

URAL - 4320 - 10, URAL - 4320 - 31 TRUCKS AND THEIR MODIFICATIONS



URAL - 4320 - 10, URAL - 4320 - 31 TRUCKS AND THEIR VERSIONS

Operation Manual
4320 - 3902035 - 10 PЭ
(Ninth edition, revised & enlarged)

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Open - End Joint Stock Co.



This Manual is intended for drivers and motor transport workers who are involved in operation of URAL trucks. Specifications of the trucks, brief description of their components and assembly units with illustrations, operating requirements, a list of maintenance operations and reference data are given in the Manual.

In connection with continuous work relating to improvement of the product, which increases their reliability and improves its operating conditions, particular alterations, which are not highlighted in this edition, can be introduced in the design.

When using the trucks, this Operation Manual and the Manual for the power unit manufactured by Yaroslavl Motor Works, technical description and "Air Heater" Installation Manual should be applied.

FOREWORD

URAL trucks (6x6) with YAMZ - 236M2 and YAMZ - 238M2 diesel engines manufactured by "Autodiesel" Joint Stock Co., Yaroslavl, Russia, with a three - seat, all - metal cab located behind the engine, is intended for transporting cargoes, people and towing trailers on all kinds of roads and terrain. The basic models are URAL - 4320 - 10 (Fig. 1) and URAL - 4320 - 31 (Fig. 2) multi - purpose trucks developed by means of updating URAL - 4320 truck, where hyphens – 10 and 31 (30) indicate the model of the engine (i.e. YAMZ - 236M2 and YAMZ - 238M2 correspondingly) installed into the truck.



Fig.1. URAL - 4320 - 10 truck



Fig. 2. URAL - 4320 - 31 truck

URAL trucks are designed for operation at ambient temperatures ranging from + 50 °C down to – 45 °C (a short - time operation at – 50 °C).

The following versions are manufactured on basis of URAL - 4320 - 31 and URAL - 4320 - 10 trucks:

- URAL - 43202 - 0351 - 31 general - transportation truck with a wooden platform body;

- URAL - 4420 - 10 and URAL - 4420 - 31 bolster trucks intended for towing special semi - trailers on all kinds of roads and terrain;
- URAL - 44202 - 0311 - 31 bolster truck designed for towing semi - trailers on all kinds of roads;
- URAL - 44202 - 0612 - 30 bolster truck designed for pulling semi - trailers on airfields even sites;
- URAL - 4320 - 0911 - 30 truck with an enhanced base intended for transportation of cargoes and people on all kinds of roads and terrain;
- URAL - 4320 - 0611 - 10 and URAL - 4320 - 0611 - 31 trucks equipped by a wooden platform body and a canopy intended for cargo transportation.

The chassis - cabs with the similar specifications (including chassis - cabs for wagon bodies) are manufactured on the basis of the trucks. The trucks with various complete sets, i.e. those with a winch or without it, having a different location of the spare wheel holder: behind the cab, at the rear of the chassis frame (with an upright or horizontal arrangement) or trucks without a holder, but having a temporary fastening on the chassis frame, with power take - off from the gearbox (PTO) or transfer box (auxiliary PTO), with a drawbar available for towing semi - trailers or without it, can be produced.

It is allowed to use the trucks with pull - type systems, which have air outlets as per GOST R 50023 Standard and electric outlets as per GOST 9200 (version II), the brake system air outlet as per GOST 4364 Standard, the brake systems as per GOST R 41.13 Standard, a gross weight, corresponding to the specifications, and a drawbar for trailers as per GOST 2349 Standard or a coupling pivot as per GOST R 41.55 Standard for semi - trailers having "A" diameter as per GOST 12017 Standard that is equal to 50.8 mm and mounting dimensions as per GOST 12105 Standard for rated load on the fifth wheel from 49.0 kN (5.0 tf) to 83.4 kN (8.5 tf).

The trailers, models 782B (2PN - 4M), GKB - 8350, and OdAZ - 935, OdAZ - 9370 semi - trailers – for URAL - 44202 - 0311 - 31 trucks are the main trailers and semi - trailers for the said trucks and bolster trucks.

