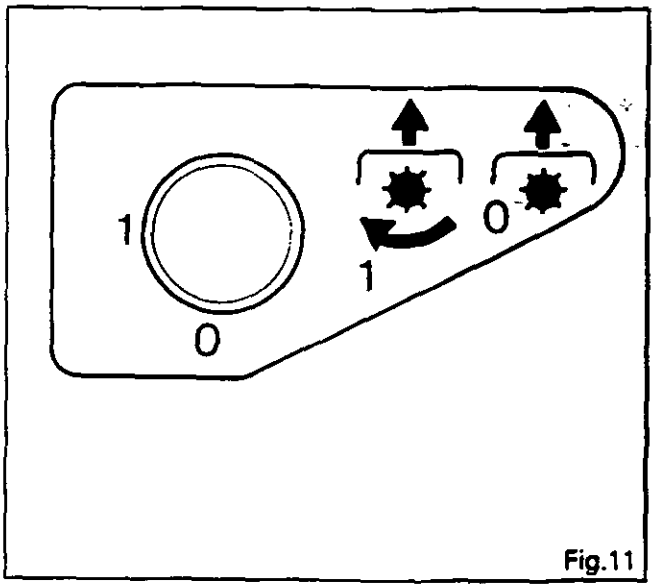


Fig.11

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10 C02 Repairing the front PTO

CONTENTS

- **General - Operation** ____ 2

A. **Removing the PTO unit** ____ 5

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C. **Reassembly** ____ 8

D. **Refitting the PTO unit** ____ 11

E. **Removing and refitting the connecting shaft** ____ 11

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10C02.2 Accessories - Repairing the front PTO

General

The front power take-off unit is mounted under the front frame. It can be installed on two or four-wheel drive tractors. The PTO shaft rotates at single speed of 1,000 rpm and can be installed in 6 or 21 spline versions.
The maximum torque transmitted by the PTO shaft is 50 m/kg.

Operation

The power take-off is provided from the input shaft **(40)** which is connected to the engine pulley by means of shaft **(86)** which is splined at both ends. The link is provided by the splined sleeve **(85)** and the flexible couplings **(76)** and **(79)**.
The solenoid valve **(62)** sends the oil from the 17-bar low-pressure system via the union **(73)** to act on the piston **(a)** of the clutch **(1)**, thus linking the hub **(b)** and the unit **(c)** via the clutch friction discs. The shaft **(33)** and driving pinion **(29)** transmit the output drive to the PTO shaft **(9)** via gears **(20)** and **/4**. As soon as the control knob is turned to the "0" position, the solenoid valve **(62)** shuts off the oil supply and the electromagnetic brake **(32)** immobilises shaft **(33)** and, consequently, stops the PTO shaft **(9)** rotating.
The unit is lubricated by means of the oil flow outlet from the cooler at a pressure of 1.5 bar (orifice **L**).
An eccentric type pump **(21)** **(22)** **(23)** ensures that a constant oil level is maintained in the unit. Capacity of housing: approximately 4.75 litres.

Reverse direction version

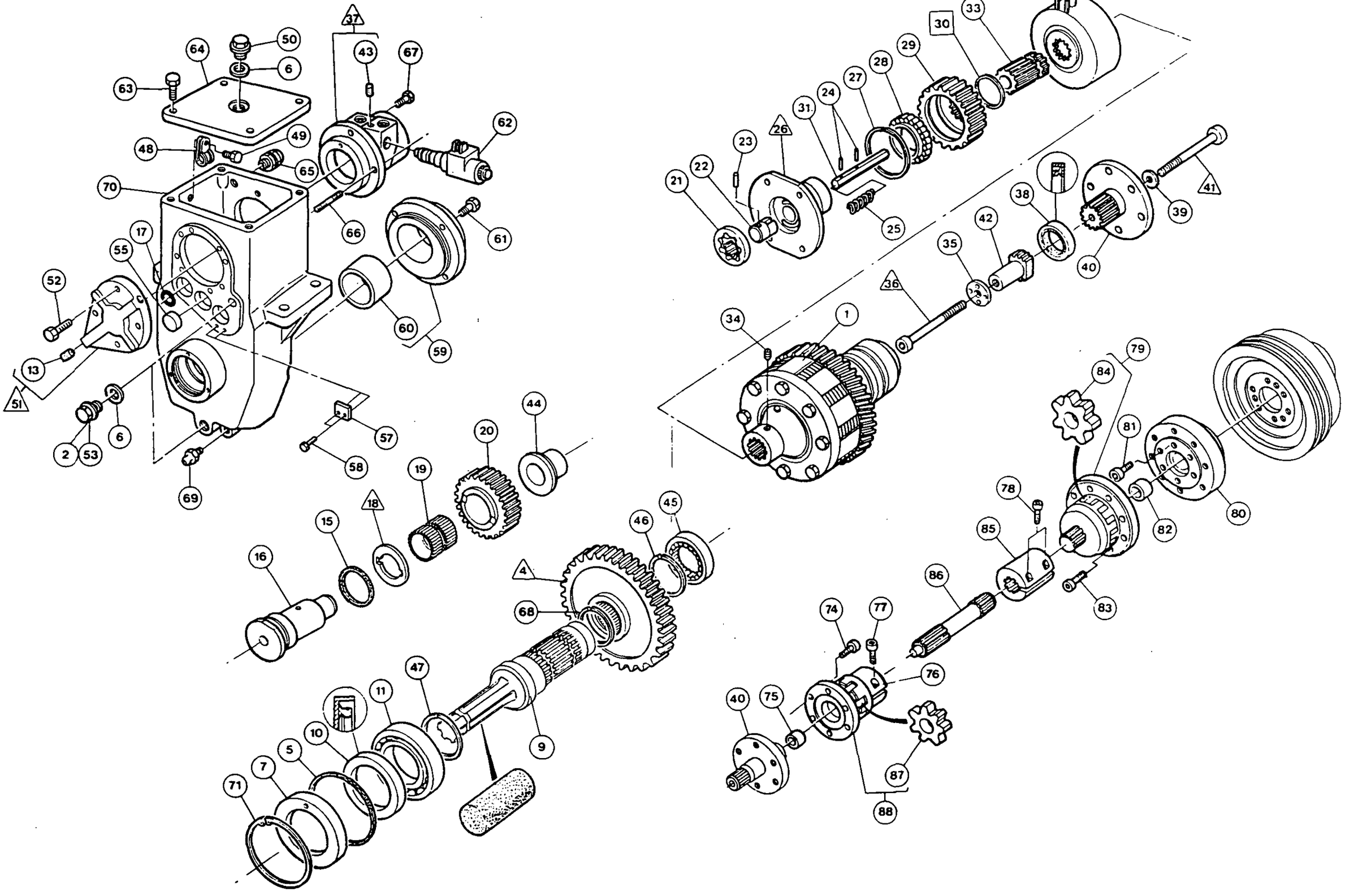
An additional pin **(16)** and a gear **(20)** which is meshed with gear **/4** allows the direction of rotation of the output shaft **(9)** to be reversed.

List of parts

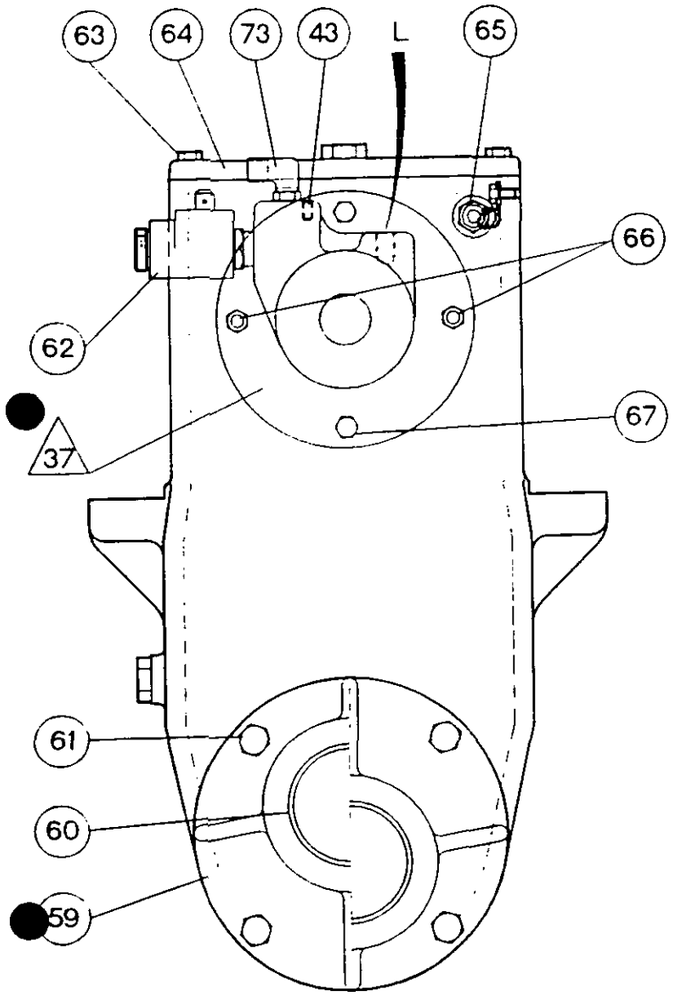
(1) Clutch assembly
(2) Plug
(3) O-ring
/4 Driven gear
(5) O-ring
(6) O-ring
(7) Seal holder
(8) Guard
(9) PTO shaft
(10) Sealing bush
(11) Bearing
(12) Bolt
(13) Rivet
(14) Guard
(15) O-ring
(16) Pin
(17) O-ring
/18 Washer
(19) Double needle-roller bearing
(20) Intermediate gear
(21) Pump assembly
(22) Pump hub
(23) Pump pin
(24) Dowels
(25) Spring
/26 Support
(27) Stop ring
(28) Bearing
(29) Driving gear
(30) Adjusting shims
(31) Pin
(32) Electromagnetic brake
(33) Shaft
(34) Bolt
(35) Washer
/36 Bolt
/37 Cover
(38) Sealing bush
(39) Seal
(40) Shaft
/41 Bolt
(42) Special nut
(43) Rivet
(44) Shouldered bushes
(45) Bearing
(46) Retaining ring
(47) Stop ring
(48) Clamp
(49) Bolt
(50) Filler plug
/51 Cover
(52) Bolt
(53) Plug
(54) Plugs
(55) Cup plug(s)
(56) Rivet
(57) Lock plate
(58) Bolt
(59) Rear bearing
(60) Bush
(61) Bolt
(62) Solenoid valve
(63) Bolt
(64) Cover
(65) Grommet
(66) Studs
(67) Bolt
(68) Retaining ring
(69) Grease nipple
(70) Housing
(71) Circlip
(72) Union
(73) Union
(74) Bolt
(75) Bush
(76) Coupling
(77) Bolt
(78) Bolt
(79) Coupling
(80) Hub
(81) Bolt
(82) Bush
(83) Bolt
(84) Bush
(85) Sleeve
(86) Shaft
(87) Bush
(88) Coupling

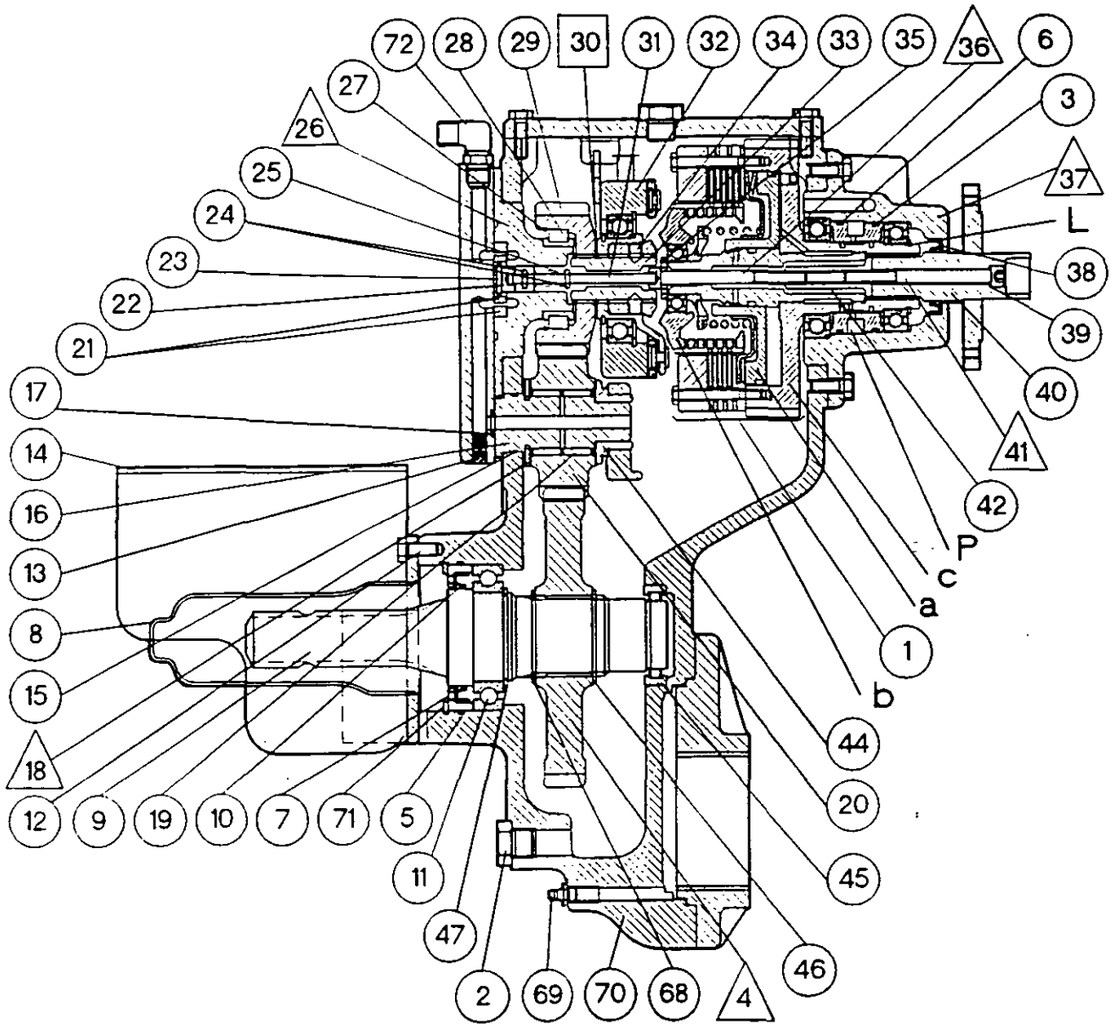
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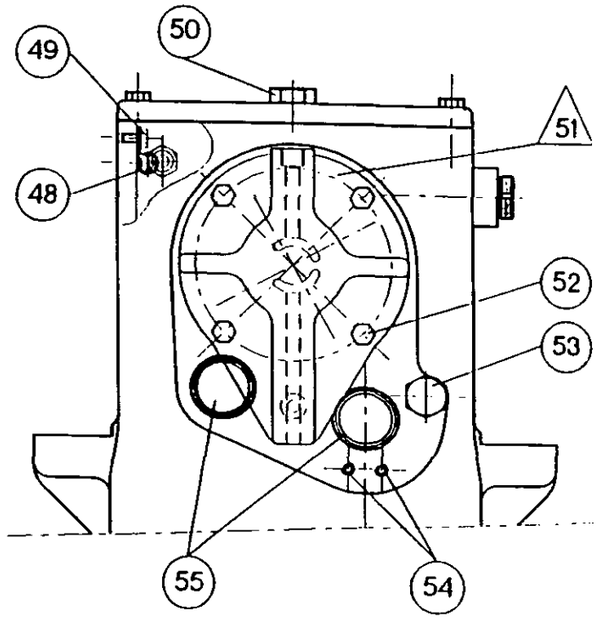
10C02.4 **Accessories** - Repairing the front PTO

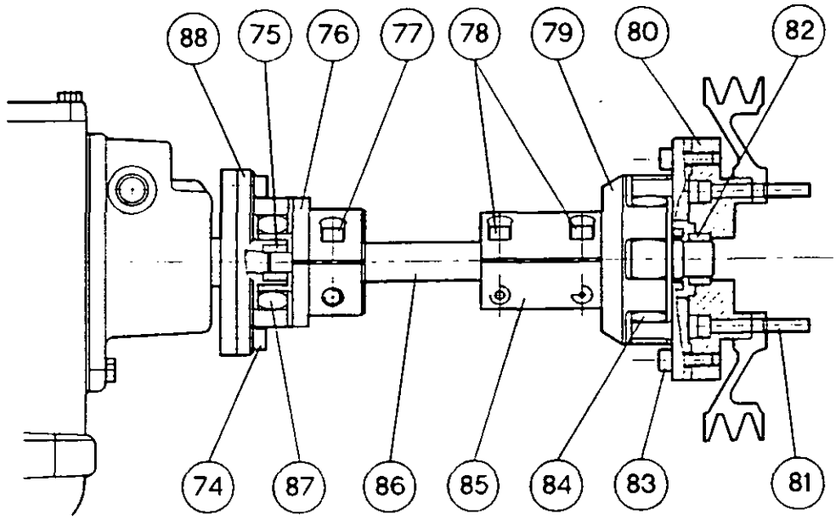


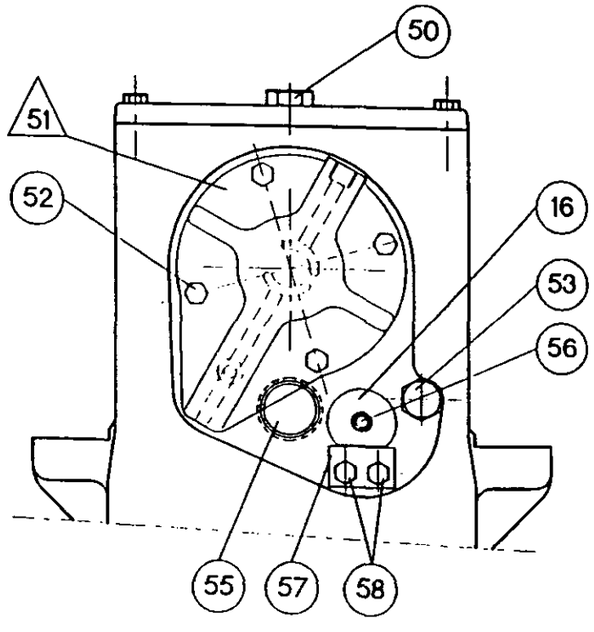
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10C02.5 Accessories - Repairing the front PTO

A. Removing the PTO unit

1. Immobilise the rear wheels with blocks. Apply the handbrake fully. Remove the sheet metal.
2. Remove the front weights (if installed), their support and the spacer (depending on type).
3. Disconnect and remove the batteries (depending on type). Remove the grille.
4. Remove the battery bracket. Disconnect the wiring harness from the solenoid valve. Remove the supply (17 bar), return and lubricating pipes.
5. Drain the PTO unit.
6. On 4WD tractors, disconnect the front differential locking hoses (and plug the openings). Remove the guard and the drive shaft.
7. Lift the tractor with a jack positioned in line with the axle housing. Install a stand (see Fig. 2) under the engine's lower casing.
8. Install a sling and hold the front axle with straps (see Fig. 2).
9. Remove the bolts **(1)** and the grease nipple **(69)** (see Fig. 1).
10. Screw a locally manufactured hook in place of the filler plug **(50)**. Using a travelling hoist, remove the PTO unit as shown in Fig. 2, disengaging the bush **(87)** from the coupling **(76)**. Recover the chamfered washer /7\ (see Fig. 1).

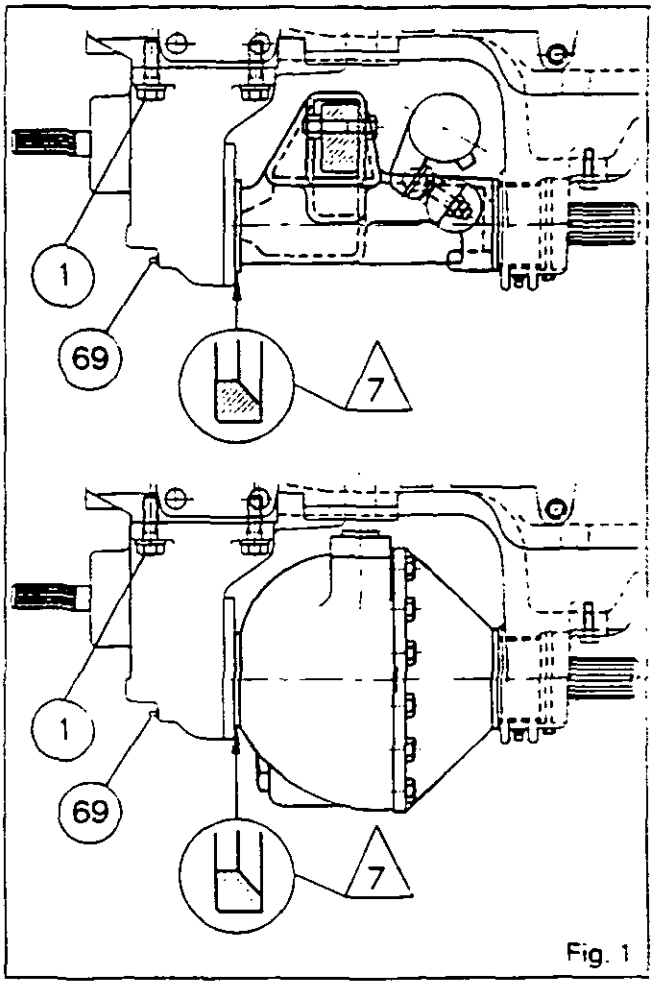
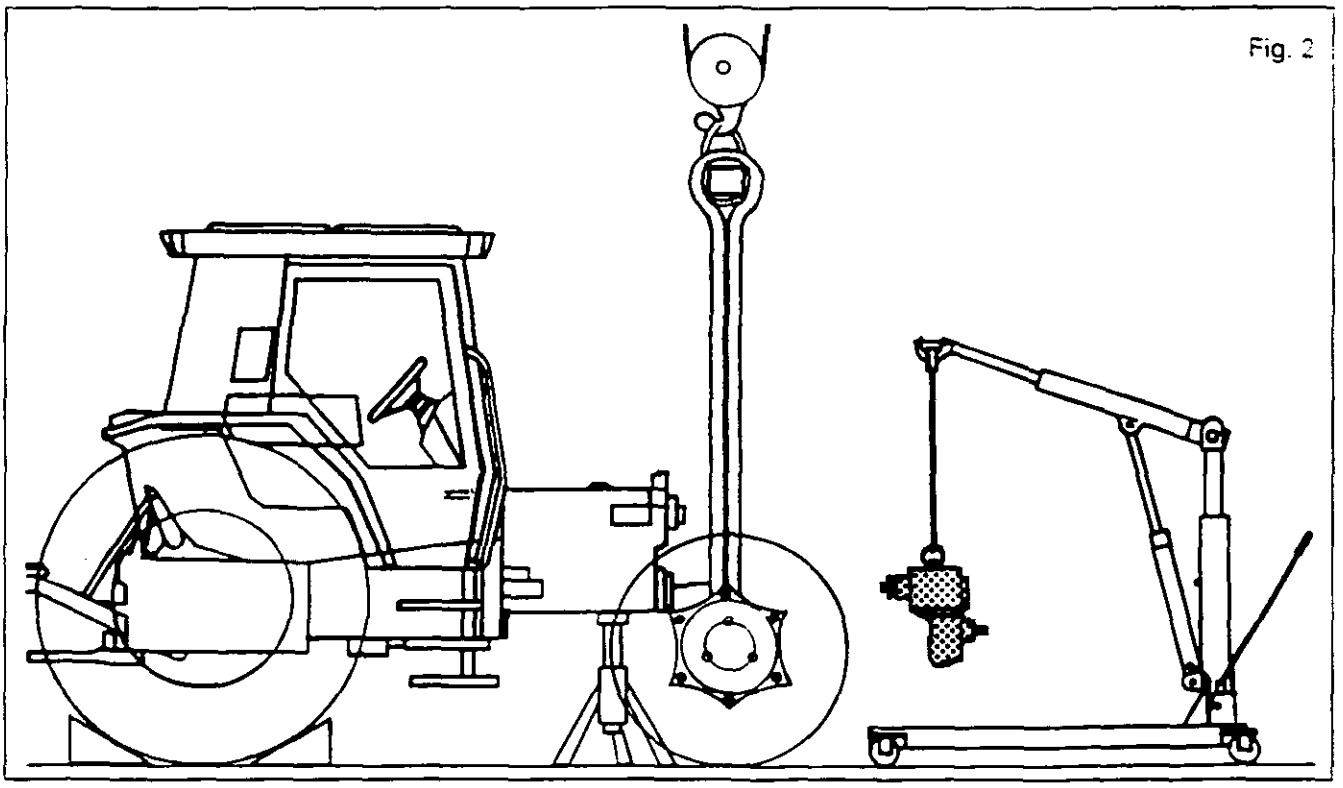


Fig. 1


Fig. 2

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B. Disassembly

Clockwise and reverse PTO versions

11. Position the assembly on a suitable support.
12. Remove the bolts **(63)** and **(52)**. Detach and remove the covers **(64)** and **/51**. Recover the O-ring **(17)**.
13. Remove the pump assembly **(21)**, the hub **(22)**, the pin **(31)** installed with the spring **(25)** and dowels **(24)**.
14. If necessary, extract dowels **(23)** and **(24)**. Remove the spring **(25)**.
15. Detach and remove the support **/26** installed with gear **(29)**, bearing **(28)** and stop ring **(27)**.
    If necessary, separate the gear **(29)** and the bearing **(28)** from the support **/26**. Take off the stop ring. Remove the bearing.
    Note : The bearing (28) has no external cage. Recover the rollers.
16. Remove the shims **(30)**.
17. Remove the bolt **/41** (left-hand thread) and the seal **(39)**. Remove the shaft **(40)**.
18. Remove the bolts **(67)** and the nuts from studs **(66)**. Detach and remove the cover **/37** with the solenoid valve **(62)**.
    If necessary, drive out the seal **(38)**. Remove the solenoid valve **(62)**.
19. Remove the bolt **(49)** and the clamp **(48)**. Unscrew the grommet **(65)**. Free the supply wire. Remove the clutch assembly **(1)** along with the electromagnetic brake **(32)** and the shaft **(33)**.
20. If necessary, separate the brake from the clutch. Take out the bolt **(34)** and remove the shaft **(33)**.
    Note: The front PTO clutch is fitted with three discs, three backing plates and two spacers. If it is necessary to dimantle it, see Section 6 G01, part D.

Clockwise PTO version (Fig. 3)

21. Take out pin **(16)**. Remove the gear **(20)**, the bearing **(19)** and washer **/18**.
22. Discard the O-ring **(15)**.
23. If necessary, extract the shouldered bush **(44)**. Drive out the cup plugs **(55)**.

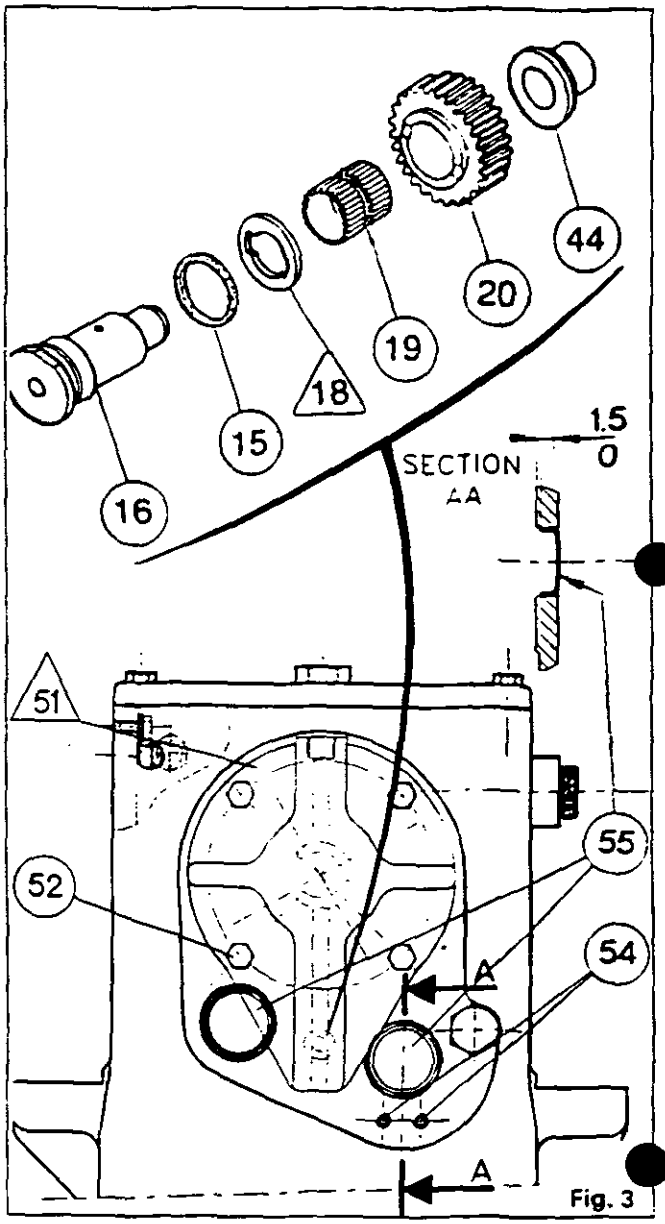


Fig. 3

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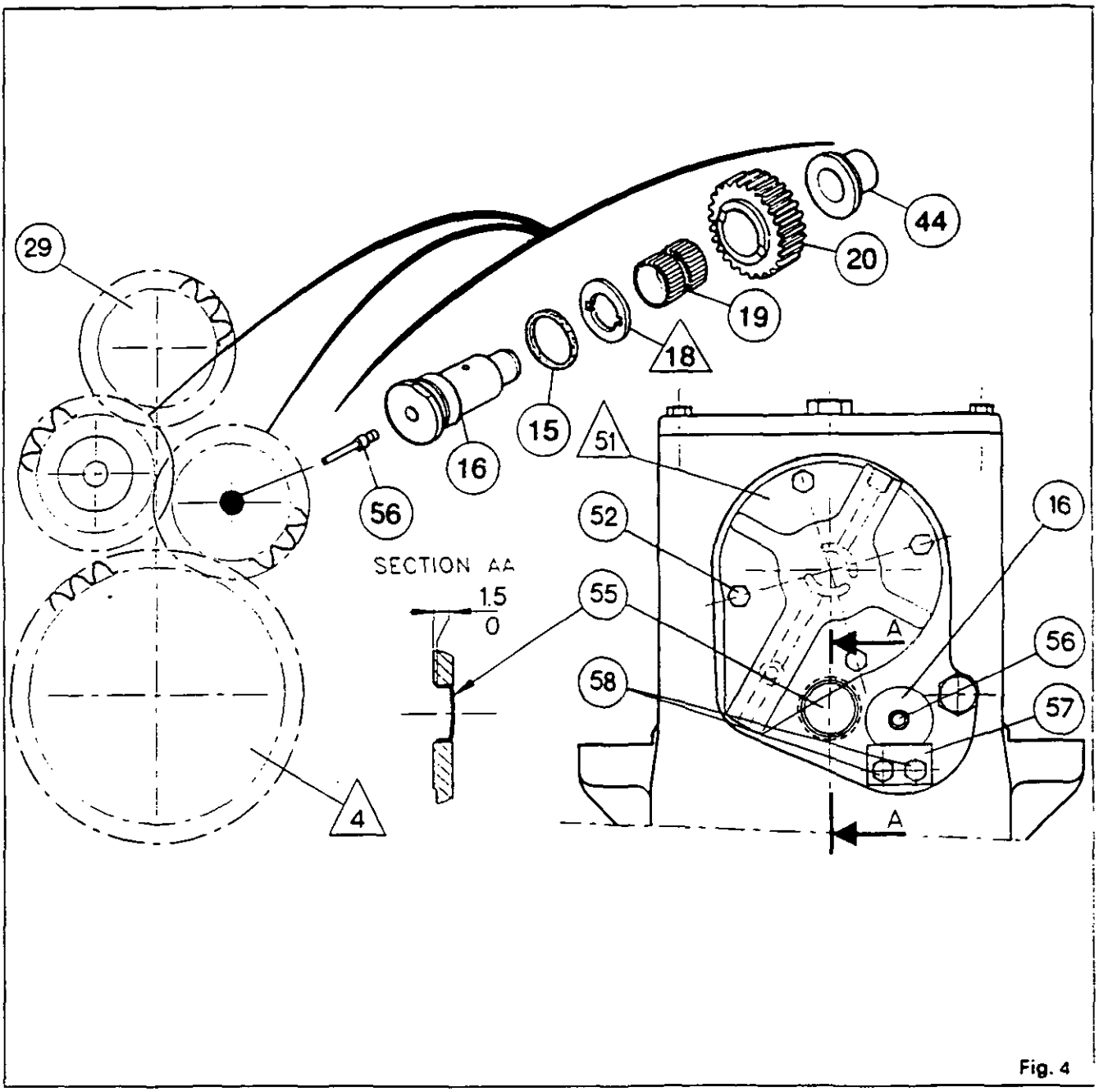


Fig. 4

Reverse PTO version (Fig. 4)

24. Remove the bolts **(58)** and the lock plate **(57)**. Take out pins **(16)**.
Remove the gears **(20)**, the bearings **(19)** and the washers **(18)**.
Discard the O-ring **(15)**.
If necessary, extract the shouldered bushes **(44)**.
Drive out the cup plug **(55)**.
Note: On the outer face of pin (16) held by plate (57), the end of the hole is blanked by a rivet (56).

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Clockwise and reverse PTO versions

25. Remove the guards **(8)** and **(14)** (depending on type).
26. using tool MF 460 (section F) fitted with a sleeve of suitable length, remove the retainer ring **(46)**.
27. Remove the circlip **(71)**.
28. Extract the seal holder **(7)** with the sealing bush **(10)** using the locally manufactured tool (section F) (see Fig. 5).
    If necessary, drive out the seal holder of the sealing bush.
29. Discard the O-ring **(5)**.
30. Secure gear **/4**, take out the shaft assembly **(9)**, the bearing **(11)**, the stop ring **(47)** and the retaining ring **(68)**. Remove the gear.
    If necessary, extract the bearing **(45)**. Remove the plugs **(2)** and **(53)** with their seals. Remove the rear bearing **(59)** and extract the bush **(60)**. Remove the studs **(66)** and the grommet **(65)** equipped with its seal.

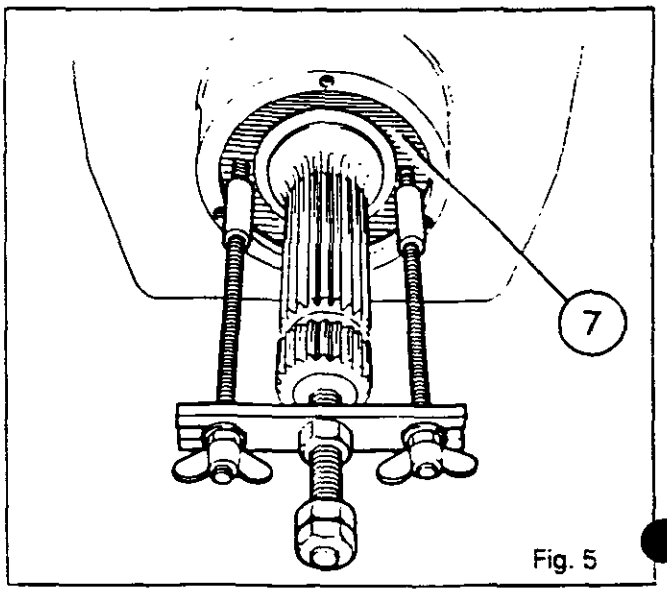


Fig. 5

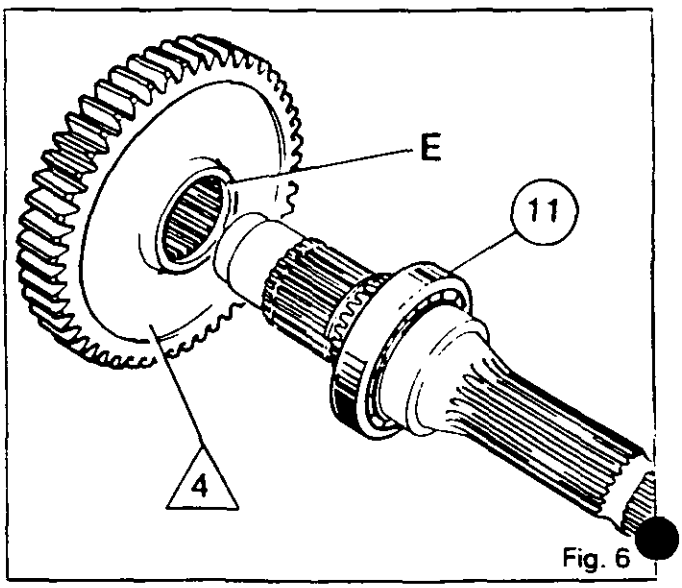


Fig. 6

C. Reassembly

31. Clean and check the parts and replace any that are faulty.
32. If necessary, fit the bush **(60)** in the rear bearing **(59)** and reinstall it.
    Tighten the bolts **(61)** to a torque of 90 - 120 Nm, after coating them with Loctite 241. Screw in the plugs **(2)** and **(53)** with their seals.
    Lightly smear the outside diameter of the bearing **(45)** with loctite 638 and fit it into the housing.
    Fit the bearing **(11)** onto the shaft **(9)**.
    Position the stop ring **(47)** and the retaining ring **(68)**.
    Using a press and a suitable fixture, install the sealing bush **(10)** in the seal holder **(7)**.
33. Hold the gear **/4** in the housing, orienting the gear tooth chamfer **E** towards the bearing **(11)** (see Fig. 6). Engage the shaft in the gear and in the bearing **(45)**.
34. Using tool MF 459 (section F) fitted with a sleeve of suitable length, install the retaining ring **(46)** in its correct position. Position the lubricated O-ring **(5)** in the recess in the housing.
35. Lubricate the sealing bush **(10)**. Install the seal holder **(7)** and the circlip **(71)**.

Clockwise PTO version (Fig. 3)

36. Slightly smear the shouldered bush **(44)** with Loctite 638 and fit it into the housing.
37. Fit the cup plugs **(55)**, coated with Loctite 542 and positioned back from the face of the housing.
38. Slide the gear **(20)** with the bearing **(19)** into the housing.
39. Position the washer **/18** with its lubricating grooves oriented towards the gear **(20)**.
40. Check that the channels in pin **(16)** are not blocked.
41. Fit the pin with the O-ring **(15)**, line up the flats with those on the washer **/18**.
42. Fit the plugs **(54)** after coating them with Loctite 510. Check the normal backlash and the end play on the gear **(20)** by hand.

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Reverse PTO version (Fig. 4)

43. Slightly smear the shouldered bush **(44)** with Loctite 638 and fit it into the housing.
44. Fit the cup plugs **(55)**, coated with Loctite 542 and positioned back from the face of the housing.
45. Slide the gears **(20)** with the bearings **(19)** into the housing.
46. Position the washers **/18** with its lubricating grooves oriented towards the gears **(20)**.
47. Check that the channels in pins **(16)** are not blocked.
    Note: Pin (16) secured by plate (57) is riveted at its end.
48. Fit the pins with the O-rings **(15)**, line up the flats with those on the washers **/18**.
49. Immobilise the riveted pin **(16)** with the lock plate **(57)**. Coat the bolts **(58)** with Loctite 510 and tighten them to a torque of 25 - 35 Nm.
    Check the normal backlash and the end play on the gears **(20)** by hand.

Clockwise and reverse PTO versions

Note: If it was necessary to dismantle the clutch, see Section 6 G01, part D. Coat the bolt /36\ with Loctite 270 and tighten it (left-hand thread) to a torque of 25 - 35 Nm.

50. If it was disassembled, position the shaft **(33)** in the clutch **(1)**.Install and tighten the bolt **(34)**, coated with Loctite 221.
    Slide the electromagnetic brake **(32)** onto the shaft **(33)**.
51. Reinstall the clutch and brake assembly via the opening in the cover **(64)**.
52. Using a press and a suitable fixture, fit the bush **(38)** in the cover **(37)** if necessary.
    Check for the presence of the rivet **(43)**.
    Tighten and lock the studs **(66)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
    Check the cleanliness of the channels in the cover **/37**.
53. Coat the cover **/37** with a sealing compound (Master Joint 510 Loctite or equivalent).
54. Check that the O-rings **(3)** and **(6)** are not damaged.
    If they are to be replaced, see Section 6 G01, procedure 79.
    Fit the cover **/37**. Tighten the bolts **(67)** and the nuts on the studs **(66)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
55. Lubricate the bush **(38)**. Fit the shaft **(40)** in the clutch. Position the seal **(39)**. Fit and tighten the bolt **/41** (with left-hand thread) to a torque of 25 - 35 Nm.

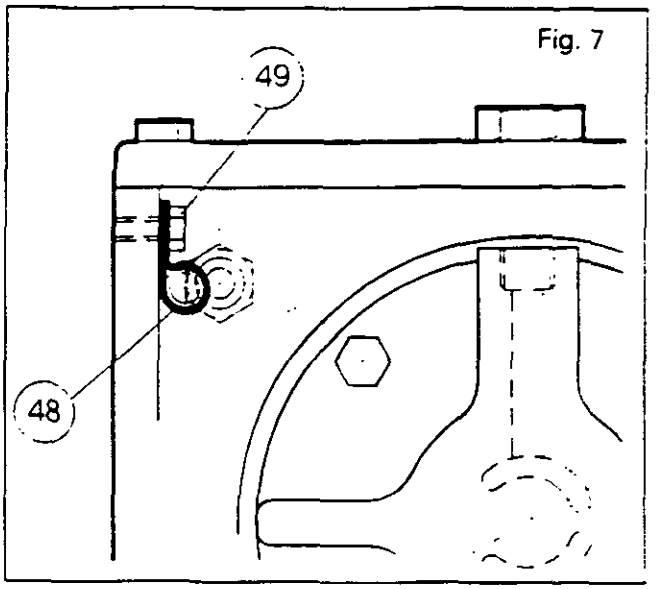


Fig. 7

56. Fit and tighten the solenoid valve **(62)**.
    Tightening torques:
    - body : 18 - 20 Nm
    - knurled nut : 5 Nm
57. Position the electromagnetic brake wiring harness in the clamp **(48)**. Check that the harness is not in contact with the clutch.
    Install and tighten the bolt **(49)**, coated with Loctite 510 (see Fig. 7).
58. Install and tighten the grommet **(65)** equipped with its seal.
59. Assemble the bearing **(28)** in the gear **(29)**. Fit the stop ring **(27)**.
60. Fit the gear **(29)** and bearing **(28)** assembly on the support **/26**.
61. Position the assembly without the shims **(30)**. Install and tighten the bolts **(52)**.

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62. Carry out shimming in order to obtain a play of (see Fig. 8):
J1 = 0.20 to 0.50
Check that the clutch **(1)** and the gear **(29)** are correctly positioned.
Using a set of shims, measure the space between the electromagnetic brake **(32)** and the gear **(29)**. According to the measured value, determine the thickness of shims required to obtain a play of 0.20 to 0.50.
63. Remove the bolts **(52)**. Remove the support **/26** and gear **(29)** assembly.
64. Slide the previously selected shims onto the shaft **(33)**.
65. Smear the housing **(70)** with a sealing compound (Master Joint 510 Loctite or equivalent).
Screw in two diametrically opposite locating studs.
66. Install the support assembly **/26** (with the holes **L** oriented in accordance with Fig. 10), the bearing **(28)** and the gear **(29)**.
67. If they were dismantled, assemble the spring **(25)**, the dowels **(24)** and **(23)**, and the pin **(31)** as per Fig. 10.
68. Check that the parts, **(21)**, **(22)** and **(31)** slide freely in their respective positions.
69. Fit the pin **(31)** assembly correctly positioned in the head of bolt **/36**. Position the hub **(22)** with the groove engaged on the dowel **(23)**. Install the pump assembly **(21)**.
70. Smear the support **/26** with a sealing compound (Master Joint 510 Loctite or equivalent) as shown in Fig. 11.
Note: No trace of Loctite should be visible around the pump assembly (21).

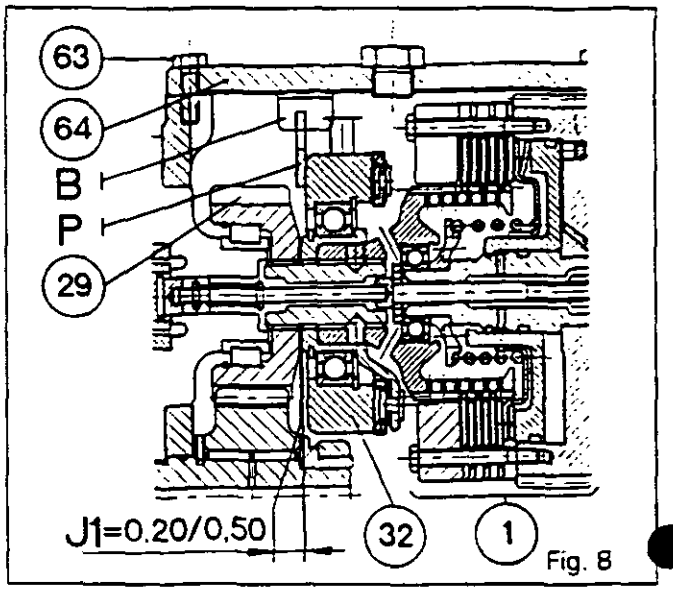


Fig. 8

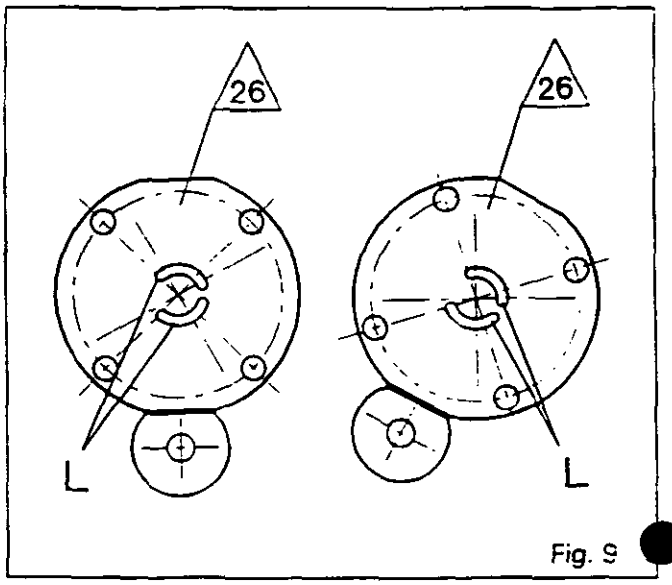


Fig. 9

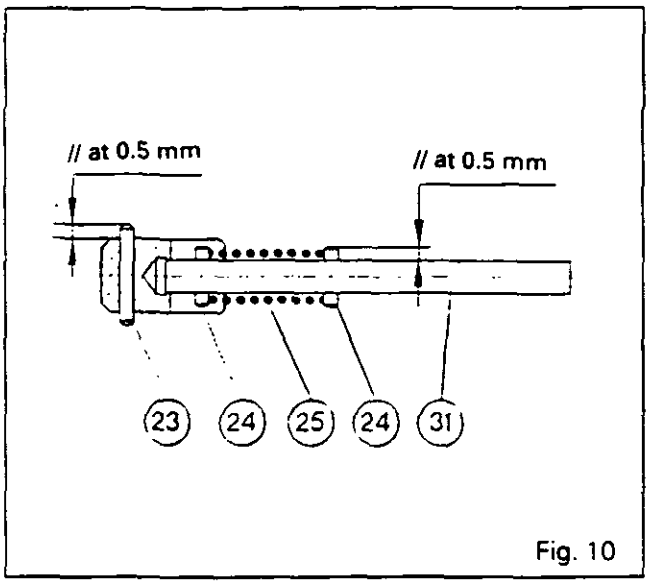


Fig. 10

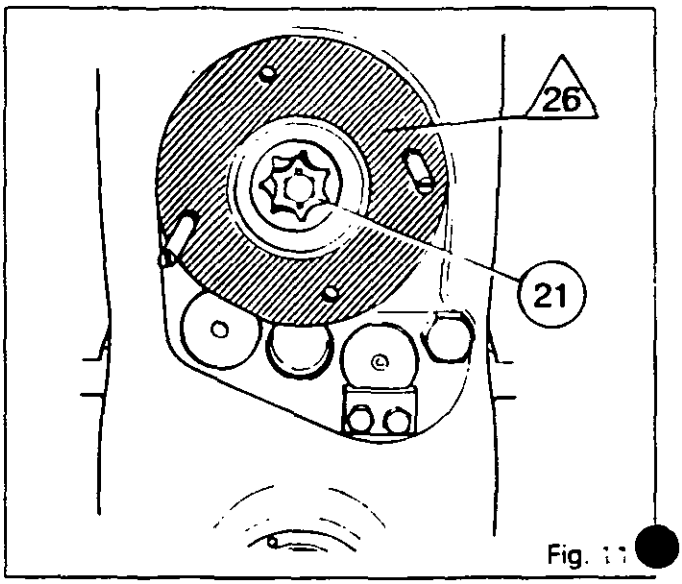


Fig. 11

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71. Install and position the union **(72)** on the cover **/51**. Fit a new O-ring **(17)**.
72. Install and orient the cover **/51** as shown in Fig. 3 (for the clockwise PTO version) or in Fig. 4 (for the reverse PTO version).
Remove the locating studs. Tighten the bolts **(52)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
73. Check the normal backlash and the rotation of the gears by hand.
74. Using a battery, check that the electromagnetic brake operates correctly.
75. Smear the cover **(64)** with a sealing compound (Master Joint 510 Loctite or equivalent).
76. Install the cover **(64)** with the stop **B** positioned in the lock plate **P** (see Fig. 8).
Fit the bolts **(63)** and tighten them to a torque of 25 - 35 Nm, after coating them with Loctite 510.
77. Pour 4.75 litres of transmission oil through the plug orifice **(50)**.
Install and tighten the plug with its O-ring.
78. Visually check the operation of the pump by turning the shaft **(40)** by hand in the direction of rotation of the engine until oil runs from the union **(72)**.
79. Remove the PTO unit from the support.