On the basis of URAL trucks and chassis various products (tank trucks, crane trucks, oil field equipment, vans, etc.) are manufactured as well. All comments and proposals regarding their work should be referred to manufacturers of those products.

Mounting of various equipment and mechanisms onto the truck and its chassis is allowed only after agreeing it upon with the Engineering Department of the "URAL" Automobile Works. Otherwise, a customer shall be deprived to make any claims relating to premature failure of truck components.

Marking of URAL trucks and chassis - cabs comprises the truck marking as a whole transport means, marking of the chassis and cab as constituent parts of the transport means and engine marking.

The truck as a whole transport means is marked on the manufacturer's plate fixed to the r.h. panel of the cab bonnet nearby the foot step. The plate contains the trade mark, a truck model with indication of its complete set, VIN identification number (17 symbols), and an engine model.

Structure of the vehicle identification number and its explanation:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
X	1	P	4	3	2	0	0	0	*	*	*	*	*	*	*	*
* - Variable data																

- Item 1 - 3 – X1P – “URAL” Automobile Works” JSC, Miass, Chelyabinsk Region, Russia (manufacturer’s international identification code)
Item 4 - 9 – Product denomination
Item 10 – Year of manufacture
Item 11 - 17 – Serial production number of vehicle

Digits used for indicating the year of manufacture:

1 – 2001	3 – 2003	5 – 2005
2 – 2002	4 – 2004	6 – 2006

The chassis as a constituent part of the vehicle is marked on its frame at the rear of the r.h. side member at a distance of 1000 - 1250 mm backwards from the rear bogie axis and 40 – 60 mm downward from the side member upper flange. The marking contains 14 symbols and is applied by hammering.

The cab as a constituent part of the vehicle is marked on its r.h. side in the direction of the truck movement at the bottom of the door aperture between the two front holes. The marking contains 14 symbols and is applied by hammering.

Data on engine marking are given in «YAMZ - 236M2, YAMZ - 238M2 Engines» Operation Manual.

SAFETY REQUIREMENTS AND PRECAUTIONS

SAFETY REQUIREMENTS

1. Before starting work, make sure that the truck and its coupling devices are in good working order.

2. Put the truck on a flat horizontal site for its service and repair. Engage the truck parking brake, switch off the storage battery, cut off the fuel feed by pulling the engine stop lever as far as it will go and put chocks under the wheels.

3. Keep the engine and the starting preheater clean and in good working order. Do not allow fuel and oil to leak: it can serve as a reason of fire. When the preheater is engaged, the driver should stay near the truck.

4. Do not warm up the engine, if the truck is indoors, and ventilation is poor.

5. Cooling (low - freezing) liquids and brake fluids are toxic, handle them with due care.

6. When servicing the engine, fix the hood lifting mechanism with a safety hook 1 (Fig.3).

7. To climb the truck bumper and come down from it use the step, the central and extreme left ribs (in the direction of the truck travel) of the radiator grill, which have inserts on the inside (Fig. 4).

8. Prior to removing a wheel, fix the truck by putting chocks under the other wheels, which will not be lifted, to avoid the truck rolling down. Slacken the wheel nuts and after that lift up the wheel with the help of a jack or other hoisting gear.

To lift the front axle with the jack insert its screw head in the spring clamp socket; to lift the rear axle – under the spring supporting bracket.

9. It is prohibited to remove any wheel from the truck, if all air has not been let out of its tyre before.

10. It is prohibited to mount a just assembled and uninflated wheel with its tire onto the truck and inflate the tire using the tire inflation system.

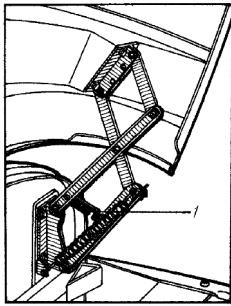


Fig. 3. Hood Lifting
Mechanism Safety Lock:
1 - safety hook

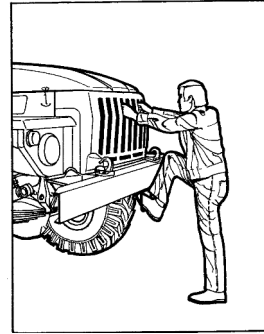


Fig. 4. How to Use Step and Radia -
tor Grill Ribs, When Climbing
Bumper and Coming Down It

A special caution is given by the manufacturer regarding the necessity to observe safety rules strictly, when mounting the tyres (see chapter "wheels and tyres").

11. While lowering the spare wheel, keep yourself out of reach of the wheel holder hinged bracket.

12. It is prohibited to use the truck without lock spring ring 14 (See Fig.92) and winged nut 7 of the storage battery compartment cover.

13. To avoid falling down the storage batteries in the course of their servicing on the truck move the battery out of the container only on the container hinged cover, make sure it is fixed securely in its horizontal position.

14. Check condition of the insulation of the wire from " + " battery terminal to the starter. Damaged insulation can cause fire.

15. When upgrading, select the required gear in good advance.

16. When carrying passengers in cab, fix the r.h. door lock of the cab by turning the lock handle downwards.

17. When crossing gutters or rough ground, do not allow the semi - trailer front to thrust against elements of the bolster truck, because the semi - trailer kingpin can get free from the fifth wheel catches (spontaneous unhitching).

18. Hitch and unhitch the trailer (semi - trailer) on an even flat side.

19. Before unhitching the bolster trucks, the semi - trailer support rollers should rest on the ground. Unhitching is not allowed if there are clearances between the rollers and ground.

20. When using the winch:

- do not stay under the cargo to be transferred as well as close to the tensioned rope;

- avoid kinks or knots on the rope as they can result in its damage and break.

When extending the rope across the road, put a guard and warning signs prohibiting to pass.

21. Perform welding on the truck, observing fire safety measures. Connect the welder ground conductor close to the weld spot, having prevented the electric current passing through bearing and friction pairs.

22. If it is required to dismantle the power unit on URAL - 4320 - 10 trucks with a diaphragm clutch, screw an eye bolt into the rear end of the cylinder head. The eye bolt is enclosed in the box of truck spare parts, tools and accessories.

23. When the truck operates with the autonomous heating unit running, it is prohibited:

- to sleep in the cab with the autonomous heating unit running;
- operation of the unit with the suction and exhaust branch pipes completely or partially cutoff;
- refuelling the truck with heating unit running;
- to leave the running heating unit without supervision;
- start and operation of the unit poured over with fuel;
- to use the heating unit without a gas exhaust pipe.

When using the autonomous heating unit, mind if no care is taken in the course of its operation, as well as its faults can be the reason of fire or poisoning by exhaust gases.

PRECAUTIONS

Proper operation of the truck and its long service life can be ensured if you observe all recommendations given in this Manual.

1. When running the first 1000 km (50 hours of engine operation), comply with the rules described in Section "Running - in (Operation) of New Truck".

2. After the engine cold starting do not allow it to operate with a high engine speed.

3. When the engine is running at a full load, its instantaneous stop is not permissible. The engine should run at its minimum idling speed within 1 - 3 min.

4. To prevent air penetration in the fuel-feed system do not burn all the fuel from the fuel tank.

5. After the truck has run a distance of 1000 km (50 hours of engine operation) and the technical maintenance is performed after running-in, the network between the air intake nozzle and connecting pipe of the engine intake manifolds should be dismantled, but the gasket should be kept.

6. See that the preheater fuel pump is adjusted correctly, not allowing open flame in the gas conduit of the heat exchanger.

7. Do not allow the preheater to operate for more than 15 sec without a coolant in the heat exchanger. Upon washing the truck of its fording, engage the pump unit for 2 - 3 min to remove water from the preheater air duct.

8. Start travelling after the coolant has been heated up to 40 °C minimum. The optimum temperature of the fluid should be 75 - 100 °C.