D. Refitting the PTO unit

80. Position the washer **/7** lightly coated with grease (and with the chamfer oriented towards the axle or the front axle assembly) (see Fig. 1).
81. Using a travelling hoist, reinstall the PTO unit as shown in Fig. 2, engaging the bush **(87)** in the coupling **(76)**.
82. With the unit correctly supported on the washer **/7** fit the bolts **(1)** (see Fig. 1) and tighten them to a torque of 520 - 640 Nm, after coating them with Loctite 270.
83. Fit the grease nipple **(69)** and grease the bearing surface.
84. Remove the straps securing the axle or the front axle assembly (depending on the type). Lift the tractor. Remove the stand.
85. Carry out procedures 6 and 1 to 4 in reverse.
86. Check the operation of the PTO and its brake.
87. Check the mating faces and the hydraulic unions for leaks.

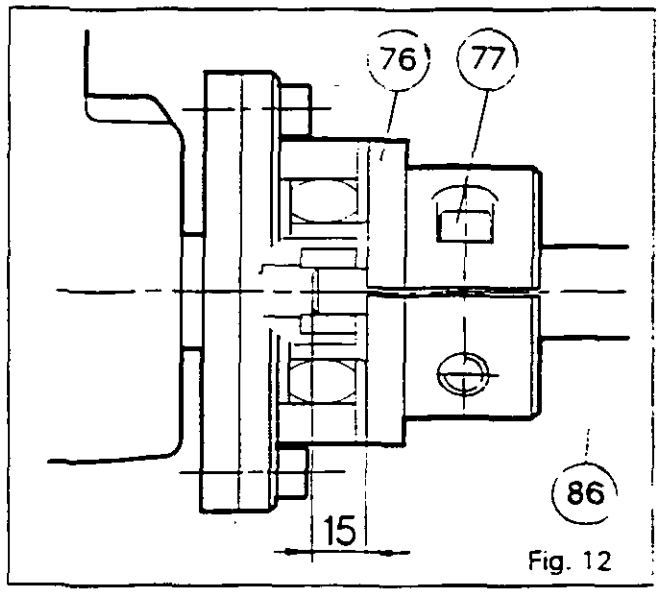


Fig. 12

E. Removing and refitting the connecting shaft

Removal

88. Remove the bolts **(78)**. Slide the sleeve **(85)** forwards.
89. Free the coupling assembly **(76)**, the shaft **(86)** and the bushes **(87)** and **(75)**.
90. If necessary, separate the shaft **(86)** from the coupling **(76)**. Remove the couplers **(79)** and **(88)**. Dismantle the hub **(80)** with the bush **(82)**.

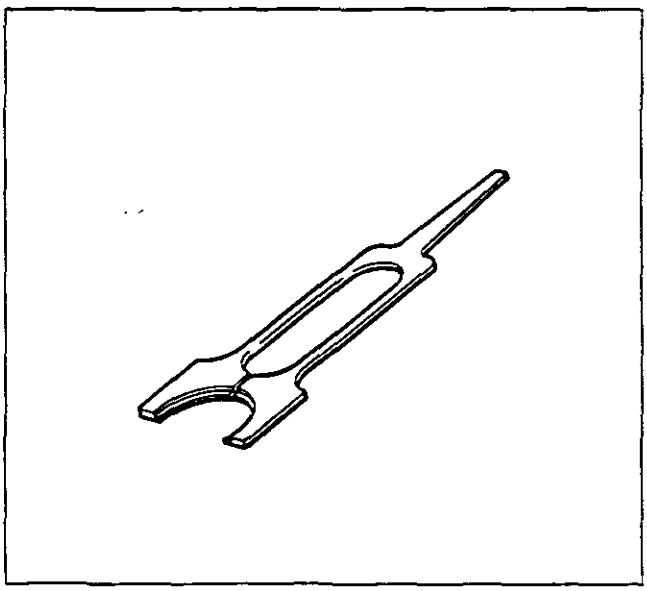
Refitting

91. If they were dismantled, assemble the shaft **(86)** with the coupling **(76)**, complying with the dimension of 15 mm (see Fig. 12).
Tighten the bolt **(77)** to a torque of 36 - 46 Nm.
Reassemble the hub **(80)** with the bush **(82)**.
Tighten the bolts **(81)** to the torque of :
4 cyl. engine : 51 - 69 Nm.
6 cyl. engine : 52 - 75 Nm.
Refit the couplings **(79)** and **(88)** with their respective bushes **(84)** and **(87)**. Tighten the bolts **(74)** and **(83)** to a torque of 36 - 46 Nm.
92. Correctly position the shaft **(86)**. Slide the sleeve **(85)** in contact with the coupling **(79)**. Tighten the bolts **(78)** to a torque of 36 - 46 Nm.

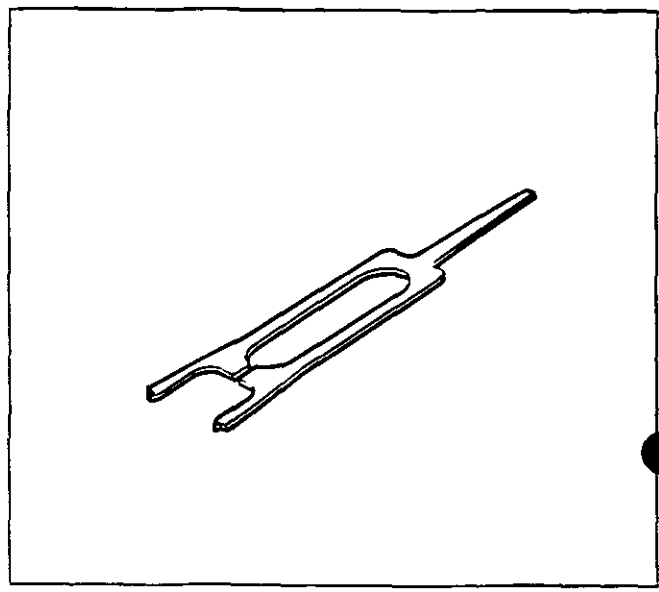
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F. Service tools

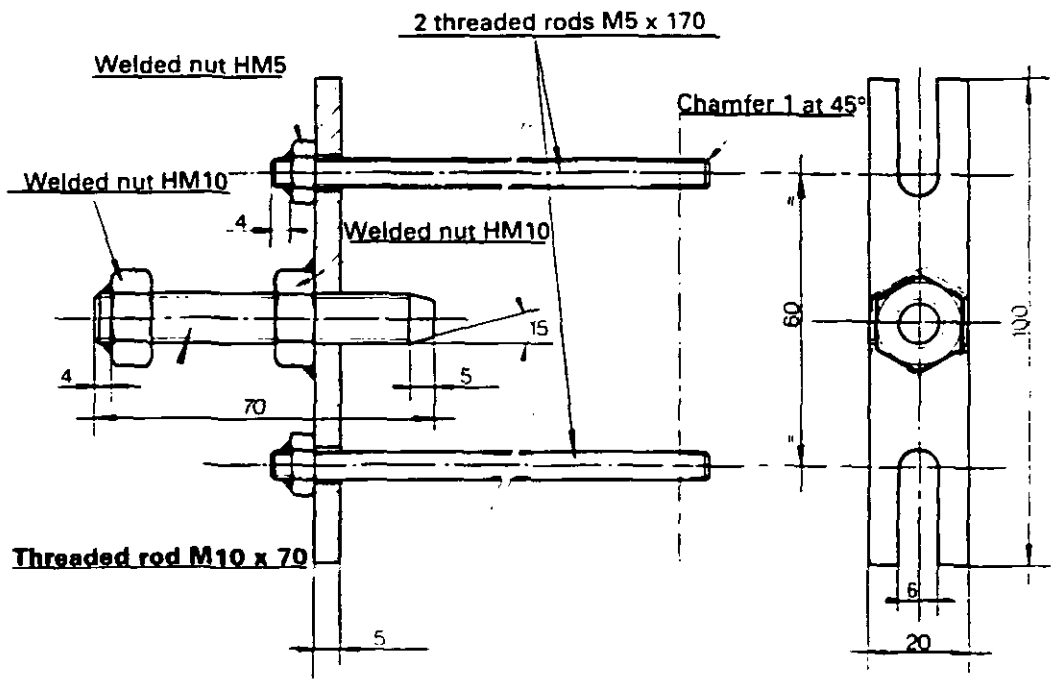


MF 459 Retaining ring refitting tool



MF 460 Retaining ring removing tool

Tool to be manufactured locally



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10 D01 Front lift position indicator

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- **Operation** ____ 2

- **Utilisation for work** ____ 2

A. **Checking the position indicator power supply** ____ 3

B. **Checking the position sensor potentiometer** ____ 3

C. **Setting the position sensor** ____ 4

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10D01.2 **Accessories** - Front lift position indicator

Operation (Fig. 1 and 4)

The position indicator **(3)** is supplied with 12 V + power after starting up and is protected by a 5 A fuse located on the black power supply wire.
The position sensor **(4)** installed in the position of the right-hand lifting arm pin consists of a potentiometer. The sensor pin A is immobilised by a locating pin fitted in the cover **(6)** which is held to the front support by means of bolts **(5)**.
The sensor body is actuated by the lifting arms. It is connected to the position indicator by three wires (blue for earth, white for signal, red for power supply). The indicator's diodes light up according to the signals emitted by the position sensor **(4)** and the potentiometer **(1)** of the position indicator **(3)**.

Utilisation for work (Fig. 2 and 3)

1. Determine the required height of the lifting arms at which the tool operates correctly.
2. Set the switch **(2)** to the "on" position.
3. Turn the potentiometer knob **(1)** until the green diodes **E** located in the middle of the screen light up.
4. Each time the hitch linkage is raised or lowered, the movement of the arms is shown by the lighting up of the red diodes **D**. When the green diodes come back on, the lifting arms have returned to the initial position.

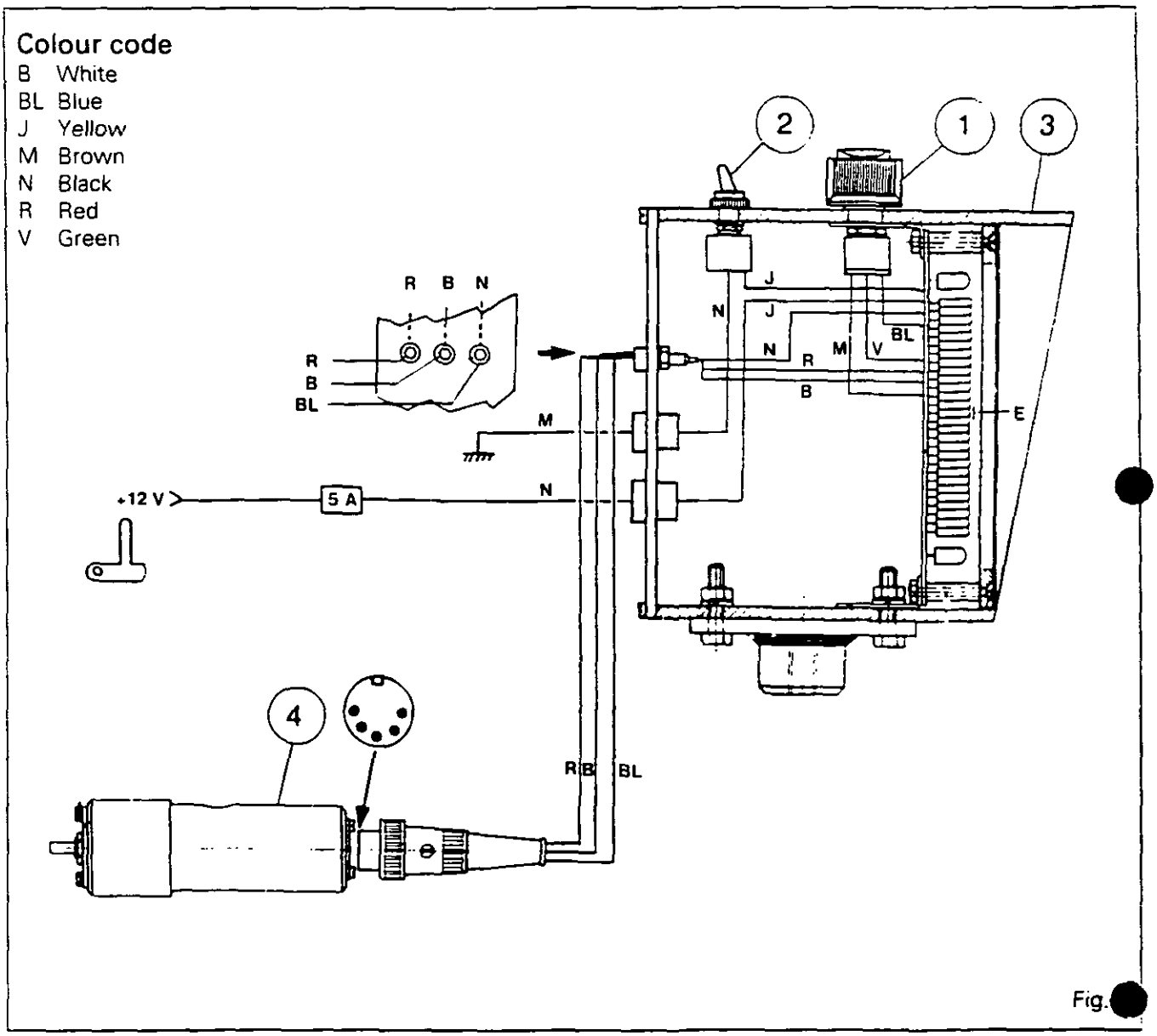


Fig.

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A. Checking the power supply to the position indicator (3)

1. On the position indicator **(3)**, disconnect the wires (blue, white, red) for the position sensor **(4)**.
2. Start up. Set the switch **(2)** to the working position.
3. On the position indicator, check that the lower round diode comes on.
   If does not, check: the brown earth wire, the black power supply wire and the 5 A fuse between the starting switch and the position indicator, the switch **(2)**, etc..

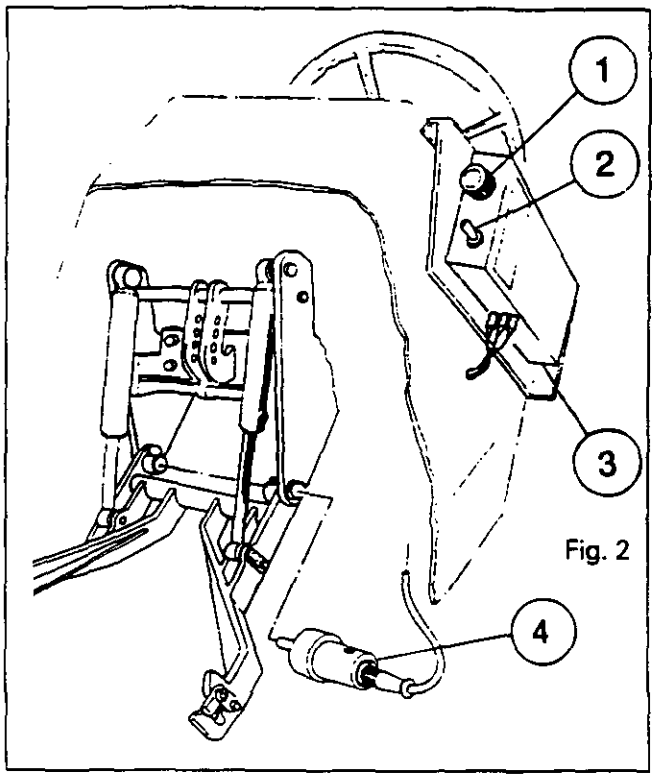


Fig. 2

B. Checking the potentiometer (1) and position sensor (4)

1. On the position indicator, reconnect the wires (blue, white, red) for the position sensor **(4)** and set the lifting function to the mid position.

2. Turn the potentiometer **(1)**. Check that all the diodes come on one after the other.If they do not:
   a) Check the wires between the potentiometer and the position indicator PCB. If they are satisfactory:
   b) On the position indicator **(3)**, disconnect the wires (blue, white, red) for the sensor **(4)**. Check the resistance between the red **(+)** and blue (earth) terminals of the harness.
   If it is approximately 10 kohms: it is correct (see step c).
   If R = 0 ohms: there is a short circuit between the two wires.
   Disconnect the harness from the position sensor **(4)**. Trace the short circuit (sensor or harness).
   If R is infinite: check the connection of the sensor, the continuity of the lines and the resistance of the sensor.
   c) Carry out the same test between the blue (earth) and white (signal) terminals. The correct value must be between 100 ohms and 11,000 ohms approximately (depending on the sensor adjustment and the position of the lifting arms).
   If R = 0 ohms: there is short circuit between the two wires.
   Disconnect the harness from the position sensor **(4)**. Trace the short circuit (sensor or harness).
   If R is infinite: check the connection of the sensor, the continuity of the lines and the resistance of the sensor.
   d) If it is correct, reconnect the position sensor and check the potentiometer or the diodes.

3. Raise and lower the lifting mechanism. Check that the diodes light up to indicate lifting or lowering.
   If they do not:
   a) Disconnect the sensor on the position indicator and check that the resistance between the blue and white terminals of the sensor harness increases when the hitch linkage is lifted and decreases when it is lowered.
   b) Remove the cover **(6)** and check the attachment of the trunnion **(8)**. Readjust the sensor setting (see part C).

4. Check that all the diodes light up when the potentiometer **(1)** is turned, regardless of the position of the lifting system (minimum or maximum position).
   If they do not: readjust the sensor setting (see part C).

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C. Setting the position sensor (4) (Fig. 3 and 4)

1. Place the arms in the maximum high position.
2. Remove the cover **(6)** from the position sensor **(4)**.
3. Unscrew the grooved trunnion **(8)** fitted on the sensor pin.
4. Turn the sensor pin **A** as far as it will go in the clockwise direction.
5. Turn the pin **A** in the anticlockwise direction until the lower round diode lights up. With the diode lit up, turn through 10 more degrees.
6. Check the position of locating pin **P** on the outer face of the cover **(6)** and position it with bolts **(5)**. On the front support, draw a marking in line with that on the cover. Remove the cover.
7. Without turning the sensor pin, fit the trunnion **(8)**, lining up the groove **R** with the marking drawn on the support. Refit the cover **(6)** with seal **(7)**, ensuring that the markings are aligned. Tighten the bolts **(5)** lightly.
8. Start up the tractor. Check that the lifting function and the position indicator **(3)** operate correctly.

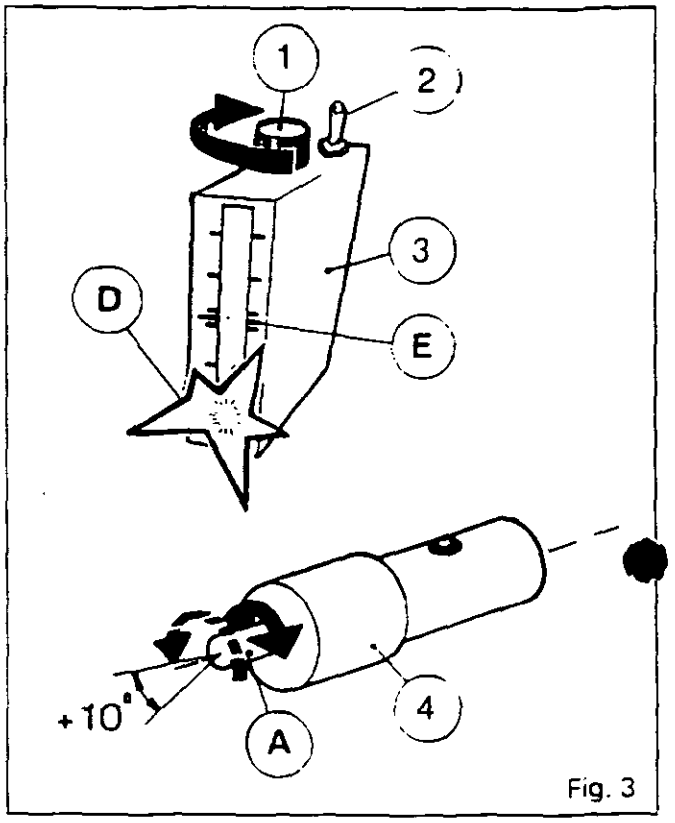


Fig. 3

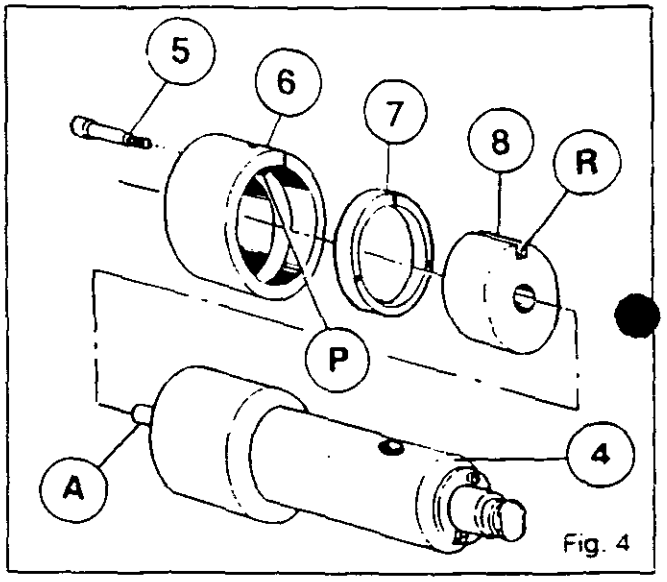


Fig. 4

List of parts

(1) Potentiometer
(2) Switch
(3) Position indicator
(4) Position sensor
(5) Bolt
(6) Cover
(7) Seal
(8) Trunnion

A Sensor pin
R Trunnion groove
P Locating pin
D Diodes (red)
E Diodes (green)

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11 A01 General description

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B. Working principles ____ 3

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D. Attaching an implement ____ 6

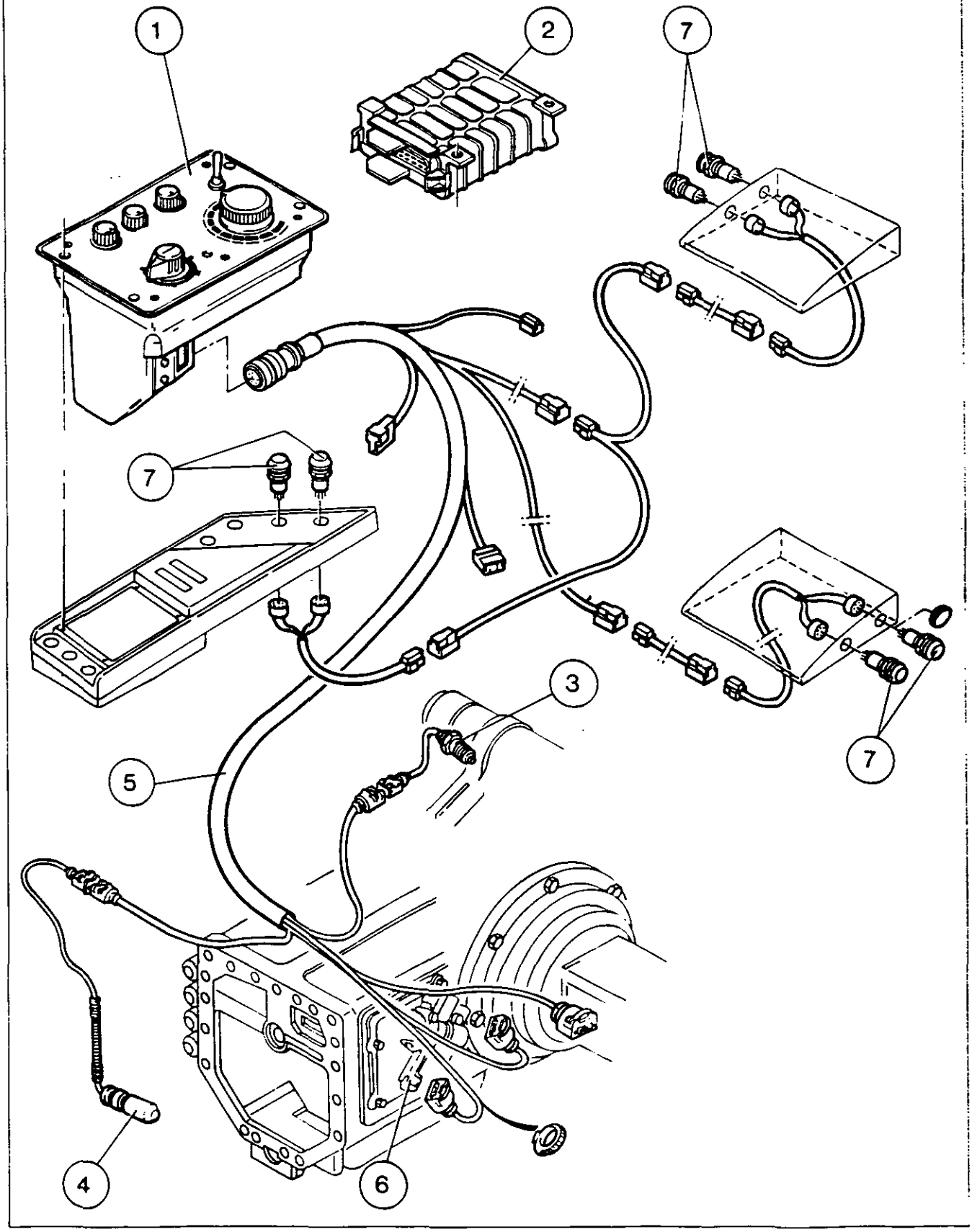
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11A01.2

Electronic lift control - General description

General description



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Electronic lift control - General description

A . Description of components

The electronic linkage control system consists of 7 basic components :

(1) Control panel
Situated inside the cab on the right hand side, it comprises the various potentiometers and diodes for the 8 main functions.

(2) Electronic calculator
Situated directly underneath the control panel and connected to it.
The electronic calculator is the «brain» of the system. The purpose of the electronic calculator is to compare the signals relayed from the sensors **(4)** and **(3)** with the settings of the various controls on the control panel **(1)**.
When the value of the control panel settings differs from those sent from the sensors, the electronic calculator sends a signal to the control valve solenoids **(6)**. This raises or lowers the 3 point hitch until the values set on the controls equal those received from the sensors.

(3) Position sensor
Located on the right hand side of the lift cover.
The position sensor registers the angular position of the cross shaft (rock shaft) by means of a linear sensor, located against a cam connected to the cross shaft (see 6 B01, p.3). The electrical signal from the sensor is relayed back to the electronic calculator by means of a well-protected cable.

(4) Draft sensors (sensing pins)
Situated at the pivot point where the lower links meet the axle housings.
The draft sensors register the draft force on the lower links. The sensors are built into the lower link pivot pins. They measure draft forces extremely accurately by measuring changes in internal forces caused by the changing loads on the pins. The electrical signals from the sensor are then relayed back to the electronic calculator by means of well-protected cables.

(5) Electrical harness linking the various components

(6) Hydraulic/Electrical control valve
Located on the left hand side cover on the rear axle housing.
The valve is of the open centre type and forms one section of the high flow (high pressure) hydraulic circuit. The circuit components are connected in series, the circuit also contains the trailer brake valve (if fitted) and the auxiliairy spool valves.
The valve is basically hydraulic in design with 2 pilot valves controlled electrically by solenoids. One solenoid is lift and the other lower. The solenoids receive electrical signals from the electronic calculator **(2)**.
Note : Never connect an electrical supply directly to the solenoids as serious damage to the solenoids may occur.

(7) External controls
Situated on the fenders or inside the cab according to the specifications.
Designed to simplify the coupling of implements, the system allows the operator to control the height of the lower links by means of two push button switches conveniently mounted on the outer edge of rear fenders.

B . Working principles

The principles by which these components work together to achieve an effective linkage control system is as follows :
The system operates around the central component which is the electronic calculator **(2)** «the brain».
The electronic calculator receives 2 types of electrical signal, the operator's signal, through the dials on the control panel, and the tractor/working signal, from the draft and position sensors.
The calculator takes the signal, sent from the various controls on the control panel and compares that signal with the signal relayed from the sensors. If the 2 signals are of different values the electronic calculator will then send its own signal to the control valve solenoids. This raises or lowers the 3 point hitch until the values set on the controls are equal to those received from the sensors.

When the tractor is working these corrections are constantly being made ensuring that the quality of the work is maintained and optimum performance is achieved.

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C . Using the control panel

(A) Maximum height control

This potentiometer is used to set the maximum lift/height.

It is normally used with PTO driven linkage mounted implements where excessive lift height can cause rapid wear on the PTO shaft universal joints.

It can also be used to save time at the headland by avoiding lifting the implement to transport height.

(B) Sensitivity control

The sensitivity control establishes the size of the systems «dead band».

An electronic system is always capable of being more sensitive than a hydraulic one. To accomodate this the calculator has a «dead band « incorporated into it. This «dead band» is a means of reducing the sensitivity of the system. Under the majority of applications this built in «buffer» will prevent the «shuddering» experienced when the calculator is reacting to too many draft signal variations.

However, should the application mean that large rapid variations in draft force are ocurring (subsoiler in stoney subsoil) then it is possible to increase the «dead band» by movement of the sensitivity dial.

The sensitivity control operates on draft and intermix but not on position control.

(C) Rate of drop control and transport lock

This potentiometer provides an adjustable rate of implement drop.

The system allows optimum implement lowering rate consistent with fast entry into work, whilst still protecting the implement from damage. The implement drop speed is independent of the implement weight.

Also when turned fully clockwise past the slow position, it locks the hydraulic lift in the transport position.

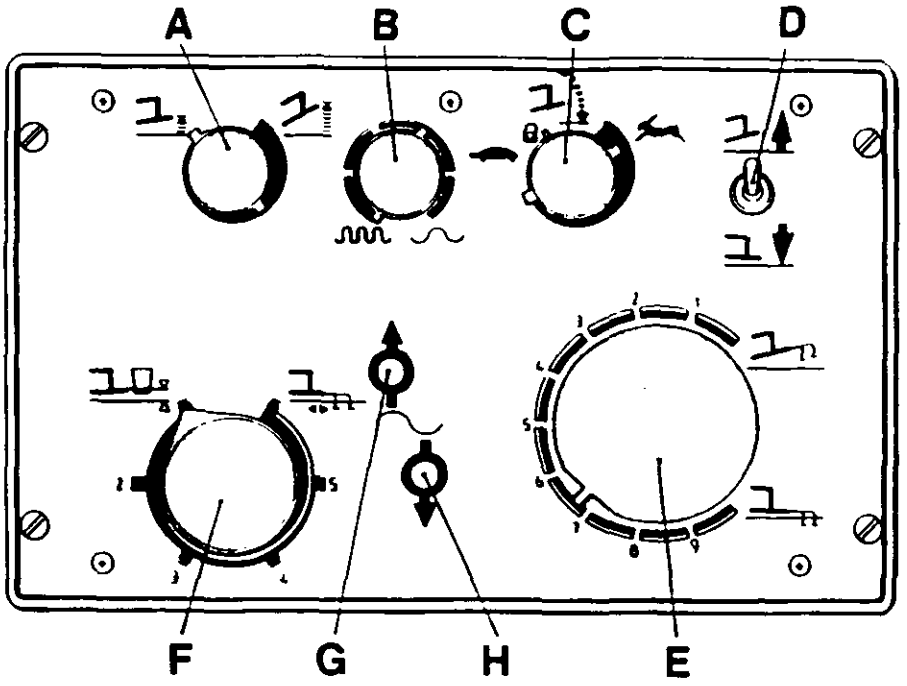
(D) Lift/Lower switch

This toggle switch controls the lift and lowering of the 3 point hitch.

A safety device is built into the system which automatically locks the hydraulic lift when the engine is switched off.

This places the whole hydraulic system into «hold» making it impossible to operate any of the hydraulic functions. When the engine is started up again movement on the lift/lower switch to the lift position will re-actuate the system and all functions will become "live".

Fig. 1 - Early control panel



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Electronic lift control - General description

(E) Depth/Height control

This dial is used with one of the three controls. position, draft or intermix, as determined by the position of the function selector control.

When the dial is used with the function selector in position control (fully clockwise), it will act as an implement height control (used with non-soil engaging implements).

When the dial is used with the function selector in draft control (fully anti-clockwise), it will act as an implement depth control (used with soil engaging implements). The system senses draft forces on the lower links to attain the depth set on the dial.

When the dial is used with the function selector in any other position (2, 3, 4 or 5) it will act as an implement depth control (soil-engaging implements). The system will attain the depth set on the dial by sensing draft forces on the lower links as well as the height of the implement by sensing the angular position of the cross shaft (rock shaft). This is known as Intermix. The position of the function selector will determine the percentage mixture of draft/position signals.

The purpose of intermix is best explained as follows. With the increasing size of tractors and implements a system of linkage control that relies solely on changes in draft force for its reactions can have its limitations. Large changes in draft force will result in excessive linkage movement, a problem often associated with very wide (heavy draft) shallow cultivating implements or implements working in soils with bands of different consistency. Using intermix which reacts to position sensor signals, as well, will result in less linkage movement for the same change in draft force allowing a closer control of the depth to be attained.

(F) Function, Selector Control

The purpose of this dial is to select position control, draft control or various degrees of intermix

Mark 1	:	position control only
Marks 2 to 5	:	draft control progressivity
Mark 6	:	draft control only

(G) (H) Indicator lights (diodes)

The two indicator lights show the operator when and in which direction the hydraulic linkage is moving. They are a visual check that the Electronic Lift Control is operating as the lights will continually go on and off when working in draft control or intermix.

(G) : Lift warning light

(H) : Lower warning light

(J) Quick soil engagment button

This button was introduced on the new control panel from June 1991.

You can obtain working depth quicker by pressing button J. When you release the button, working depth returns to that set on button E.

Fig. 3 :

1 : normal engagement

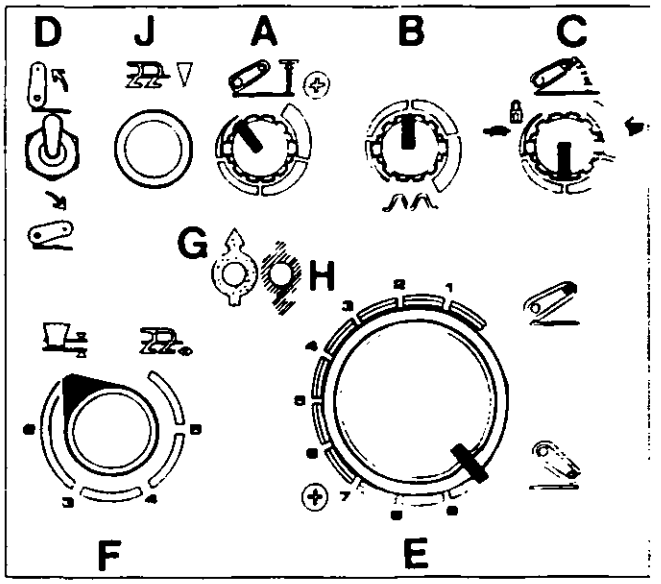
2 : quick soil engagement

Advantages : faster, more precise entry of soil.

Note : When you press the quick soil engagement button, active slip control is deactivated until the button is released.

During rapid soil engagement, keep slip control below 80 % to prevent the implement from lifting when releasing the button.

Fig. 2 - New control panel



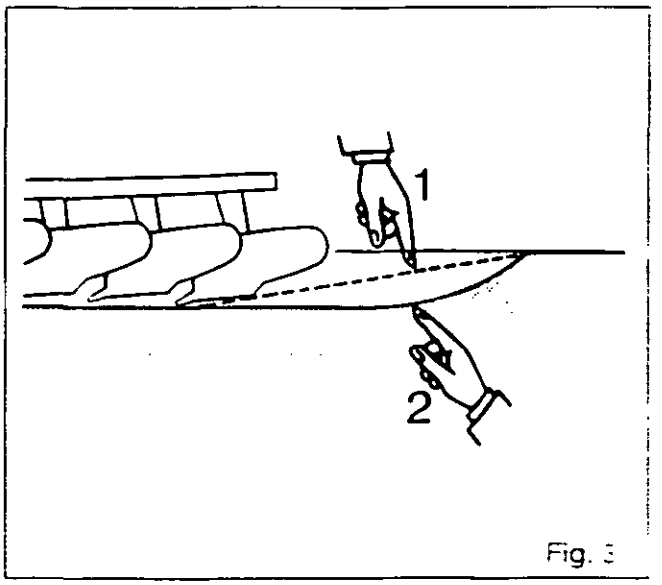


Fig. 3

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D . Attaching an implement (Fig. 4-5)

1. **With the internal controls**
   After starting the engine. move the switch **(D)** to lift, then lower, in order to bring the console into service. then adjust the position of the arms with the depth control knob **(E)**.
   Note : The other controls must be placed as follows :
   (A) At the maximum position
   (B) In intermediate position
   (C) In intermediate position
   (F) On position control

2. **With the external controls**
   Use of the external control can only be made if the switch **(D)** is in the lower position or neutral. In this position, a simple movement of the external control allows the lift arms to move. For safety. when the external buttons are operated, the control panel is automatically switched off.
   Note : The movement of the linkage stops as soon as the button is released . When the external control is used, the lowering speed is 70% of the maximum speed.

3. **Reactivate the control panel**
   After attaching an implement as described previously, or also after stopping the engine. move the switch **(D)** into the lift, then the lowering position.
   Note : Locking of the arms is carried out with the potentiometer (C) controlling the lowering speed : if this is set at lock, with control (A) set at maximum position and (E) at any position.

4. **Headland turn manœuvres**
   Switch **(D)** at lift ; depending upon the position of **(A)** the arms will rise.
   At the end of manœuvring, set **(D)** at lower and the former position will be resumed.
   Note : The floating position is obtained with button (E) set between 8 and 10.

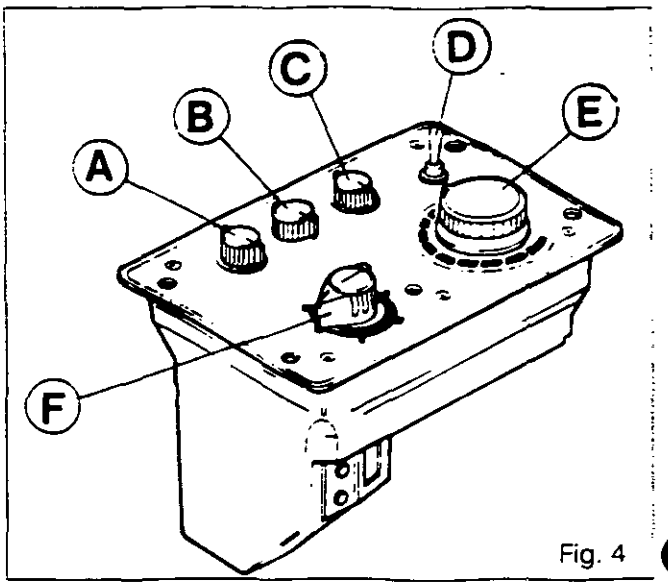


Fig. 4

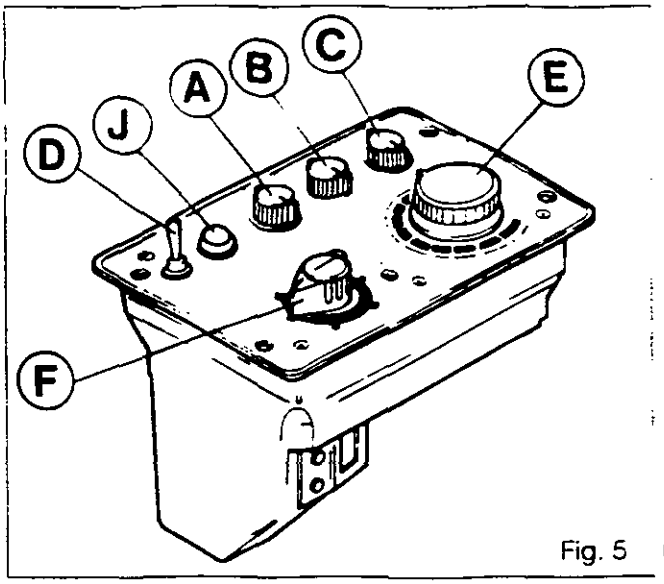


Fig. 5

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11B01 Fast checking of lift

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B. Lift/lower switch in "lift" ____ 2

C. Lift/lower switch in "lower" ____ 3

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Electronic lift control - Fast checking

For these checks, the oil must be at 60° C and the engine running at approx. 1200 rev/min ; a load of 300 to 400 Kg is required on the lower links in order to overcome the friction resistances.

A . Lift/lower switch in neutral

Check that there is no reaction on the arms.
Make sure that the lift functions correctly when operating the external controls.

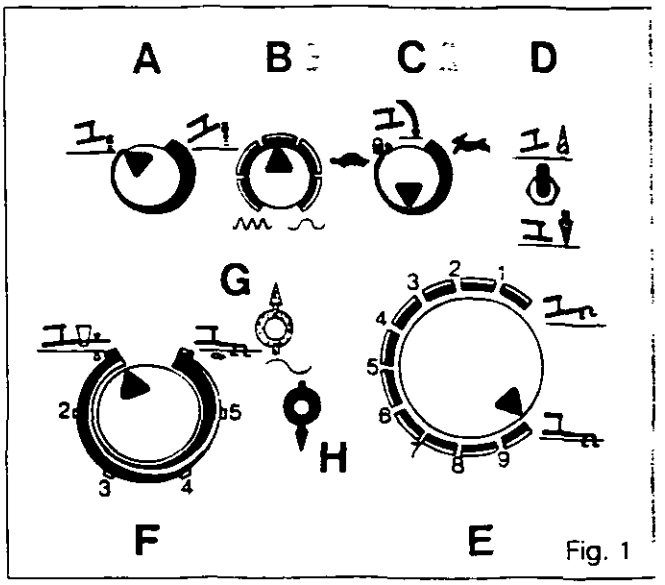


Fig. 1

B . Lift/lower switch in lift

Set controls as shown in Fig. 1 : lower links at lowest position.
Switch **D** set to lift allow lift arms to raise and stop, check that the ram rods have moved out 50 ± 5 mm. The warning light **G** remains lit as long as the arms are rising. Rotate **A** and check that :
- The lift is proportional
- There are no oscillations when the arms have reached their position. (**G** light goes off).
- Knob **A** at maxi height setting, relief valve does not blow off whatever other knob settings ; light **H** never comes on.
- Check also that operating the external controls do not bring about any variations.

Fault identification
Push on electrovalve spools manually. If linkage lifts and lowers the hydraulic circuit is not faulty. The following electrical test procedure should be carried out.

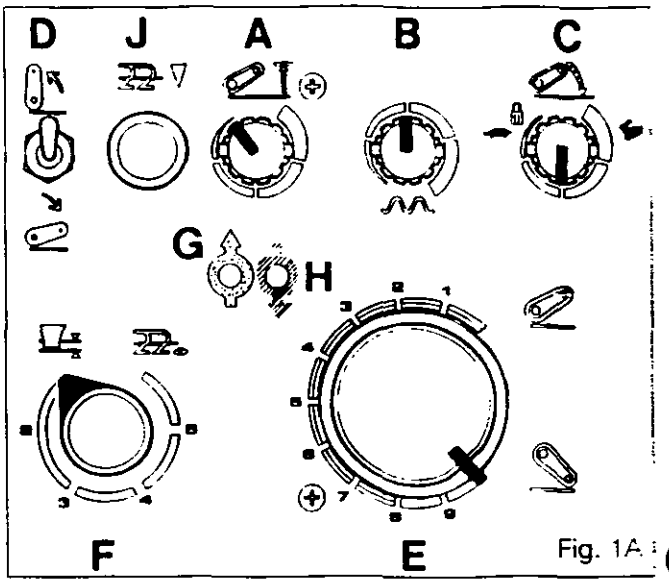


Fig. 1A

Fig. 1 : Old control panel
Fig. 1A : New control panel from serial n° S191036

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Electronic lift control - Fast checking

C . Lift/lower switch in "Lower"

Timing active (Datatronic only)

Datatronic «Timing active» light comes on a few seconds after switch **D** is placed on «lower» position (whatever above settings are).

Depth control

a) Lift

Set controls as shown Fig. 2, lower links at lowest position, light **H** on.

When the depth control knob is turned towards O: check that the lifting warning light **G** comes on when the setting 7.5 to 8.5 is reached.

The lifting of the arms must then be proportional to the settings of knob **E**, without oscillations.

The lift arms reach the maximum high position when the depth control knob **E** is at 0: the warning light goes out: make sure that the relief valve does not blow.

Set sensitivity to maxi, repeat above operations. Reactions should be identical.

Sensitivity is inactive for 100 % position setting.

b) Lower

Set controls as shown Fig. 3, lower links at highest position.

Turn depth control **E** to lower, light **H** should come on from 0.

Lower links should be at lowest position from 7.5-8.5.

From 8.5 light **H** should stay on.

Set sensitivity to maxi, repeat above operations. Reactions should be identical.

Maxi height

Lower links at lowest position, set controls as shown Fig. 4.

Raise lower links using knob **E** : ckeck that from 6, **G** light goes out, lift not possible, lift rams have moved out 50 ± 5 mm.

c) Quick soil engagement

Set controls as shown fig. 3.

Push on button J and check that lift arms lower. Release the button and check that they raise to their initial position.