9. To drain the fluid from the engine cooling system completely, place the truck on a flat site or incline it forward.

10. Drain the coolant from the engine cooling system through three cocks (on the heat exchanger, on the pump unit and on the water pump inlet branch) with the open cab heater cock and the open plugs of the radiator and preheater filling pipe. If water is used in the engine cooling system in an emergency situation, remove the rest of water from the preheater liquid pump by engaging the pump unit for 10 - 15 sec to avoid the fan impeller freezing - on. Upon draining the fluid, close the cocks.

11. At an ambient temperature lower than -10 °C, cut off the oil cooler by closing the cock located on the cylinder block.

12. Travelling with the locked differential in the transfer box on hard and dry roads is not recommended, because it results in the rapid wear of the differential and tires. The locking lever should be set in the extreme front position, when the differential is unlocked.

13. When moving the truck out of the track, do not travel with the steering wheel turned in the extreme position for a long time, because it can cause overheating of the oil in the steering hydraulic system and the pump failure as a result. By the same reason, if the power is taken off the engine under steady-state conditions, release the load from the steering control shaft by turning the steering wheel until it turns freely.

14. Before the truck starts travelling, the air pressure in the brake system should be not less than 400 kPa (4 kgf/cm²). If alarm lamp 4 (see Fig.13) on the dashboard turns on and the horn (buzzer) is engaged, remedy a fault occurred in the pneumatic part of the drive.

15. When the truck operates, especially under heavy-duty conditions (sand, muddy roads, etc.), take care of condition of the brakes and adjust the clearance between the shoes and drums in due time. If a fault occurs, pilot lamp 3 (see Fig. 13) on the dashboard is ON. In this case remedy the fault in the hydraulic part of the brake drive or adjust clearances in the service brakes.

If the parking brake is not efficient enough, do not adjust clearances between the parking brake shoes and drum with tierod 4 (see Fig.84) to avoid failure of the parking brake components.

16. Before travelling, check if the alarms of the pilot lamp assemblies (see Fig.13) are in good working order.

17. Do not use the truck with the lowered tailgate, because in this position it closes the rear signalling lights.

18. If the starter has switched on repeatedly (repeated switching - on 1 – 2 min after break) and the engine has not been started or has stalled by any reasons, first set the key into its initial upright position. Frequent starting of the engine with its short-term operation result in quick discharge of the storage battery.

19. Do not move the truck with the help of the starter, because it can be a reason of the starter failure and quick discharge of the storage battery.

20. To avoid the generator failure connect the wire from the starter to the “+” terminal of the storage battery, and the wire from the storage battery switch to its “-” terminal.

21. Connect wires to the generator and voltage regulator in accordance with the marks applied on these products.

22. Prior to removing the generator from the engine switch off the storage battery.

23. During long-term parking of the truck disconnect the storage battery from the “ground” with the help of the “ground” switch button (see Fig.21).

24. When starting the engine from an external source through the external starting socket, it is required to switch on the storage battery. It is prohibited to use a direct-current source with ratings exceeding 24 V at a current of 0 (zero) A and 18.3 V at a current of 1000 A and the storage battery that has a rated capacity different from 190 A.h by more than ± 20 A.h.

25. Removal of the seals (2 pcs.) from the speedometer drive flexible shaft deprives a customer to make any claims.

26. At an ambient temperature lower than -15°C use an auxiliary power take-off only after a short run (approximately, 15 km) or warming-up of the oil in the transfer box by other method, for example, by hot air.

27. When towing a trailer that limits manoeuvrability of the truck, remove the rear bumpers.

28. During the truck travelling the wheel valves of the tire pressure control system should be opened.

When the truck has been parked for a long time, close the wheel valves. At an ambient temperature lower than -35°C open the wheel valves 15 – 20 km after beginning of travel.

Upon opening the wheel valves blow through the tire pressure control system with the air from the tires (see the Section “Central Tire Pressure Control System”).

29. When towing the truck with the shut-down engine, the primary and intermediate shafts of the gearbox do not rotate, and in this case the oil pump does not operate and does not deliver grease into the bearings of the main shaft gears and on conical surfaces of the synchronizers, and it will cause seizing of the sliding surfaces, wear of the synchronizer rings results in failure of the whole gearbox.