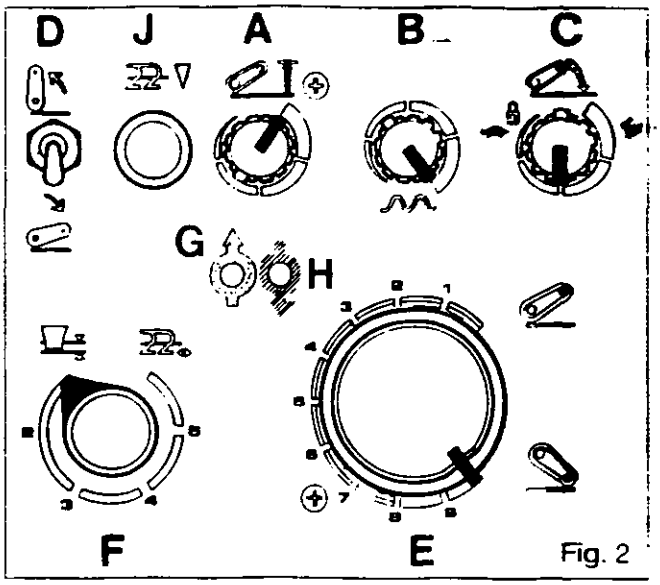


Fig. 2

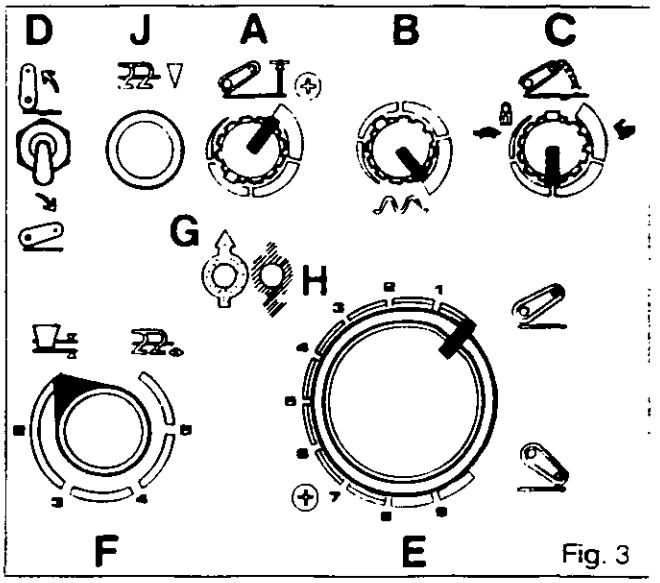


Fig. 3

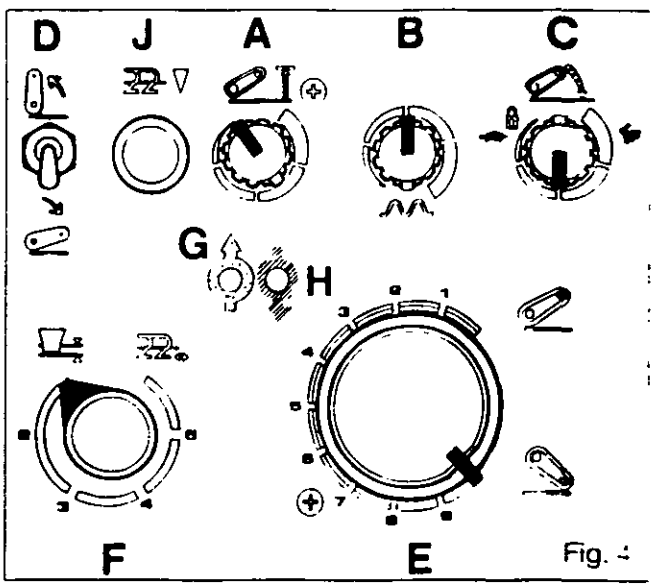


Fig. 4

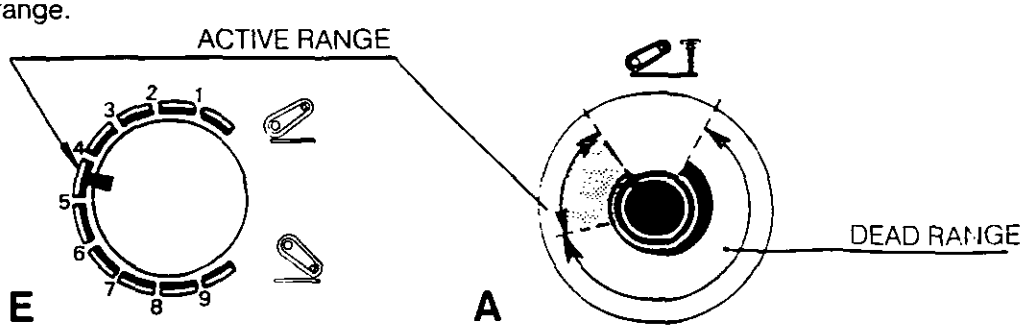
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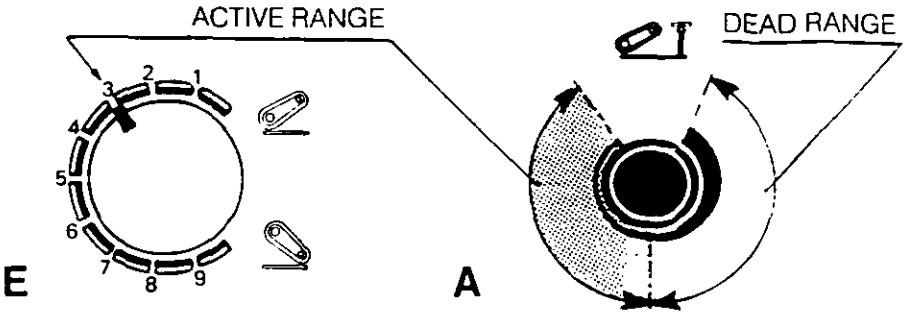
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Electronic lift control - Fast checking

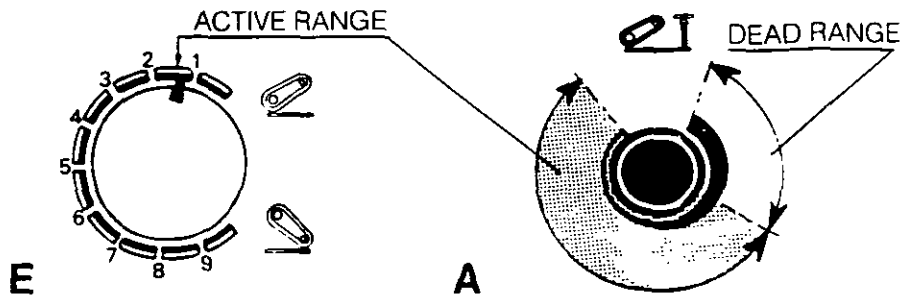
Continue the test procedure as follows :
Set knob **E** at 4.5. Operate knob **A** and check that the lifting or lowering operates only for the first quarter of the potentiometer range.



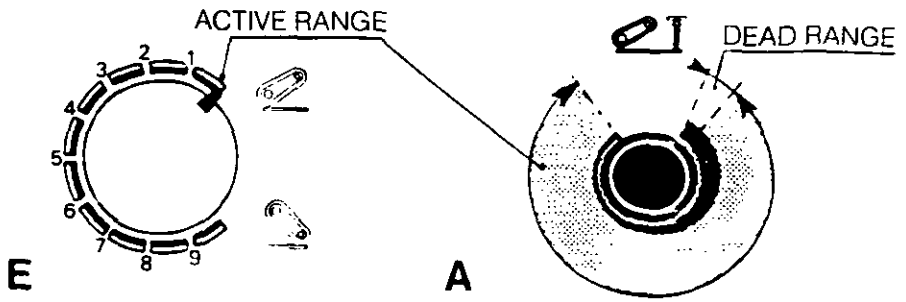
Depth control knob **E** at mark 3 ; the arms raise through half the adjustment range, when **A** is operated.



Knob **E** at mark 1.5. When knob **A** is turned, the arms raise over 3/4 of the range.



Knob **E** at 0 ; knob **A** at top position ; the arms raise over 7/8 of the adjustment range of the potentiometer



When switch **D** is at "lower", lift stroke is limited from mark 6 by knob **A**. Max height range setting is influenced by knob **E** setting.

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Electronic lift control - Fast checking

Draft control

Draft control at minimum sensitivity

Position the various potentiometers as shown Fig. 5.
Lower links at lowest position, **H** light on.

Lift control

Then turn knob **E**. In order to raise the lift, the warning light **G** must come on at the setting 3-3.5.
The lift reaches the transport position at setting 2.5.
Note : Lift stroke is no longer proportional to knob E setting.

Lowering control

Turn knob **E** to low, check that :
- lift lowers from 3-3.5
- lift is at lowest position at 4.5
- stroke not proportional to knob **E** setting.

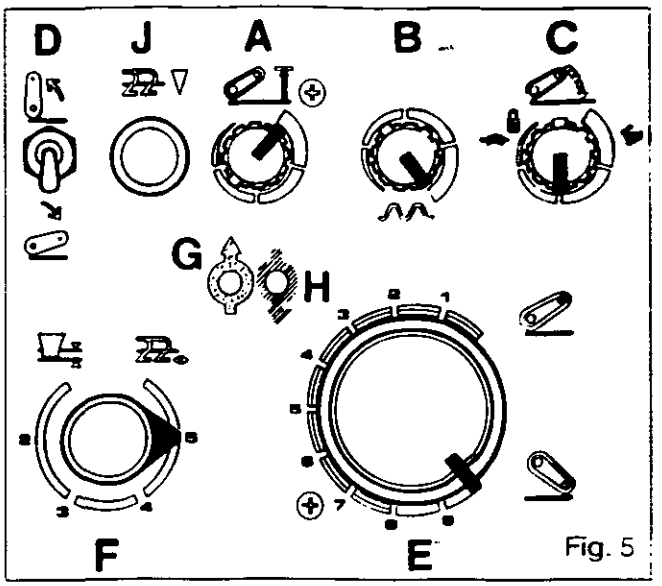


Fig. 5

Draft control at maximum sensitivity

Position the various potentiometers as shown Fig. 6.
The lower links at lowest position, the lowering warning light is lit.

Lift

Raise the arms by operating knob **E** ; the warning light must come on from 4-4.5. They reach the transport position at 3.

Lower

Turn knob **E** to low, check that :
- light comes on at 3-3.5
- lift is at lowest position from 4.5.
- stroke not proportional to knob **E** setting.

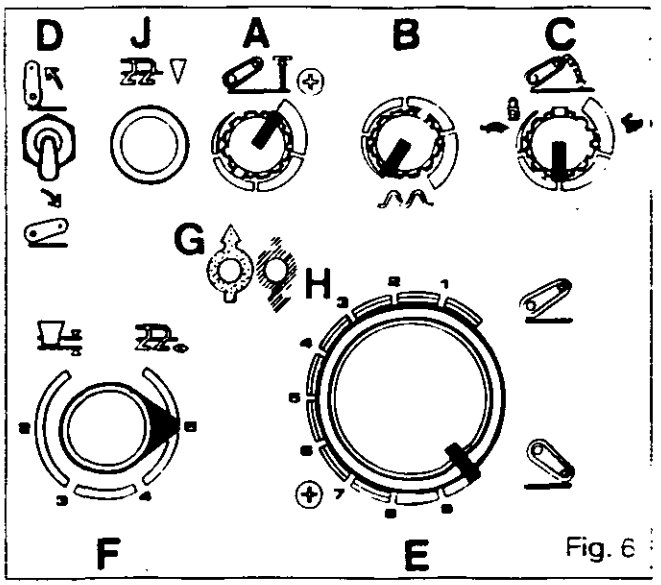


Fig. 6

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Electronic lift control - Fast checking

Draft / position intermix minimum sensitivity

Position the potentiometer as shown Fig. 7.
By operating knob **E**, raise and lower the arms making sure that the depth control range is limited (4 to 3 marks).
Set knob **F** to marks 4, 3, 2 check that depth control range increases as shown Fig. 8.
Note : On the earlier control panel the minimum sensitivity position on knob B is situated at the right.

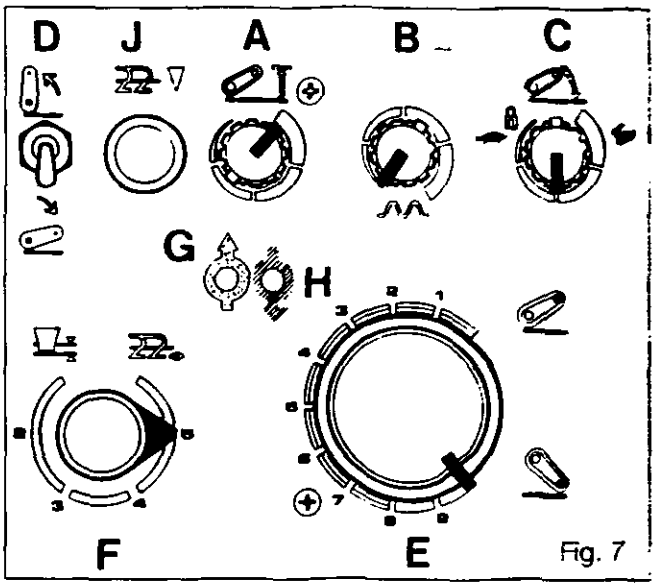


Fig. 7

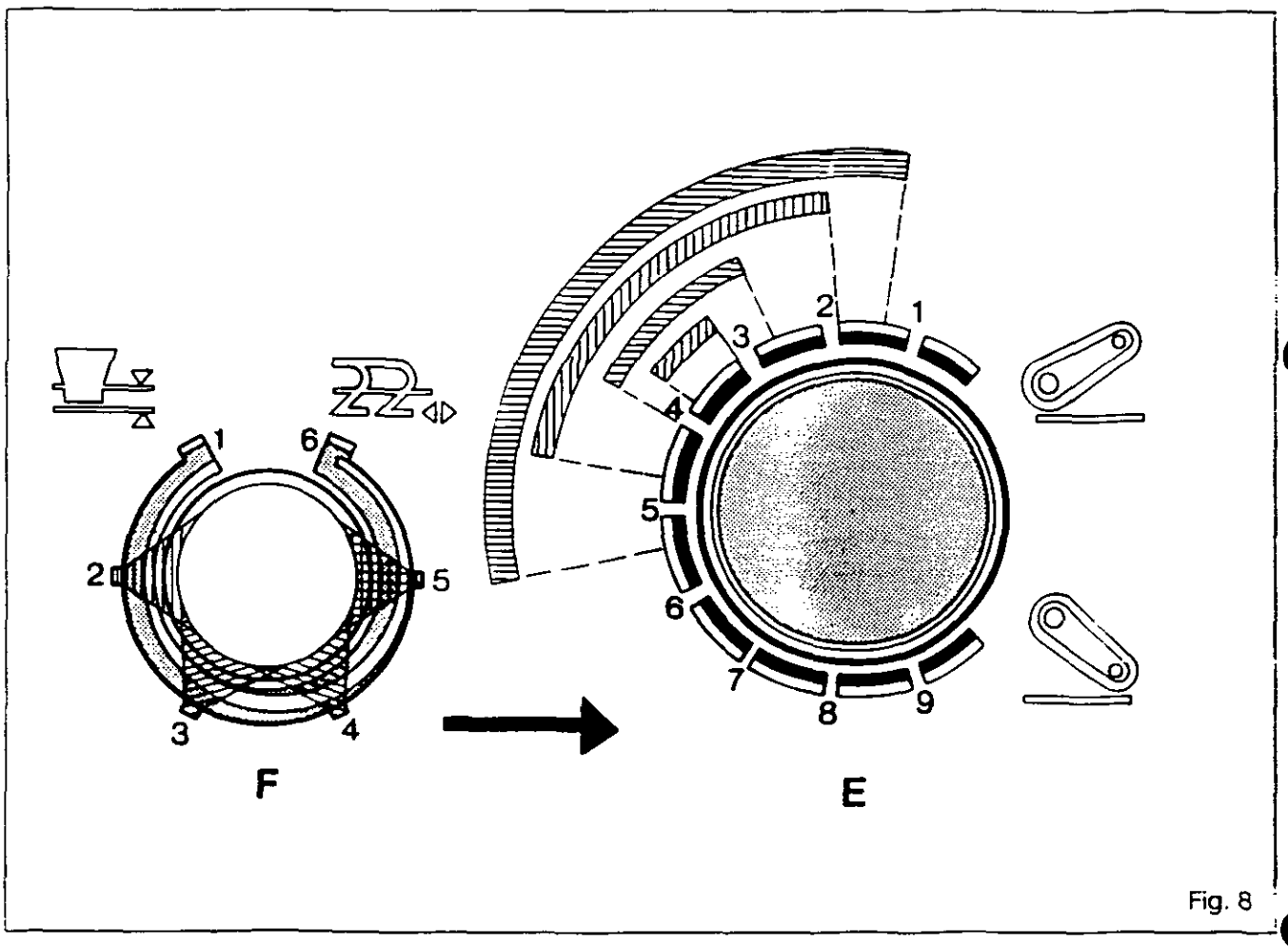


Fig. 8

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Electronic lift control - Fast checking

Draft/position mixing, maximum sensitivity

Adjust the potentiometers as shown Fig. 9.

Carry out same operations as previously, but checking as shown Fig. 10.

The sensitivity adjustment acting on the draft control has a lesser effect if the draft/position selector is nearer to the pure position control, because sensitivity only acts on draft.

Note : the indications are given for a load of approx. 400 Kg on the ball ends and may vary if the load is different.

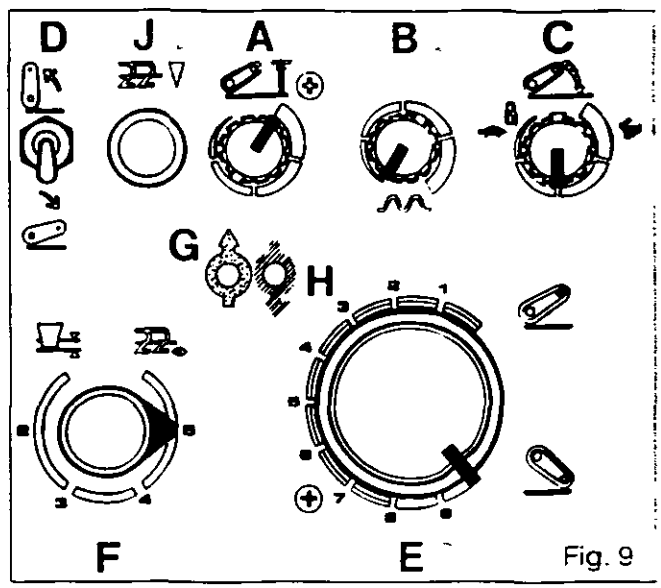


Fig. 9

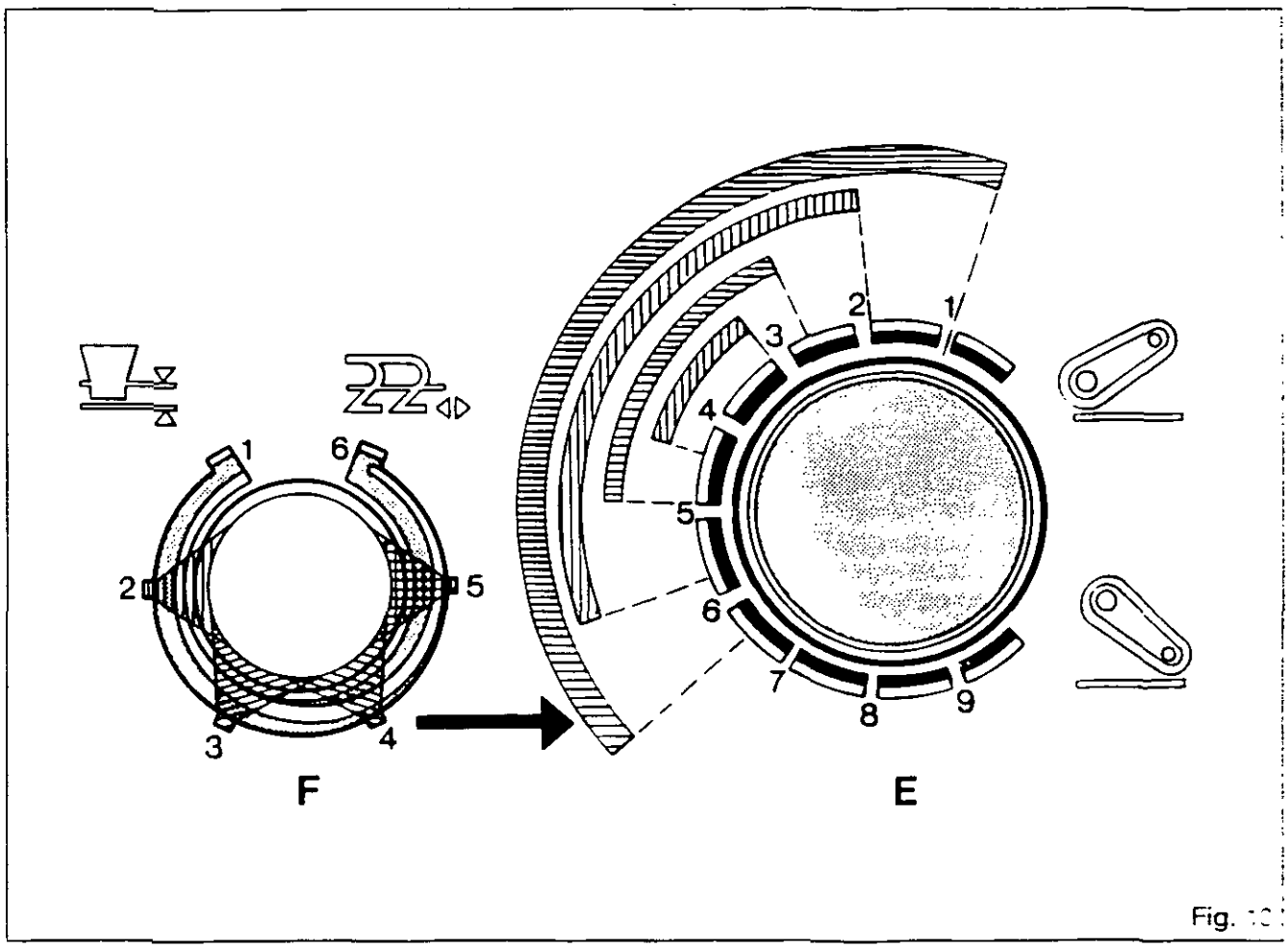


Fig. 10

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Electronic lift control - Fast checking

Lowering lock

Make sure that the lift arms are in the lowest position, then set controls as shown Fig. 11.
Light **H** goes out.

1) **Calculator 3383891 M3 (Bosch 053 82 001 008)**
   Check that it is impossible to raise the lift arms with switch **D** on lift, or with knobs **A** or **B**.
   Check it is possible to raise the lift arms with depth control knob **E** (switch **D** set to lower), but that it is impossible to lower the arms.
   Lower the lift arms to lowest position, set the controls as follows :
   - knob **A** to minimum
   - Knob **E** to 1
   - Knob **C** on lock

   Make sure that it is impossible to raise the lift arms with switch **D**.
   Make sure that it is possible to raise the arms when turning knob **A**, but that it is impossible to lower them.

2) **Calculator 3383891 M2 (Bosch 053 82 01 006)**
   Set controls as shown fig. 11.
   Make sure that it is possible to raise the lift arms by turning the knob **E** but not possible to lower them.
   Check that it is possible to raise the lift arm with switch **D** on lift but that it is not possible to lower them.
   Lower the arms to lowest position. Set the controls as follows :
   - Knob **A** to minimum
   - Knob **E** to 1
   - Knob **C** on lock

   Check that it is possible to raise then to lower the lift arms when turning knob **A**.

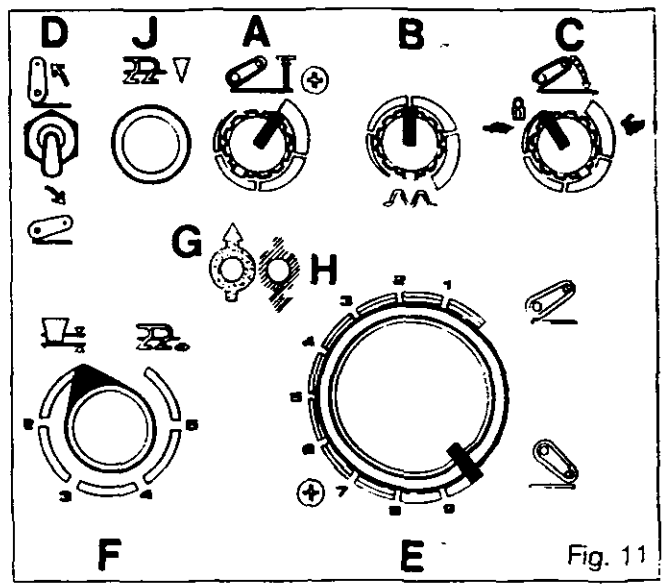


Fig. 11

External controls (if fitted)

Make sure that operation of the external controls takes priority over adjustment carried out at the console.
If this operation ceases, the lift must stop. (Warning light goes out).
In order to control the lift again from the console, set the lift/lower selector **D** at least once at the position Lift.

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11 C01 Checking the harnesses and components

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B. Voltage checks ____ 3

C. Checking resistances ____ 4

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E. Checking control console ____ 7

F. Checking potentiometers ____ 8

G. Adjusting position sensor and depth control knob ____ 9

H. Circuit diagram (with quick soil engagement) ____ 11

I. Circuit diagram (without quick soil engagement) ____ 13

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A . General

The various checks to be carried out on tractors equipped with electronic lift, when there is a functional anomaly, are carried out using a tester 3389502 M1 and multimeter MF 3005.
The tester **(B)** is connected to the round 24 pin connector **(C2)** or the harness **(FR)**, or both (Fig. 1).
The aim of the tester is to prevent damage to the plugs on the connector and it is provided with female plugs which are able to fit the ohmmeter test leads.

Use of the ohmmeter / voltmeter (multimeter) (Fig. 2)
Before carrying out any measurements read carefully the multimeter use instructions. Select ohmmeter (Ω) - voltmeter direct current (VDC) or voltmeter alternating current (VAC).
For the ohmmeter function, measuring resistance, it is useful to make readings according to the scale of resistances.

Interpretation of readings with ohmmeter :
When the display is about 0 Ω, this means that there is no break in the harness or in the part forming the line where the measurement is being carried out.
When the display is 0.L M Ω (infinity), this means that there is a break on the line, hence there is more chance of current and voltage transfer, which may be the cause of the breakdown.
Note : Never connect two test box jacks when calculator is functioning.

Trouble - Shooting on Datatronic tractors
To find the cause of faults in case of incorrect functioning of the Electronic Lift Control, disconnect connector L and check to see if the problem still exists. If it does not, check the Datatronic wiring harness (see 13B01-4) and not the lift control.

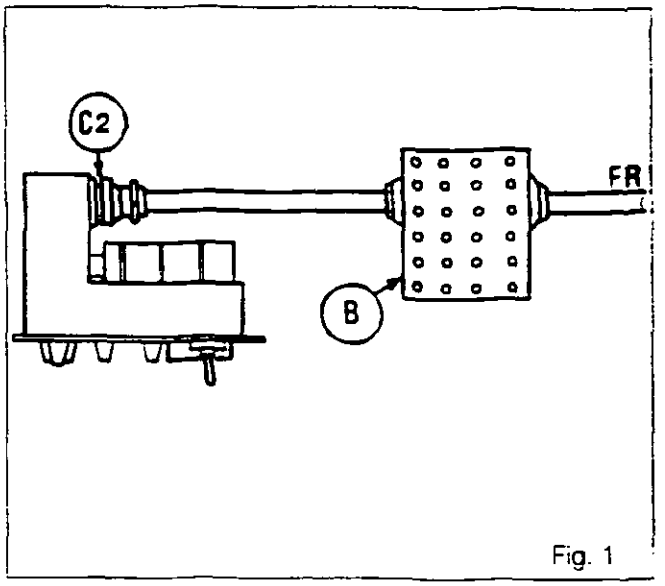


Fig. 1

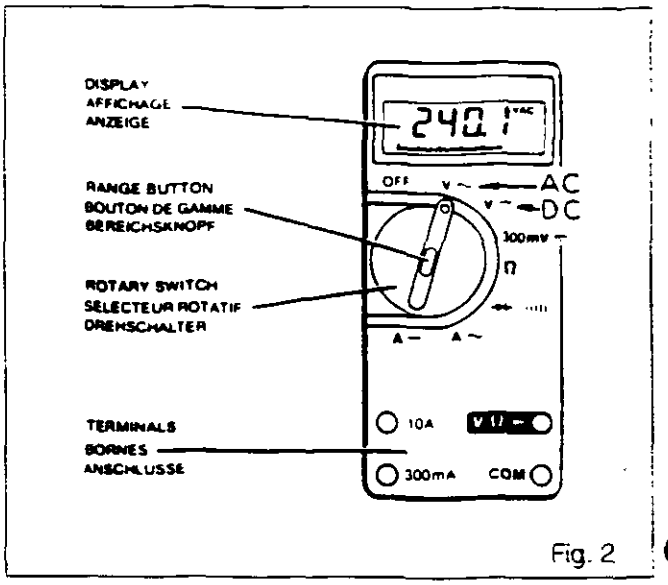


Fig. 2

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B . Voltage checks

Tester **(B)** connected between control console and tractor harness **(FR)** as shown Fig. 1.

Engine stopped, ignition off

Voltage between terminal + -	Normal values	Others values see fault nbr in 11 D-01
16 - 14	Battery voltage 10.4 - 15.3 VDC	1
17 - 14	Alternator voltage 0 VDC	2

Engine running, ignition on

The console must be brought into use by operating the switch **D** (see chapter 11 A. pages 4-5) to transport position.
Battery charging warning light off.

Voltage between Terminals + -	Instructions	Normal Values	Other values See Faults in 11D-01
16 - 14		Battery voltage 10.4 -15.3 VDC	1
17 - 14		Alternator Voltage 13.5 - 14.5 VDC	3
2 - 14		Battery voltage to solenoids 10.4 - 15.3 VDC	4
8 - 10		Voltage provided by calculator to draft sensors 9.5 - 10.5 VDC	5
9 - 10	Lower links unloaded	RHS draft sensor signal Maxi 5.7VDC Mini 4.3 VDC	20
12 - 10		LHS draft sensor signal	20
5 - 7	Select multimeter MF 3005 "Range hold" for these measures. Press white button once and place selector on V~(VAC)	Position sensor power supply 6.7 - 7.2 VAC	6
6 - 7	Set switch D to neutral. Press (lift) external control button until links stop raising	Position sensor signal 4.5 - 4.9 VAC	21
6 - 7	Set switch D to lift then to lower Lower links in minimum position	Position sensor signal 2.0 - 2.6 VAC	21

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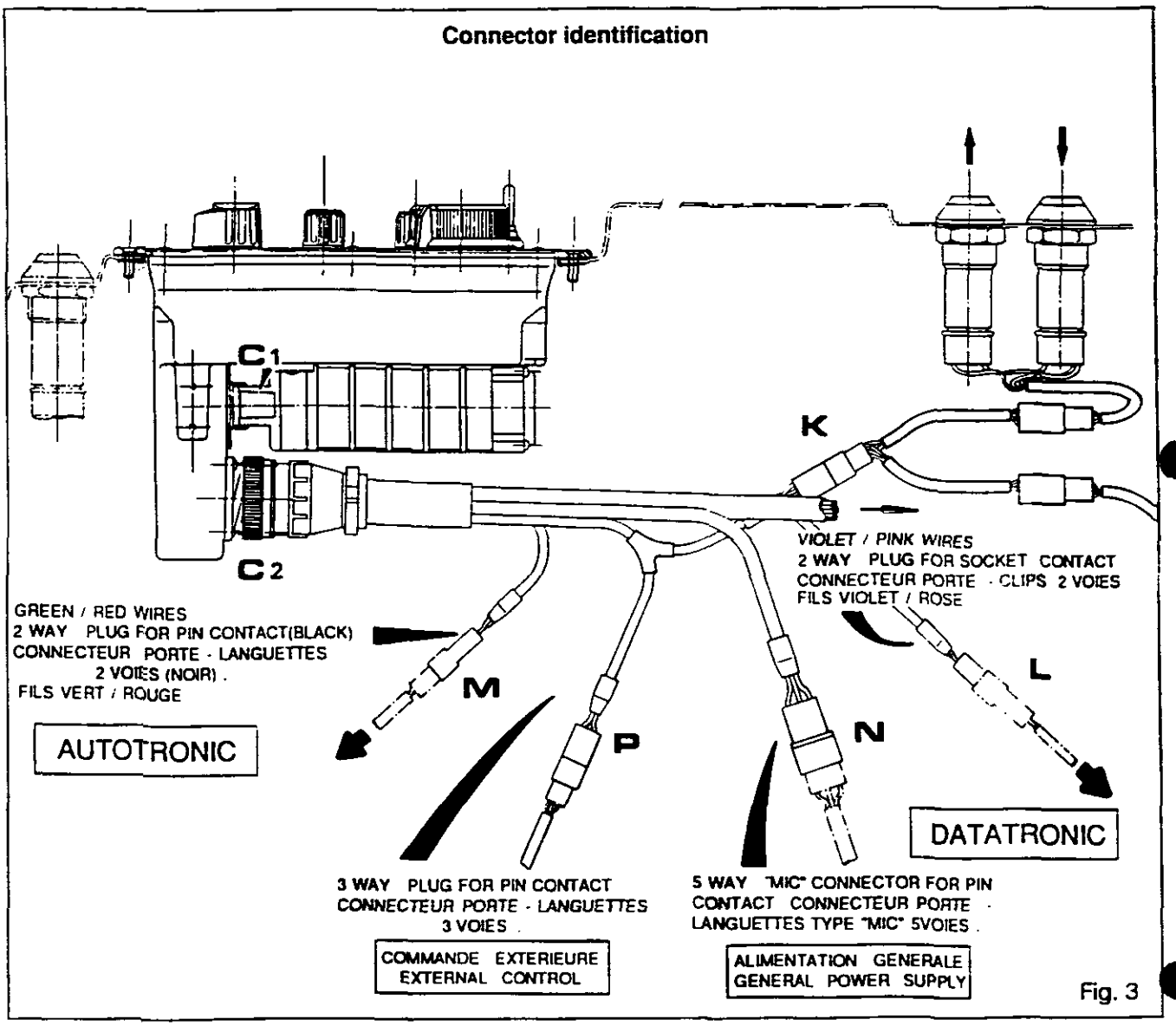


Fig. 3

C . Checking resistances

- harness
- sensors
- solenoids
- external controls

Engine stopped - Ignition off

Disconnect the control console (Fig. 4)
Disconnect Autotronic and Datatronic connectors **M** and **L** (Fig. 3).
Measure resistance between tester **(B)** terminals.
Replace the multimeter in "automatic range selection" mode.

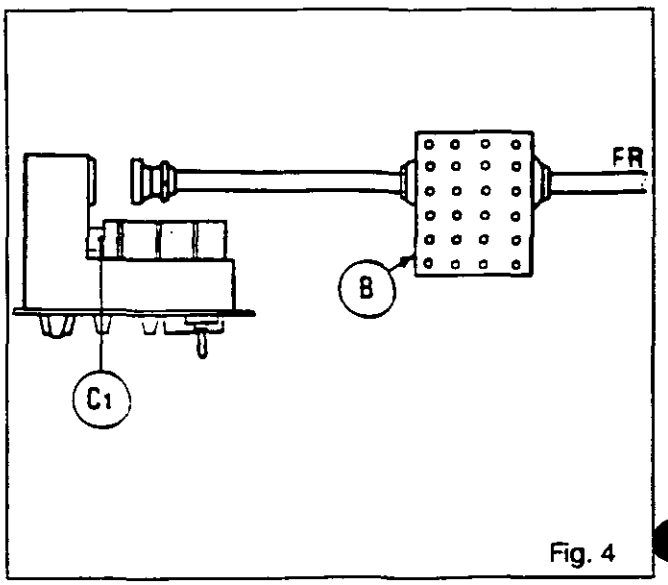


Fig. 4

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Resistance between terminals B	Instructions	Normal values	Other values see faults in 11D.01
5 - 7		Position sensor R=48 ± 3 Ω	7
5 - 6		Position sensor R=24 ± 1 Ω	8
7 - 6		Position sensor R=24 ± 1 Ω	9
	Disconnect left hand draft sensor *before measurement on RH side* : white connector + white band (Fig. 5)		
		Right hand draft sensor	
10 - 8		R = 30 K Ω *min* - 40 K Ω *max* *	10
9 - 8		R = 35 K Ω min - 45 K Ω max *	11
9 - 10		R = 6.5K Ω min - 7 K Ω max *	12
	Reconnect LH sensor		
	Disconnect right hand draft sensor before measurement : RH side of *tractor.*		
10 - 8		*Left hand draft sensor*	
		R = 30 K Ω min - 40 K Ω max *	13
12 - 8		R = 35 K Ωmin - 45 K Ω max *	14
12 - 10		R = 6.5 K Ω *min* - 7 K Ω *max* *	15
	Reconnect RH sensor		
2 - 1		Lifting electrovalve R = 1.7 Ω + 0.5 **	16
2 - 3		Lowering electrovalve R = 1.7 Ω + 0.5 **	17
23 - 1	External controls for lifting (Fig. 6)		18
	Release lift button	R = 0 L - M Ω	
	Press lift button	R = 0 Ω	
23 - 3	External controls for lowering (Fig. 6)		19
	Release lower button	R = 0 L - M Ω	
	Press lower button	R = 0 Ω	

* Values correct for multimeter giving voltage drop < 0.2 V. (All digital display multimeters) - other multimeter will induce different measurements

** When measuring electrovalves, very low resistance can be influenced by harness and test leads resistance

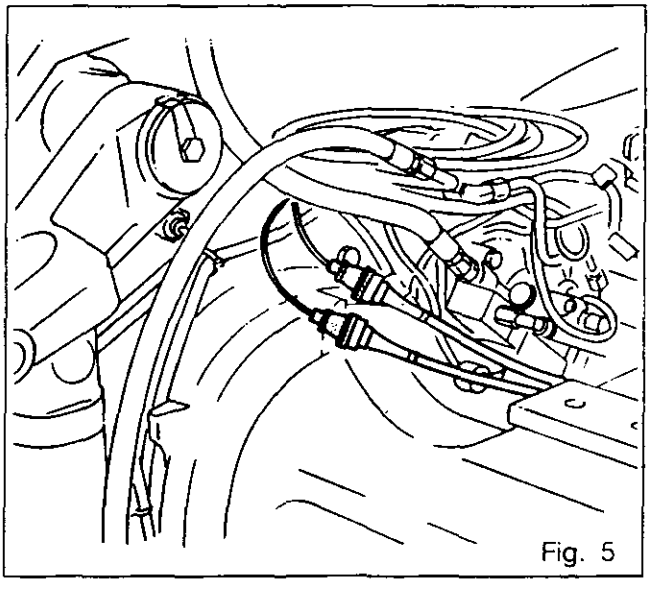


Fig. 5

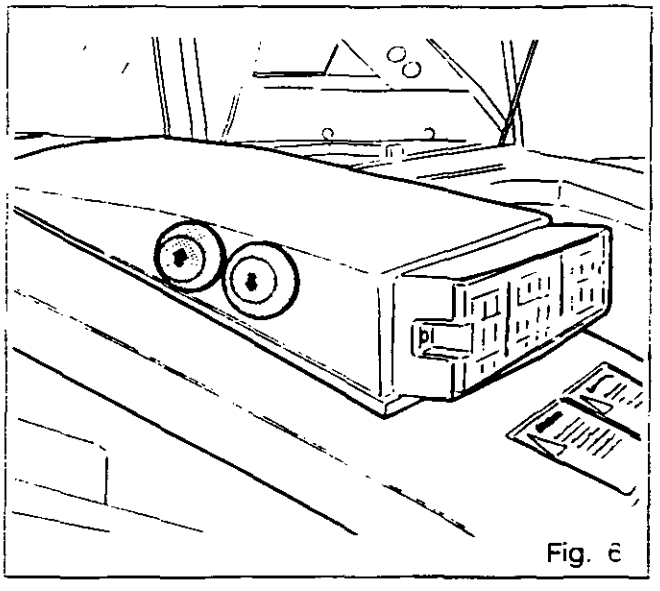


Fig. 6

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D . Checking connectors C1 - C2 continuity (harness - calculator)

Disconnect calculator and tractor harness **(FR)**.
Connect tester **(B)** to connector **(C2)** (see Fig. 7)

Measure resistance between tester **(B)** and calculator connector **(C1)** (see Fig. 8).

*All values must be between O and 1.5 Ω except *.*

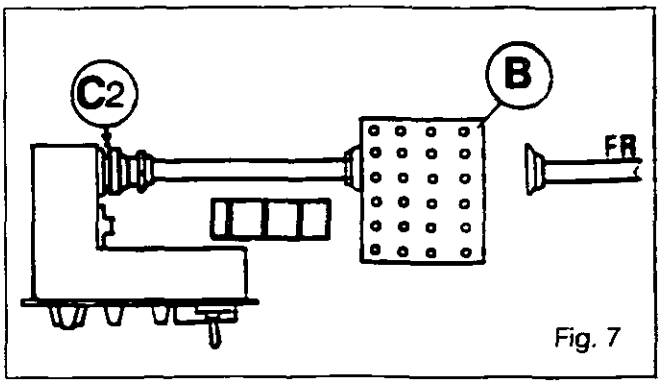


Fig. 7

Resistance between terminals		Instructions	Functions
B	C1		
7	10		Position Sensor (ground)
6	9		Position Sensor (signal)
5	19		Position Sensor (power)
12	12		LH draft sensor signal
9	11		RH draft sensor signal
23	5		External controls ground
2	4		Electrovalves power
16	1		Calculator power supply (+ battery)
* 13	8	100 Ω with quick soil engagement	Depth signal from datatronic
8	18		Draft sensors power
10	17		Draft sensors ground
3	2		Lower E.V. ground
1	3		Lift E.V. ground
24	7		Lower switch signal to datatronic
14	16		General ground (battery)
17	15		Calculator power supply (alternator voltage)
8	7	Switch D on "lower" position	
8	21	Switch D on "lift" position	

N.B : If no continuity (R = Infinity) check the internal wiring of the control console and the lift/lower switch if required.

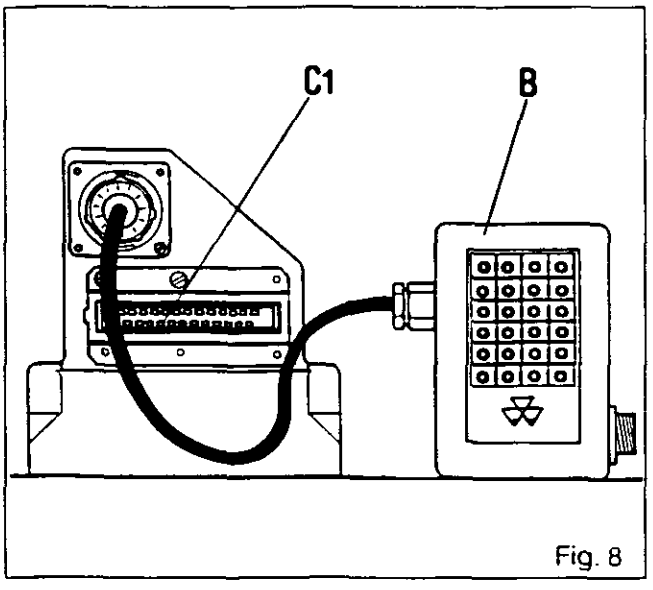


Fig. 8

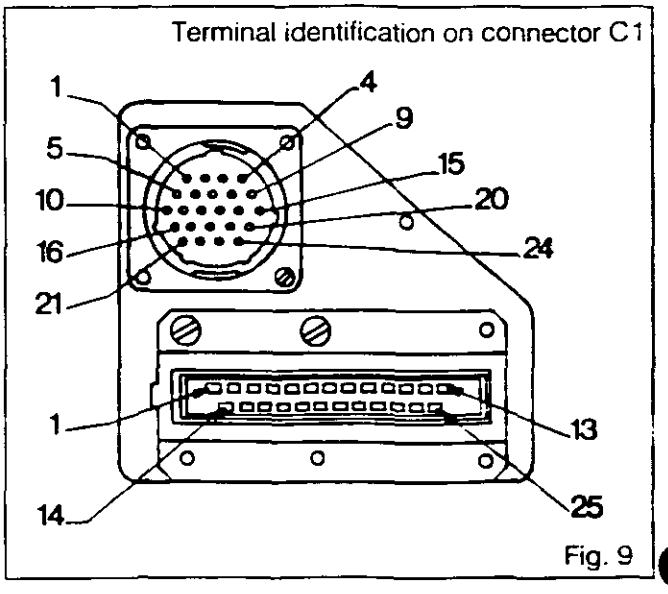


Fig. 9

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E . Checking control console

Disconnect tractor harness **(FR)** and calculator.
Connect tester **(B)** to connector **(C2)** (Fig. 7).
Follow instructions and measure resistances between **(B)** terminals.

TERMINAL NBR	INSTRUCTIONS	RESISTANCE	FUNCTION	IF FAULT,CHECK
15 - 14		18 ± 2 Ω	Internal lighting	Printed circuit (bulbs) Internal wiring
21 - 20	Selector "D" at lift pos.	0 Ω	Transport position information to Autotronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
21 - 20	Selector "D" at lower pos.	0.L M Ω (infinity)	Transport position information to Autotronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
24 - 8	Selector "D" at lower pos.	0 Ω	Timing active signal to Datatronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
24 - 8	Selector "D" at lift pos.	0.L M Ω (infinity)	Timing active signal to Datatronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
13 - 8	Depth control knob "E" at "low"	1650 ± 200 Ω	Depth control (signal from Datatronic)	Printed circuit (Depth potentiometer) Internal wiring
13 - 8	Depth control knob "E" at "high"	560 mini ± 56 Ω (1)	Depth control (signal from Datatronic)	Printed circuit (Depth potentiometer) Internal wiring
10 - 8		960 ± 96 Ω	Draft sensors power supply	Printed circuit Internal wiring

(1) See adjustment procedure page 9 if different value

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F . Checking potentiometers

Disconnect the calculator.
All the following measurements of resistance are carried out at the terminals of the 25 pin connector **C1** (Fig. 9). The two resistance values are given for a minimum and maximum adjustment. However it is necessary to measure the resistance whilst varying the adjustment of the potentiometer, in order to detect any fault within the potentiometer which would only be apparent for a certain setting of the knob. Any sudden variation denotes a fault.

WHEN TESTING TAKE PRECAUTIONS TO AVOID DAMAGING THE CONNECTION TERMINALS.

Note : It is normal to observe that the value of the resistance is greater than 960 ± 96 Ω before the potentiometer reaches its stop. However, this value must not exceed 2100 Ω (2200 Ω with quick soil engagement)for depth control potentiometer and 1600 Ω for the others.

See location of internal wiring page 11.

TERMINAL NBR (C1)	FUNCTION	NORMAL RESISTANCE VALUE	IF FAULT, CHECK :
8 - 17 Control *console without* quick soil engagement	Depth Control	High : 1650 ± 200 Ω Low : 560 ± 56 Ω *(see adjustment p. 9)*	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
8- 17 Control console with quick soil *engagement*	*Depth* Control	*High : 1750 ± 200 Ω* Low : 660 ± 56 Ω (see adjustment p. 9)	-*R = 0.LM Ω, console printed circuit* (soldering) internal wiring - other values, potentiometer
8- 17 Control *console with* quick soil engagement	Quick soil engagement (button *pressed)*	R = 63 Ω ± 7	Button J Printed circuit
6 - 17	Maxi height	Mini : 864 - 1056 Ω Maxi : 0 Ω	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring -other values, potentiometer
24 - 17	Sensitivity	Mini : 0 Ω Maxi : 960 ± 96 Ω	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
14 - 17	Drop speed	Mini : 0 Ω Maxi : 960 ± 96 Ω	- R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
20 - 17	Intermix	Draft : 0 Ω Position : 960 ± 96 Ω	- R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
18 - 17	Potentiometers power supply	960 ± 96 Ω	- R > 1.1 k Ω = one or more potentiometers not powered. Check console printed circuit or internal wiring

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G . Adjusting position sensor and potentiometer

Adjusting position sensor

If work is carried out on the lift requiring it to be assembled and adjusted, the following method should be applied :

1. Position sensor removed.
2. Run engine and raise the arms using the external control or solenoid manual actuation, until the relief valve blows.
3. Stop engine, then make a mark between the lift cover and a lift arm hub.
4. Screw down the sensor fully by hand, without forcing it, then turn back one turn and a half.
5. Start engine, then lower and raise the arms with position control potentiometer.
   The difference between marks on the lift cover hub and the lift arm must be about 3 mm, which corresponds to the transport position.
   N.B. : If the difference is less than 3 mm : screw in sensor.
   If the difference is greater than 3 mm : screw out sensor.
6. Tighten nut to 20 Nm.

Adjusting depth control knob

If resistance at terminals 8 - 7 of connector C1 is higher than 560 ± 56 Ω (660 ± 66 Ω with quick soil engagement) when knob is at index 10 ("low"), turned up to it's stop, then check installation on potentiometer shaft as follows :

1. Unscrew screws and remove knob preventing loss of springs and pads by placing fingers on mark 5 and opposite.
2. Turn potentiometer shaft anti-clockwise up to it's stop.
3. Replace springs and friction pads.
4. Replace knob on potentiometer shaft, indexed to 8 or 7.
5. Turn knob anti-clockwise up to it's stop, then tighten the 2 screws (preventing knob from turning clockwise before tightening screws).

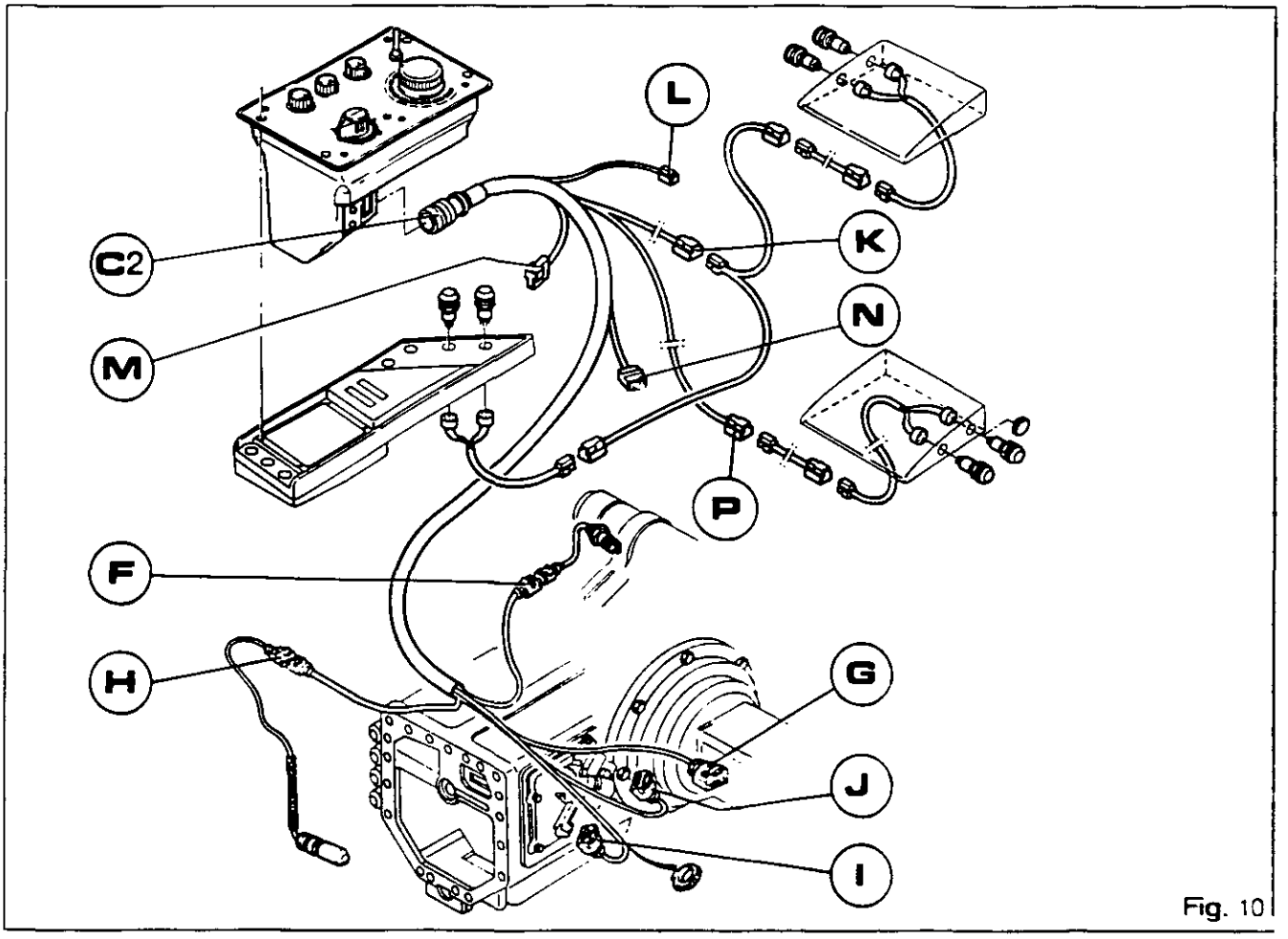


Fig. 10

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H . Wiring diagram (with quick soil engagement)

Key

42 . Position sensor
43 . LH draft sensor
44 . RH draft sensor
45 . Lift control valve
46 . External lift control buttons
47 . ELC calculator
F . ELC harness junction with position sensor
G . ELC harness junction with LH draft sensor
H . ELC harness junction with RH draft sensor
I . ELC harness junction with lift valve (lowering)
J . ELC harness junction with lift valve (raising)
K . ELC harness junction with external control buttons
L . ELC harness junction with Datatronic (connector Z)
M . ELC harness junction with Autotronic (connector Q)
N . ELC junction with Datatronic (connector AB) or console harness (connector AD)
P . ELC harness junction with external control buttons.
C1 . 25-way connector on ELC calculator
C2 . 24-way ELC harness connector
C3. 20-way connector on printed circuit

Wire colour code

B : White
B.BL : White, blue mark
B.R. : White, red mark
B.V. : White, green mark
BL : Blue
BL.J. : Blue, yellow mark
BL.R. : Blue, red mark
BL.V. : Blue, green mark
G : Grey
J : Yellow
J.BL. : Yellow, blue mark
M : Brown
N : Black
R : Red
R.B. : Red, white mark
R.N. : Red, black mark
RO : Pink
V : Green
VI : Violet

Description of calculator functions

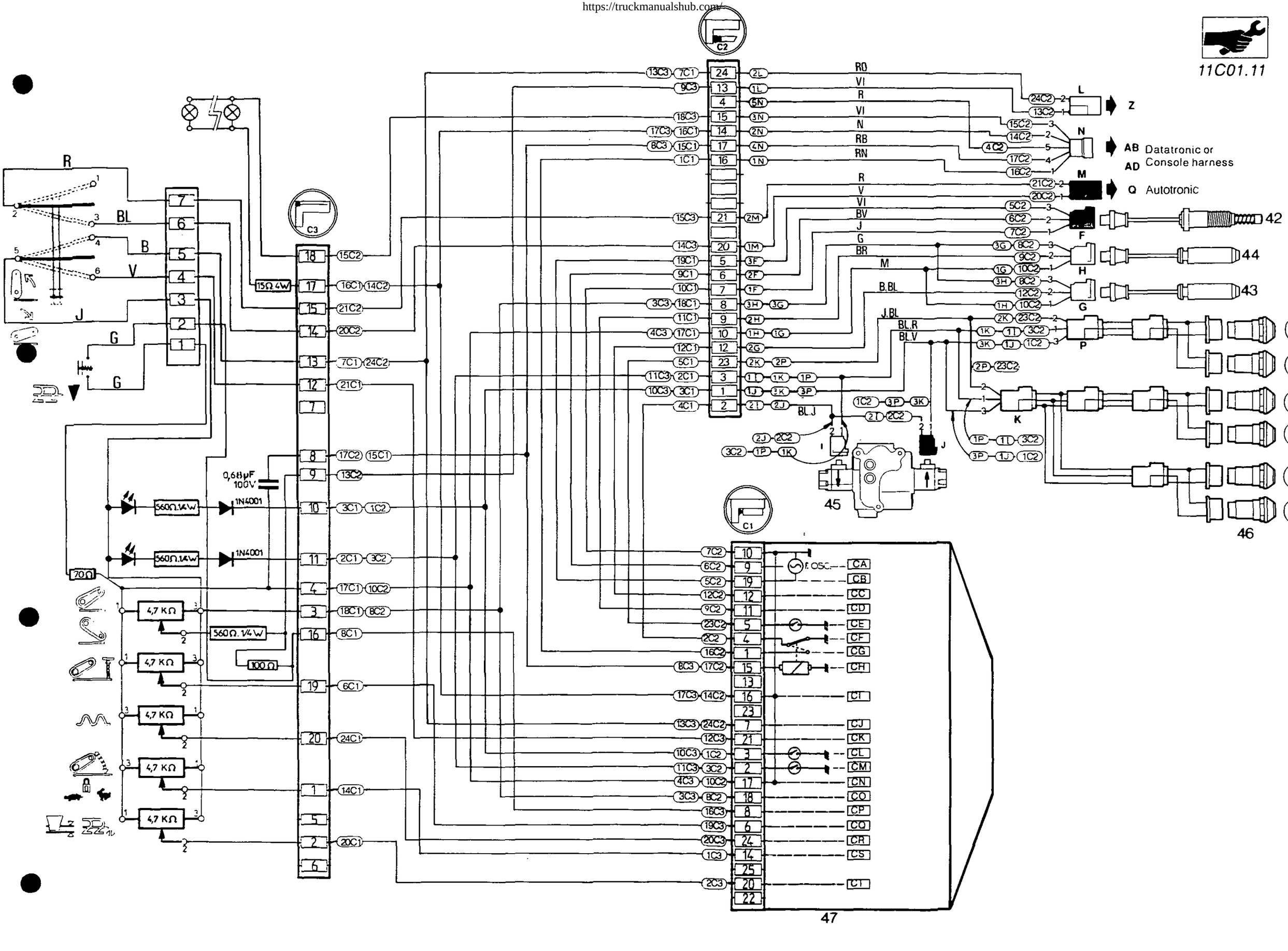
CA : Position sensor signal
CB : Position sensor power supply
CC : LH draft sensor signal
CD : RH draft sensor signal
CE : External controls ground
CF : ELC solenoids power supply
CG : Power supply from battery
CH : Safety relay power supply (+ engine running)
CI : General ground (from chassis)
CJ : Working mode
CK : Transport mode
CL : Lift solenoid
CM : Lower solenoid
CN : Ground
CO : 10 volt - Draft sensors power supply
CP : Info. depth setting
CQ : Info. high position setting
CR : Info. sensitivity
CS : Info. lowering speed setting
CT : Info. intermix setting

Identification of connector terminals

Connector	Terminal	Identification
N	1	+Battery
	2	Ground
	3	+ Lighting
	4	+ Engine running
	5	Dual Control provision
L	1	Slip control
	2	Working position (for Datatronic)
P,K	1	Lower (external control)
	2	Ground
	3	Lift (external control)

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I. Wiring diagram (without quick soil engagement)

Key

42 . Position sensor
43 . LH draft sensor
44 . RH draft sensor
45 . Lift control valve
46 . External lift control buttons
47 . ELC calculator
F . ELC harness junction with position sensor
G . ELC harness junction with LH draft sensor
H . ELC harness junction with RH draft sensor
I . ELC harness junction with lift valve (lowering)
J . ELC harness junction with lift valve (raising)
K . ELC harness junction with external control buttons
L . ELC harness junction with Datatronic (connector Z)
M . ELC harness junction with Autotronic (connector Q)
N . ELC junction with Datatronic (connector AB) or console harness (connector AD)
P . ELC harness junction with external control buttons.
C1 . 25-way connector on ELC calculator
C2 . 24-way ELC harness connector
C3. 20-way connector on printed circuit

Wire colour code

B : White
B.BL : White, blue mark
B.R. : White, red mark
B.V. : White, green mark
BL : Blue
BL.J. : Blue, yellow mark
BL.R. : Blue, red mark
BL.V. : Blue, green mark
G : Grey
J : Yellow
J.BL. : Yellow, blue mark
M : Brown
N : Black
R : Red
R.B. : Red, white mark
R.N. : Red, black mark
RO : Pink
V : Green
VI : Violet

Description of calculator functions

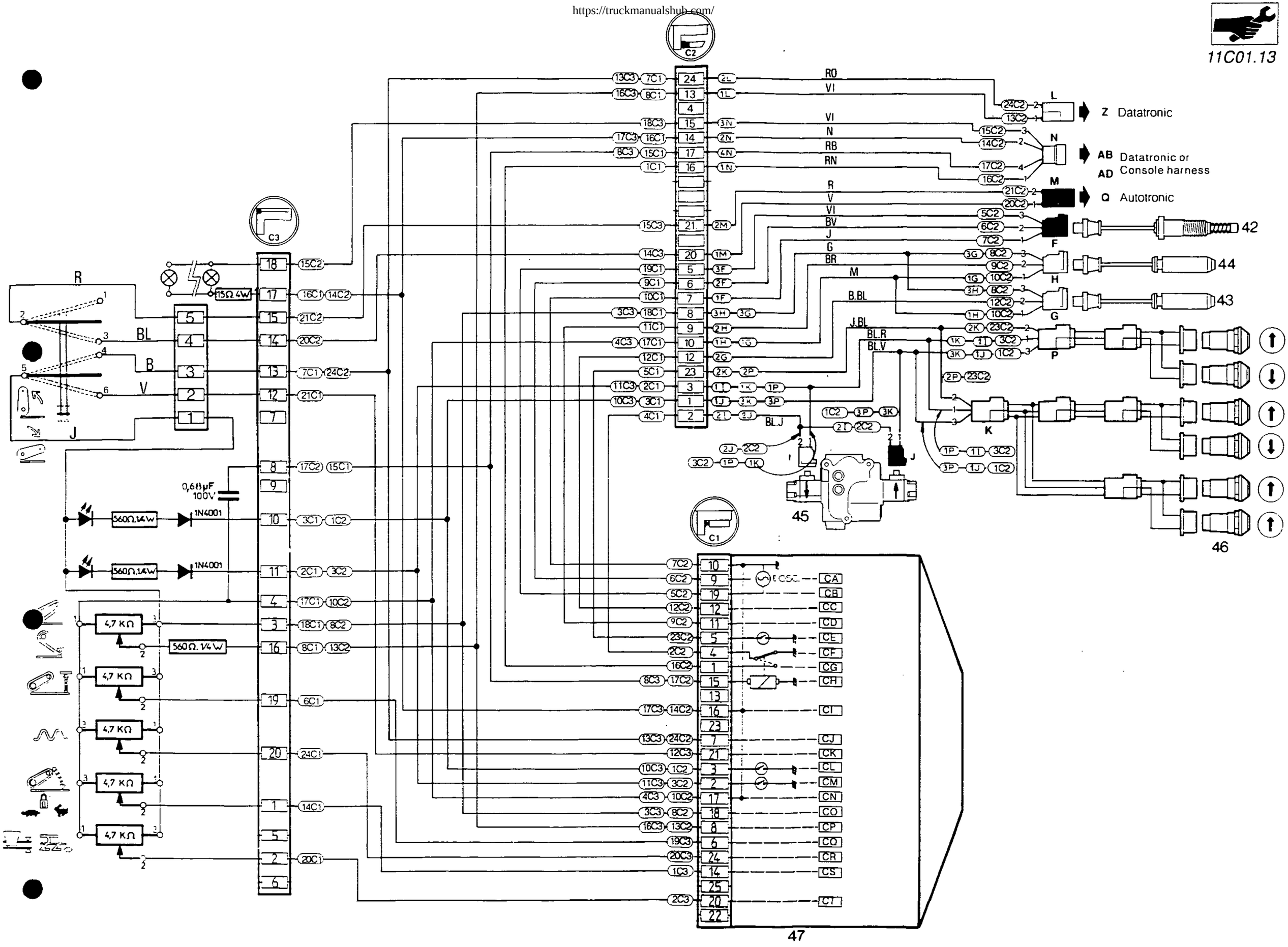
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CC : LH draft sensor signal
CD : RH draft sensor signal
CE : External controls ground
CF : ELC solenoids power supply
CG : Power supply from battery
CH : Safety relay power supply (+ engine running)
CI : General ground (from chassis)
CJ : Working mode
CK : Transport mode
CL : Lift solenoid
CM : Lower solenoid
CN : Ground
CO : 10 volt - Draft sensors power supply
CP : Info. depth setting
CQ : Info. high position setting
CR : Info. sensitivity
CS : Info. lowering speed setting
CT : Info. intermix setting

Identification of connector terminals

Connector	Terminal	Identification
N	1	+Battery
	2	Ground
	3	+ Lighting
	4	+ Engine running
L	1	Slip control
	2	Working position (for Datatronic)
P.K	1	Lower (external control)
	2	Ground
	3	Lift (external control)

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Electronic lift control

11 D01 Analysis of possible faults

Issue 1

November 1991

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Electronic lift control

FAULT 1

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester

If 0 < voltage < 10.4 V : The battery is insufficiently charged to achieve correct operation of the electronic lift.

If voltage > 15.3 V : Risk of damage to calculator.

If voltage = 0 V :

1. Check battery compartment connections :
   If OK : see 2

2. Check 7.5 A fuse in battery compartment :
   If OK : see 3
   If faulty : see 5

3. Check voltage between **(16)** and tractor chassis :
   If 12 V : see 4
   If 0 V : supply line from battery broken

4. Check resistance between **(14)** and tractor chassis :
   If R approx. 0 Ω : OK
   If other value : ground line broken or bad ground connexion (see gearbox cover or battery)

5. Disconnect console and positive terminal of the battery.
   Check resistance between **(16)** and **(14)** :
   If R = O Ω : short circuit between + battery line and ground.
   If R = infinity : see 6 (harness correct)

6. *Connect the console to the tester. Disconnect computer and harness.*
   Check resistance between **(16)** and **(14)** :
   If R approx. infinity: OK and computer faulty if all other harness checks are correct
   If R approx. O Ω : console faulty (see internal wiring)

FAULT 2

If voltage = 12 V approx. Check that the + line after the starter switch is not directly connected to a permanent + 12 V line.
(Check starter switch or look for short circuit)

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Electronic lift control

FAULT 3

Tractors with serial number after U262030

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If 0 < voltage < 13.5 V : The alternator warning light remains lightly illuminated (engine running or stopped, ignition on).
Disconnect alternator connector (engine stopped - ignition on).
Connect earth to connector contact of the alternator (linked by a violet wire) :

If the alternator warning light comes on normally :
- alternator regulator faulty.

If the alternator warning light comes on slightly :
- engine harness faulty (break).

If voltage > 14.5 V Voltage too high. Check alternator regulator and battery.

If voltage ≃ 0 V

1. Check the 7,5A fuse in the fuse box (F9)

2. Engine stopped. Ignition on.
Check the alternator warning light :
If on , check : - lift harness
- console harness / fuel gauge.

If off , check : - dashboard fuse F10
- alternator warning light
- engine harness } Break between alternator and Dashboard
- main harness (on panel) }

FAULT 3

Only for tractor with serial number up to U262030

If voltage < 10.3 V : The battery is insufficiently charged to achieve correct operation of the electronic lift.

If voltage > 15.3 V : Voltage too high. Risk of damage to computer.

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Electronic lift control

FAULT 3 (cont'd)

Only for tractor with serial number up to U262030

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If voltage = 0 V :

1. Check 7,5 A fuse
   If OK : see 2.
   If faulty : short circuit between + after starter contact.
   Disconnect the 9 way red connector (under hood on left hand side of cab).
   Measure resistance between terminal 8 (red wire) of the 9 way red connector located in engine harness and earth.
   If R = 0 Ω : short circuit (engine harness faulty or panel main harness faulty).
   If R = infinity : disconnect the 2nd 5 way white connector located under the lift console.
   Measure resistance between terminals 5 and 2 of this connector (on plug side)
   If R ≃ 0 Ω : short circuit in harness or relay faulty (located behind the right pillar trimming of cab).
   If R ≃ 650 Ω : short circuit in coupled harness.

2. Check 7,5 A fuse in battery compartment.
   If OK : see 3.
   If it is faulty : check whole of the circuit between + battery and C1 - 15

Checking instructions :

a) Disconnect connectors one by one, as far as you're carrying out checking from + battery to harness.
For each disconnected connector, look for its corresponding terminal, connected to + battery.
(Measure resistance between terminal linked to + battery and each connector contact).
If R = 0 Ω : the contact is good.

b) Measure resistance between this contact and earth.
If R = infinity : reconnect connector and carry out the same operations for the next one.
If R = 0 Ω : harness is faulty.
If harnesses and console are correct : computer unit is faulty

3. If the first checked resistance (between terminals **(16)** and **(14)** is OK:
   - Check circuit between terminal 5 of relay (located down the right pillar of cab, behind trimming) and C1 - 15, then check the relay.

   If voltage is 0 V :
   - Check whole of the circuit between + battery and terminal 3 of relay (located down the right pillar of cab, behind trimming).

   Follow checking instructions given in paragraph 2 here above but on section a :
   If R = infinity at all terminals, harness is faulty.

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Electronic lift control

FAULT 4

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If voltage < 10,3 V : The battery is insufficiently charged to achieve correct operation of the lift.

If voltage > 15,3 V : The voltage is too high (risk of damage to calculator).

If voltage ~ 0 V : Engine stopped, ignition off

1. Disconnect calculator. Measure the resistance between terminals **(17)** and C1 - 15
   If R = infinity : console faulty (internal wiring)
   If R approx. 0 Ω : see 2

2. Measure the resistance between terminals **(16)** and C1 - 1
   If R approx. 0 Ω : see 3
   If R approx. infinity: console faulty (internal wiring)

3. Measure the resistance between terminals **(2)** and C1 - 4
   If R = infinity : console faulty (internal wiring)
   If R approx. 0 Ω: see 4

4. Check position sensor as indicated page 11C01-04 and 05
   If OK : see 5

5. Check the selector "D" as indicated page 11C01-6 (terminals 8/7 and 8/21)

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Electronic lift control

FAULT 5

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(10)** = Terminal 10 on tester
- C1 - 17 = TERMINAL 17 ON CONNECTOR C1

If voltage ≤ 9,5 V or if voltage > 10,5 : Calculator faulty if all other checks of voltage and resistance are correct. Carry on test procedure.

If voltage ≃ 0 V :

1. Disconnect the harness and the calculator.
   Measure the resistance between terminals **(10)** and C1 - 17
   If R approx. 0 Ω OK : see 2
   If R approx. infinity : console faulty (internal wiring)

2. Measure the resistance between terminals **(8)** and C1 - 18
   If R approx. 0 Ω OK : see 3
   If R approx. infinity : console faulty (internal wiring)

3. Measure the resistance between terminals **(8)** and **(10)**
   If R = 960 ± 96 Ω : calculator faulty if the checks of resistance of the harness are OK. Carry on procedure 11C01-4.
   If R approx. 0 Ω or infinity : console faulty (potentiometers or internal wiring).

FAULT 6

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER . Example **(5)** = Terminal 5 on tester
- C1 - 19 = TERMINAL 19 ON CONNECTOR C1

If voltage ≃ 0 V :

1. Disconnect the harness and calculator.
   Measure resistance between terminals **(5)** and **(7)**.
   If R approx. 0 Ω : console faulty
   If R approx. infinity : see 2

2. Measure the resistance between terminals **(5)** and C1 - 19
   If R approx. 0 Ω : see 3
   If R approx. infinity : console faulty

3. Measure the resistance between terminals **(7)** and C1 - 10
   If R = infinity : console faulty
   If R approx. 0 Ω : OK - calculator faulty if all the checks of resistance of harness are correct. Carry on test procedure 11 C01-4.

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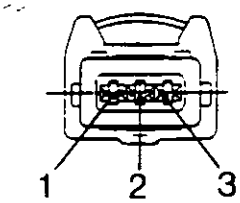
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Electronic lift control

FAULT 7

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(7)** = Terminal 7 on tester

If R > 49 Ω or infinity :



1. Disconnect the position sensor black connectors
   Measure the resistance between terminal **(5)** and terminal 3 of the position sensor female connector
   - If R approx. 0 Ω : see 2
   - If R = infinity : harness faulty (break)
2. Measure the resistance between terminal **(7)** and terminal 1 of the position sensor female connector
   - If R = 0 Ω : harness OK - sensor faulty
   - If R = infinity : harness faulty (break)

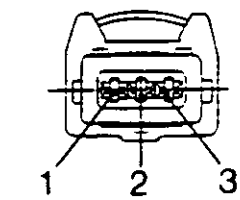
If R < 47 Ω :

1. Disconnect the position sensor
   Measure resistance between terminals **(5)** and **(7)**
   - If R approx. 0 Ω : harness faulty (short circuit)
   - If R approx. infinity : harness OK (sensor faulty)

FAULT 8

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER Example **(6)** = Terminal 6 on tester

If R > 25 Ω or infinity :



1. Disconnect the position sensor
   Measure the resistance between terminal **(5)** and terminal 3 of the position sensor female connector (black connectors)
   - If R approx. 0 Ω : see 2
   - If R = infinity : harness faulty (break)
2. Measure the resistance between terminals **(6)** and terminal 2 of the position sensor female connector (black connectors)
   - If R approx. 0 Ω : harness OK - sensor faulty
   - If R approx. infinity : harness faulty (break)

If R < 23 Ω :

1. Disconnect the position sensor
   Measure resistance between terminals **(5)** and **(6)**
   - If R approx. 0 Ω : harness faulty (short circuit)
   - If R approx. infinity : harness OK (sensor faulty)

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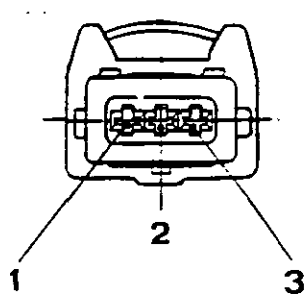
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Electronic lift control

FAULT 9

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(6)** = Terminal 6 on tester

If R > 25 Ω (or infinity) :



1. Disconnect the position sensor black connectors
   Measure the resistance between terminal **(7)** and terminal 1 of the position sensor female connector
   If R approx. 0 Ω : see 2
   If R = infinity : harness faulty (break)

2. Measure the resistance between terminals **(6)** and terminal 2 of the position sensor female connector (black connectors)
   If R approx. 0 Ω : harness OK - sensor faulty
   If R approx. infinity: harness faulty (break)

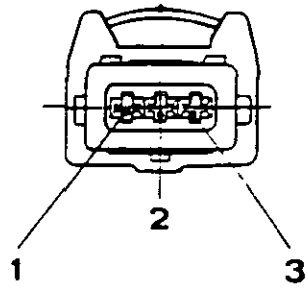
If R < 23 Ω :

1. Disconnect the position sensor
   Measure resistance between terminals **(6)** and **(7)**
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: harness OK (sensor faulty)

FAULT 10

LABELED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 40 K Ω (or infinity) :



1. Disconnect both draft sensors.
   Measure the resistance between terminal **(10)** and terminal 1 of the right hand side draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity: harness faulty (break)

2. Measure the resistance between terminal **(8)** and terminal 3 of the right hand side draft sensor female connector (white connector).
   If R approx. 0 Ω : harness OK - sensor faulty
   If R approx. infinity: harness faulty (break)

If R < 30 K Ω :

1. Disconnect both draft sensors
   Measure the resistance between terminals **(8)** and **(10)** .
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: harness OK - sensor faulty

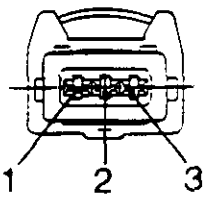
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FAULT 11

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(9)** = Terminal 9 on tester

If R > 45 K Ω (or infinity) :



1. Disconnect both draft sensors
   Measure the resistance between terminal **(9)** and terminal 2 of the right hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity: harness faulty (break)

2. Measure the resistance between terminal **(8)** and terminal 3 of the right hand draft sensor female connector (white connector).
   If R approx. 0 Ω : right hand sensor faulty
   If R approx. infinity: harness faulty (break)

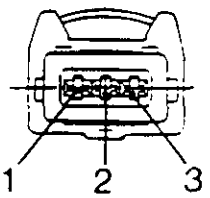
If R < 35 K Ω :

1. Disconnect both draft sensors
   Measure the resistance between terminal **(8)** and **(9)**.
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: right hand sensor faulty

FAULT 12

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 7 K Ω (or infinity) :



1. Disconnect both draft sensors.
   Check continuity for the right hand draft sensor.
   Measure the resistance between terminal **(9)** and terminal 2 of the right hand draft sensor female connector in order to ensure that there is no break.
   If R approx. 0 Ω : see 2.
   If R approx. infinity: harness faulty (break).

2. Measure the resistance between terminal **(10)** and terminal 1 of the right hand draft sensor female connector.
   If R approx. 0 Ω : right hand sensor faulty.
   If R approx. infinity: harness faulty (break).

If R < 6.5 K Ω :

1. Disconnect both draft sensors
   Measure resistance between terminals **(9)** and **(10)**
   If R approx. 0 Ω : harness faulty (short circuit).
   If R approx. infinity: harness correct, right hand sensor faulty.

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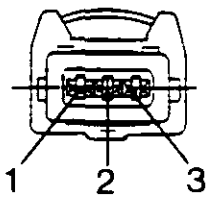
Electronic lift control

FAULT 13

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 40 K Ω (or infinity) :

1. Disconnect both draft sensors
   Check continuity for the left hand draft sensor.
   Measure the resistance between terminal **(10)** and terminal 1 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. Measure the resistance between terminal **(8)** and terminal 3 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : harness correct, left hand sensor faulty
   If R approx. infinity : harness faulty (break)

If R < 30 K Ω :

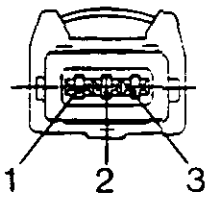
1. Disconnect both draft sensors.
   Measure resistance between terminals **(10)** and **(8).**
   If R approx. 0 Ω : harness faulty (short circuit).
   If R approx. infinity : harness correct, left hand sensor faulty

FAULT 14

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(12)** = Terminal 12 on tester

If R > 45 K Ω (or infinity) :

1. Disconnect both draft sensors
   Measure the resistance between terminal **(12)** and terminal 2 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. Measure the resistance between terminal **(8)** and terminal 3 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : harness correct, left hand sensor faulty
   If R approx. infinity : harness faulty (break)

If R < 35 K Ω :

1. Disconnect both draft sensors.
   Measure the resistance between terminals **(12)** and **(8)**.
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity : harness correct, left hand sensor faulty

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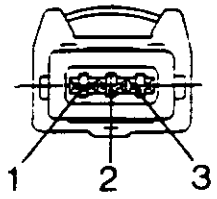
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Electronic lift control

FAULT 15

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(12)** = Terminal 12 on tester

If R > 7 K Ω (or infinity) :



1. Disconnect both draft sensors
   Measure resistance between terminal **(12)** and terminal 2 of the left hand draf sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity : harness faulty (break)

2. Measure resistance between terminal **(10)** and terminal 1 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : left hand sensor faulty
   If R approx. infinity : harness faulty (break).

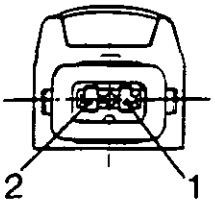
If R < 6.5 K Ω :

1. Disconnect both draft sensors
   Measure resistance between terminals **(12)** and **(10)**.
   If R approx. 0 Ω : harness faulty
   If R approx. infinity : harness correct. left hand sensor faulty

FAULT 16

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(2)** = Terminal 2 on tester

If R > 2.2 Ω (or infinity) :



1. Disconnect the lift solenoid (black connector).
   Measure the resistance between terminal **(2)** and terminal 1 of the lift solenoid female connector (black connector).
   If R approx.0 Ω : see 2
   If R approx. infinity : harness faulty (break)

2. Measure the resistance between terminal **(1)** and terminal 2 of the lift solenoid female connector (black connector).
   If R approx. 0 Ω : harness correct. lift solenoid faulty
   If R approx. infinity harness faulty (break)

If R < 1.2 Ω :

1. Disconnect the lift solenoid (black connector).
   Measure the resistance between terminals **(1)** and **(2)**.
   If R approx. infinity : harness correct. lift solenoid faulty
   If R approx. 0 Ω : harness faulty (short circuit)

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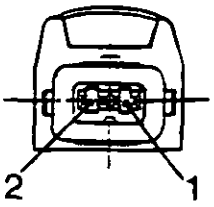
Electronic lift control

FAULT 17

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

If R > 2.2 Ω (or infinity) :

1. Disconnect the lower solenoid (yellow connector).
   Measure the resistance between terminal **(3)** and terminal 2 of the *lower solenoid female connector (yellow connector).*
   If R approx 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. *Measure the resistance between terminal* **(2)** *and terminal 1 of* female lower solenoid (yellow).
   If R approx. 0 Ω : harness correct, lower solenoid faulty
   If R approx. infinity : harness faulty (break).

If R < 1.2 Ω :

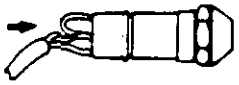
1. Disconnect the lower solenoid (yellow connector).
   Measure the resistance between terminals **(2)** and **(3)**
   If R approx. 0 Ω : harness faulty
   If R approx. infinity harness correct, lower solenoid faulty

FAULT 18

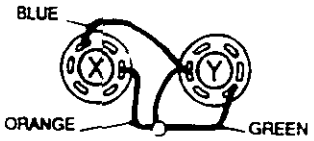
LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(1)** = Terminal 1 on tester

If R approx = infinity position "released" and R = infinity position "activated" :

1. Disconnect all "Y" connectors from external lift push-buttons (raising).
   Measure the resistance between terminals **(1)** and the terminals of the connectors linked by a green wire.
   If R approx. 0 Ω : see 2
   If R approx. infinity : see 3



2. Measure the resistance between terminal **(23)** and the terminals of the connectors linked by a blue wire.
   If R approx. 0 Ω : harness correct, replace push-button
   Before replacing the push-button, check that the lugs are fully engaged onto the connector terminals as indicated.
   If R approx. infinity : see 4



X = DOWN Y = UP

3. Disconnect the external control harnesses at the connectors located beneath the contrc! console (three way white connectors).
   Measure the resistance between terminal **(1)** and the terminal of each three-way connector linked by a green wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

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Electronic lift control

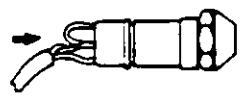
FAULT 18 (cont'd)

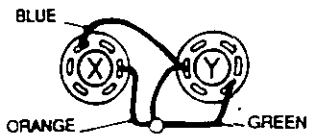
LABELLED CIRCLES INDICATE TEST JACK ON TESTER : **example (1)** = Terminal 1 on tester

4. Disconnect the external control harness at the connectors located beneath the control console (three way white connectors). Measure the resistance between terminal **(23)** and the terminal of each three-way connector linked by a yellow wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

5. Should the tractor be equipped with two external controls, find which is the harness linked to the faulty control : this harness is faulty.
   -If there is only one external control, the harness which links it to the main harness is faulty (break).
   -If the two controls do not function : the two harnesses are faulty.

If R approx. 0 Ω : "released" and R approx. 0 Ω position "activated"





X = DOWN Y = UP

1. Disconnect all "Y" connectors from external lift push-buttons (raising). Measure the resistance between terminals **(1)** and **(23)**.
   If R approx. 0 Ω : see 2
   If R approx. infinity : control knob faulty

2. Disconnect the external control harnesses at the connectors located beneath the control console (three-way white connectors).
   If R approx. 0 Ω : main harness faulty (short circuit)
   If R approx. infinity : see 3

3. Measure the resistance of each three-way white connector between the terminals linked by a green and blue wire.
   If R approx. 0 Ω : the corresponding harness is faulty (short circuit).

If R approx. 0 Ω : position "released" and R approx. infinity position "activated"

1. Check that the lugs are properly fitted into the connector terminals, as indicated.

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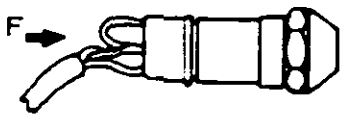
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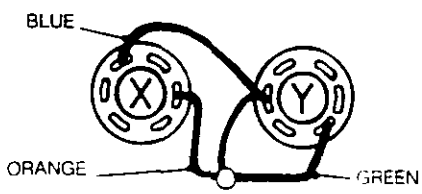
Electronic lift control

FAULT 19

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

If R approx. infinity : **position "released" and R approx. infinity position "activated"**





X = DOWN Y = UP

1. Disconnect all "X" connectors from external lift push-button (Lower).
   Measure the resistance between terminal **(3)** and the terminals of the connectors linked by an orange wire.
   If R approx. 0 Ω : see 2
   If R approx. Infinity : see 3

2. Measure the resistance between terminal **(23)** and the terminals of the connectors linked by a blue wire.
   If R approx. infinity : see 4
   If R approx.0 Ω : harness correct, push-button faulty
   Before replacing the push-button, check that the lugs are properly fitted into the connector terminals as indicated.

3. Disconnect the external control harness at the connectors located the control console (three-way white connectors).
   Measure the resistance between terminal **(3)** and the terminal of each three-way connector linked by an orange wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

4. Disconnect the external control harness at the connector located beneath the control console (three-way white connector).
   Measure the resistance between terminal **(23)** and the terminal of each three-way connector linked by a yellow wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

5. If only one external control is operating the harness which links the control to the main harness is faulty.
   If there are two external controls, the harness which is linked to the control not operating is faulty.
   If the two controls do not operate, both harnesses are faulty.

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Electronic lift control

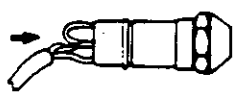
FAULT 19 (cont'd)

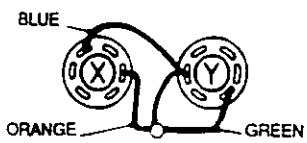
LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

If R. approx. 0 Ω : position "released" and R approx. 0 Ω position "activated"

1. Disconnect the "X" connectors from external lift push-button (Lower).
   Measure the resistance between terminals **(3)** and **(23).**
   If R approx. 0 Ω : see 2
   If R approx. infinity : push-button faulty

2. Disconnect the external control harness at the connectors located beneath the control console (three-way white connectors).
   If R approx. 0 Ω : main harness faulty (short circuit)
   If R approx. infinity : see 3





X = DOWN Y = UP

3. Measure the resistance of each three-way white connector between the terminals linked by an orange and blue wire.
   If R approx. 0 Ω : the corresponding harness is faulty (short circuit).
   Check that the lugs are properly in the connector terminals, as indicated.

If R approx. 0 Ω : position "released" and R approx. infinity position "activated"

1. Check that the lugs are properly fitted into the connector terminals, as indicated.

FAULT 20

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(8)** = Terminal 8 on tester

If voltage < 4,3 VDC or voltage > 5,7 VDC :

1. Carry out voltage checks (in particular between terminals **(8)** and **(10)**)
   If correct : see 2.

2. Carry out resistance checks on lift harness (limited to checks relating to draft sensors)
   If correct : see 3.

3. Carry out all measurements of resistance relating to control console (page 11C01-6).
   If correct : draft sensor faulty

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Electronic lift control

FAULT 21

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(5)** = Terminal 5 on tester

Lift in up position
If voltage < 4.5 VAC
or voltage > 4.9 VAC :

1. Check that the lift arms are in highest position by operating the push-button at the end of the lift solenoid.

   Check that the multimeter is not in "automatic range selection" mode.

2. Carry out voltage checks (in particular between terminals **(5)** and **(7)**).
   If correct : see 3.

3. Check adjustment of position sensor.
   If correct : see 4.

4. Carry out resistance checks on lift harness (limited to checks relating to position sensor)(page 11C01- 3-4 and 5).
   If correct : see 5.

5. Carry out all measurements of resistances relating to control panel (page 11C01-6).

Lift in down position
If voltage < 2 VAC
or voltage > 2.6 VAC :

1. Check that the lift arms are in the lowest position by operating the push button at the end of the lower solenoid.

   Check that the multimeter is not in "automatic range selection" mode.
   If correct : report to n° 2 of this page.

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12 . AUTOTRONIC

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12 B01 CHECKING AND REPAIR WITH TESTER

12 C01 DYNASHIFT SYSTEM

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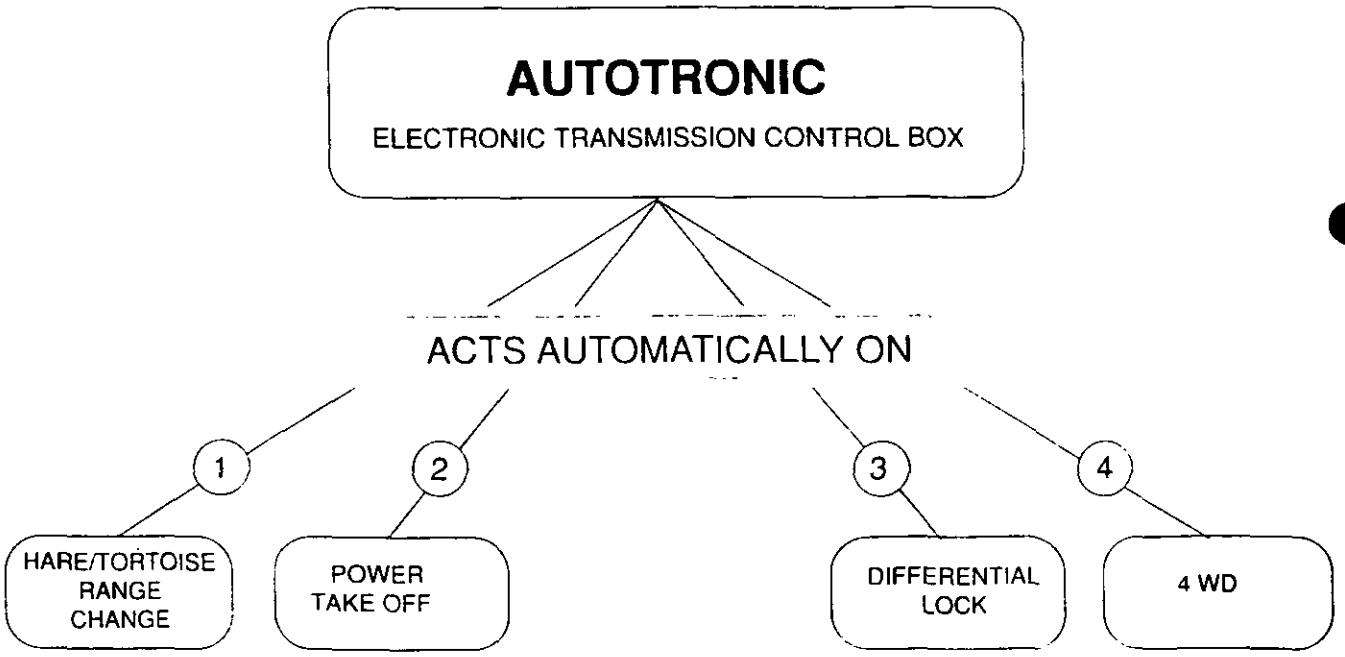
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12A01.2

Autotronic

Description

General : The following information and procedure apply to Autotronic generation 2 equipped with the new ETCU box 3582042 M fitted on 3000/3100 tractors from serial n° N047049.
For previous tractors refer to workshop service manual n° 1646640 M1.



Hydraulic protection of functions 1 - 2 - 3 - 4

Automatic cut-out of both following functions if hydraulic pressure becomes too low (17 bar nominal)

2 - P.T.O.
3 - Diff. lock
1 - Hare/Tortoise range change prevented
4 - Automatic engagement of 4 WD

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HARE/TORTOISE RANGE CHANGE

1

Tortoise/Hare or Hare/Tortoise change impossible

- If ground speed higher than 2 Kph
- If hydraulic pressure too low

Change to Hare range prohibited

- If the hare range is selected when the creeper gear is engaged the Hare warning light flashes. In this case move the gear lever to Tortoise position.

POWER TAKE OFF

2

Controlled gradual engagement

- by supplying pulsed current to the solenoid until full engagement is achieved.

Disengaged if PTO clutch slips

- If pressure drops (17 bar nominal), or if clutch slips, oil supply to PTO clutch is cut-off (warning light flashes)

Does not re-engage when engine started

- If engine is stopped with PTO engaged, or if PTO is re-engaged before starting the engine, Autotronic prevents PTO engagement when engine is started (warning light flashes)

Does not engage if implement is blocked

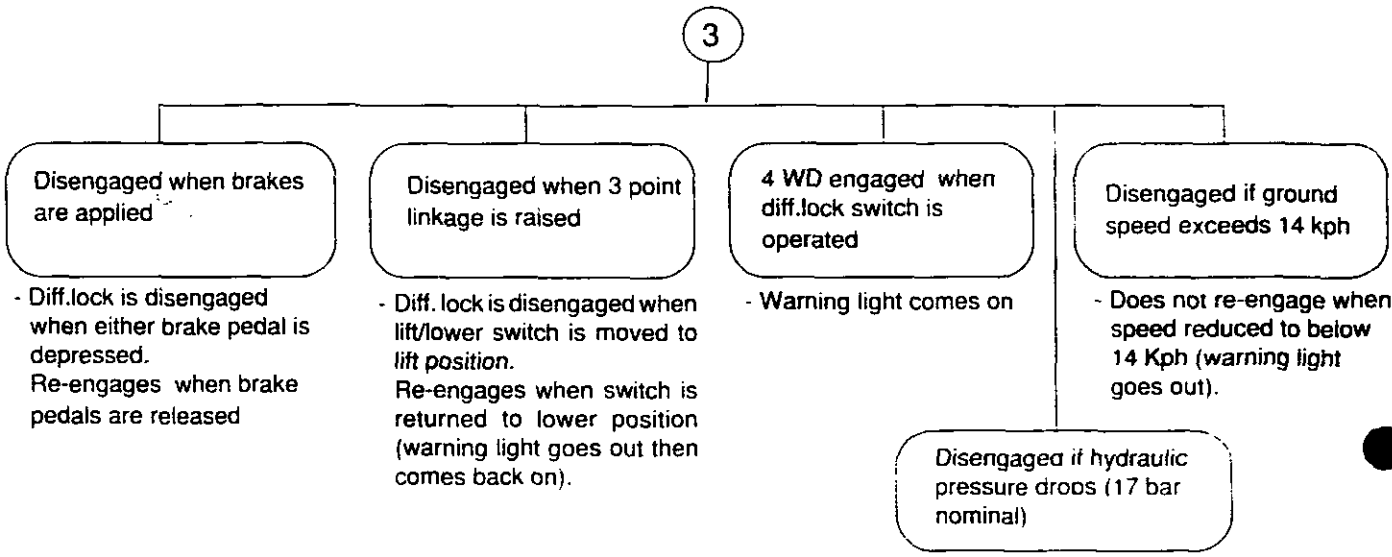
- If implement is blocked engagement is cut-off before stalling (warning light flashes).

Economy PTO desengagement in case of over speed

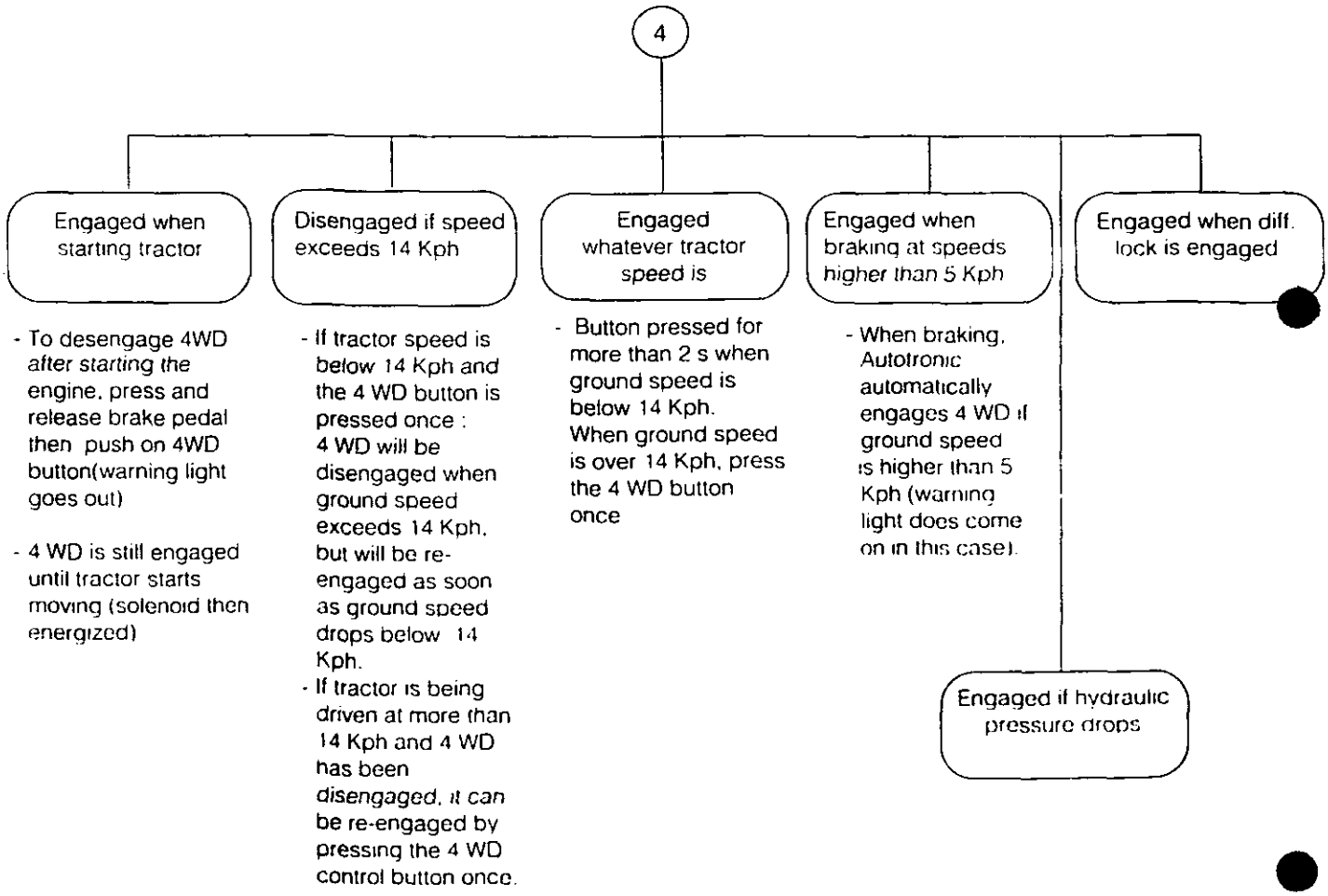
- If economy PTO (engine 1550 rpm) is selected, Autotronic disengages the PTO when the engine speed exceeds 1900 rpm

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DIFFERENTIAL LOCK



FOUR WHEEL DRIVE



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General

Note : The following procedure applies from serial n° N047049. For previous tractors refer to service manual n° 1646650 M1.

This procedure is for checking correct operation of the electronic transmission control unit generation two as well as for solving very simple breakdown problems.

The use of the tester becomes necessary in more complex cases.

You will find in this section checks to be made, set out in chronological order ; when you have a problem, refer to the corresponding paragraph in the section with tester.