To perform towing disengage the clutch and shift the direct (fourth) gear in the gearbox or disconnect the gearbox from the transmission. Towing of the truck for a distance exceeding 20 km without disconnecting the cardan shaft or pressing the clutch with the engaged gearbox is not permitted.

30. Manoeuvring, particularly while reversing, do not allow big angles of the road train folding to avoid damage of the drawbar.

31. When using a trailer at an ambient temperature less than -25°C , do not leave the rubber buffer of the drawbar under load before a long parking to avoid freezing of the pressed rubber bumper and appearing an axial clearance in the drawbar. Disconnect the trailer or unload the axial load from the rubber buffer by moving the truck forwards and backwards.

32. When a loader having a total weight exceeding 3200 kg is running onto the truck platform, put shields (boards) under its wheels.

33. Put heavy small-sized cargoes, which can cause local sagging of the platform floor or damage the body sides and seat components, onto sills (boards) and fix them securely. Place the cargo so that its centre of inertia is located in the middle of the truck platform.

34. The truck loading height was increased on URAL - 4320 - 0611 - 10 truck. Due to increasing the truck centre of inertia its static lateral stability decreased.

35. In connection with increasing the effort on the diaphragm clutch pedal without a pneumohydraulic booster and due to the fact that the clutch can not be released, if the pressure is not available in the supplying bottle of the clutch releasing air cylinder, it is not recommended to park the truck with an engaged gear for a long time (exceeding four hours).

If after parking the truck for a long time or for the reason of high air leaks, the complete air leakage occurred and the gear is engaged, it is necessary to disengage the gear (setting in the neutral position) by alternate turning the engine crankshaft to the right and left through approximately 180° , using the technique described in the Section “Adjustment of Valve Timing Mechanism” of the Operation manual for YAMZ - 236M2 and YAMZ - 238M2 trucks or release the clutch by filling the pneumatic system by the compressed air with the help of another truck via the towing valve.

36. URAL - 44202 - 0311 - 31* bolster trucks equipped by lighting devices in conformity with GOST R 41.48 Standard can only operate with semi-trailers which have a distance from the pin to the nearest part of the mechanism of the semi-trailer supporting device not less than 2000 mm.

* For the trucks delivered for civil needs.

SPECIFICATIONS

Parameter	Ural - 4320 - 10 Ural - 4320 - 0611 - 10	Ural - 4420 - 10
1	2	3
GENERAL		
Payload, kg	5000	-
Payload on chassis, kg	5875	-
Semitrailer weight falling on tractor fifth wheel, kg	-	5500
Truck Kerb Weight, kg	8795* ¹	8161
Chassis Kerb Weight, kg	7605	-
Gross Vehicle/Road Train Weight (GVW), kg	14 095* ¹	23 615/20 915* ²
Kerb Vehicle Weight distribution, kg: on front axle on rear bogie	4225* ¹ 4570* ¹	4205 3905
GVW distribution, kg: on front axle on rear bogie	4520* ¹ 9575* ¹	4630 9285
Gross Trailer/Semitrailer Weight, kg	11 500/7000* ²	18 500/12 500* ²
OPERATIONAL DATA		
Maximum travelling speed of GWV truck/road train, km/h	85/82* ³	75
Estimated fuel consumption* ⁴ , l/100 km, not more: at speed 40 km/h: single truck/chassis road train at speed 60 km/h single truck/chassis road train	30 - 35 -	- 40 - 48

1	2	3
Cruising range, km, not less: at speed 40 km/h: single truck /chassis road train at speed 60 km/h single truck/chassis road train	1100 - 980 -	- 860 - 715
Braking distance at 60 km/h, when applying service brake system, m, not more: Gross Vehicle Weight Gross Combination Weight (GCW)	36.7 -	
Maximum gradeability, degree (%), not less: GVW GCW	31 (60) 19 (34)	- 15 (27)
Minimum turning radius on track axis of front (outer relative to turn centre) wheel, m, not more	10.8	
Obstacles to be overcome, m: width of ditch/trench height of upright wall depth of hard - bottom ford	0.6 0.55 0.7 *5	

*1 For the Ural - 4320 - 10 truck equipped with a winch

*2 When operating on bad natural roads featuring some heavy sections; for the Ural - 4320 - 10 truck also when operating on roadless terrain.