1. Power supply

Engine stopped, ignition off

The following warning lights should illuminate almost immediately :
- hydraulic pressure
- 4 WD
- Hare/Tortoise

Re-engage : the warning lights should extinguish after four seconds.

This shows that :
- There is power supply to the Autotronic system.
- Processor is operating.
- Hydraulic pressure warning light, 4 WD light, hare/tortoise light are correctly wired.
- Clutch switch is correct.

2 . Hydraulic pressure switch

Engine stopped (disconnect fuel injector pump shut-off valve : series 1000 engines).

Declutch and turn over the starter without starting the engine for no more than ten seconds (only do this if the ambient temperature is greater than 10° C).

The hydraulic pressure warning light should illuminate when you declutch. After a few seconds of turning over the starter, the hydraulic pressure warning light extinguishes. Stop operating the starter. The warning light should re-illuminate.

This shows that :
- The 17 bar circuit operates and is primed.
- No major hydraulic leak on the circuit.
- The 17 bar pressure switch is connected and appears to be operating.

3 . Hydraulic pressure switch

Reconnect fuel injection pump shut-off valve (series 1000 engines) and start the engine at idling .

The hydraulic pressure warning light should extinguish. Wait 4/5 seconds.

Accelerate to more than 1500 rev/min. Wait 4/5 seconds. The warning light should remain extinguished.

This shows that :
- The 17 bar circuit appears to be normal.

4 . Differential lock

Engine idling

4 WD light illuminated.
Press differential lock button.
Differential lock light illuminates.
Press differential lock button again.
Differential lock warning light extinguishes.

This shows that :
- Differential lock button is correct.
- Differential lock warning light is correct.

5 . Brake switch

Engine idling

4 WD light illuminated.
Press differential lock button again.
Differential lock light illuminates.
Unlatch brake pedals. Apply light pressure to each brake pedal in turn. The differential lock warning light should go out as soon as each pedal has left the return stop.

This shows that :
- The two brake switches are correct and well adjusted.

6 . Four wheel drive

Engine idling

4 WD light illuminated.
Press the 4 WD button.
The 4 WD warning light should go out.
Press diff.lock button : 4 WD and diff.lock warning lights come on.
Press both buttons in turn, both lights should extinglish.

This shows that :
- 4 WD button correct.

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7 . Lift raising/lowering switch

Engine idling

Lift switch in down position. Press the differential lock button. The differential lock and 4 WD warning lights come on. Then put it to up position : the differential lock warning light should go out. Move the switch to down position, the differential lock warning light should re-illuminate (the 4 WD light stays on).

This shows that :
- The lift raising/lowering switch is working properly.

8 . Hare/tortoise range change

Engine idling. Tractor stationary

Operate the Hare/Tortoise change using the lever. On each movement the Hare/Tortoise warning lights should illuminate alternately.

This shows that :
- The hare/tortoise is correctly wired.
- The range warning lights are correctly wired.

9 . P.T.O.

Engine idling

Engage the P.T.O.
The P.T.O. warning light should come on.
The P.T.O. shaft should start to rotate.

This checks that :
- The P.T.O. switch is correctly wired.
- The P.T.O. warning light is correctly wired.
- The P.T.O. electrovalve is correctly wired.

Disengage the PTO

10. Checking the engine speed sensor

Stop engine

Disconnect 17 bar hydraulic pressure switch.
Start engine on idling.
The hydraulic pressure warning light should illuminate.
Wait approx 10 seconds after having released the clutch pedal. If the engine speed sensor is operating, the hydraulic pressure warning light will remain illuminated. If the engine speed sensor is not operating, the hydraulic pressure warning light and the range warning light will extinguish after four seconds.

This shows that :
- The engine speed sensor is operating.

Note : Subsidiary check : in these conditions the 4 WD, differential lock and P.T.O. must not be capable of being engaged. If these functions are operating, this means that there is a problem with the wiring of the hydraulic pressure switch.

Reconnect the hydraulic pressure switch.

11 . Checking the P.TO. speed sensor

Engage the P.T.O. with engine idling.

Disconnect the P.T.O. sensor (near the LH lifting ram). The P.T.O. should stop after 5/6 seconds and the P.T.O. warning light should begin to flash.

Note : Reconnect the sensor. If this is not done the P.T.O. would appear to operate but in reality without progressive engagement and without clutch protection. This is specially designed in such a way that the user can continue to work even if the sensor is faulty. If the P.T.O. does not reengage and the warning light continues to flash, stop the P.T.O., set the engine at 2000 rev/min for thirty seconds minimum then re-engage.

12. Checking the forward speed sensor

Start moving

Check that above 2 Kph the hare/tortoise range change is impossible.

This shows that :
- the forward speed sensor is operating.

Note :
These tests indicate that the sensors are present, electrically connected and operating. These tests do not prove that they have been correctly adjusted. The only way to ensure correct adjustment is by carrying it out again :
- Screw down the sensor fully against the pinion teeth, without forcing it.
- Slacken off the sensor by half to three quarter turn.
- Lock the securing nut moderately - maximum 2 0 Nm.

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13. Hare/tortoise range solenoid wiring

Drive the tractor forward and change the range several times. checking that the forward speed changes. Also check that the range warning light corresponds to the range actually engaged. Above approx 2 Kph , it should be impossible to change the range.

14. Four wheel drive solenoid wiring

Drive the tractor forward at approx 4 Kph. Make as tight a turn as possible. Engage and disengage the 4 WD alternately several times. When 4 WD is engaged you should see the front wheels skid and feel a jerk as you engage and disengage.

This shows that :
- The front axle solenoid is wired and operates.
- The front axle clutch is operating.

15. Differential lock solenoid wiring

Whilst moving along at 4 Kph engage the differential lock.
The 4 WD will engage as well. Make a tight turn, raise and lower the lift. The diff.lock warning light should illuminate and extinguish : you should see the rear tyres skid when the differential lock is engaged, and feel a jerk as you engage and disengage.

This shows that :
- The solenoid is wired and operating.
- The differential lock is operating.

16. Checking the non synchro earth wire

Check presence of a «2 Kph» earth wire on C1(black wire) to ETCU.
If the wire is not present check that C1 terminal of ETCU box is connected to ground. If not add an earth wire.

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12 B01 Checking and repair with tester

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12B01.2

Autotronic

A . General

The «Autotronic» is an electronic system including :
- inputs
- Electronic Transmission Control Unit (ETCU)
- outputs

The inputs are created by signal sent from :
- The sensors :
  .. Engine speed
  . Forward speed
  . PTO speed

- The switches :
  . hydraulic pressure
  . Differential lock
  . 4 WD
  . Lift raising/lowering
  . P.T.O.
  . Hare/Tortoise
  . Brake
  . Clutch

- The earth wire :
  . non synchro

- Power supply :
  . + 12 volts
  . Earth

The outputs activate the following components :
- The warning lights :
  . Differential lock
  . 4 WD
  . P.T.O.
  . Oil pressure
  . Hare
  . Tortoise

- The solenoids :
  . Differential lock
  . 4 WD
  . P.TO. clutch
  . Hare/Tortoise

According to the state of the inputs (if there is a signal or not), the ETCU controls the corresponding outputs. To check a correct operation of an ETCU system, it is necessary to control simultaneously the inputs and the outputs of the ETCU, i.e. to visualize the state of inputs and outputs. The ETCU tester is the quickest and most efficient equipment to perform this check.

Remarks

- The test procedure must be carried out in the proper order.

- When a ETCU box has been changed, the test procedure should be carried out from start to finish.

Recommended equipment

- 1 ETCU Tester with its harness : 3584002 M92
- 1 Multimeter : MF 3005
- 1 Test screwdriver 12 V.
- 2 Test leads
- 1 Repair kit comprising :
. Repair wires with terminals
. Service tools : 3580817M1, 3580818M1, 3580820M1

B . The ETCU tester

The tester is connected between the tractor harness and the ETCU. The Tester is fitted in parallel with input and output lines.

Description

- On the front face, a decal shows all the inscriptions corresponding to the inputs and outputs. On the left are the inputs, on the right are the outputs such as solenoids. In the middle, are the warning lights which are also on the instrument panel, near the Hare/ Tortoise Range lever.

- On the side of the Tester, are the terminals to allow to make measures without removing the connectors.

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Tester installation (see page 5)

- Remove the ETCU box cover and disconnect harnesses at junction A.B.C.
  Caution : To disconnect each connector, press the blade lock as shown by the arrow (Fig. 1).
- Connect the male connectors of the tester harness to the corresponding female connectors of the ETCU.
- Connect the female connectors of the tester harness to the corresponding male connectors of the ETCU harnesses.

Note : When a warning light illuminates on the Tester, this does not mean there is a breakdown, but that the control signal comes to or goes out the ETCU.

Example : When the diff.lock button is pressed, the following warning lights should appear on the tester :
- Diff.lock switch
- Diff.lock light
- Diff.lock solenoid

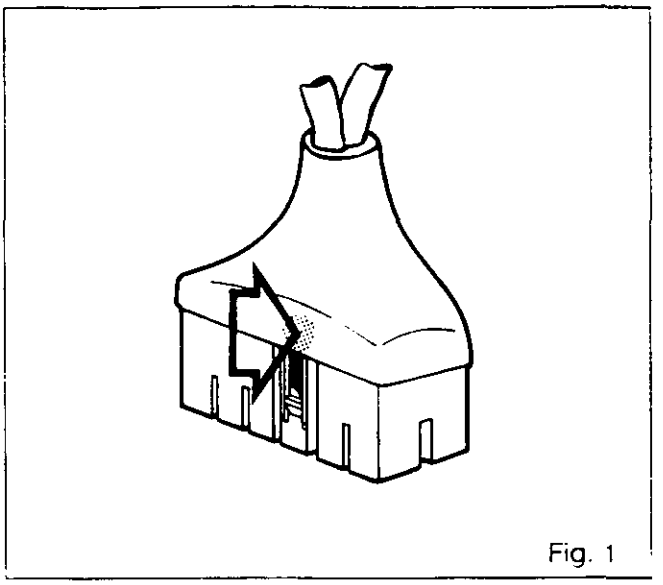


Fig. 1

Because the ETCU installation is a system with inputs and outputs, the investigation of a breakdown is based on the following possibilities :

1) The diff.lock button input signal does not come to the ETCU :
   Check the circuit from the input component (example : switch).

2) The input signal comes to the ETCU but no signal comes out of the ETCU to the output (solenoid or warning light) :
   The ETCU is probably faulty.

3) The input signal is present on the ETCU.
   The output signal is correct, but the selected function is not obtained :
   Check the circuit to the controlled component (for example : solenoid, warning light).

If something appears wrong in the correct operation section, refer to the same section in incorrect operation (12 B01-10 to 17).

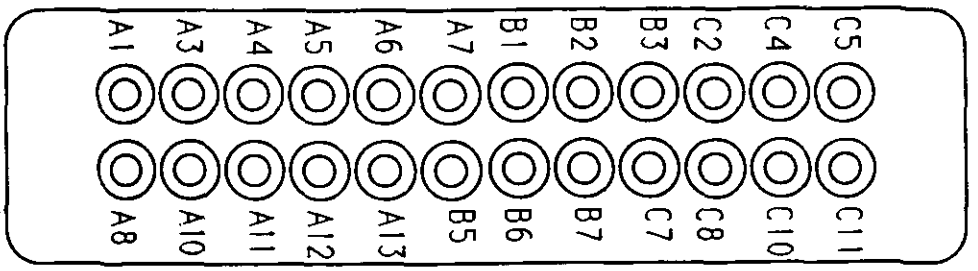
Precaution to be taken

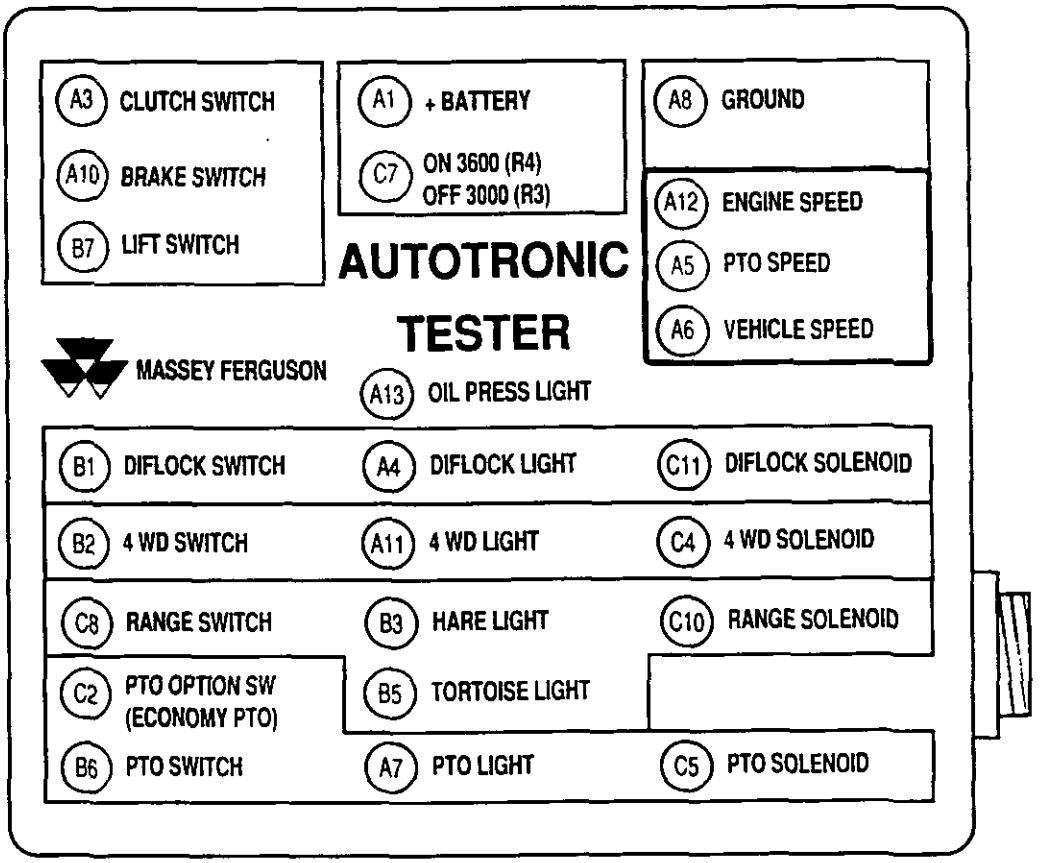
To avoid damaging the tester, only carry out the tests described in this procedure.

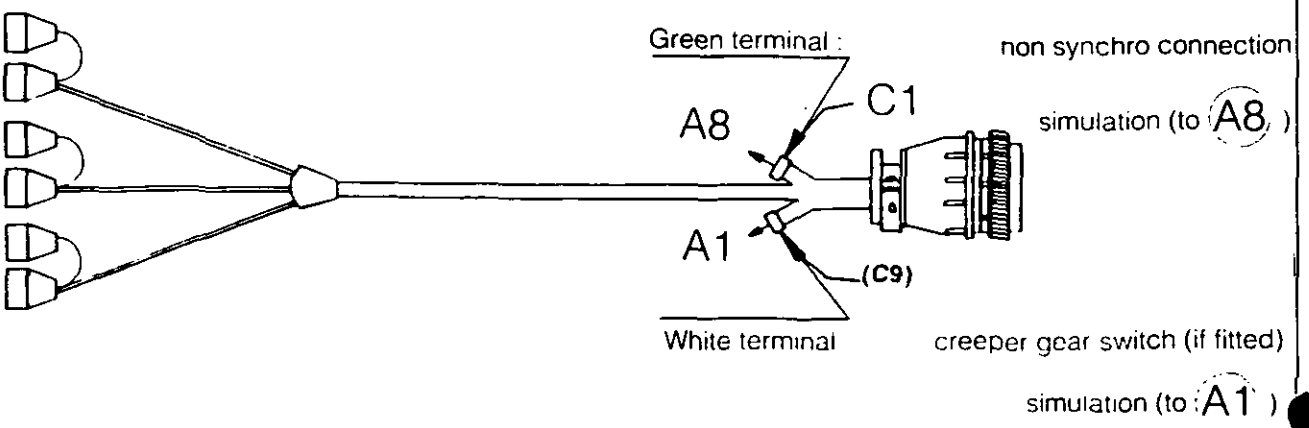
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Tester description



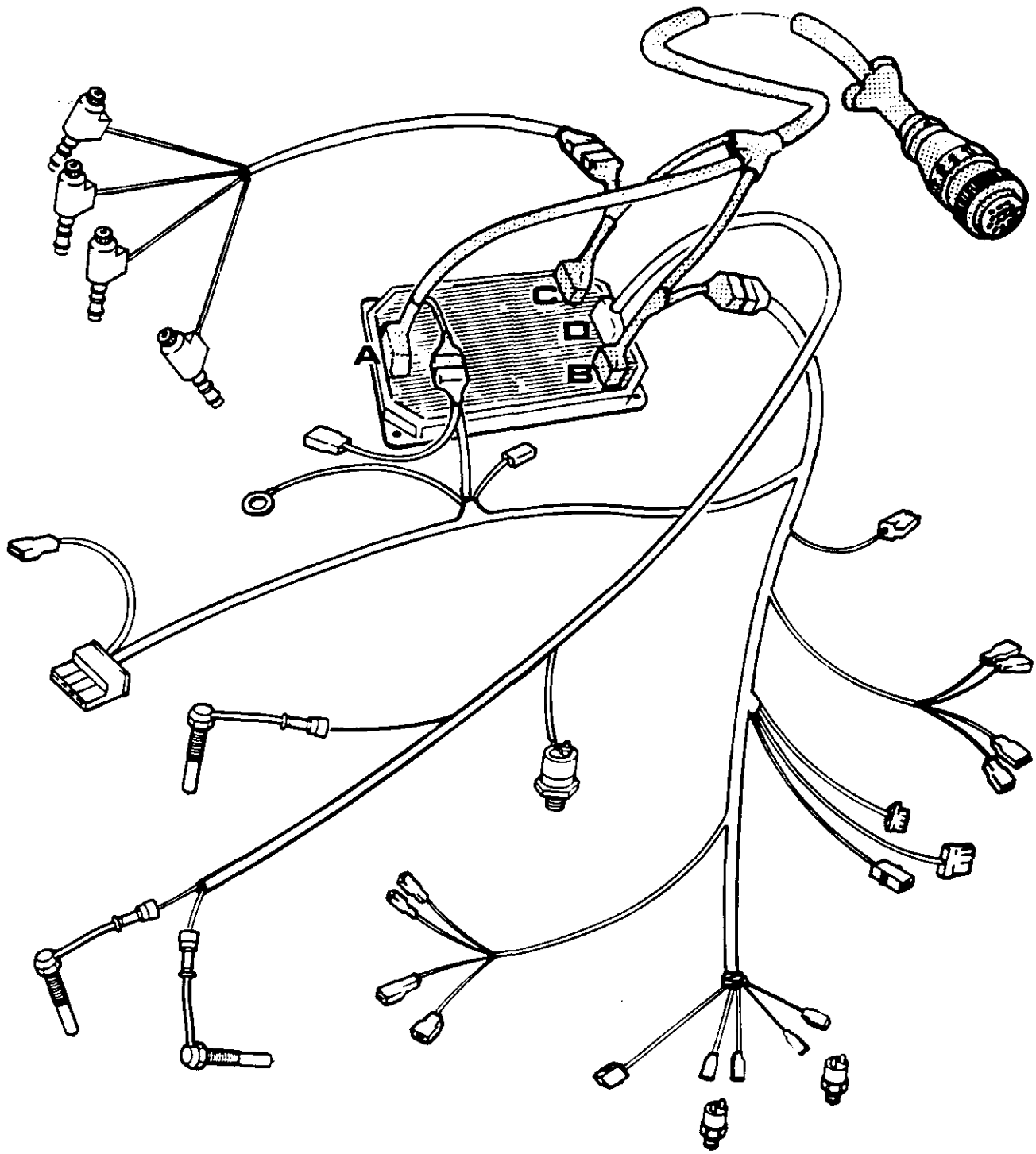




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Tester harness installation



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C . Correct operation

Note : The following procedure applies from serial n° N047049.
For previous tractors refer to service manual n° 1646650 M1

PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER
TEST N°1 - Power supply - Engine stopped		
Ignition off Declutch	4 WD light Oil pressure light Hare/Tortoise light } **come on**	Clutch switch Oil pressure light Hare light and range solenoid or Tortoise light 4 WD light } **come on**
Re-engage clutch	After 4 seconds. the lights **go out**	After 4 seconds. the lights **go out**

TEST N°2 - Hydraulic pressure switch - Engine stopped

Declutch	4 WD light Oil pressure light Hare/Tortoise light } **come on**	Clutch switch light Oil pressure light Tortoise light or Hare light and range solenoid 4 WD light } **come on**
Operate the starter without starting engine	Oil pressure light **goes out**	Engine speed light **comes on** Oil pressure light **goes out**

TEST N°3 - Hydraulic pressure switch - *Engine idling*

Start the engine	Hare/Tortoise light 4 WD light } **illuminated**	Tortoise light or Hare light and range solenoid 4 WD light Engine speed light } **illuminated**

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PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER
TEST N° 4 - Differential lock - Engine idling		
Press the diff. lock button (holding on)	Diff. lock light **comes on** 4 WD light } **remain** Range light } **illuminated**	Diff. lock switch Diff. lock light Diff. lock solenoid } **come on** 4 WD light Hare light and Range solenoid or Tortoise light } **stay on** Engine speed light
Release diff. lock button	Diff. lock light 4 WD light } **remain illuminated** Range light	Diff. lock switch **goes out**
Press diff. lock button once	Diff. lock light **goes out**	Diff. lock light Diff. lock solenoid } **go out**
TEST N° 5 - Brake switch - Engine idling		
Press diff. lock button.	Diff. lock light 4 WD light } **come on**	Diff. lock switch Diff. lock light Diff. lock solenoid 4 WD light } **come on** Hare light and Range solenoid or Tortoise light Engine speed light } **stay on**
Apply light pressure to each brake pedal in turn	Diff. lock light **goes out** 4 WD light **stays on**	Brake switch **comes on** Diff. lock solenoid Diff. lock light when pedal is pressed } **go out**
TEST N° 6 - 4 WD - Engine idling		
Press and release brake pedal		Brake switch **comes on** when brake pedal is pressed
Press 4 WD button for less than 2 sec.	4 WD light **goes out**	4 WD switch **comes on** when button pressed 4 WD light **goes out** 4 WD solenoid **comes on** when tractor starts moving

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PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER

TEST N°7 - Lift raising/lowering switch - Engine idling

Engage diff.lock , lift/lower switch in neutral or lower Move lift/lowering switch to lift position	Diff. lock light **goes out** 4 WD light **stays on**	Lift switch B7 **comes on** Diff. lock light } **go out** Diff. lock solenoid 4 WD light **stays on**

TEST N°8 - Hare/Tortoise range change -Engine idling - Creeper gear disengaged - Tractor stationary

Move the range lever	Hare light Tortoise light } **Alternately illuminated**	Hare light and Range solenoid orTortoise light } **Alternately illuminated** Range switch **comes on** each change

TEST N°9 - P.T.O. - Engine idling

Engage the P.T.O.	P.T.O. light **comes on**	P.T.O. switch P.T.O. light P.T.O. solenoid P.T.O. speed sensor } **come on**
Disengage the P.T.O.		
If economy PTO fitted engage it (shaft not rotating)		P.T.O. option switch light **comes on**

TEST N°10 - Engine speed sensor - Engine stopped. disconnect the hydraulic pressure switch

Start engine on idling Wait for 10 seconds after having released the clutch pedal	Hydraulic pressure light Range light 4 WD light } **stay on**	Hydraulic pressure light **stays on** Engine speed sensor 4 WD light Hare light and Range solenoid or Tortoise light } **come on**
Reconnect the sensor		

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PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER

TEST N°11 - PTO speed sensor - Engine idling

Engage the P.T.O.	P.T.O. light **comes on**	Engine speed **illuminated** P.T.O. switch **comes on** Hare light and range solenoid or Tortoise light } **illuminated** P.T.O. light and P.T.O. solenoid P.T.O. speed } **come on**
Disconnect the P.T.O. sensor The P.T.O. should stop rotating after 4/5 seconds	P.T.O. light **should begin to flash**	P.T.O. speed light P.T.O. solenoid light } **go out** P.T.O. light **flashes**
Reconnect sensor		

TEST N°12 - Forward speed sensor - Tractor moving

Engage 4 WD Check that above 14 kph, 4 WD disengages automatically	4 WD light should **go out**	Forward speed sensor **on** 4 WD light **goes out** 4 WD solenoid **comes on**
Then decrease speed below 14 kph	4 WD light **comes on**	Forward speed sensor **stays on** 4 WD light **comes on** 4 WD solenoid **goes out**

TESTS N° 13 - 14 - 15 - 16

These tests are covered in the operation and checking (without tester). If you encounter problems refer to n° 13 - 14 - 15 and 16 of incorrect operation, page 12B01-13)

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D . Incorrect operation

The numbers in brackets ( ) correspond to the numbers of the tester lights or test jacks on the side.
The numbers not in brackets correspond to the terminal of the tractor harness connector .
For example :
(A1) = Female test jack on tester side
A1 = Terminal 1 on connector **A** of the tractor harness (see 12B01-14).

To prevent a short circuit and therefore damage to the tester ensure that when putting a jump wire from another terminal to (A1), (A1) must be the last to be connected.

In case of only one non-working output, report directly to the correct paragraph a, b, c or d.

GROUND

Bad ground connection of the ETCU may cause an intermittent incorrect working of the electronic system. Always check resistance between terminal A8 of the harness and the negative terminal of the battery.
If R ≃ 0 Ω : correct
If other value : check ground connections on battery or on gearbox cover

TEST N° 1 . Checking power supply

If no light on instrument panel check a, b and c.

a) Power supply engine stopped - ignition off
Check voltage between **A1** and **A8**
If V = 12 V : correct figure. No problem in power supply (see b)
If V = 0 V : incorrect figure. Check voltage between **A1** and chassis
If V = 12 V : break on line **A8**
If V = 0 V : break on line **A1**

b) Clutch switch
Tractor starts when you declutch
Tractor does not start when clutch engaged
} Clutch switch correct (see c)

Ignition off, depress the clutch pedal and check resistance between **A3** and **A8** .
If R = 1 - 1.5 ohm correct value
If R = infinity break on line **A3** or clutch switch faulty (see diagram, page 14)

c) Hydraulic pressure switch
1) Check resistance between **D1** and the feed wire (green) connected to the hydraulic pressure switch
If R = 55 to 65 Ω, correct value. See 2.
If R = 0 Ω, short circuit on line **D1**
If R = infinity, break on line **D1**. Check the resistance of the portion of wire including the 60 Ω resistance.

2) Check resistance between **D4** and the black wire connected to the hydraulic pressure switch.
If R = 0 Ω, correct. See 3.
If R = Infinity, break on line **D4**

3) Disconnect the hydraulic pressure switch. Check resistance between **D1** and **D4**.
If R = 0 Ω, short circuit
If R = infinity, correct. See 4.

4) Measure the resistance between the two terminals of the hydraulic pressure switch, correct values :
R = infinity, when engine stopped
R = 0 Ω, when engine running
If not, hydraulic pressure switch faulty

d) Instrument panel hydraulic pressure warning light off
Shunt **(A1)** - **(A13)** with a test lead.
- *If the warning light does not come on : check line* **A13**
- If the warning light comes on refer to the instructions in paragraphs **a**, **b** and **c** above.

e) Instrument panel 4WD light off
See test 6d, page 12B01-11

f) Hare and Tortoise light off
See test 8 b and c, page 12B01-12

TEST N° 2 . Hydraulic pressure switch

a) Hydraulic pressure switch
If the tests performed in paragraph 1C are OK, continue the procedure as follows :
- Check pressure in 17 bar circuit.
- Start engine : check switch closes at 17 bar.
- Stop engine : check switch opens at 9 ± 0.9 bar.
- If opening and closing are correct with tractor running, ETCU is defective.

b) Engine speed sensor
See test 10 page 12B01-12

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TEST N° 3 . Hydraulic pressure switch

See test 2 page 12B01-10.

TEST N° 4 . Differential lock

Engine idling, operate the differential lock button.

a) Diff. lock switch
Input **(B1)** does not come on, neither do outputs **(A4)** **(C11)**
Now shunt between **(A1)** and **(B1)**
(A4) and **(C11)** come on, then check line **B1**, fuse F12, switch supply or switch
(A4) or **(C11)** remain extinguished, refer to following instructions

b) Diff. lock warning light
Output **(A4)** does not come on, shunt between **(A1)** and **(A4)**. If **(A4)** and the diff. lock warning light illuminate, the ETCU is faulty.
If **(A4)** comes on and the diff. lock warning light on instrument panel remains extinguished then check line **A4**

c) If output (C11) does not comes on :
Measure voltage between **(C11)** and **(A8)**
If 0 V : ETCU is faulty
If 12 V : check line **C11**

TEST N° 5 . Brake switch

Engine idling, operate the differential lock button to engage the diff. lock.
Press on each brake pedal in turn.
Warning lights **(A4)** and **(C11)** go out.
Warning light **(A10)** illuminates

a) The input (A10) remains extinguished, therefore (A4) and (C11) stay on.
Shunt between **(A1)** and **(A10)**
If **(A4)** and **(C11)** come off, check line **A10** (fuse F14, brake switch....).
If **(A4)** and **(C11)** remain extinguished, see instructions b - c.

b) The input (A10) comes ON and (A4) and (C11) stay on :
ETCU faulty if test 4 was correct.

TEST N° 6 . 4 WD

Engine idling, 4 WD light ON, operate the 4 WD button after having pressed the brake pedal.

a) If input (B2) does not come ON, therefore (A11) remains ON
Shunt between **(A1)** and **(B2)** for less than 2 seconds
If **(A11)** comes OFF, then check line **B2**
If **(A11)** remains ON, refer to next paragraphs.

b) If (B2) comes ON and (A11) does not come OFF
the ETCU is faulty

c) If the output (C4) does not illuminate when moving
Measure voltage between **(C4)** and **(A8)**
If = 12V : check line **C4** to solenoid.
If = 0 V : the ETCU or the forward speed sensor are defective (see test 12 p. 12B01-13).

d) If the output (A11) does not come on
Shunt between **(A1)** and **(A11)**
If **(A11)** and 4 WD warning light come on, the ETCU or its connections are faulty.
If **(A11)** comes on and the 4 WD warning light remains extinguished, check line **A11**

TEST N° 7 . Lift raising/lowering switch

With the electronic lift operating normally, push the differential lock button, so that diff. lock and 4 WD engage. Put the lift/lower toggle switch to the lift position.
Warning light **(A4)** and **(C11)** go out
Warning light **(A11)** remains illuminated.

a) Warning lights (A4) and (C11) remain illuminated.
Shunt between **(A1)** and **(B7)**
If **(A4)** and **(C11)** go out, check line **B7** (connection between ELC and Autotronic)
If **(A4)** and **(C11)** stay on, the ETCU or its connections are faulty

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TEST N° 8 - Hare/Tortoise range change

If a creeper gear is fitted, carry out the tests with creeper gear disengaged.
With engine idling, operate the range lever Hare/Tortoise.
(C8) should come on each time a range is selected.
(B5) or **(B3)** will come on alternately
(C10) will illuminate every time **(B3)** is on.

a) Input (C8) stays off.
Shunt between **(C8)** and **(A1)** while maintening the range lever on left position.
If **(B5)** or **(B3)** comes on, check line **C8**
If **(B5)** and **(B3)** remain off, ETCU or its connections are faulty.

b) Output (B3) never illuminates
Shunt between **(A1)** and **(B3)**
If **(B3)** and the Hare warning light come on, the ETCU or its connections are faulty.
If **(B3)** is on and the Hare warning light remains off, check line **B3**.

c) Output (B5) never illuminates
Shunt between **(A1)** and **(B5)**
If **(B5)** and the Tortoise warning light illuminate, ETCU or connections are faulty.
If **(B5)** illuminates and the Tortoise light remains off, check line **B5**
If each time you change the range, the opposite warning light for the range selected illuminates, the wires have been crossed at the warning lights.

d) Output (C10) never comes on
Measure voltage between **(C10)** and **(A8)**. Operate the range lever.
If 12 V or 0 V according to the position of lever check line **C10**
If always O V, no matter what the position of the lever, the ETCU or its connections are defective.

TEST N° 9 . PTO

Engine idling - engage PTO
(B6) (A7) (C5) (A5) come on.
a) Input light (B6) stays off, therefore (A7) (C5) (A5) as well
Shunt between **(B6)** and **(A1)**
If **(A7)** or **(C5)** or **(A5)** come on, check line **B6**
If **(A7)**, **(C5)** and **(A5)** remain off, ETCU or its connections are faulty

b) Output (A7) does not come on
Shunt between **(A7)** and **(A1)**
If **(A7)** and the P.T.O. warning light come on, ETCU or its connections are faulty.
If **(A7)** comes on and the P.T.O. warning light remains extinguished, check line **A7**

c) Output (C5) does not come on
Measure voltage between **(C5)** and **(A8)**
If value = 12 V , check line **C5**
If value = 0 V , ETCU or connections are faulty

d) Output light (A5) does not come on and the PTO shaft is not rotating
Check solenoid or line C5.

e) Output light (A5) does not come on and PTO shaft is rotating
Measure resistance between **D6** and **D7**
If R = 450 ohms : check connections **D6** and **D7**
Check the adjustment of the P.T.O. speed sensor.
If R = 0 ohm : short circuit on lines **D6** and **D7**
If R = infinity : break on line **D6** or **D7**

TEST N° 10 .Engine speed sensor

a) Engine stopped, disconnect connector D
Measure resistance between **D2** and **D3**
If R = 450 ohms : check connections **D2** and **D3** to ETCU then see b.
If R = 0 ohm : short circuit between lines **D2** and **D3**
If R = infini : break on line **D2** or **D3**

b) Sensor adjustment
Screw down the sensor until it is in contact with the pump gear.
Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20Nm max.

TEST N° 11 .PTO speed sensor

a) Engine stopped, disconnect connector D
Measure resistance between **D6** and **D7**
If R = 450 ohms : check connections **D6** and **D7** on ETCU then see b.
If R = 0 ohm : short circuit between lines **D6** and **D7**
If R = infini : break on line **D6** or **D7**

b) Sensor adjustment
Screw down the sensor until it is in contact with the PTO gear
Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20 Nm max.

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TEST N° 12 . Forward speed sensor

a) Engine stopped, disconnect connector D

Measure resistance between **D4** and **D5**

- R = 450 ohms : check connections **D4** and **D5** on ETCU then see b.
- R = 0 ohm : short circuit between lines **D4** and **D5**
- R = infini : break on line **D4** or **D5**

b) Sensor adjustment

Screw down the sensor until it is in contact with the differential crownwheel.

Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20Nm max.

TEST N° 13 . Hare/Tortoise range solenoid wiring

If test 8 was correct, check the solenoid (line C10, ground,....)

TEST N° 14 . 4 WD solenoid wiring

If test 6 was correct, check the solenoid (line C4, ground,....)

TEST N° 15 .Differential lock solenoid wiring

If test 4 was correct, check the solenoid (line C11, ground,....)

TEST N° 16 .Checking the non synchro earth wire

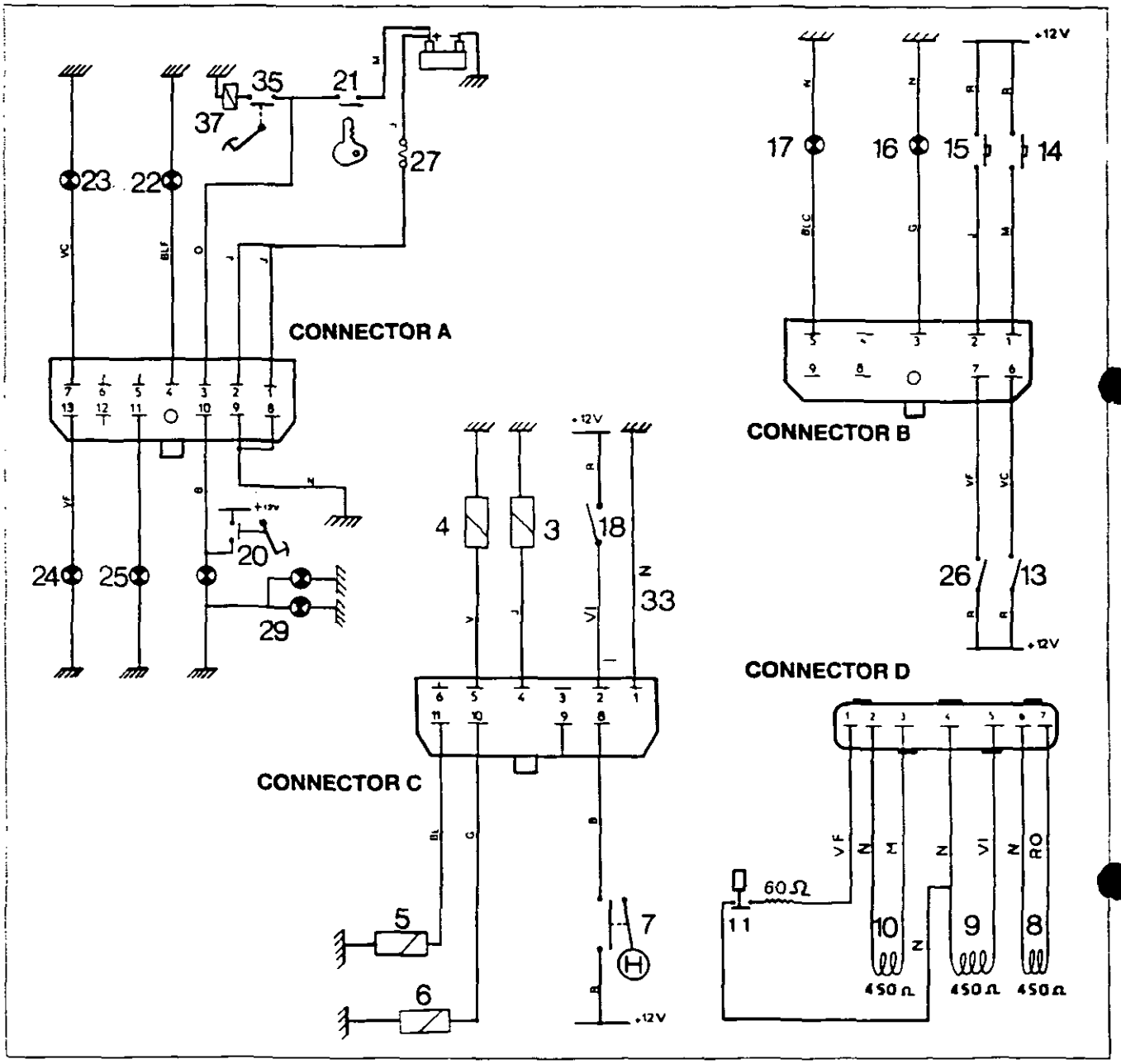
Check that a black wire connected to earth is present on the terminal **C1**. If it is not the case, check that the terminal **C1** of the ETCU is connected to ground. If not, add an earth wire.

Note : (C7) warning light should not be illuminated, otherwise check for a short circuit on line C7.

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E. Identification of terminals on tractor harness connectors



Wire colour

B	=	White
BL	=	Blue
G	=	Grey
J	=	Yellow
M	=	Brown
N	=	Black
O	=	Orange
R	=	Red
RO	=	Pink
V	=	Green
VI	=	Violet
C	=	Light
F	=	Dark

Component description

3. 4 WD solenoid
4. P.T.O. solenoid
5. Differential lock solenoid
6. Hare/Tortoise solenoid
7. Hare/Tortoise switch
8. P.T.O. speed sensor
9. Forward speed sensor
10. Engine speed sensor
11. Hydraulic pressure switch
13. P.T.O. switch
14. Differential lock button
15. 4 WD button
16. Hare warning light
17. Tortoise warning light
18. Economy PTO switch
20. Brake switch
21. Starter switch
22. Differential lock warning light
23. P.T.O. warning light
24. Oil pressure warning light
25. 4 WD warning light
26. Lift raising/lowering switch
27. Fuse 10 A
29. Stop lights
33. Non synchro earth wire
35. Safety switch
37. Starter motor

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F . WIRING DIAGRAM (with ETCU)

Components description

1 . Transmission control unit box (TCU)
2 . PTO brake solenoid *
3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
8 . P.T.O. speed sensor
9 . Forward speed sensor
10 . Engine speed sensor
11 . Hydraulic pressure switch (17 bar)
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
18 . 4 speed PTO switch *
19 . PTO brake switch *
20. Brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
27 . Fuse 10 A (to starter + permanent)
28 . Fuse 25 A (to starting contact + after contact)
34 . Fuse 15 A (brake contact)
35 . Safety switch
36 . Alternator
37 . Starter motor
38 . Battery
39 . Fuse 7,5 A (Instrument panel)
41 . Fuse 7,5 A (ELC permanent supply)
67 . Speedshift switch *
68 . Speedshift solenoid *

* Not controlled by the TCU

Harness identification

(a) Main harness, instrument panel
(b) Engine harness
(d) Console harness
(m) Electronic harness, instrument panel
(n) Electronic harness, cab/console
(o) Battery harness
(p) Electronic harness transmission
(q) Sensor harness
(s) Harness, instrument panel and ETCU
(v) Harness, instrument panel lighting

Wires colour

A = Aluminium
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
C = Light
F = Dark

Wiring diagram abbreviations

Emb : End
+ AC : *+ after contact*
+P : Permanent live
— - - — : Engine harness wiring
— — — : Lighting harness wiring
** : not connected on tractors with super creeper gear

Connector identification

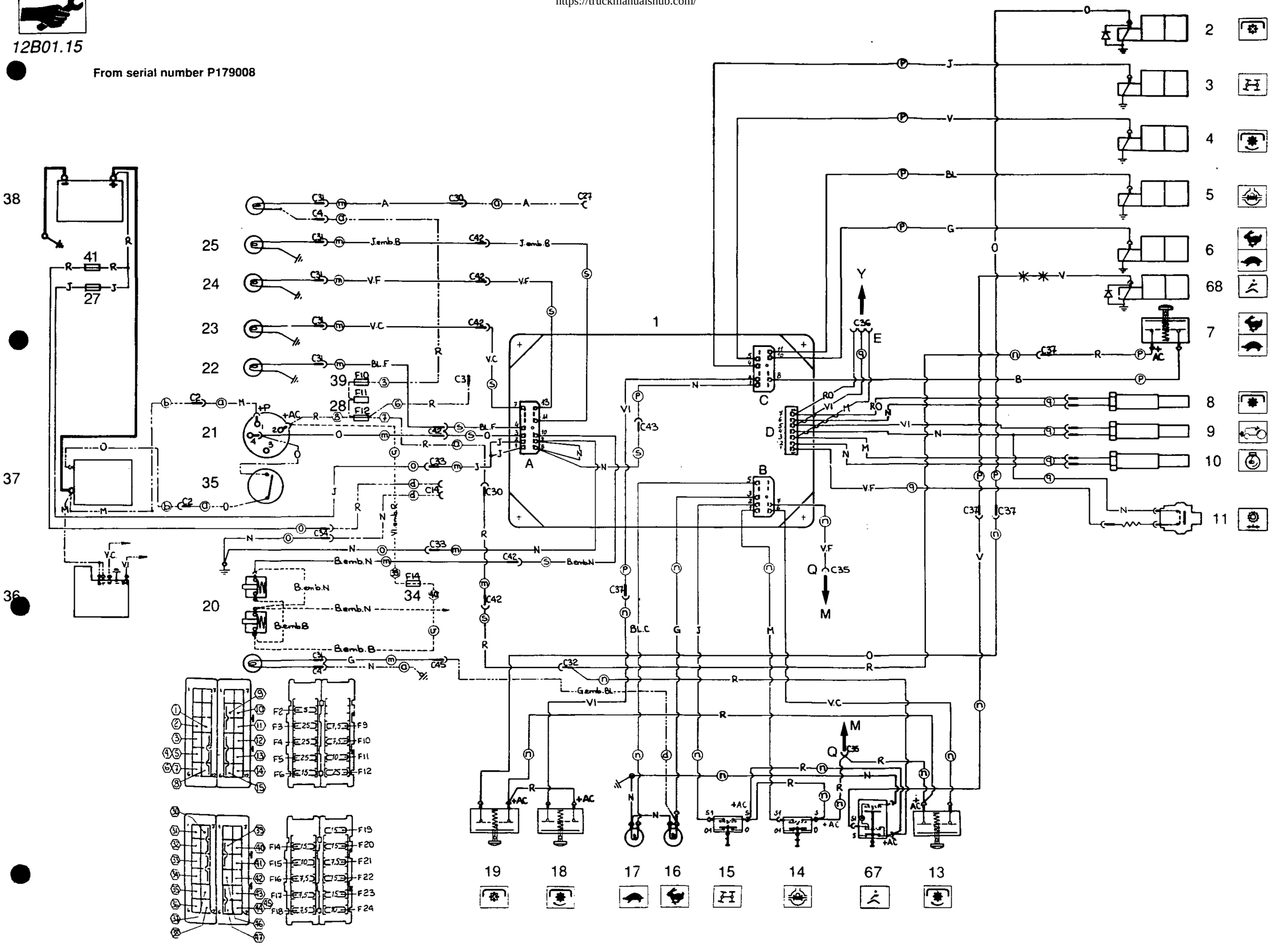
A : 13-way connector on TCU
B : 9-way connector on TCU
C : 11-way connector on TCU
D : 7-way connector on TCU
C1 : 9-way black connector, under engine hood
C2 : 9-way black connector, red band, under engine hood
C3 : 6-way black connector
C4 : 5-way white connector (instrument panel)
C14 : 5-way white connector
C27 : not connected
C30 : 2-way black connector
C31 : 7-way white connector (instrument panel)
C32 : 1-way black connector
C33 : 2-way black connector
C34 : 2-way black connector
C35 : 2-way white connector
C36 : 3-way white connector
C37 : 6-way black connector 4 way
C42 : 8-way black connector under instrument panel
C43 : 1-way white connector
C45 : 1-way black connector

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SIMPLIFIED DIAGRAM
Components description

1. Transmission control unit box (TCU)
2. PTO brake solenoid *
3. 4 WD solenoid
4. P.T.O. solenoid
5. Differential lock solenoid
6. Hare/Tortoise solenoid
7. Hare/Tortoise switch
8. P.T.O. speed sensor
9. Forward speed sensor
10. Engine speed sensor
11. Hydraulic pressure switch (17 bar)
13. P.T.O. switch
14. Differential lock button
15. 4 WD button
16. Hare warning light
17. Tortoise warning light
18. 4 speed PTO switch *
19. PTO brake switch *
20. Brake switch
21. Starter switch
22. Differential lock warning light
23. P.T.O. warning light
24. Oil pressure warning light
25. 4 WD warning light
27. Fuse 10 A (to starter + permanent)
28. Fuse 25 A (to starting contact + after contact)
34. Fuse 15 A (brake contact)
35. Safety switch
36. Alternator
37. Starter motor
38. Battery
39. Fuse 7.5 A (instrument panel)
40. Fuse 7.5 A (lift - engine running)
41. Fuse 7.5 A (lift + direct battery)
53. Lighting switch
54. Fuse 7.5 A
55. Resistor
57. Alternator warning light
67. Speedshift switch *
68. Speedshift solenoid *

* Not controlled by the TCU

Wires colour

A = Aluminium
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
C = Light
F = Dark

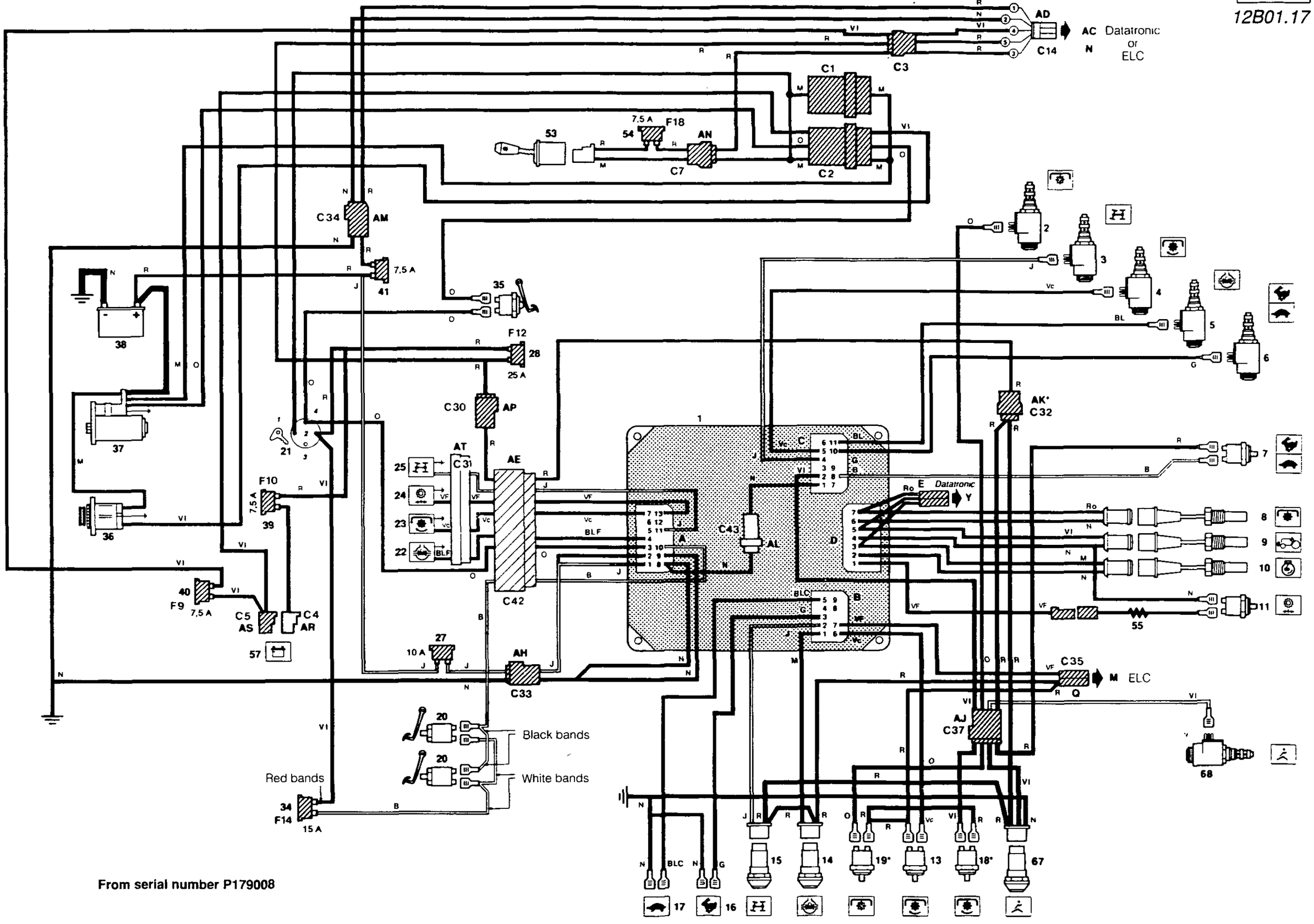
Connector identification

A : 13-way connector on TCU
B : 9-way connector on TCU
C : 11-way connector on TCU
D : 7-way connector on TCU
E : 3-way white connector. Autotronic/Sensors harness(junction with Datatronic. connector Y)
Q : 2-way white connector. TCU junction with ELC harness (connector M)
AD : 5-way white connector, console harness junction with Datatronic and/or ELC (connector AC or N)
AE : 8-way black connector, instrument panel harness junction with Autotronic harness
AH : 2-way black connector, permanent power supply to "Autotronic"
AJ : 6-way black connector
AK : 1-way black connector, switches power supply (ignition on)
AL : 1-way white connector
AM : 2-way black connector, ELC power supply and ground
AN : 4-way white connector, ELC console lighting
AP : 2-way black connector, switches power supply (ignition on)
AR : 5-way white connector, junction with instrument panel
AS : 7-way black connector, junction with instrument panel
AT : 7-way white connector, junction with instrument panel
C1 : 9-way round black connector located under the engine hood
C2 : 9-way round black connector (red band) located under the engine hood
C3 : 6-way black connector

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G . WIRING DIAGRAM (without Autotronic)

Components description

2 . PTO brake solenoid
3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
11 . Hydraulic pressure switch (17 bar)
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
19 . PTO brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
27 . Fuse 10 A (to starter + permanent)
28 . Fuse 25 A (to starting contact + after contact)
36 . Alternator
37 . Starter motor
38 . Battery
39 . Fuse 7,5 A
41 . Fuse 7,5 A (ELC + direct)
67 . Speedshift switch
68 . Speedshift solenoid
69 . Telebreaker
70 . Oil pressure switch (17 bar)

Harness identification

(a) Main harness, instrument panel
(b) Engine harness
(d) Console harness
(m) Electronic harness, instrument panel
(n) Electronic harness, cab/console
(o) Battery harness
(p) Electronic harness transmission

Wires colour

A = Aluminium
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
C = Light
F = Dark

Wiring diagram abbreviations

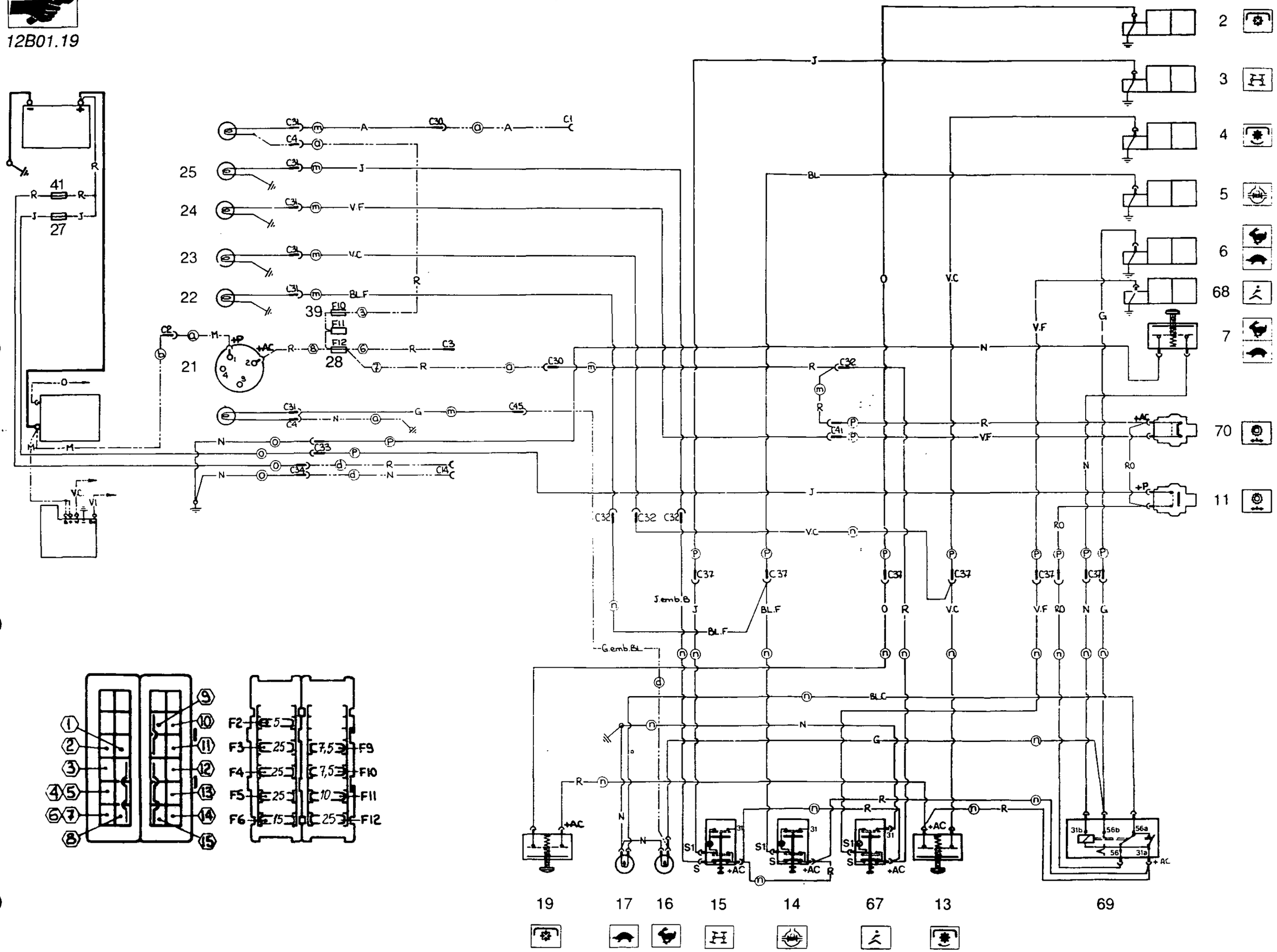
Emb : End
+ AC : + after contact
+P : Permanent live
— - - — : Engine harness wiring

Connector identification

C1 : 9-way black, connector, under engine hood
C2 : 9-way black, connector, red band, under engine hood
C3 : 6-way black, connector
C4 : 5-way white, connector (instrument panel)
C1[illegible] : [illegible]-way white connector
C30 : 2-way black connector
C31 : 7-way white connector (instrument panel)
C32 : 4-way black connector
C33 : 2-way black connector
C34 : 2-way black connector
C37 : 8-way black connector
C41 : 1-way black connector
C45 : 1-way black connector

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12 C01 Dynashift System

CONTENTS

A.	**General**	**2**
B.	**Electronic control unit functions**	**3**
C.	**Test procedure**	**4**
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Autotronic - Dynashift

A . General

The «Dynashift» system controls consist of six main components.

(1) *Control lever*

Located near the steering wheel, to the left of the steering column, it selects the four ratios A, B, C, D without declutching. It operates a four-position switch whose terminals are linked to the electronic control unit **(2)**.

(2) Elecronic control unit

Fixed above the clutch pedal, it is supplied by the + 12V after ignition line and is connected to earth through the Autotronic harness.

Depending on the data sent by the control lever (switch) **(1)** and the data provided by the Autotronic system, (hydraulic pressure, theoretical tractor speed, engine speed, clutch switch state) it authorizes gear changes by supplying the solenoid valves **(3)** and activating the warning lights **(4)**.

The unit can include an internal system for limiting speed to 30 km/h (for certain markets).

(3) Solenoid valves

Mounted in an external valve block at the front right of the gearbox, they supply the Dynashift unit.

They have two terminals (supply and earth).

The upper solenoid valve is identified by its brown connector.

The lower solenoid valve is identified by its black connector.

(4) Warning lights

Located on the instrument panel, they indicate the Dynashift ratio (A, B, C or D) which is currently engaged.

If they flash, this indicates that this ratio does not correspond to the lever position.

(5) The electrical harness connects the different components.

(6) The temperature sensor fitted on the gearbox selector cover to measure the transmission oil temperature. It is fitted from serial numbers :

- 3600 : A296013
- 3100 : A290012
- 3000 : A295035

In that case, the electronic control unit is fitted with a 17-way connector instead of a 15-way connector.

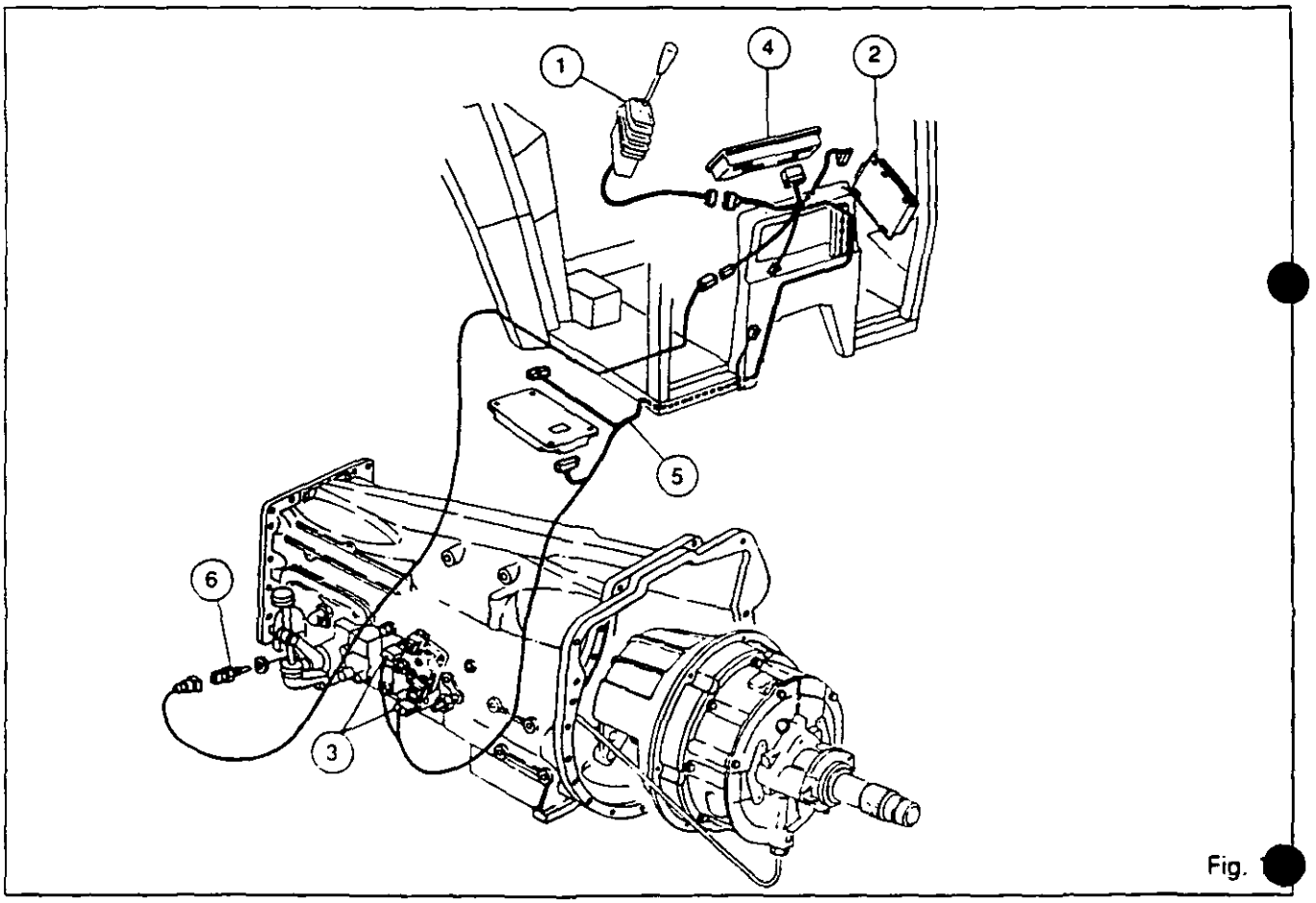


Fig. 1

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B . Control unit functions

The control unit carries out of certain number of automatic functions which can easily be checked while driving the tractor.

1. Time delay

By moving the lever directly from position A to positions C or D the Electronic Control unit will shift the intermediate ratios.
Example : If the lever is moved from A to D, gearbox ratios B, C and D are engaged in succession. This is indicated by the warning lights.
This does not apply when the theoretical tractor speed is zero and the clutch is depressed.
The shifting of the intermediate ratios is interrupted when the clutch is depressed while the tractor is moving (simultaneous change of the Dynashift and the synchronised gears).

2. Max. engine speed

All shifting of lower ratios are ignored when the engine speed measured by the Autotronic sensor is greater than 2400 rev/min.

3. Engine speed drop

If, during an automatic ratio change (see paragraph 1), the engine speed falls by more than 12 %, the system locks itself in the gear engaged. The corresponding light flashes.
A change to the next gear will only be authorized if the engine speed rises again.

4. Hydraulic pressure drop

When a hydraulic pressure drop is detected by the Autotronic pressure switch, the Electronic Control unit goes into «Alarm» mode. The four instrument panel warning lights go on. The engaged ratio is locked but the system will automatically change to ratio D as soon as tractor speed is zero.

5. Electrical fault detection on control lever

If the Electronic Control unit detects an electrical fault on the control lever, it goes into «Alarm» mode and will :
- automatically change to D ratio
- light the A, C and D lights

In this case, check the lever lines as indicated in test 3 of the test procedure.

6. Electrical fault detection on solenoids (Electronic Control unit with 17 terminals only)

If the Electronic Control unit detects a break on the solenoid lines, it will shift to alarm mode and :
- change to D ratio
- light A, B and D lights for a fault on solenoid EV1 (brown connector)
- light B and C lights for a fault on solenoid EV2 (black connector)

In that case, check line continuity.

7. Speed limit 30 km/h (for certain markets)

The control unit prevents the maximum legal speed being exceeded by automatically selecting the lower Dynashift ratio (e. g. : 4 D to 4 C or 4 C to 4 B).
Before the change, the light for the engaged ratio flashes, then the 4 lights flash to inform the operator.
To take over control of the system, the lever must then be returned to the position corresponding to the ratio which has just been automatically selected.
Warning: This limit takes account of the theoretical tractor speed measured by the Autotronic sensor and not the real speed measured by the Datatronic radar.

8. Temperature monitoring

If the temperature of the transmission oil is below 0° Celsius when the tractor is started, the Electronic Control Unit will shift to alarm mode and :
- maintain D ratio engaged whatever the lever position is.
- light A and D are on.

With 30 km/h version, if the speed of the tractor exceeds 30 km/h while the temperature is below 0° Celsius, the Dynashift will automatically shift to B ratio.
In all cases, as soon as the temperature reaches the 0° Celsius limit, this will be indicated by :
- A and D lights flashing (40 km/h version)
- D or B light flashing according to engaged ratio (30 km/h version).

It will be possible to change the ratio after having put the control lever on the position corresponding to the engaged ratio (D or eventually B).

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C . Test procedure

The system has its own test program.
A test switch **(I)** is installed on the unit electronic circuit (Fig. 2) :
- letter **W** or white dot = "Work" position
- letter **T** or red dot = "Test" position

Before carrying out the test, open the box, remove the printed circuit card and reconnect it to the harness.
Avoid touching the electronic components.
Check that the switch is in "work" position.
In the event of a fault, check the component concerned, the line continuity up to the Autotronic system and the line continuity of the Autotronic-Dynashift unit link.
Note: In all cases, carry out a quick check of the Autotronic system before referring to the Dynashift unit test. If a fault is detected, repair it before testing the Dynashift control unit.

Start the engine.

Test 1: Supply line and warning lights test

- Move the switch to "Test" position
- The four warning lights flash ten times.
- Then light A remains lit (ready to continue).

Fault:
- If the warning lights do not light at all: check the power supply (Dynashift connector terminal 8), the 5A in-line fuse on the unit supply line, the cab relay fuses F6, F11, the earth, etc.
- If one light does not operate: check the bulb and the wiring (terminals 7, 14, 6, 13 of the connector J1).

Test 2: Clutch switch test

- Move the switch to «Work» position. Lights A and B must be lit. They must change from A, B to C, D each time the clutch is pressed.

Fault:
- Check the clutch switch and the corresponding lines (terminal 4 of connector J1).

- Move the switch to the "Test» position.
- Light B lit : ready to continue.

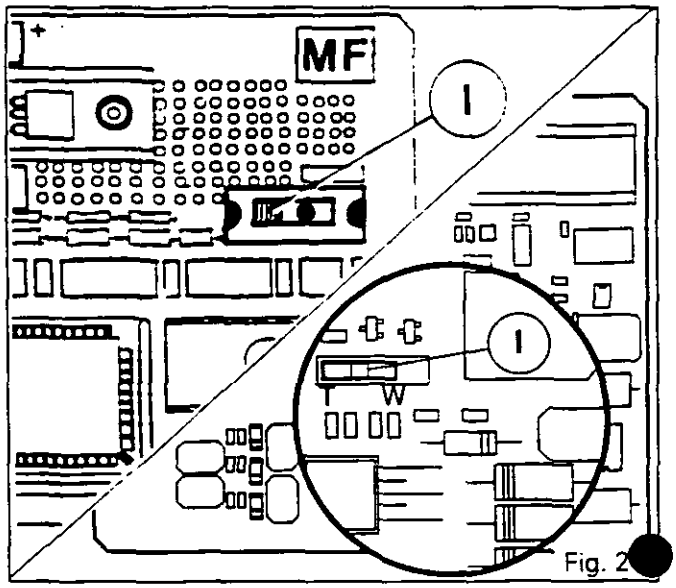


Fig. 2

Test 3: Control lever test

Note: a fault on the lever must have previously been detected during working.
-Move the switch to «Work» position.
-The corresponding light must be lit for each lever position.
The solenoid valves do not react.

Fault: Disconnect the lever
- Check terminal 4 supply
- Check the continuity between terminals 1, 2, 3 and 4 for each lever position (see table).

Connector J3				
Terminal	1	2	3	4
A				+
B	+			+
C	+	+		+
D	+	+	+	+

- Check the continuity of the lines between connectors J3 and J1 :

Lever (J3)	Dynashift (J1)
1	5
2	11
3	3
4	8

- Move the switch to «Test» position.
- Lights A and B lit : ready to continue.

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Test 4 : Testing solenoid valve supply according to lever position.

- Move the switch to "Work" position.
- Check that the solenoid valves are correctly supplied for each lever position.

	Line	A	B	C	D
Brown connector EV1	Yellow	+12V	+12V	0 V	0 V
Black connector EV2	Dark blue	0 V	+12V	+12V	0 V

CAREFUL : With 17 terminals Electronic Control unit, do not disconnect the solenoids to avoid shifting to alarm mode. The solenoid valve supply can be checked using two lamps of 6 watts approx. (maximum 10 watts).

Fault:

- Check the supply directly at terminals 2 and 10 of the connector J1. If correct, check the lines up to the solenoid valves and to the earth. If correct, change the control unit.

- Move the switch to «Test» position.
- Light C lit : ready to continue.

Test 5: Engine speed sensor test

- Move the switch to «Work» position.
- Lights A and D must be lit when the engine speed is less than 1000 rpm.
- Lights A, B, C and D must be lit when the engine speed is greater than 1000 rpm.

Fault:

- Check the continuity of connector line n°9 J1.
- Check the continuity of the sensor lines (see Autotronic tests, connector D) and of Autotronic output A12.
- Check sensor adjustment.
- Check the Autotronic calculator.
- If it is not possible to reach an engine speed less than 1000 rpm, slightly modify the idle speed adjustment of the injection pump.

- Move the switch to «Test» position.
- Lights A and C lit : ready to continue.

Test 6 : Forward speed sensor test

- Move the switch to «Work» position.
- Drive the tractor forward:
  . lights A and D must be lit for a tractor speed less than 3 km/h
  . the lights A, B, C, D must go on for a tractor speed greater than 3 km/h

Fault:

- First of all, check the continuity of Dynashift connector line n°1
- Check the continuity of the sensor lines (Autotronic test) and of Autotronic output A6.
- Check sensor adjustment.
- Check the Autotronic calculator.

- Move the switch to «Test» position.
- Lights B and C lit : ready to continue.

Test 7 : Hydraulic pressure switch test

- Move the switch to "Working" position.
- Lights A and D must be lit.
  Disconnect the hydraulic pressure switch to simulate a hydraulic pressure drop: the four lights must be lit.
- Reconnect the hydraulic pressure switch.
- Lights B and C go off.

Fault:

- First of all, check the continuity of Dynashift connector line n° 12.
- Check pressure switch opening and closing (see Autotronic test).
- Check the continuity of the pressure switch lines to the Autotronic system.
- Check Autotronic output A13 (12V pressure switch open - 0V pressure switch closed).

- Move the switch to «Test» position.
- Lights A, B and C are lit : ready to continue

15-WAY ELECTRONIC CONTROL UNIT

Test 8 : End of test

- Move the switch to «Work» position.
- The four lights go on one by one continuously, this indicates the end of the test.

- Move the switch to «Test» position.
- Light D is lit: ready to continue.

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Return to working conditions

- Move the switch to "Work" position.
- The solenoid valves and the warning lights must switch on in accordance with lever position.

17-WAY ELECTRONIC CONTROL UNIT

Test 8 : Temperature sensor lines test

- Disconnect the temperature sensor fitted on the gearbox selector cover.
- Move the switch to "Work" position.
- Lights A, D must be lit
- Put a short on the sensor connector.
- Lights A, B, C, D must be lit.

Fault :

- Check lines to the Electronic control unit

- Move the switch to "Test" position
- The light D must be lit : ready to continue
- Reconnect the sensor

Test 9 : Temperature sensor test

- Move the switch to "Work" position.
- The lights A, D are lit if the temperature is over 0° Celsius ± 2.
- The lights A, B, C, D are lit if the temperature is below 0° Celsius ± 2.

Fault :

- Check the resistance of the sensor :
  - R = 10,7 K Ω (± 1,3) at 0° Celsius
  - R = approx. 4,0 K Ω at 20° Celsius
  - R = approx. 0,5 K Ω at 50° Celsius
- Check continuity lines
- Check the adjustment of the limit temperature after having finished the test.

- Move the switch to "Test" position.
- The lights A, D must be lit = ready to continue

Test 10 : End of test

- Move the switch to "Work" position.
- The four lights go on one by one continuously, this indicates the end of the test.
- Move the switch to "Test" position.
- The lights B and D are lit.

Return to working mode

- Move the switch to "Work" position.
- The solenoid valves and the warning lights must switch on in accordance with the lever position

If the results of the test procedure are positive and if the system still operates incorrectly (impossible to select one or more ratios):

- *Check the earth very precisely (RH gearbox cover)*
- *Check the resistances of the two solenoid valves.*
- *Check the operation of the spools (see pressure measurement, chapter 8 K01 p. 5).*

Note:

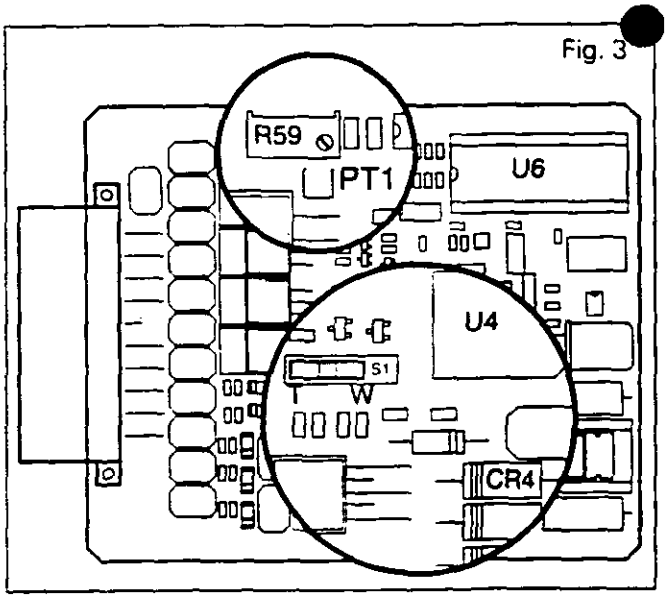
1. ***Before closing the control unit, ensure that the switch is in the "Work" position.***
2. ***If the test is interrupted, disconnect the control unit and repeat the procedure starting from test n° 1. A test may have been disrupted if the switch is not moved fully into position.***

Checking the low temperature monitoring system

- Check voltage between points PT1 and CR4 of the electronic card (see Fig. 3).
- The voltage must be 3,06 VDC (± 0,1)
- If the voltage is not correct, turn the potentiometer screw fitted over PT1 to obtain the correct value.

Note : It is very important to maintain this adjustment to keep the low temperature monitoring operating correctly.

Fig. 3



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Test summary : engine running

	WARNING LIGHTS ON A B C D		
SWITCH POSITION	**IN WORKING POSITION** ○ |	**IN TEST POSITION** | ●	**FUNCTION TESTED**
TEST 1	-	A B C D flash then A	Supply and warning lights
TEST 2	A B or C D declutched	B	Clutch switch
TEST 3	A or B or C or D depending on lever position	A B	Lever
TEST 4	Same - Check solenoid valves supply	C	Solenoid valves
TEST 5	A - D when V < 1000 rev/min A B C D when V > 1000 rev/min	AC	Engine speed sensor
TEST 6	A - D when V < 3 km/h A B C D when V > 3 km/h	B C	Forward speed sensor
TEST 7	A D pressure switch connected A B C D pressure switch disconnected	A B C	Hydraulic pressure switch

15-WAY ELECTRONIC CONTROL UNIT (WITHOUT TEMPERATURE SENSOR)

TEST 8	A then B then C then D continuously	D	End of test
WORK	According to lever position	-	Return to working mode Travail

17-WAY ELECTRONIC CONTROL UNIT (WITH TEMPERATURE SENSOR)

TEST 8 (temperature sensor disconnected)	A D open A B C D short	D	Temperature sensor lines
TEST 9	A D over 0° C A B C D below 0° C	A D	Temperature sensor
TEST 10	A then B then C then D	B D	End of test
WORK	According to lever position	-	Return to working mode

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Autotronic - Dynashift

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D . Wiring diagram, without temperature sensor (up to A296013)

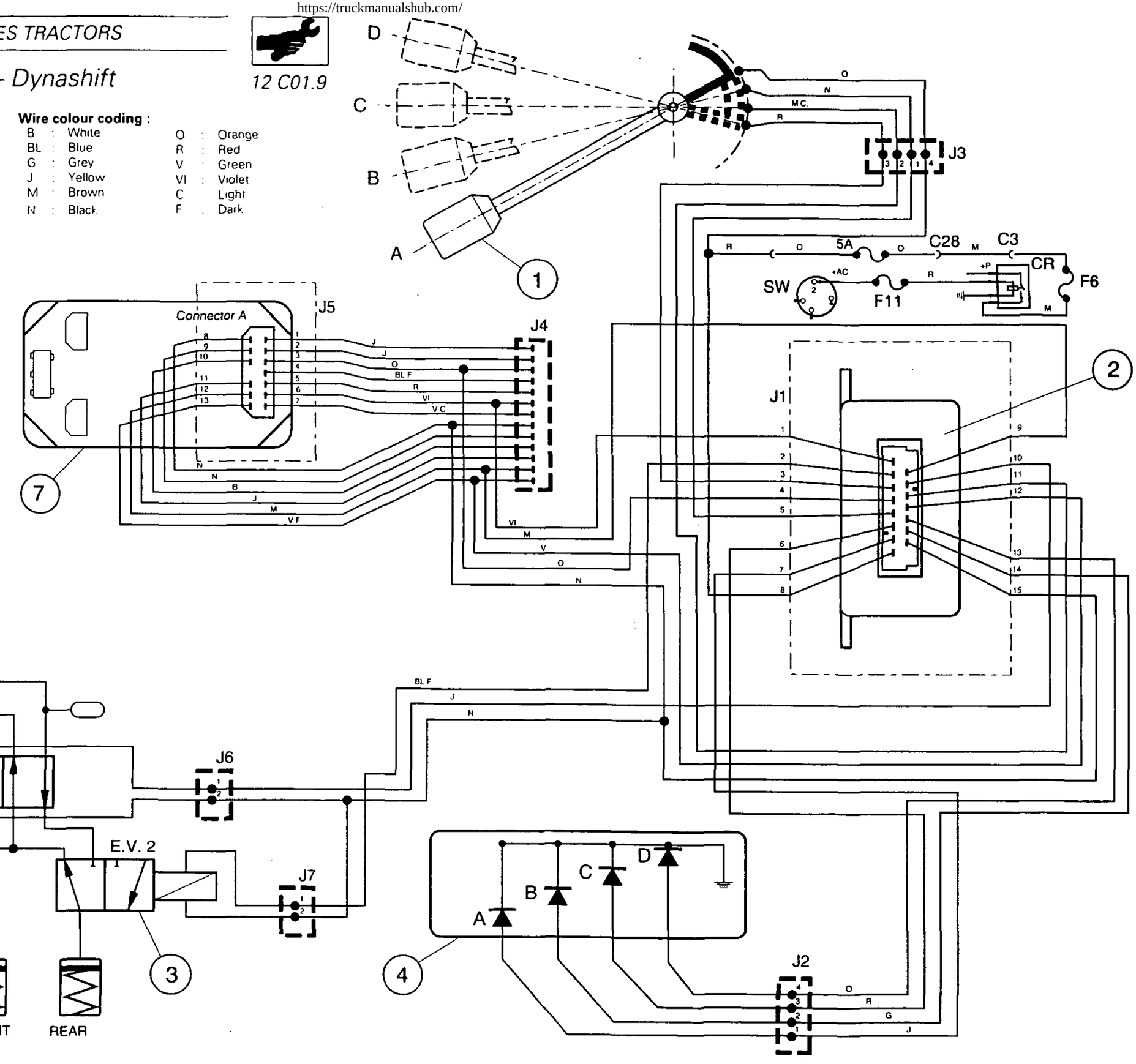
Unit (2) terminal identification	
Terminal n°	**Function**
1	Theoretical tractor speed (ETCU output)
2	Solenoid valve EV2
3	D ratio selection
4	Clutch pedal swith (earth = declutched)
5	B ratio selection
6	C ratio warning light
7	A ratio warning light
8	+ 12 V supply
9	Engine speed (ETCU output)
10	Solenoid valve EV1
11	C ratio selection
12	Low pressure warning light (ETCU output)
13	D ratio warning light
14	B ratio warning light
15	Earth

Wire colour coding :

B	:	White	O	:	Orange
BL	:	Blue	R	:	Red
G	:	Grey	V	:	Green
J	:	Yellow	VI	:	Violet
M	:	Brown	C	:	Light
N	:	Black	F	:	Dark

Key

	Function
SW	Key switch (ignition)
C3	6-way connector (see 9 D01 p.5)
C28	1- way connector (see 9 D01 p.5)
F6	Fuse 15 A
F11	Fuse 10 A or 15 A (see 9 E01 p.5)
CR	Cab relay
J1	15-way connector, electronic unit
J2	4-way connector, dashboard
J3	4-way connector, lever
J4	13-way connector, harness
J5	13-way connector, Autotronic
J6	2-way connector, EV1
J7	2-way connector, EV2



Parts list
(1) Control lever
(2) Electronic control unit
(3) Solenoid valves
(4) Warning lights
(7) Electronic transmission control unit

E.V. STATE		PISTON STATE		RATIO
E.V.1	E.V.2	FRONT	REAR	
1	0	P	P	A
1	1	P	O	B
0	1	O	P	C
0	0	O	O	D

0 = Not energised
1 = energised
P = Pressure
O = No pressure

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Autotronic - Dynashift

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E . Wiring diagram, with temperature sensor (after A296013)

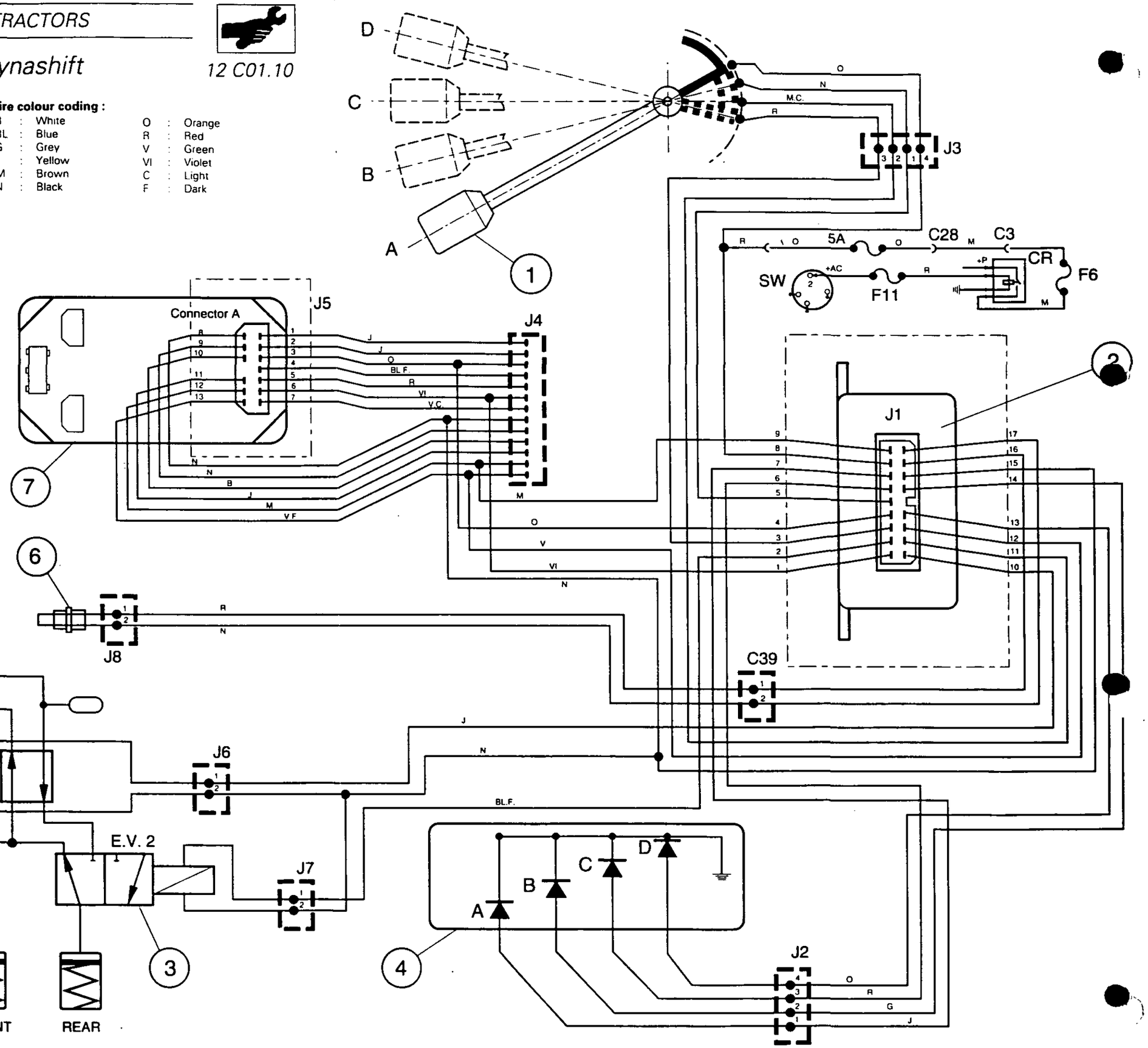
Wire colour coding :

B	:	White	O	:	Orange
BL	:	Blue	R	:	Red
G	:	Grey	V	:	Green
J	:	Yellow	VI	:	Violet
M	:	Brown	C	:	Light
N	:	Black	F	:	Dark

Unit (2) terminal identification	
Terminal n°	**Function**
1	Theoretical tractor speed (ETCU output)
2	Solenoid valve EV2
3	D ratio selection
4	Clutch pedal swith (earth = declutched)
5	B ratio selection
6	C ratio warning light
7	A ratio warning light
8	+ 12 V supply
9	Engine speed (ETCU output)
10	Solenoid valve EV1
11	C ratio selection
12	Low pressure warning light (ETCU output)
13	D ratio warning light
14	B ratio warning light
15	Earth
16	Temperature sensor
17	Temperature sensor (earth)

Key

	Function
SW	Key switch (ignition)
C3	6-way connector (see 9 D01 p 5)
C28	1-way connector (see 9 D01 p 5
C39	2 -way connector (if fitted)
F6	Fuse 15 A
F11	Fuse 10 A or 15 A (see 9 E01 p 5)
CR	Cab relay
J1	15-way connector, electronic unit
J2	4-way connector, dashboard
J3	4-way connector, lever
J4	13-way connector, harness
J5	13 -way connector, Autotronic
J6	2-way connector, EV1
J7	2-way connector, EV2
J8	2-way connector temperature sensor



Parts list
- **(1)** Control lever
- **(2)** Electronic control unit
- **(3)** Solenoid valves
- **(4)** Warning lights
- **(6)** Temperature sensor
- **(7)** Electronic transmission control unit

E.V. STATE		PISTON STATE		RATIO
E.V.1	E.V.2	FRONT	REAR	
1	0	P	P	A
1	1	P	O	B
0	1	O	P	C
0	0	O	O	D

0 = Not energised
1 = energised

P = Pressure
O = No pressure

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13A01 Using the Datatronic system

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13A01.2

Datatronic - Use

A . General

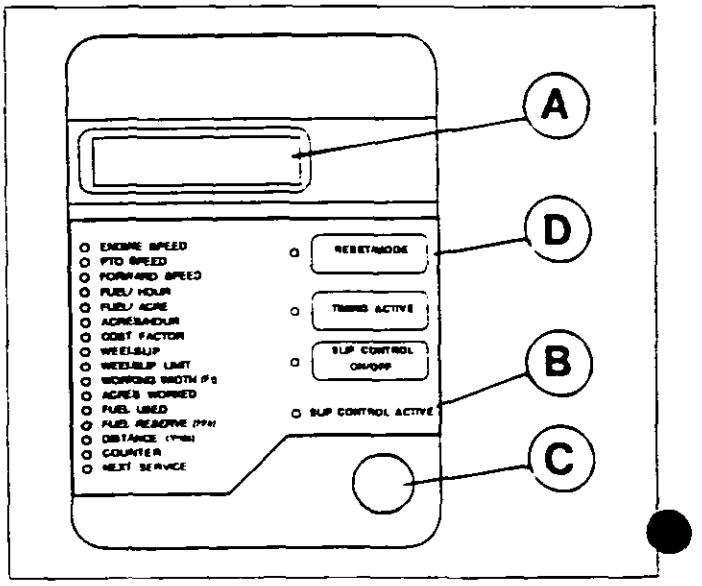
This is an electrical measuring system, the information from which helps to make better use of the tractor. It consists of a plastic box, containing the monitoring electronics.

Dialogue between the computer and the operator is carried out by means of :

- the digital display **(A)**
- the decal showing the functions **(B)**
- a rotating knob **(C)**
- touch sensitive keys **(D)**

The computer is placed half way up the internal right hand pillar of the cab. It is connected to the whole of the circuit by an electrical harness which links it in particular to :

- electronic transmission control (Autotronic)
- electronic lift control (ELC)



B. Description of functions

ENGINE SPEED	Instantaneous engine speed in rev/min
PTO SPEED	in rev/min (selection of 540 or 1000 rpm using the switch on the panel beside the computer)
FORWARD SPEED	This is the actual forward speed of the tractor in relation to the ground in km/h
FUEL/HOUR	Instantaneous consumption in litres per hour.
FUEL/HECTARE	Consumption per hectare worked, in litres per hectare. Updated only when the implement is working.
ACRES/HOUR	Surface worked per hour. Updated only when the implement is working. It does not take into account the time taken up on headland turns.
COST FACTOR	Combines the time used, engine rating, consumption and surface per hour into a single figure which varies IN PROPORTION to the expenditure per hectare
WHEELSLIP	This is the actual degree of wheelslip as % age
WHEELSLIP LIMIT	This is the limit figure for wheel slip you authorize for the wheels. Above this limit, the wheel slip monitor comes into action. Figure shown as %
WORKING WIDTH	This is the width in metres of the implement being used
ACRES WORKED	This is the total surface worked in hectares
FUEL USED	This is the total consumption in litres of fuel since the function was reset
FUEL RESERVE	This is the time in hours during which you can still work, having regard to the current consumption in litres per hour. Must be reset when filling up the tank.
DISTANCE	This is the total distance in metres covered since the last occasion on which you initialised the function
COUNTER	Allows to count and memorise any number desired (for example, bales)
NEXT SERVICE	Displays the number of hours before the next service. Calculation of the hours is not carried out in real time. It takes into account the engine running. If this function reaches the figure 0, every time current is applied to the battery (ignition key) it activates the function SERVICE whilst causing the display «L000» to flash. Once the service has taken place, the user resets the function for the next service. If he wishes, the operator can change this figure and adjust it to any figure of his choice, but each time he resets, the figure will be the default figure (250 hours)

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C . Use of the tractor performance monitor

1 . Modifying working parameters

In the course of your work you will need to modify the working parameters, such as the working width or the permissible wheel slip.

Example : MODIFICATION OF WORKING WIDTH
- Select the function WORKING WIDTH
- Press once the SELECTION Key.
  You will get a four figure display of the standard figure (in this case 3m).
- Press SELECTION again.
  The display starts to flash.
  For example if you will replace 3 m by 4 m, turn the rotating knob C, figure 4 flashes. Then press SELECTION to memorize the new value.
- In order to adjust the other figures whilst the display is flashing, press twice on SELECTION. The next figure flashes.

Note : You move from one mode to the other (flashing or not flashing display) by pressing the selection key as many times as necessary.

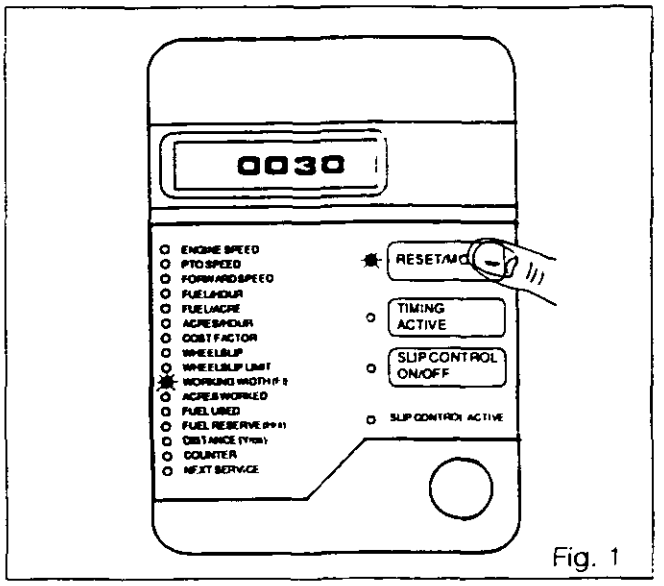


Fig. 1

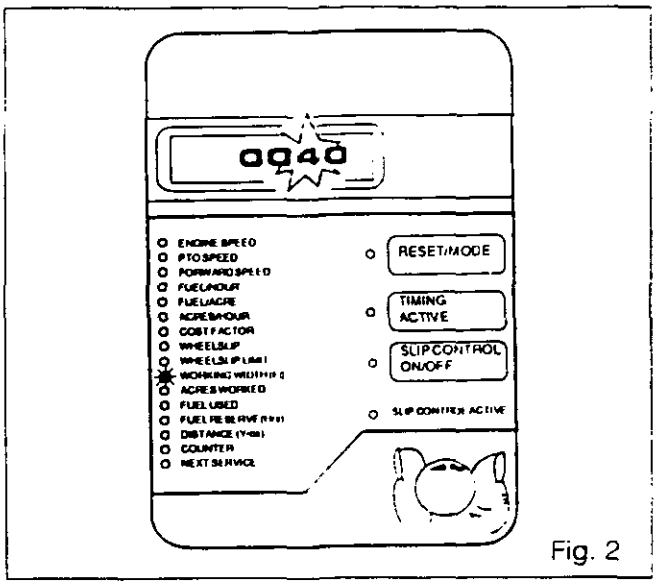


Fig. 2

2 . Working position

Meaning : the working position means that the implement is working, i.e., for example, the plough is in the furrow. This means that the headland turns are not counted.

Automatic control by the lift

As soon as you lower the implement, the working position is activated.
- You reach the end of the field : you raise the implement to turn. When the implement is raised, the working position automatically ceases to be active.
  The working position warning light extinguishes.

- When you lower the implement again, THE WORKING POSITION is reactivated.
  The working function warning light comes on after a delay of one second to allow the implement to be lowered. The area covered is again counted.

Manual control

Should you not be using the lift, it is possible to control the operation manually by pressing on the WORKING POSITION key.

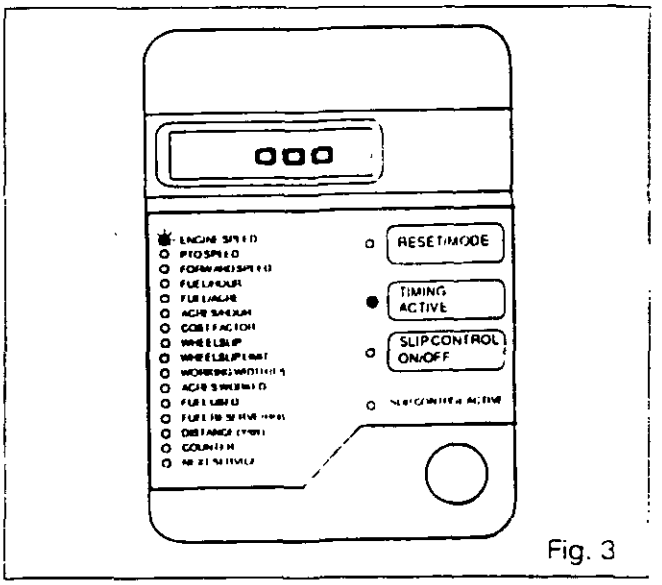


Fig. 3

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3 . Wheelslip monitoring

Operation

If the wheelslip monitoring system is running, the system constantly compares the rate of actual wheel slip to the limit fixed by the operator.
If the actual wheelslip is lower than the limit, everything carries on as normal.
If the wheelslip becomes excessive (greater than the limit fixed by the operator), the system raises the implement as much as necessary for the rate of wheel slip not to exceed the programmed limits.
The system operates precisely in the same manner as if the operator changes the position of the depth knob.

Adjustment and use

a) Reset to zero in order to allow the on board computer to make correct calculation of the rate of wheel slip. Whilst moving with the tractor in conditions where the wheels do not slip (on the road for example), never carry out the operation when working.
- Select the function RATE OF WHEELSLIP
- Press selection
- The screen should then show a sequence of dashes. Keep pressing for 4 seconds approx. until the display becomes normal.

b) Adjustment of permissible limit
- Select the function PERMISSIBLE WHEELSLIP.
- Press twice on the SELECTION key.
  The display should flash.
- Adjust the limit with the rotating knob.
  Adjustment is made from 0 to 99 % in jumps of 3 %.
  The wheel slip monitoring unit warning light is operating.

c) Using the wheel slip monitor unit
- In order to use the wheel slip monitoring unit, it is sufficient to press the WHEELSLIP MONITOR on/off key .
  The warning light illuminates, so the wheel slip monitoring system is operating.

- As soon as wheelslip exceeds the specified slip (18 % for example), the wheel slip monitoring unit becomes active, i.e. the computer control system lifts the implement so as to reduce tractive load and bring wheelslip back to preset limit.

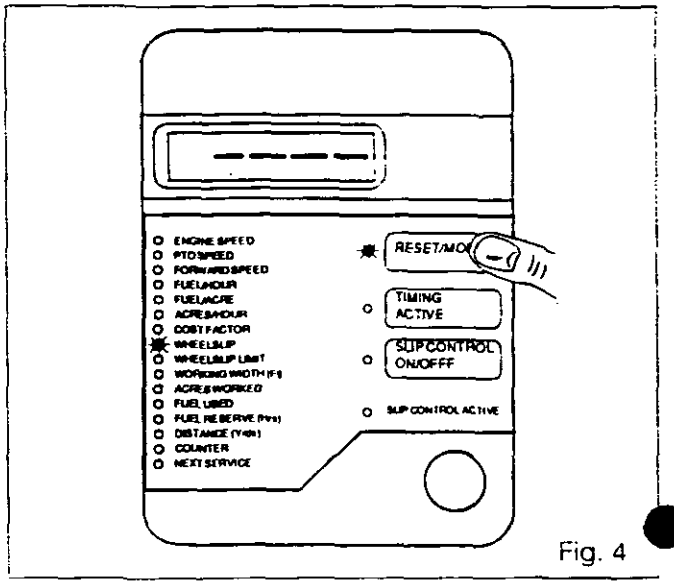


Fig. 4

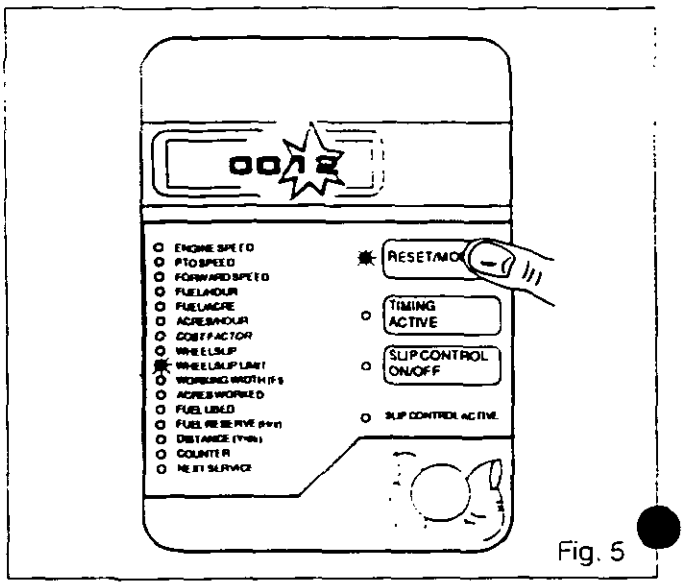


Fig. 5

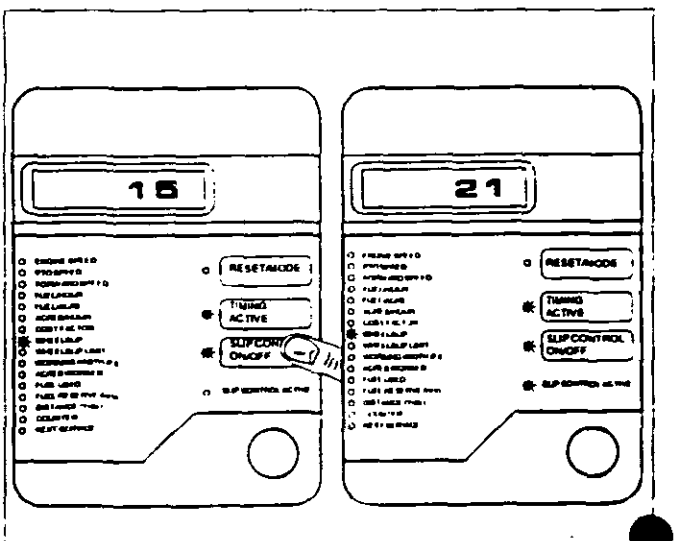


Fig. 6

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4 . Initializing the counters

Initial setting

a) Select the function to be initialized, for example TOTAL SURFACE.

b) Press the SELECTION key.
As soon as you press the SELECTION key the parameter is initialized at its factory preset figure in this case 0. To change the figure, press SELECTION again and the display flashes. Set the figure desired by means of the rotating knob.

Functions which can be initialized

Function	Preset figure
Total area	0 ha
Total fuel	0 litre
Total distance	0
Counter	0
Service	250 hours

Note : The display may show the value L000 with L flashing when the service limit (i.e. 250 hours) is reached.

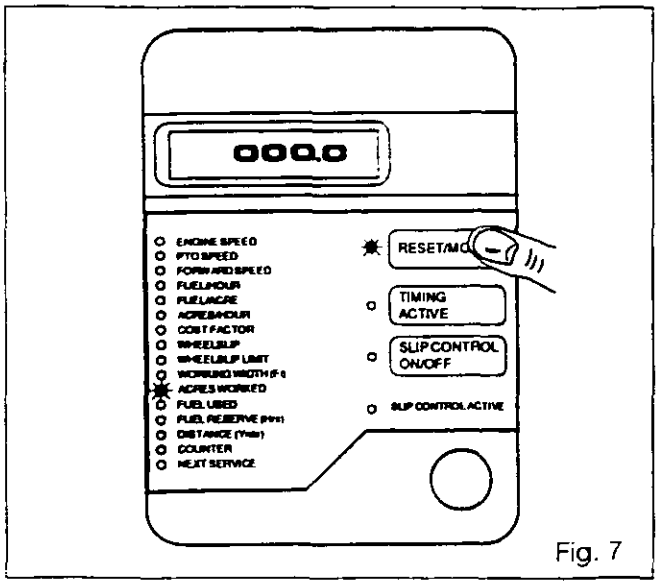


Fig. 7

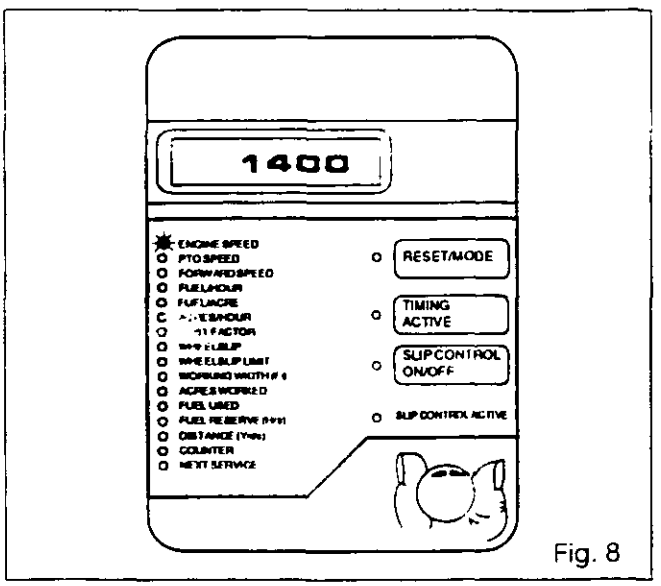


Fig. 8

5 . Using the comparative mode

a) Use of this mode enables the monitoring of the influence of modifying a figure for one function upon the others, notably the cost indicators. In this way you can find the optimum setting for the particular use of the tractor.

b) **Use**

General remarks

This mode can be used for certain functions (engine speed, PTO, forward motion, fuel/hour, fuel/hectare, hectare/hour, cost indicator).

Use

You are moving at more than 2 km/h.

You are about to display one of the functions using the comparative mode.

So you press and hold the selection key.

The display becomes blank(no display) for one second.

Then four r's «**rrrr**» appear on the display. This means that the computer is about to use as a base, for reference, 100. Only when the 4 r's disappear you can release the selection key.

At this time, all the functions are at reference 100.

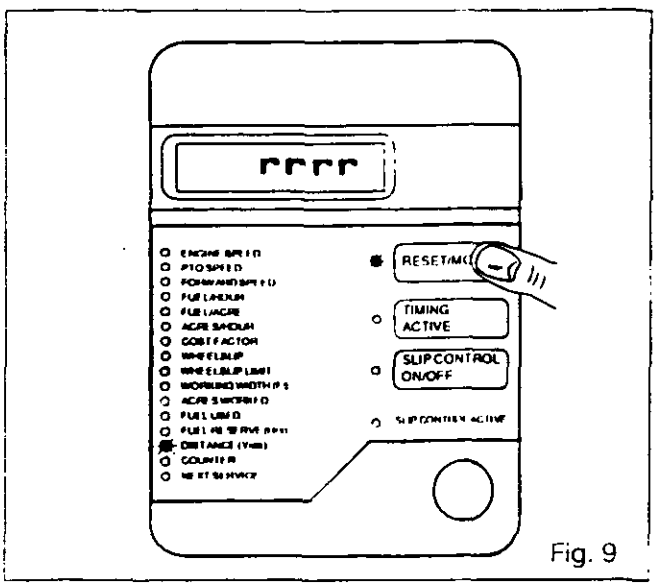


Fig. 9

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Datatronic - Use

The new base is memorized so you can see for example, the influence of the increase of the engine speed, a change of speed, a change of the depth's, ploughing.... on the consumption, working surface or cost. You can also choose a compromise between these possibilities or select one of these functions in particular.
Remark : The increase of the engine speed is shown by indications such as :
- "115" which means increase of 15 % of engine speed.
- "90" which means diminution of 10 % of engine speed.
It is the same for all the functions. It is particularly interesting because you do not have to remember figures. You know which kind of adjustment allows to work on more areas, to consummate less or to make a more economical work (see cost factor).

Example
Choose the function which you wish to change and display the effect of that change (in this case : engine speed).
a) Press SELECTION
The display moves from the normal mode to the relative mode indicated by the character (r).

b) Keep pressing the selection key
The display will show **«rrrr»**, it takes an average over 4 to 5 seconds of the figure for the function as reference 100.

c) When the display has returned to normal again, by using the relative mode you can visualize the influence of this parameter on the other functions.

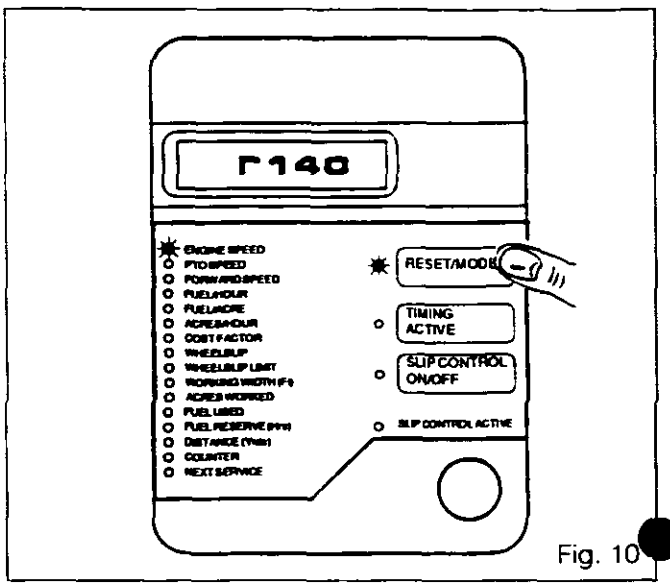


Fig. 10

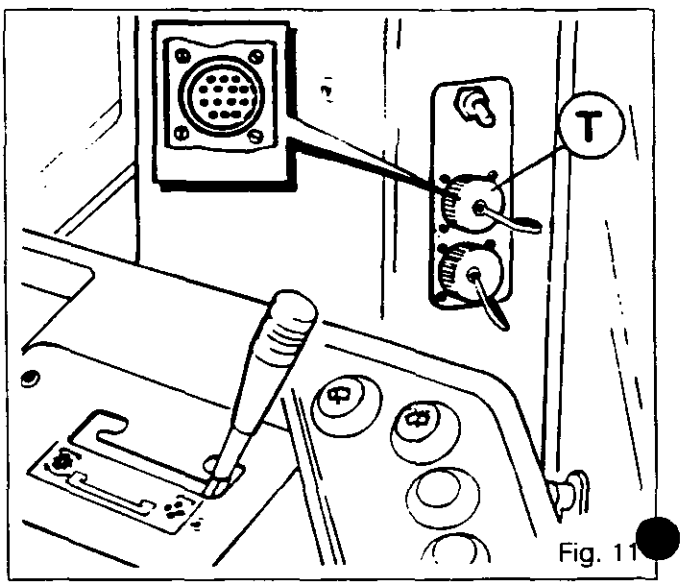


Fig. 11

6 . The counter function

By means of the socket **(T)** located on the right hand pillar of the cab (Fig. 11) and a switch **(1)** located on the implement counter display increases by one until each time this contact is made.

Connection (Fig. 12)
On the 14 pin connector **(B)** there is an input for the counter function.
Connect up as indicated.
An external special socket 3581138 M1 is available as accessory.

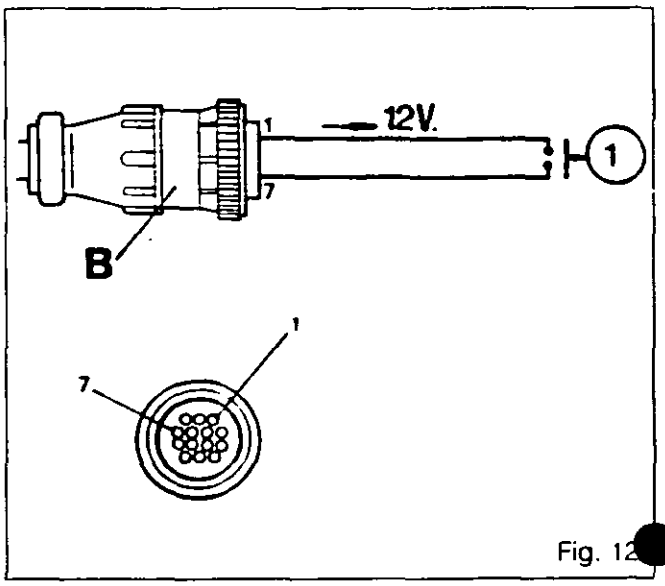


Fig. 12

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7 . Wiring for a switch for trailed implement

If you are using a trailed implement, you will not use the lift/lower switch on the lift in order to activate or deactivate the working position.
One solution consists of pressing the WORKING POSITION key, each time that you turn or if the surface covered is not to be regarded as surface covered.
This may however become tiresome if you have to operate the switch each time that you make a headland turn.
It is then more useful to connect a switch to the trailed implement which fulfils a similar function to the up-down switch of the lift.

Connection (Fig. 13)
On the 14 pin connector **(B)** there is an input for trailed implement connection.
Connect up as indicated on diagram.
Use the external special socket 3581138 M1 supplied as accessory.

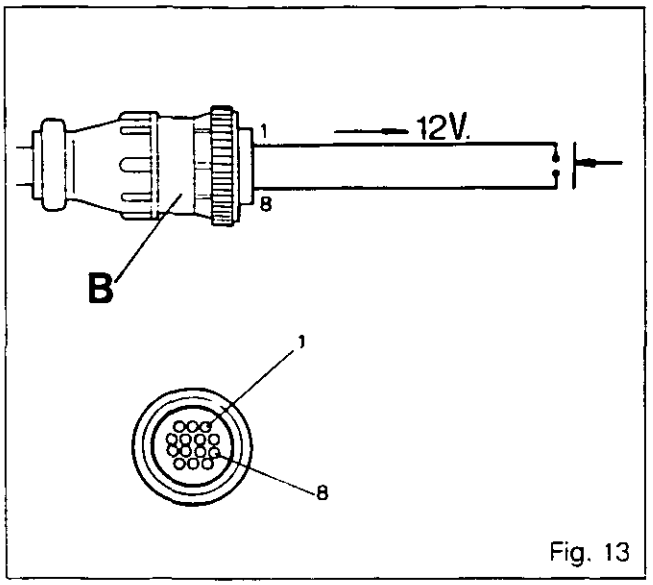


Fig. 13

8 . Use of the radar signal on the external connector

You wish to use an implement requiring the use of a radar. This is possible, with the computer system, without having to purchase the same. In fact, the implement is capable of generating radar signals which simulate the majority of radars on the market.

Method (Fig. 14)
The radar simulation signal is available on the 14 pin connector **(B)**.
Connect the radar rev/min signal output to the radar input of the implement.
Connect up as shown.
An external special socket 3581138 M1 is available as accessory.
The output signal must be adjusted as described on page 15 (programming).

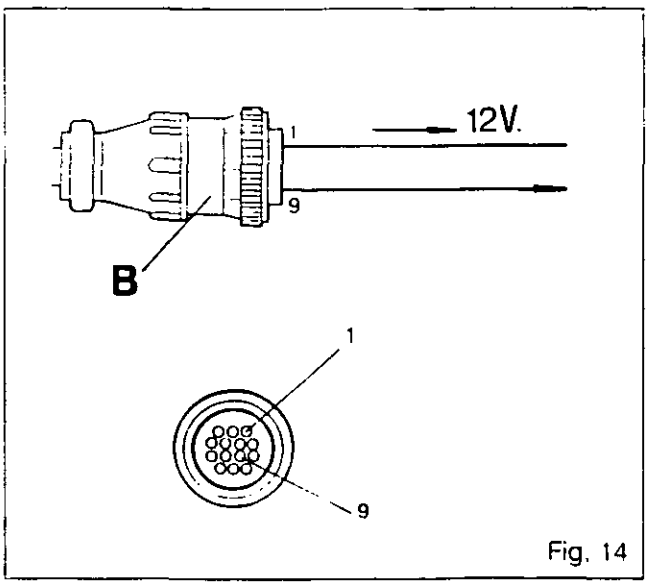


Fig. 14

9 . Battery replacement

After several years of use, the Datatronic may malfunction or become be programmed, the batteries should then be replaced. The batteries must be replaced when the voltage is 2,7 V or lower. So that the programming is not lost, replace one battery at a time, use 3 V Lithium batteries type : BR2325 (Panasonic).

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Datatronic - Use

MAIN CHARACTERISTICS

FUNCTION	UNIT (see note *)			MEMO RESET FIGURE	RELATIVE MODE	WORKING POSITION NECESSARY	DISPLAY INCREASE	MINI DISPLAY
	METRIC	IMP. (UK)	IMP. (US)					
	1	2	3					
Engine speed	Rev/min	Rev/min	Rev/min	No	Yes	No	10	100
PTO speed	Rev/min	Rev/min	Rev/min	No	Yes	No		
Forward speed	Km/hour	Mile/hour	Mile/hour	No	Yes	No	0.1	1
Fuel/hour *	l/hour	Gal/hour	Gal/hour	No	Yes	No	0.1	
Fuel/acre *		Gal/acre	Gal/acre	No	Yes	No	0.1	
Fuel/hectare *	L/ha			No	Yes	No	0.1	
Acres/hour *		Acre/hour	Acre/hour	No	Yes	No	0.1	
Hectares/hour	Ha/hour			No	Yes	No	0.1	
Cost factor				No	Yes	No	1	
Wheelslip	%	%	%	Yes	No	No	1	
Wheelslip limit	%	%	%	No	No	No	1	3
Working width	Meter	Foot	Yard	Yes	No	No	0.1	
Acres worked *		Acre	Acre	Yes	No	Yes	0.1	
Hectares worked *	Ha			Yes	No	Yes	0.1	
Fuel used	l	Gal	Gal	Yes	No	No	1	
Fuel reserve	Hour	Hour	Hour	Yes	No	No	1	
Distance	Meter	Foot	Yard	Yes	No	No	1	
Counter				Yes	No	No	1	1
Next service	Hour	Hour	Hour	Yes(250)	No	No	1	

Note : * = Display units as programmed (see page 16 stage 5).

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D . Fuel flowmeter

The assembly is made up of two parts : the degassing bowl linked with the volumetric counter located on the engine and the indicator located in the cab.

1 . Principle of operation of the degassing unit (Fig. 15)

It must always be on depression, located between the injection pump and the fuel filter when this one is already on depression, or between the inlet and the injection pump when the filters are under pressure.

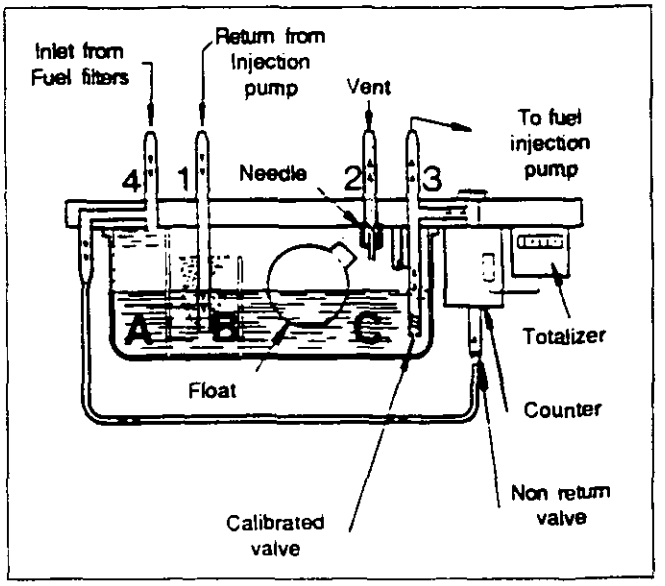
The fuel coming from the lifter fills the space **(A)**, coming in via the tube **(4)**, the fuel then passing into the counter to be sucked in by the feed pump (tube **(3)**). The injection pump forces the fuel oil to the atomisers.

The excess fuel from the injection pump comes via tube **(1)** into the well **(B)**, then overflows into the space **(C)** where the gas in removed from the fuel. The gases escape through the needle valve via the vent **(2)**. If the level in **(C)** is adequate, the float closes the needle valve again to prevent fuel escaping via the vent **(2)**. The fuel having had the gas removed is re-cycled in the feed circuit of the injection pump at a point on the line beyond the counter. A calibrated valve located on the tube **(3)** maintains in the degassing unit a pressure which is greater than the pressure in the injection pump circuit in order to prevent air being drawn in.

2 . Principle of operation of the volumetric unit (Fig. 16).

This measurement chamber consists of a mechanical measuring device mounted on the piping and an electromagnetic or electronic indicator located at distance.

The mechanical device consists of an aluminium case in which the measurement chamber is machined and two oval wheels moulded from a base of carbon and phenolic resin. It does not contain any packing press or revolving joint. A magnet countersunk in one of the wheels **(3)** (Fig. 17) opens and closes on each rotation a magnetic contact **(5)** (Fig. 17) located outside the chamber, thus eliminating any risk of escape or entry of air.



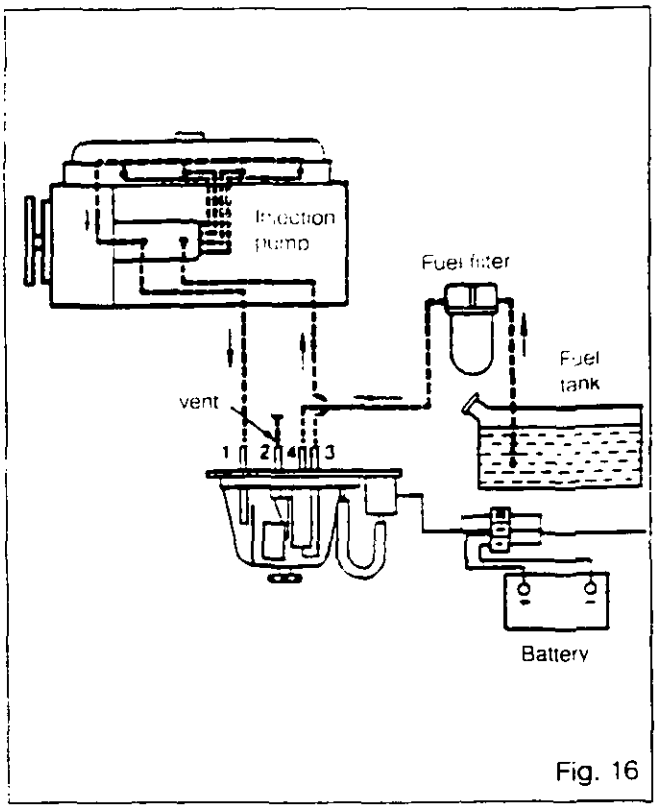
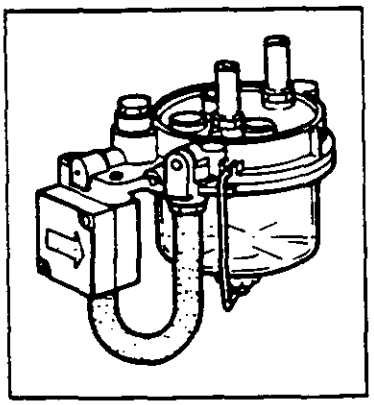


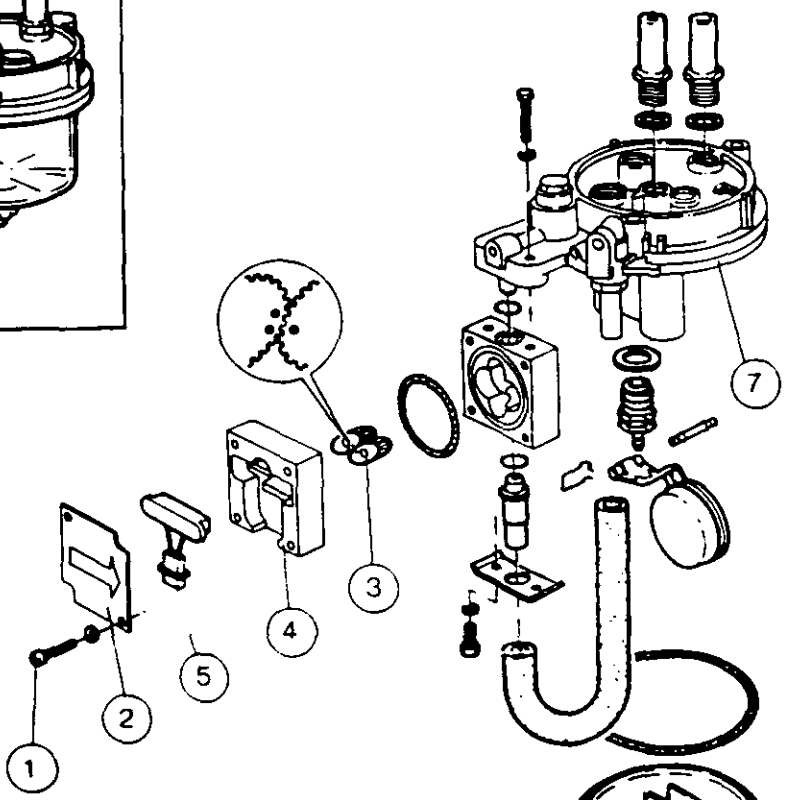
Fig. 16

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Fuel flowmeter





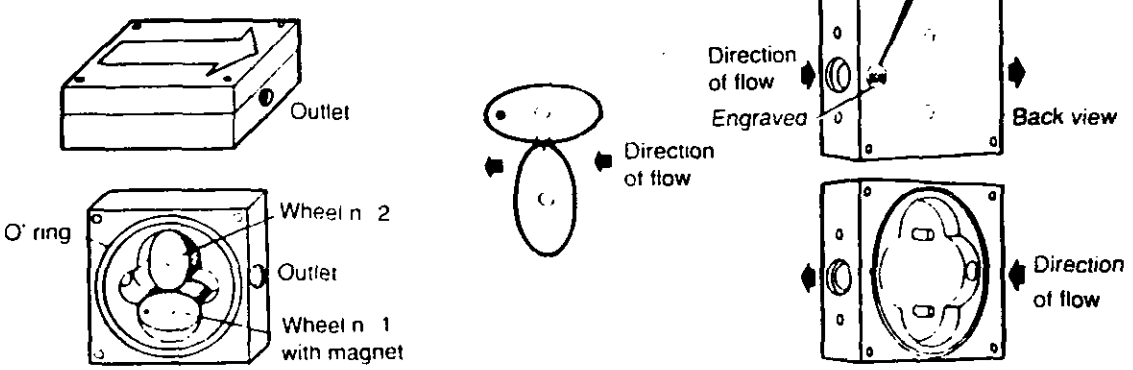


Fig. 17

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3 . Service-assembly and disassembly

Never clean with compressed air. In principle, the counter does not require any particular maintenance. However should some impurity block it, it is best to observe the following procedure (see Fig. 17).

- Unscrew the four screws **(1)**
- Separate the lids **(2)**, taking care not to pull out the oval wheels **(3)** with it.
- Remove the oval wheels **(3)** with great care and clean them with petrol using a fine brush.
- Clean the inside of the case **(4)** in the same way.
- Replace the oval wheels **(3)**, taking care to locate the wheel containing the magnet in the correct position, in accordance with the diagram (Fig. 17), since it is essential for the magnet to pass in front of the magnetic contactor **(5)** in order to make it operate.
- Check carefully that the two wheels mesh suitably. If the assembly has been carefully carried out, the two wheels rotate freely under finger pressure. Misalignment of even one tooth is sufficient to cause a blockage. **Never force them**.
- Replace in position the lid **(2)** of the case, checking carefully that the arrow is in direction of flow of the fluid and that the wheel containing the magnet is correctly opposite the magnetic contactor. By way of reference mark, the mark «IN» is engraved on the back of the counter, on the input side (see Fig. 17).

Precautions during assembly

Check carefully that the flow of the liquid takes places in the correct direction (input = «IN»).
The joint should be vertical.
When assembly, take care not to introduce any solid body into the counter or the piping. Such foreign body would risk blocking the counter.

4 . Assembly - disassembly and maintenance of the degassing bowl.

The bowl **(6)** is removed from the degassing unit lid **(7)** by unlocking **(8)**, which allows general cleaning, disassembly of the needle valve and checking of the other valve.

5 . Fitting of fuel flowmeter on 4 cylinder engines

a) Location (see Fig. 18-19)
b) Identify hoses :
(L) for n° 1
(M) for n° 3
(N) for n° 4
(P) for n° 2

c) First position hoses on the flowmeter and tighten them with clamps **(Q)**.

Connection on flowmeter	Connected to
1	Injection pump output
2	Return to atomiser n° 2 (degassing)
3	Injection pump input
4	Filter outlet

d) Then position the flowmeter on its bracket **(R)** (as shown Fig. 18).
After being tightened the flowmeter should move slightly. This is correct, it has been done to prevent it from vibrating.
e) Remove both pipes **(1)** and **(2)** connecting the filter to :
- injection pump input
- injection pump output

Position the plug **(S)** and the seal washer **(T)** on filter input.
f) Fasten the flowmeter and the bracket on the front right-hand side of the tractor on the air filter bracket.
g) Connect hoses as follows :
- hose **G** to fuel filter outlet
- hose **H** to injection pump input
- hose **J** to injection pump output
- tube **K** to atomiser n° 2.

h) Connect the hoses to the tubes.
J) Pass the flowmeter harness above the engine and *connect it to connector X on TPM harness, under* the cab, near the Autotronic box (see coloured sheet).

Note : Do not forget to drain fuel circuit before starting the engine.

Checking operation

- After priming the fuel oil circuit, start up.
- Check seals of fuel circuit at connections (watch for air being sucked in).
- Check correct operation of the unit (counter and indicator).

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Datatronic - Use

Fitting on 4 cyl. engines

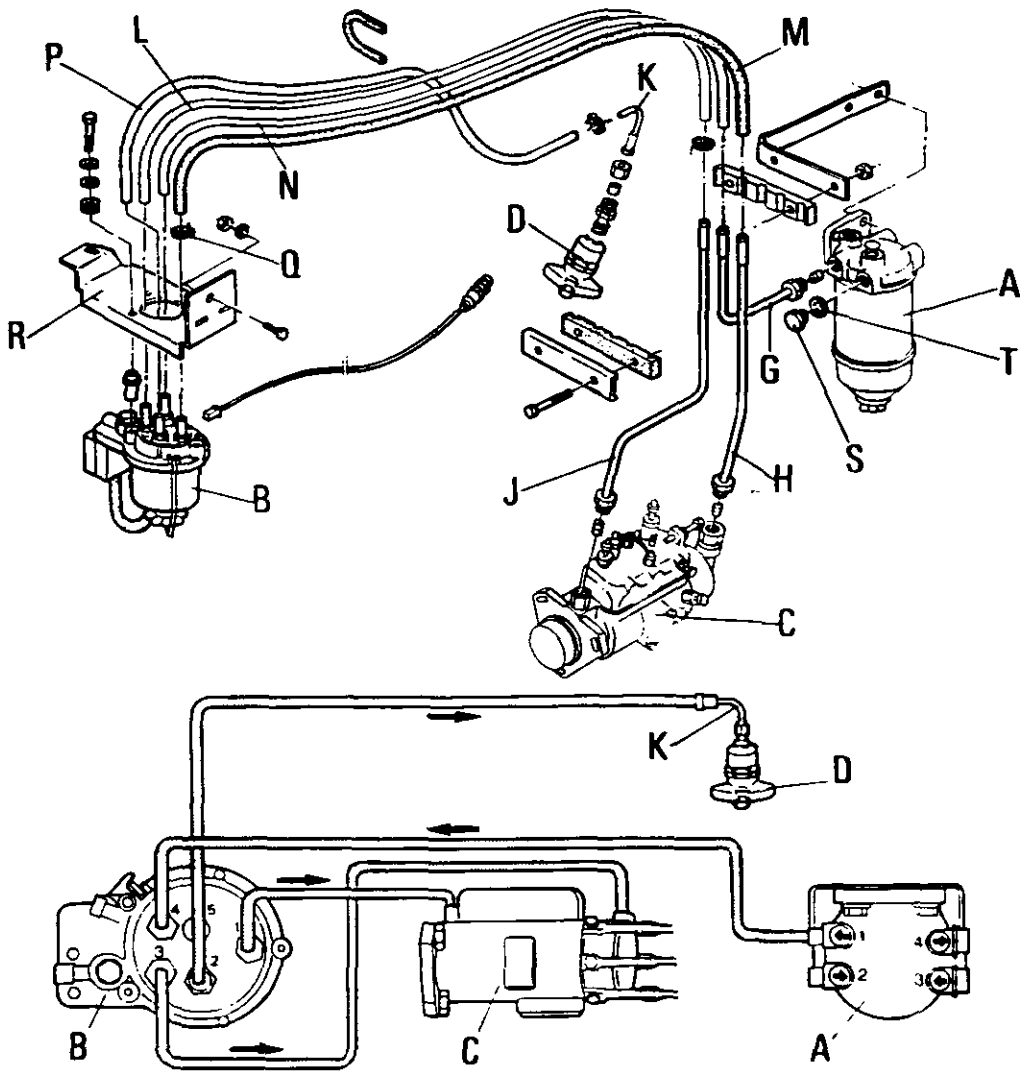


Fig. 18

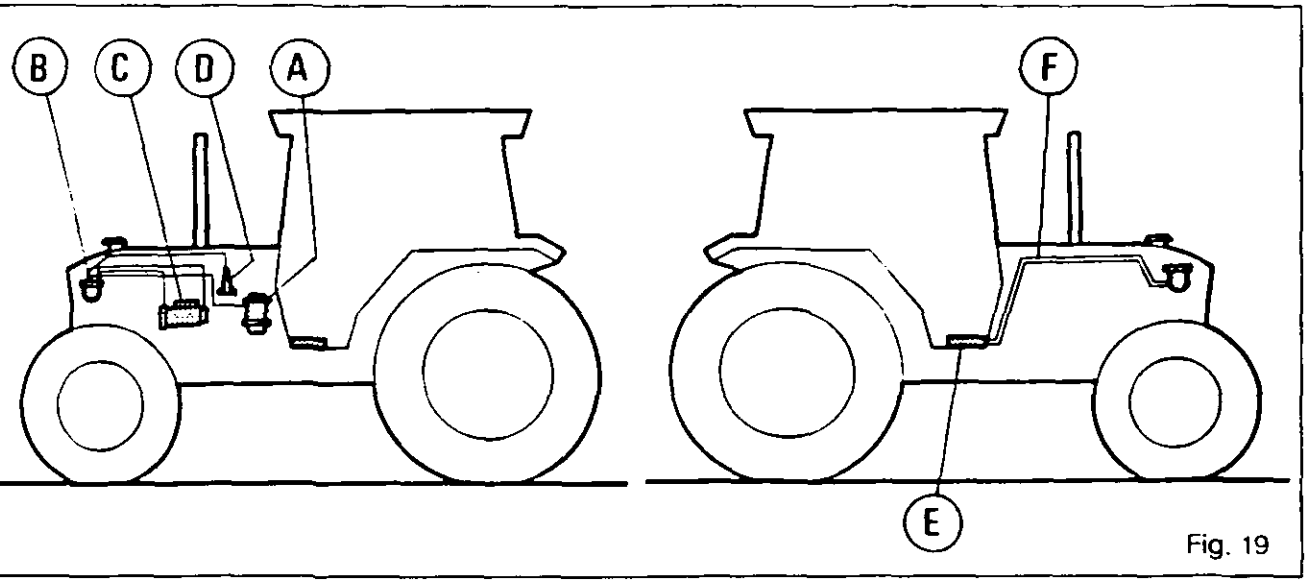


Fig. 19

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6 . Fitting of flowmeter on 6 cylinder engines (A6.354)

a) Location (see Fig. 20 - 21)

b) Identify hoses corresponding to flowmeter numbering :
- (L) for n° 1
- (M) for n° 3
- (N) for n° 4
- (P) for n° 2

c) First, position hoses on the flowmeter and tighten them with clamps **(Q)**.

d) Then position the flowmeter on its bracket **(R)** (as shown on Fig. 20).
After being tightened the flowmeter should move slightly. This is correct, it has been done to prevent it from vibrating.

e) Remove both pipes **(1)** and **(2)** connecting the filter to :
- injection pump input
- injection pump output

Position the plug **(S)** and the seal washer **(T)** on filter input.

f) Fit the three pipes **(U)** on :
- injection pump input
- injection pump output
- filter outlet

g) Fasten the flowmeter and the bracket on the rear left hand side of the engine with 2 screws **(V)** and 2 washers **(W)**.

h) Connect hoses as follows. Check carefully before starting the engine.

Connection on flowmeter	Connected to
1	Injection pump output
2	Atomiser n° 5 or 6 (vent)
3	Injection pump input
4	Fuel filter outlet

i) Connect the flowmeter harness to the connector X on TPM harness, under the cab, near the Autotronic box (see coloured sheet).

Note : Do not forget to drain fuel circuit before starting the engine.

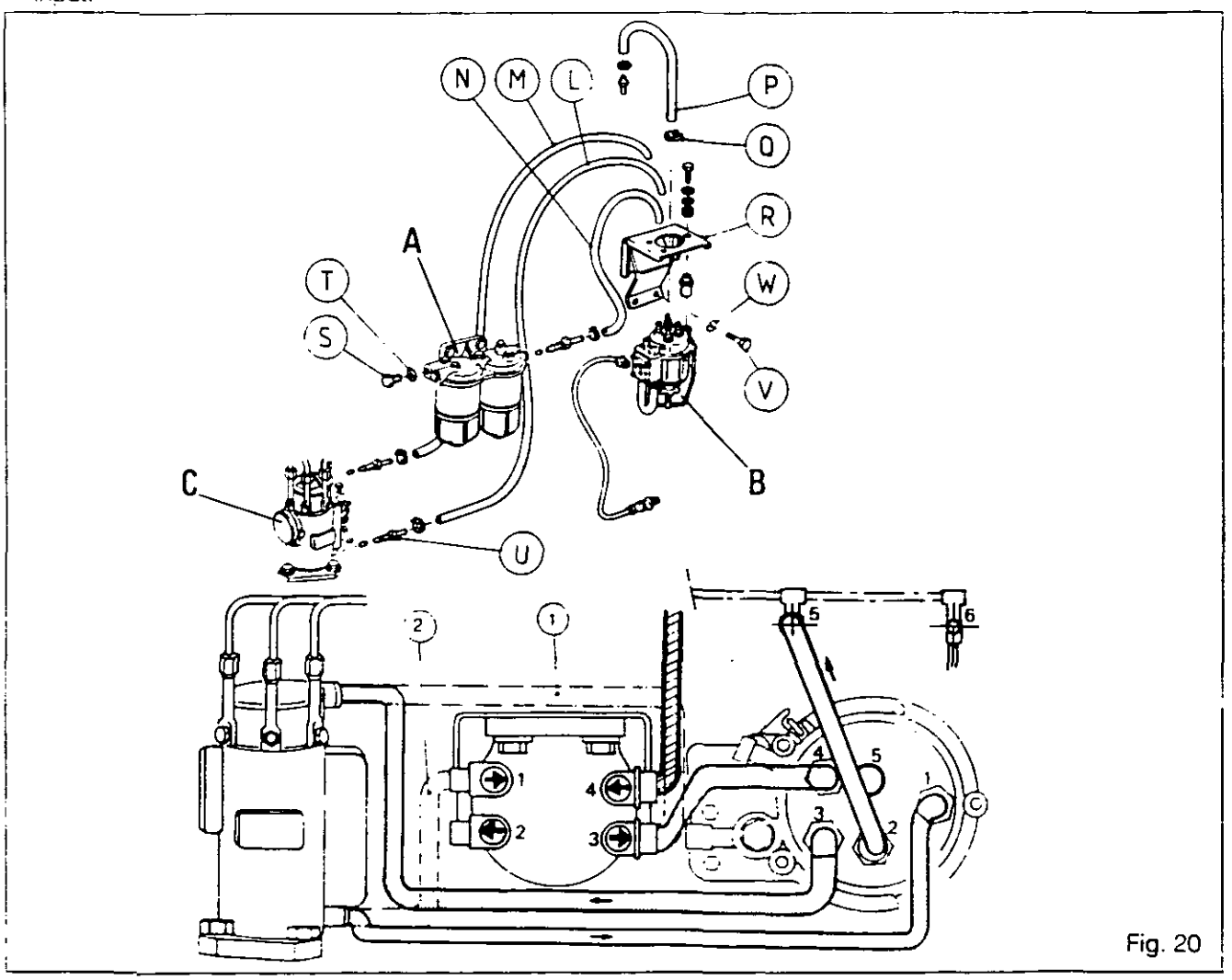


Fig. 20

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Fitting on 6 cyl. engines A6.354

(A) Fuel filters
(B) Flowmeter
(C) Injection pump
(E) Autotronic
(F) Harness

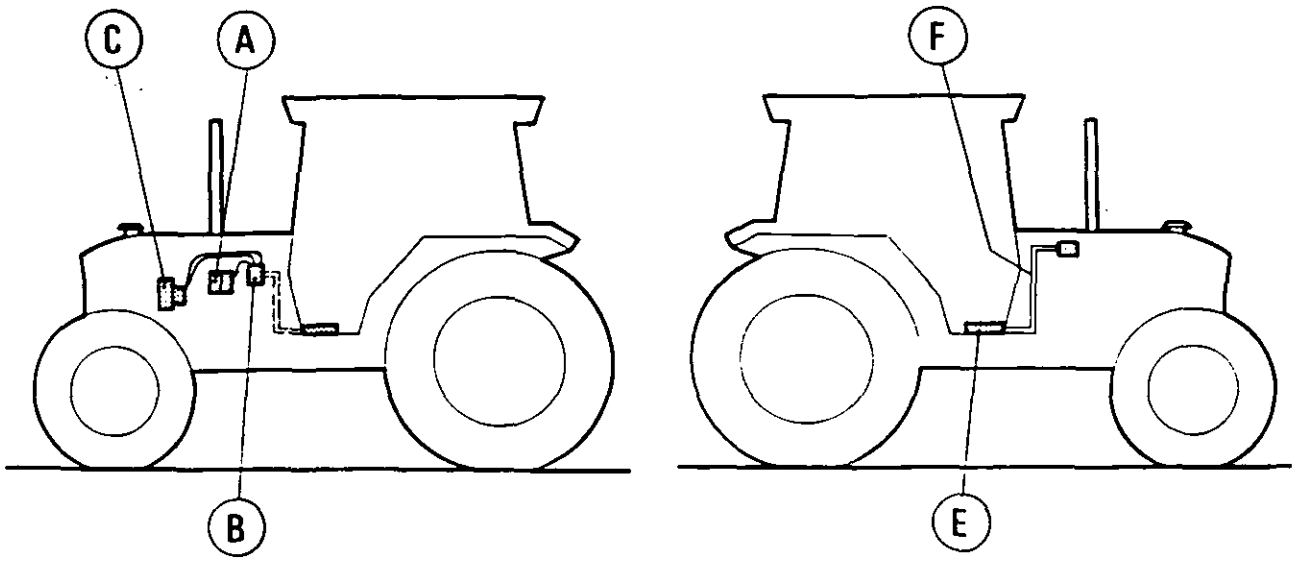
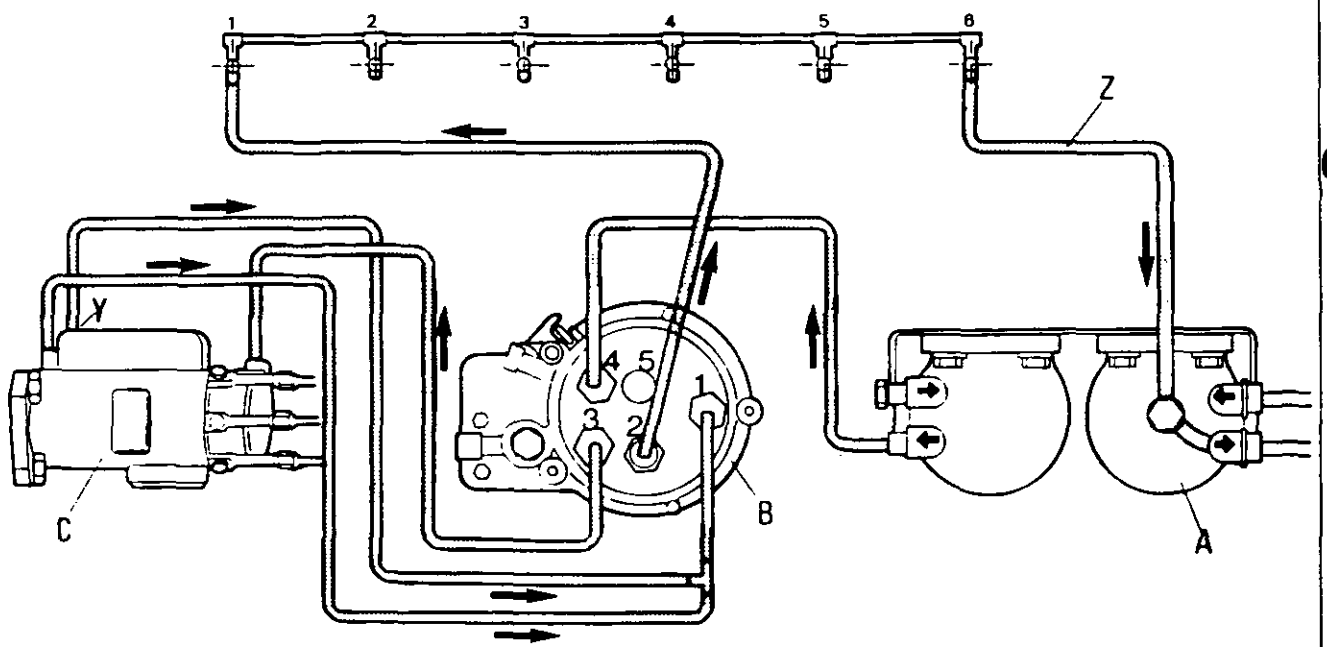


Fig. 21

7 . Fitting of flowmeter on 1000 Series engines



(A) Fuel filters
(B) Flowmeter
(C) Injection pump
(Y) Automatic bleeding
(Z) Atomisers output

Fig. 22

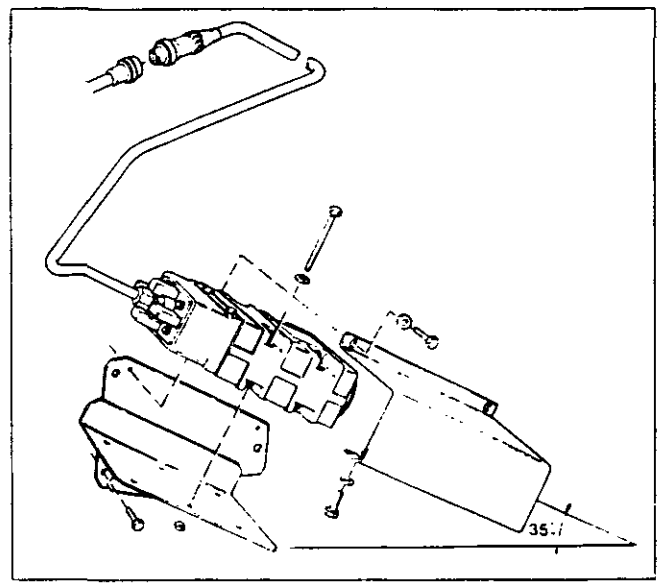
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E . Radar

The angle of assembly is critical : 35° and should not be modified.
The tolerance of the radar is ± 3 %.
Never place equipment in the radar field.
The signal measured by the radar is the difference between the transmission frequency and the reception frequency. The latter varies according to the nature and conditions of the soil.
Minimum speed display : 1 Kph

Note : Never stay in the field of the radar (about 1m) when it is on. When working in the radar area switch the ignition off to avoid problems caused by microwave signals.



F . Programming

Note : To perform the programming procedure use the programmer-tester n° 3584003 M91.
The TPM can be programmed whilst it is installed in the tractor. This is done by connecting the programmer to the TPM unit, via the 14 pin connector, situated on the RH cab pillar. The TPM can also be programmed out of the tractor.

Programmer

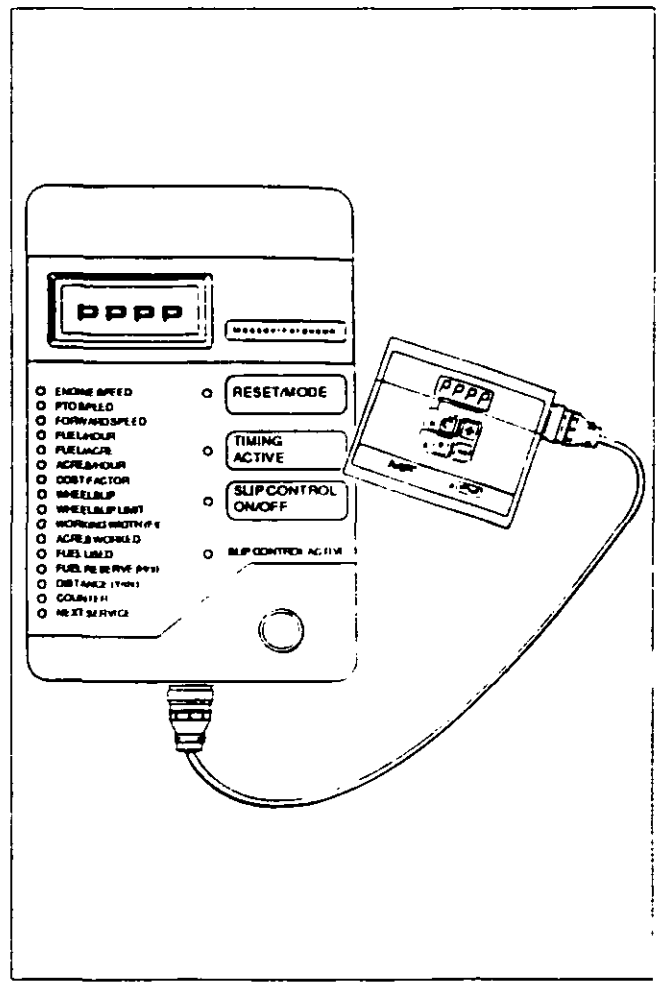
The programming of the TPM is controlled by 5 switches on the face of the programmer. The programmer can be used to programm the TPM with 2 types of parameter.

Primary

Used to program definite information, for example to determine whether the TPM will display in Metric, Imperial or American units.

Secondary

Used to allow for variations in specification during the tractor's working life.



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Datatronic - Use

The switches perform the following functions :

The «N» switch (circular arrow)
The programmer requires certain information at different stages. The «N» switch advances the programmer through the stages.

The «S» switch (upward arrow)
Switch enabling to advance the number of the secondary parameter.

The «+» switch
Increases the input value by 1, each time it is depressed. If depressed continually for more than 1.5 seconds, an auto function is engaged at a rate of 10 per second.

The «-» switch
Decrease the input value by 1, each time it is depressed. This button also has an auto function.

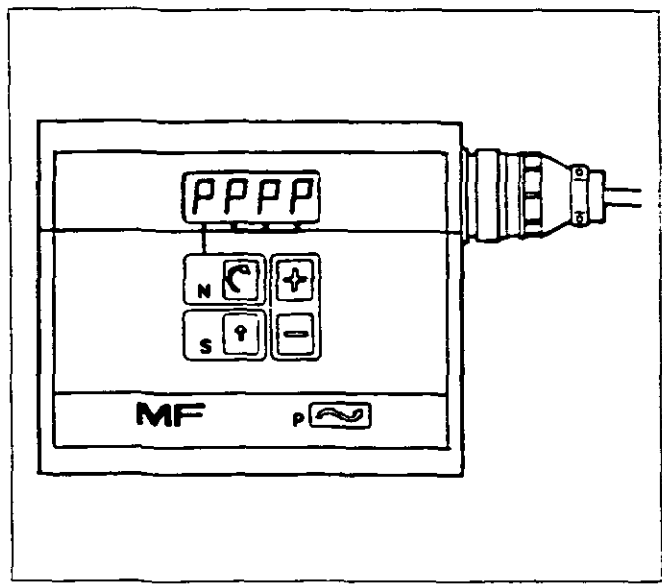
The program switch (bent arrow)
Programs the TPM with the information the user has supplied.

On power up, the programmer briefly shows a serie of rapidly flashing «3»s. If the display gets stuck in an apparently random state this indicates the programmer has detected a failure in the TPM memory circuits and will not respond to the operator's inputs. But, under normal circumstances, the display will show a single «8» advancing from left to right, thus indicating that the operator can now proceed by pressing the N button. The display reads « 10» and all the switches become functional. The programmer is in the Absolute function and is ready for the first input.

The Absolute is programmed in five stages. All five require an input before pressing the program switch.

Stage 1 - Tractor type
1 = 3050
2 = 3060 - 3065
3 = 3070
4 = 3080
5 = 3090 - 3095 - 3115 - 3125
6 = 3610
7 = 3630 - 3645
8 = 3650 - 3655 - 3670 - 3680 - 3690
9 = Test version

Stage 2 - Fuel flowmeter
1 = No fuel flowmeter
2 = Meter installed



Stage 3 - Ground speed radar
1 = No radar
2 = Radar installed

Stage 4 - Decal options
Program number in top right hand cover of decal, for example 01 on decal = 1
Note : Valid values are 1 - 3 at this stage. 1 and 2 are decal options, 3 is the code corresponding to the test procedure.

Stage 5 - Display units
1 = Metric
2 = Imperial (british)
3 = Imperial (USA)

When the user has adjusted all the inputs to the required values, then he presses the program button. This action will cause **«PPPP»** to be displayed on both the programmer and the TPM for approximately 20 seconds.

If the programming has succeeded the display on the programmer will return to its original state, prior to pressing the program button.

If the user has entered an unknown value or forgotten to adjust one of the inputs, then the programmer will not attempt to program but instead will flash the incorrect value on the display. The operator may use the **«+»** or **«-»** button to correct the input and re-try programming.

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Datatronic - Use

If the programmer display returns from programming with a flashing «0000» then it is indicating that a communication failure exists between the programmer and the TPM. This may be a result of a bad cable link between the two, or the TPM is sufficiently faulty to inhibit communications. Voltage should be good so try to program again with the engine running and alternator showing as charging.

Adjusting the secondary parameters

A . Radar signal (273 hz)

Should be reprogrammed when «total distance» display is different from actual total distance.
Calculate new value as follows :

$$A = \frac{\text{Displayed distance}}{\text{Actual distance}} \times 200$$

B . Radar simulation to implement

Should be reprogrammed when radar signal sent must be different from 278 Hz / 10 Kph.
Calculate new value as follows :

$$B = \frac{\text{Desired output frequency}}{278} \times 200$$

C . Fuel tank capacity

Should be reprogrammed when fuel tank capacity is different from capacity programmed in absolute parameter n° 1

Tractor type	Capacity for C = 200 (litre)	Actual capacity (litre)
1	148	148
2	148	
3	190	173 except for 3125 = 220
4	190	
5	190	
6	235	246 for 3600 series (306 with add fuel tank)
7	235	
8	235	
9	213	

Calculate new value as follows :

$$C = \frac{\text{New capacity}}{\text{Capacity programmed in absolute parameters}} \times 200$$

Apply C values according to chart

D . Cost factor

Apply values
D = 200 for 3000/3100 series and 3610-3630 3645 - 3650 - 3655
D = 217 for 3670 - 3680 - 3690 models

E . Cost factor

Apply values
E = 227 for 3115 - 3125 models
E = 200 for other models

F . Cost factor

F = 200 for all models

"C" Values / Models	Standard cab		Forestry cab
	Without additional fuel tank	With additional fuel tank	
3050 - 3060 - 3065	C200	-	C135
3070 - 3080 - 3090 - 3095 3115	C182	-	C105
3125	C231	-	C105
3610 - 3630 - 3645 - 3650 3655 - 3670 3680 - 3690	C209	C260	

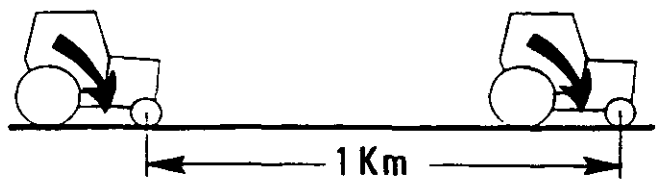
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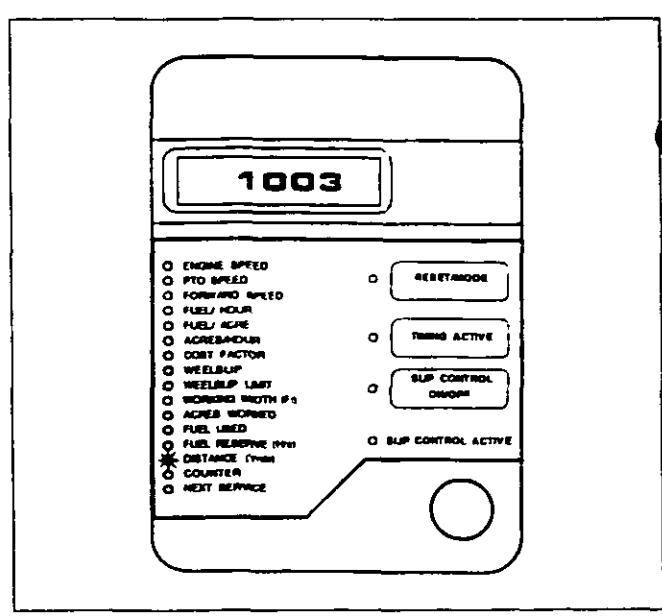
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G . Checking without tester

Function : Total distance

Select the function TOTAL DISTANCE
Reset to 0 (press the SELECTION key)
Move forward with the tractor over a set distance, for example between two kilometre posts or some other distance of your choice.
Note the information provided by the computer
The figure provided by the computer should be correct to ± 3 % in relation to the actual distance.
If the computer gives a figure which is outside the tolerance , follow programming procedure page 15.





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13B01 Checking the TPM and the harness

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A. Checking the TPM with tester ____ 2

B. Harness test procedure ____ 4

C. Wiring diagram ____ 5

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13B01.2

Datatronic - Checking TPM and harness

A . Checking with tester

Note : All the tests described in this section are to be performed with the Tester-Programmer n° 3584003M91.

General

The tester function of the programmer is used to establish that the TPM is correct and functioning properly. If the TPM fails to respond correctly to any of the test steps, then the unit should be considered damaged and returned to Massey Ferguson for repair. TPM illumination bulbs and batteries are available in service and can be replaced through the rear of the unit.

Procedure for tests of correct operation of computer (TPM)

Connect the programmer to the Tractor Performance Monitor using the larger of the two supplied harnesses. Ensure the red and black wires feed into the TPM and not the programmer. Apply power using the red and black wires connected to a charged battery.
- Red wire to + 12 V terminal
- Black wire to «-» terminal

Program the TPM in the Absolute function with the following values :

Stage	Value
1	9
2	2
3	2
4	3 (test code)
5	1

If the programming fails, there is a failure of the communication link between the programmer and TPM. This may be the result of a bad cable link between the two, or the TPM is sufficiently damaged to prevent communications and should therefore be returned for repair.

Test with decal of tractor

1 . Engine speed
2 . PTO speed
3 . Forward speed
4 . Fuel/hour
5 . Fuel/Area
6 . Area/hour
7 . Cost factor
8 . Wheelslip
9 . Wheelslip limit
10 . Working width
11 . Area worked
12 . Fuel used
13 . Fuel reserve
14 . Distance
15 . Counter
16 . Next service

1. The intensity of the lights on the face of the computer should change every 5 seconds. If this does not happen, there is a defect in the light circuit.

2. TIMING ACTIVE come on and go off alternately every 5 seconds. If this does not happen, there is fault in the warning light circuit or the switch.

3 . Turn the function knob until the function 11 AREA WORKED has been selected. Press on the selection switch six times making sure that the selection warning light illuminates each time that the selection switch is pressed. If the display now shows «0003.0» with the furthest left digit flashing, the selection warning light and the selection switch have been checked.

4. With the furthest left digit always flashing, turn the knob ten times, checking that you can adjust each digit and that you can display all the numerical characters from 0 to 9. Return to the normal display «0030». This checks all the segments of the liquid crystal display in flashing mode. At this stage you have checked that the function choice knob is operational.

5. Press RESET/MODE twice.
The 2nd most significant left digit of the display should flash.
Repeat stage 4.

6. Press RESET/MODE twice.
The 3rd significant left digit should flash.
Repeat stage 4 for the following figure.

7. Press RESET/MODE.
Repeat stage 4 to check the last figure.
Press once, any flashing on the display should cease. The LCD display for REV/MIN has been checked.

8. Turn the function choice knob back and make sure that all the functions can be seen (corresponding warning light illuminated) thus checking that they function correctly.

9. Turn the function selection knob to select function 10 WORKING WIDTH. Press on the key twice and turn the knob until the REV/MIN display shows «0012» with the last two digits flashing. Press the key, the flashing should cease.

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Datatronic - Checking TPM and harness

10. Turn the function selection knob until the function 8 WHEELSLIP has been selected. Press on the key and keep pressing for some seconds. The display should show dashes for some seconds, then it will, display «00». If this is not so, there is a fault in the «radar input» or «wheels input». Release the selection key.

11. Press the TIMING ACTIVE key. The warning light should illuminate or extinguish depending on its initial condition. If this is not the case, it means there is a fault in the work position warning light circuit or in the timing active selection key.
    Repeat this operation several times to be sure that the transition which has been observed is not due to an oscillation on an external input.

12. Press the SLIP CONTROL key. The warning light should illuminate. If this does not happen, it means there is a fault in the warning light circuit; wheelslip control, or at the level of the wheelslip control selection key. The warning light SLIP CONTROL ACTIVE should remain extinguished ; if this is not the case, there is a fault in the circuits.
    SLIP CONTROL should stay on for the following test procedure.

13. Turn the knob and select the function 3 FORWARD SPEED. The display should show 88 < V < 112. If this is not the case, it means there is a fault associated with the engine speed sensor.

14. Select the function 4 FUEL/HOUR. The display should show, alternatively 92 < V < 117 and 176 < V < 224 every 5 seconds. If neither of these figures is found, it means that there is a fault of :
    radar input
    or radar output
    or PTO input
    If these figures do not alternate, there is a fault on the 540/1000 PTO input.
    It is necessary to wait for 30 seconds after voltage supply because the radar output charges one capacitor to validate the PTO output.

15. Select the function 1 ENGINE SPEED and the display should show 6.5 < V < 8.3. If this is not the case, there is a fault on one of the two following inputs : RADAR INPUT - WHEELS INPUT.

16. Select the function 2 PTO SPEED. The display should show 7.1 < V < 9.1. If this is not the case, there is a fault on one of the following inputs : FUEL INPUT or ENGINE SPEED INPUT.

17. Select the function 16 NEXT SERVICE. The total displayed should increment every second or there is a fault in the counter input.

18. Press the S key of the programmer and keep it pressed. The warning light indicating that the wheelslip control is active should illuminate ; if this is not so, there is a fault in the signals circuit, or on the WARNING LIGHTS control, or on one of the following circuits :
    - RADAR signal input circuit
    - WHEELS signal input circuit

    The warning lights cease their variation in luminous intensity, remaining in the condition of full intensity. If this is not the case, it means there is a fault in the light circuit or on the WARNING LIGHTS. The TIMING ACTIVE warning light must stay «ON».

19. Select the function 3 FORWARD SPEED. The display should indicate 105 < V < 130 when pressing key S, holding on. If it does not do so, it means there is a fault on the circuit ENGINE INPUT signal.

20. Select the function 4 FUEL/HOUR. Press S key, the display should show 110 < V < 137 ; if it does not do so, it means there is a fault on the PTO signal input or on the RADAR INPUT signal on even on the RADAR OUTPUT signal. If the figure shown is not constant, there is probably a short circuit on the 540 / 1000 PTO input.

21. Select the function 8 WHEELSLIP. Press S key, the display should show 15 or 16 : if it does not there is a fault on the WHEELS input signal.

22. Before returning the TPM to the tractor the unit must be re-programmed to the specification of the tractor to which it will be fitted. Please refer to the Absolute Programming section of this book to accomplish this (13 A01.F).

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13B01.4

Datatronic - Checking TPM and harness

B . Harness test procedure

Purpose to test Datatronic tractor harness

Required equipment :
- 3389502 M1 : Tester
- MF 3005 : multimeter
- Test leads

Note :
All measurements are carried on tester connected between computer 24 pin circular R connector and tractor harness 24 pin female connector.

Key to abbreviations :
VAC : Volt Alternating Current
No : Test number
VDC : Volt Direct Current
Ω : Ohms

FUNCTIONS	INSTRUCTIONS	TERMINALS	VALUES	N°
	Engine stopped, ignition on			
Power supply (general)	Measure VDC between	02-23	11-13 VDC	01
Connector 14 pin		02-24	11-13 VDC	02
	Lights on			
Lighting	Measure VDC between	02-01	11-13 VDC	03
PTO selection	Set switch to 1000 Rpm			
	Measure VDC between	02-09	11-13 VDC	04
	Set switch to 540 Rpm			
	Measure VDC between	02-09	0	05
Timing active (external socket)	Measure VDC between	02-14	0	06
	Engine idling			
Fuel flow sensor	Read VDC between	13-19	0 / 12 V *Alternately*	07
Timing active	Set ELC switch to lift			
(Transport position)	Measure VDC between	02-04	0	08
	Set ELC switch to neutral. Measure VDC between	02-04	0	09
	Set ELC switch to lower			
	Measure VDC between	02-04	10 VDC	10
Radar	Measure VAC between	13-20	0	11
	Drive tractor up to 5 Kph			
	Measure VAC		06-07 VAC	
	Increase speed up to max. Check no change occurs.			
Slip control	Recalibrate 0 percent wheelslip as described in 13A01-4			
	Set ELC switch to lower position			
	Set depth control knob to obtain a reading of	02-17	5 VDC	
	Ensure lift/lower lights are off			
	Set wheelslip limit to six percent			
	Set intermix to full position control.			
	Switch on slip control.			
	Drive tractor forward on full left hand lock.			
	Check .			
	- lower links raise			
	- voltage increase	02-17	> 5 VDC	12
	Drive tractor forward in a straight line. Check			
	- *voltage decrease to* 5 VDC	02-17	5 VDC	13
	(note : Voltage will decrease as the speed of the tractor increases).			
	If slip control is found OK but problem remains. ELC should be checked			
	(see chapter 11).			
	Engine stopped			
	Disconnect the tester from the computer.			
Engine speed sensor	Measure resistance between	02-18	Approx. 450 Ω	14
PTO speed sensor	Measure resistance between	02-22	Approx. 450 Ω	15
Forward speed sensor	Measure resistance between	02-21	Approx. 450 Ω	16

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Datatronic - Checking TPM and harness

C . Wiring diagram

Key to diagram

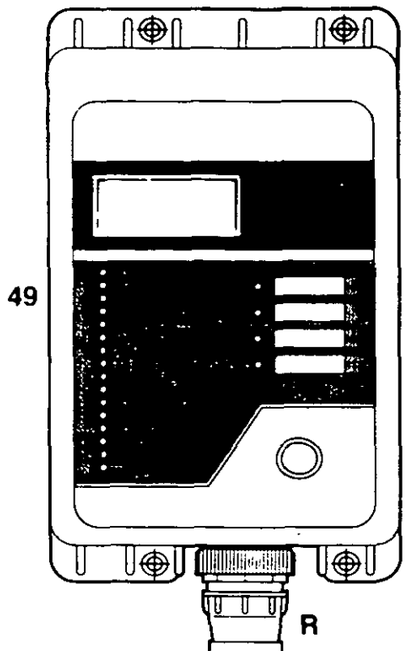
49 . Tractor performance monitor (TPM)
52 . Fuse 3 A
R . 24-way connector, junction with TPM
S . 540 or 1000 rpm PTO switch
T . External 14 pin socket
U : Internal socket
V : 3-way connector
W . TPM junction with radar harness
X . TPM junction with fuel flowmeter
Y . Datatronic junction with TCU and sensors harnesses (connector E)
Z . Datatronic junction with ELC harness (connector L)
AB . Datatronic junction with ELC harness (connector N)
AC . Datatronic junction with console harness (connector AD)

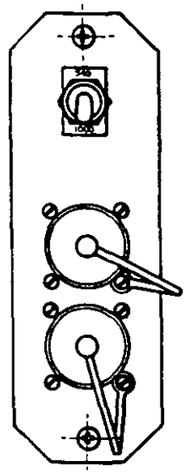
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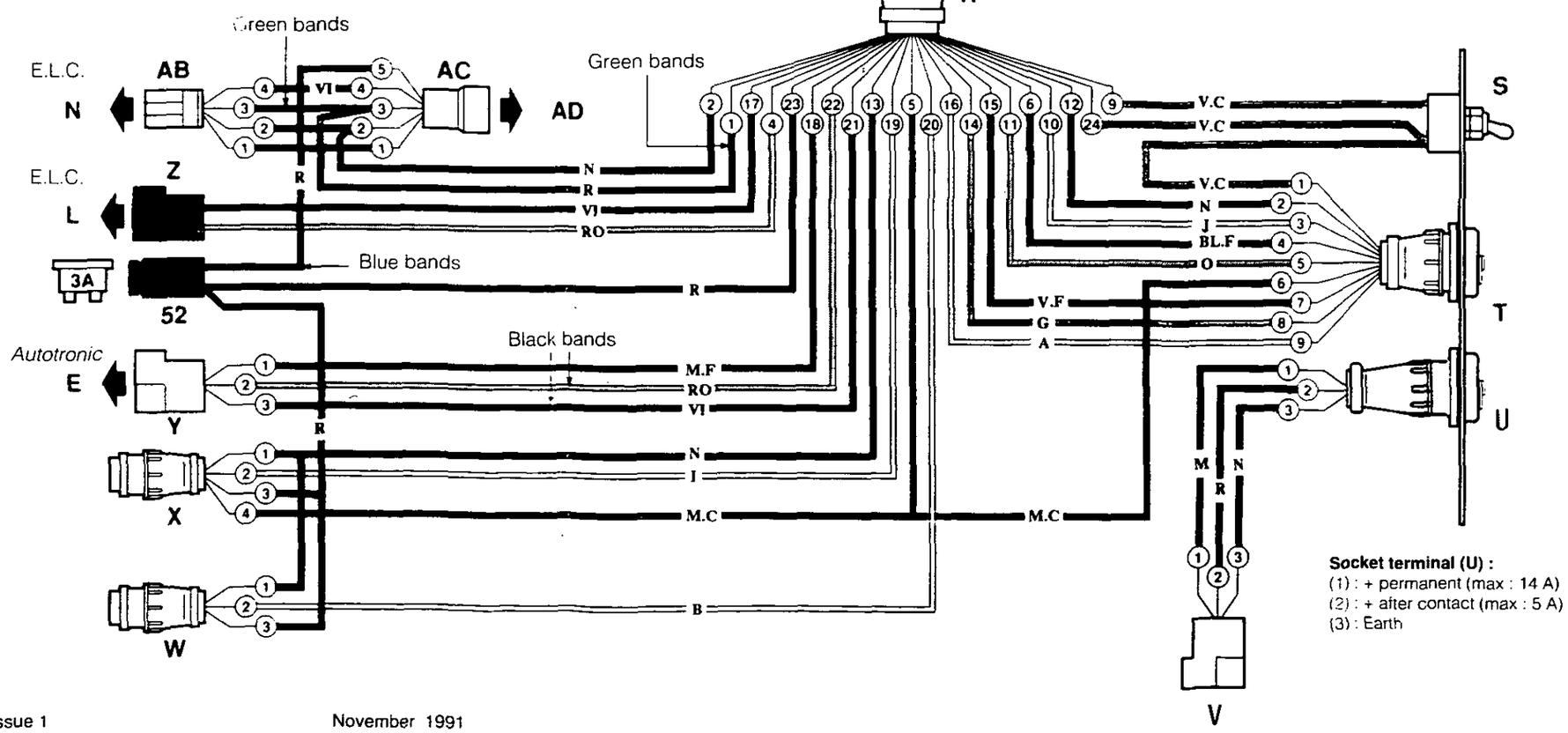
A = Aluminium
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark
C = Light

Terminal identification on 24-way connector R

1 + Lighting
2 Ground
3 not used (ground)
4 Lift «up» position info
5 Implement sensor (not used)
6 RS 232 - Programming signal
7 Not used (ground)
8 Not used (ground)
9 1000 rpm PTO speed info
10 RS 232 reception of programming signal
11 RS 232 programming connection signal
12 Ground
13 Ground
14 Trailed implement «up» position info
15 Unit counting on trailed implement
16 Radar output for trailed implement
17 Wheelslip control output
18 Engine speed sensor signal
19 Fuel flowmeter signal
20 Radar signal
21 Forward speed sensor signal
22 PTO speed sensor signal
23 + Battery after contact
24 Power supply to "S" switch







Socket terminal (U) :
(1) : + permanent (max : 14 A)
(2) : + after contact (max : 5 A)
(3) : Earth

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14 A01 Service Tools

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A. Service tools (engine excepted) ____ 2

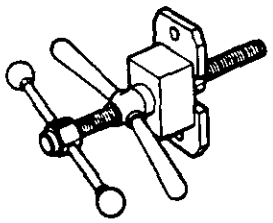
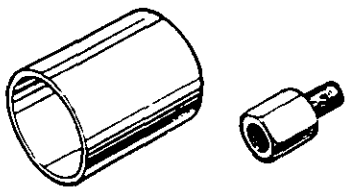
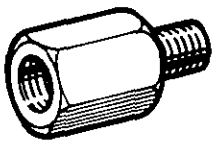
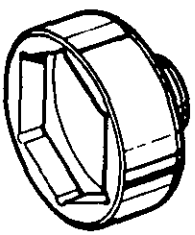
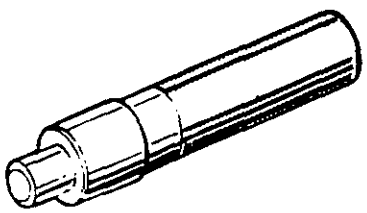
B. Engine service tools ____ 8

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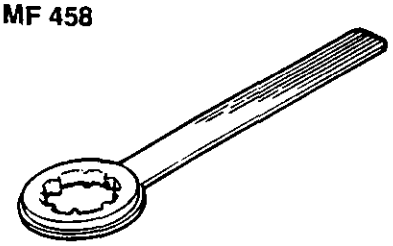
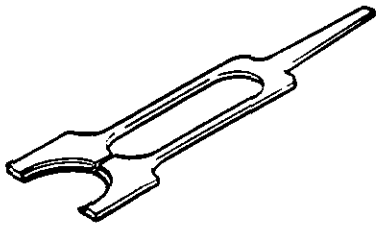
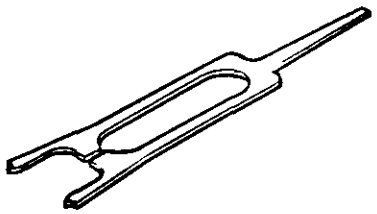
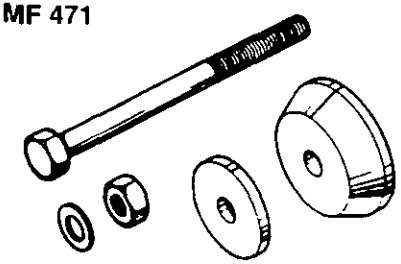
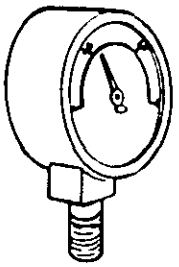
Service Tools

A . Service tools (engine excepted)

Tool Number	Description	Application
MF 195 C 	Bearing cup remover/replacer (main tool)	7 B01 - 8
MF 451 A 	4 W.D. swivel pin remover **Used with MF 195 C**	7 B01- 8
MF 451 B.2 (M14) **MF 451 B.3** (M18) 	Replacement swivel pin adaptor only ***Used with MF 451 A***	7 B01- 8
MF 456 	Mainshaft nut socket (4x4)	5 A02 - 9 5 A02 - 11
MF 457 	Clutch centralizer	5 B01 - 5

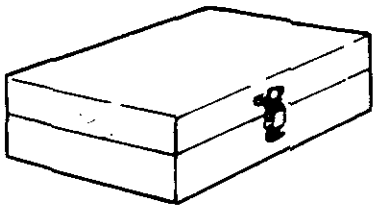
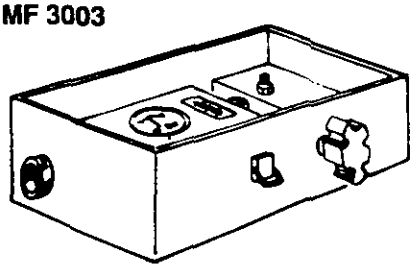
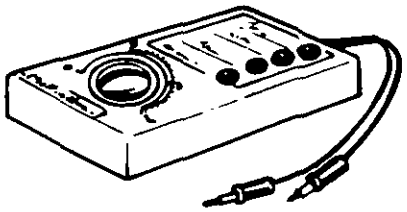
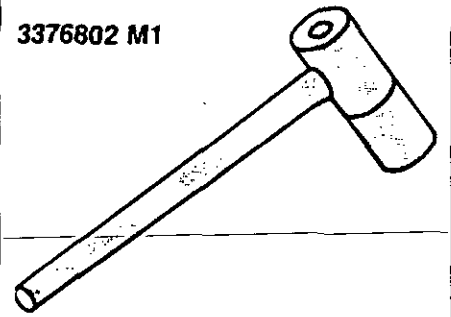
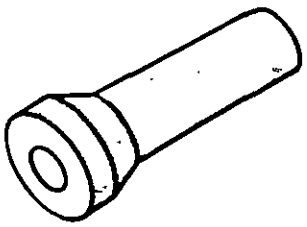
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Service Tools

Tool Number	Description	Application
MF 458 	Mainshaft retaining tool	5 A02 - 8/11
MF 459 	Output shaft snap ring replacer	5 A02 - 16
MF 460 	Output shaft snap ring remover	5 A02 - 7
MF 471 	Hydralock differential lock spring compressor (front axle)	7 C01- 7
MF 3001 	Hydraulic pressure test equipment	8 J01

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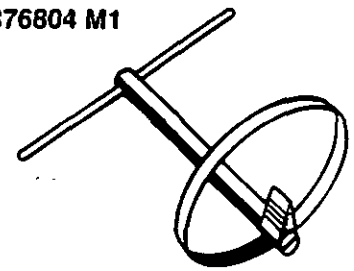
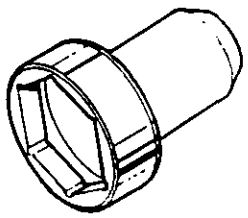
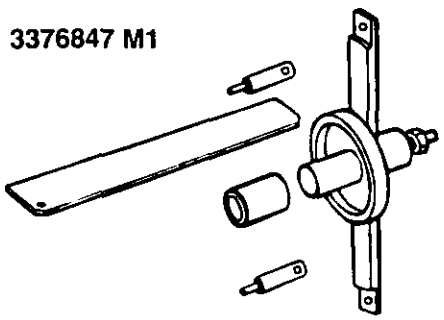
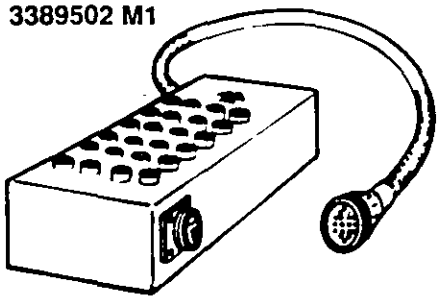
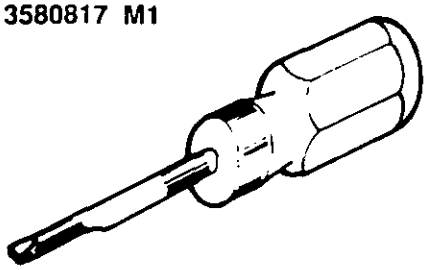
Service Tools

Tool Number	Description	Application
MF 3002 	Hydraulic flow test equipment	8 J01
MF 3003 	Hydraulic flowmeter	8 J01
MF 3005 	Multimeter for use with electronic test units	9 A01 11 C01 11 D01 12 B01 13 B01
3376802 M1 	*Pull-clutch slave cylinder wedge*	3 A02 - 3
3376803 M1 	Input hub seal depth setting tool	3 A01 - 3 3 A02 - 3

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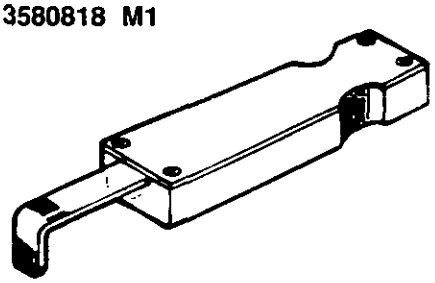
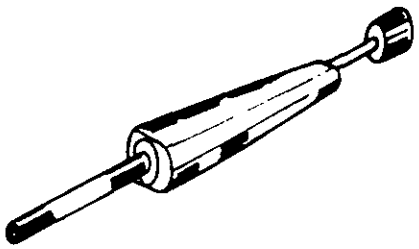
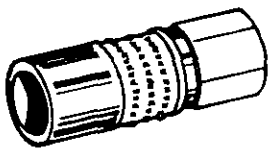
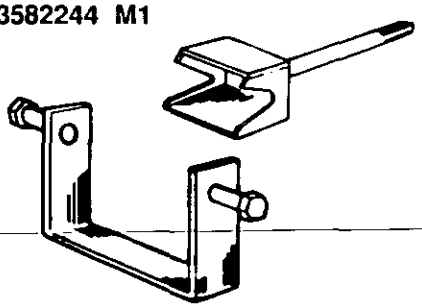
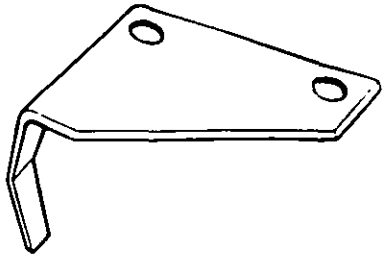
Service Tools

Tool Number	Description	Application
3376804 M1 	Pull-clutch seal compressing tool	5 C01 - 11
3376805 M1 	Mainshaft nut socket (4x2)	5 A02 - 8 5 A02 -13
3376847 M1 	Differential bearing pre-load gauge	6 J01 - 13
3389502 M1 	Electronic linkage control and datatronic break out test unit	11 C01 13 B01
3580817 M1 	Blade remover 724763-1	9 A01 12 B01

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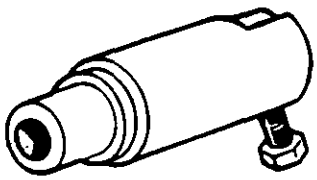
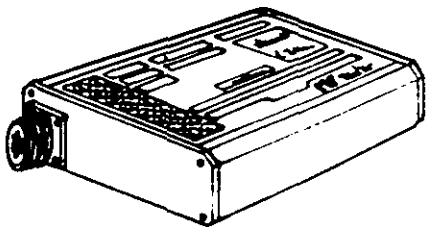
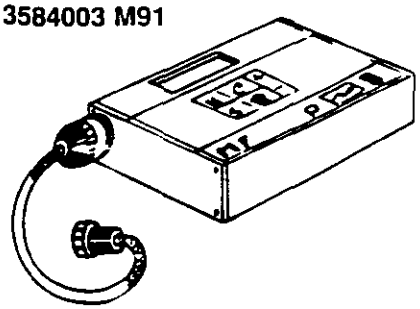
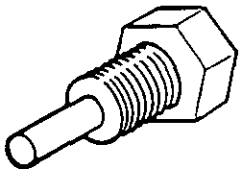
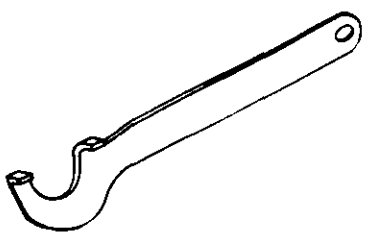
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Service Tools

Tool Number	Description	Application
3580818 M1 	Female terminal remover 723735-1	11 C01 12 B01
3580820 M1 	Circular terminal remover 305183	11 C01 12 B01
3582045 M1 	Female hydraulic quick coupler PD 242	8 J01
3582244 M1 	Steering column repair tools	7 E01 - 3
3582434 M1 	Reverse shuttle setting gauge	5 A02 - 23

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Service Tools

Tool Number	Description	Application
3583544 M1 	A/B range setting gauge (4x4)	5 K03 - 4
3584002 M92 	Transmission control test unit (Autotronic)	12 B01 - 3
3584003 M91 	Tractor performance monitor programmer and tester (Datatronic)	13 B01
3615053 M1 	Gearbox side cover locking tool	5 A02 - 24
3615334 M1 	Slotted nut wrench	5 A02 - 23 5 I01 - 11

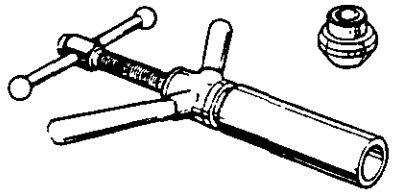
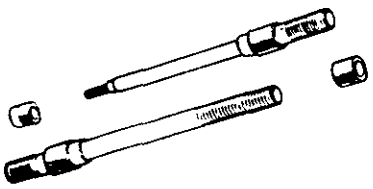
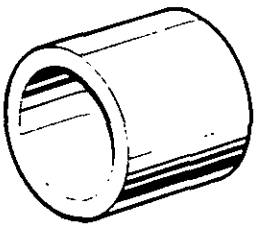
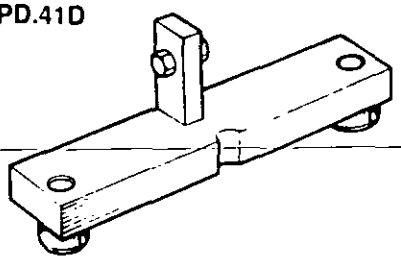
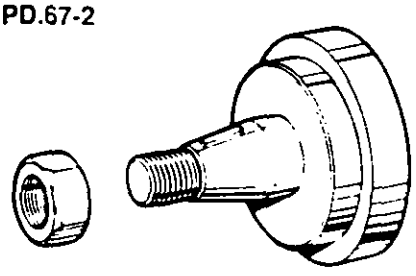
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Service Tools

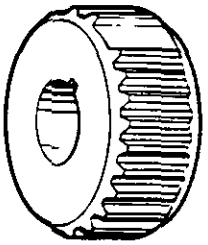
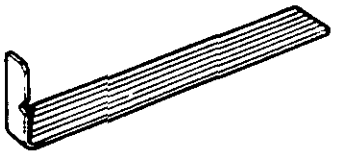
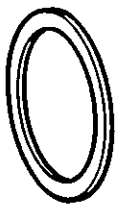
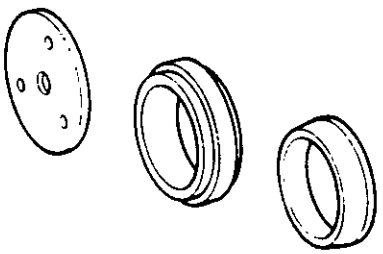
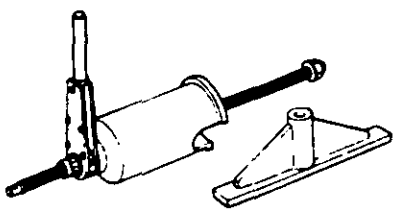
B . Engine Service tools

To use following tools refer to MF engine workshop manuals : 1646906M1 - 1856562M1.

Tool Number	Description
PD.1D 	Remover/replacer for valve guides (main tool).
PD.1D-1A 	Adaptor for use with PD.1D.
PD.1C-6 	Adaptor for use with PD.1D and PD.1D-1A.
PD.41D 	Gauge for piston height, valve depth and cylinder liner flange for use with PD.208.
PD.67-2 	Drive adaptor for use MS.67B.

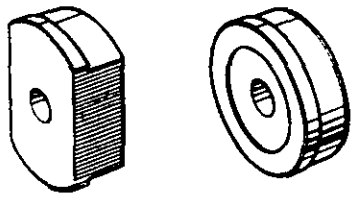
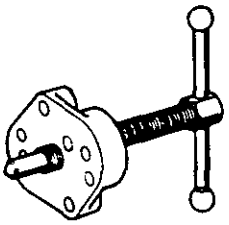
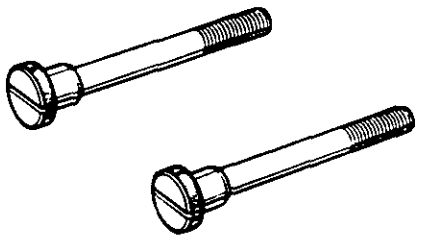
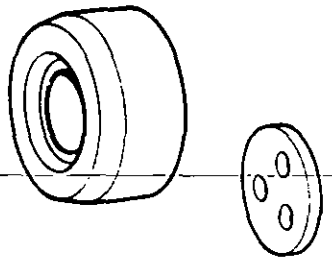
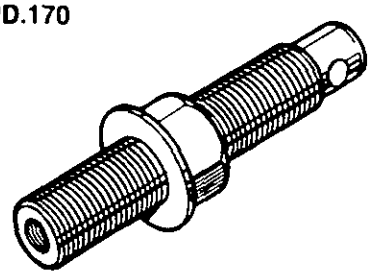
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Service Tools

Tool Number	Description
PD.67-3 	Gear adaptor for use with MS.67B.
PD.67-4 	Pointer for use with MS.67B.
PD.67-5 	Distance piece for Bosch pumps : use with MS 67B.
PD.145D 	Crankshaft rear seal refitting tool.
PD.150B 	Remover/refitting tool for cylinder liner (main tool).

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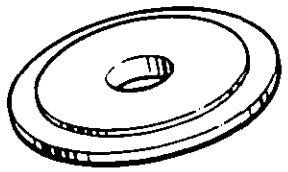
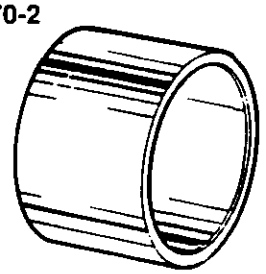
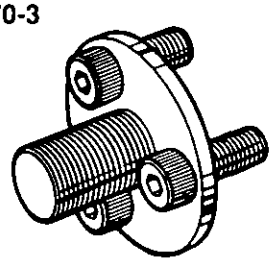
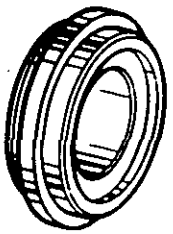
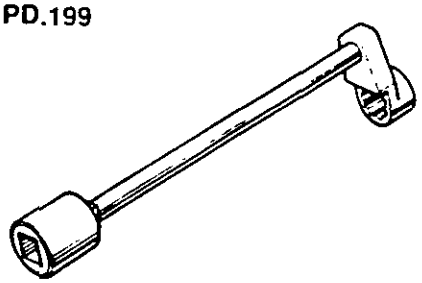
Service Tools

Tool Number	Description
PD.150B-17 	Adaptors for use with PD.150B.
PD.155B 	Basic puller for camshaft and fuel pump gears.
PD.155B-5 	Adaptors for use with PD.155B.
PD.163A 	Centralising tool for timing case cover.
PD.170 	Replacer tool for seal of timing case (main tool).

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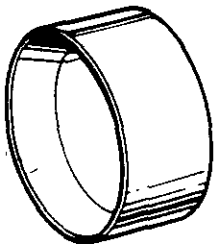
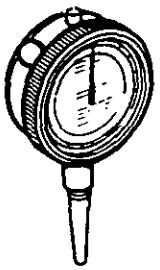
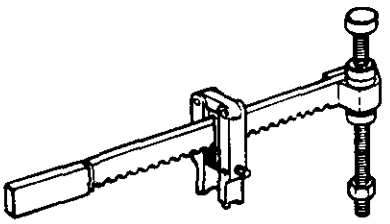
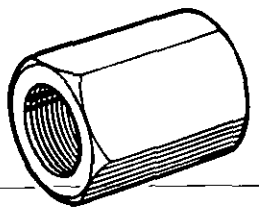
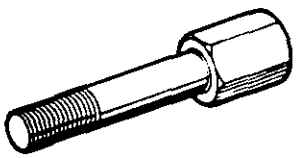
Service Tools

Tool Number	Description
PD.170-1 	Pressure plate for use with PD.170.
PD.170-2 	Fastener plate for use with PD.170.
PD.170-3 	Sleeve for use with PD.170.
PD.170-4 	Seal adaptor for use with PD.170.
PD.199 	Fuel injection pump flange nut spanner.

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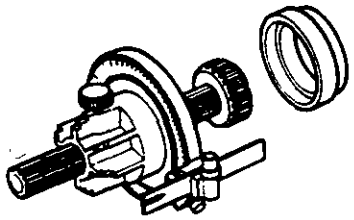
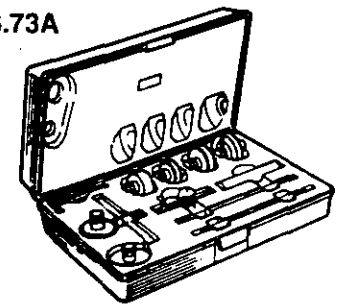
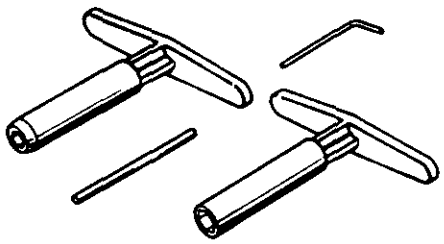
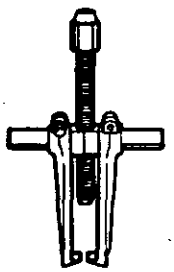
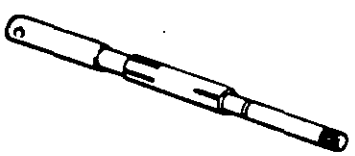
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Service Tools

Tool Number	Description
PD.206 	Piston refitting tool.
PD.208 	Dial gauge for use with PD.41D.
PD.6118B 	Valve spring compressor.
PD.6118-7 	Stud adaptor for use with PD.6118B.
PD.6118-8 	Setscrew adaptor for use with PD.6118B.

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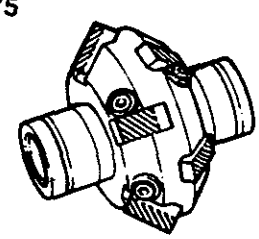
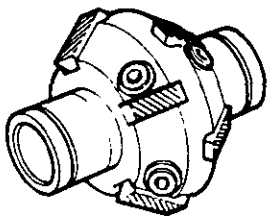
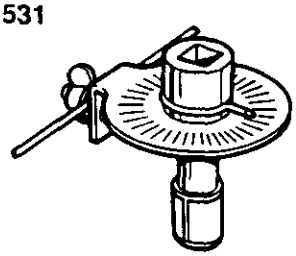
Service Tools

Tool Number	Description
MS.67B 	Timing gauge.
MS.73A 	Set of adjustable cutters for valve seats.
MS.76B 	Handle set for valve seat cutters (also included in MS.73A).
MS.99 	Gear puller for water pump.
MS.150-9.5 	Adjustable pilot for valve seat cutters (also included in MS.73A).

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Service Tools

Tool Number	Description
MS.275 	Cutter for exhaust valve seats (also included in MS.73A).
MS.281 	Cutter for inlet valve seats (also included in MS.73A).
MS.1531 	Angle gauge to tighten cylinder head setscrews.

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