*3 For trucks having final drive ratio 7.32.

*4 Estimated fuel consumption serves to estimate technical condition of a truck, and is not considered as a rate for operation.

*5 1.2 - when applying on the truck a water proof engine and sealing system for units and aggregates.

Parameter	Ural - 4320 - 31	Ural - 43202 - 0351 - 31	Ural - 4320 - 0611 - 30
1	2	3	4
GENERAL			
Payload, kg	6000	7000/5000*1	7000
Payload on chassis, kg	6435*2	7850/5850*1	-
Semitrailer weight falling on tractor fifth wheel, kg	-	-	-
Truck Kerb Weight, kg	9170*2	8690	8715
Chassis Kerb Weight, kg	8,320*2	7,690	-
Gross Vehicle/Road Train Weight (GVW), kg	15 470*2	15 990/13 990*1	16 015
Kerb Vehicle Weight distribution, kg:			
on front axle	4500*2	4380	4390
on rear bogie	4670*2	4310	4325
GVW distribution, kg:			
on front axle	4910*2	4965	4975
on rear bogie	10 560*2	11 025	11 040
Gross Trailer/Semitrailer Weight, kg	11 500/7000*1		
OPERATIONAL DATA			
Maximum travelling speed, km/h:			
GVW	85/82*3	80/75*3	
GCW	80/73*3	75/70*3	
Maximum gradeability, degree (%), not less:			
GVW	31 (60)	27 (50)	15 (27)
GCW	19 (34)	15 (27)	-
Estimated fuel consumption*4 , l/100 km, not more:			
at speed 40 km/h:			
single truck/chassis	30	31	32
road train	34	-	40

Ural - 4420 - 31	Ural - 44202 - 0311 - 31	Ural - 44202 - 0612 - 30	Ural - 4320 - 0911 - 30
5	6	7	8
			10 000
-	-	-	-
5500	8100/5500* ¹	12 000	-
8340	8320	8085	9700
-	-	-	-
23 840/21 140* ¹	27 720/21 120* ¹	38 750	20 000
4525 3815	4570 3750	4425 3660	4905 4795
4940 9200	5005 11 715	5300 15 600	5165 14 835
15 200/12 500* ¹	19 100/12 500* ¹	30 000	-
75 75	- 75/70* ³	- 65	80/75* ³ 75/70* ³
- 15 (27)	- 15 (27)	15 (27) -	15 (27) -
- 40	- 40	- 40	32 46

1	2	3	4
at speed 60 km/h: single truck/chassis road train	35 -	38 -	40 49
Cruising range, km, not less: at speed 40 km/h: single truck /chassis road train at speed 60 km/h: single truck/chassis road train	1100 - 980 -	925 - 750 -	900 720 720 590
Minimum turning radius on track axis of front (outer relative to turn centre) wheel, m, not more	10.8		
Braking distance at 60 km/h, when applying service brake sys - tem, m, not more: GVW GCW	36.7 38.5		
Braking distance at 40 km/h, when applying auxiliary brake system, m, not more: GVW GCW	33.8 35.0		
Obstacles to be overcome, m: width of ditch/trench height of upright wall depth of hard - bottom ford	0.6 0.55 0.7* ⁵		

*1 When operating on bad natural roads featuring some heavy sections; for the Ural - 4320 - 31 truck also when operating on roadless terrain.

*2 For the Ural - 4320 - 31 truck equipped with a winch.

*3 For trucks having final drive ratio 7.32.

*4 Estimated fuel consumption serves to estimate technical condition of a truck, and is not considered as a rate for operation.

*5 1.7 m - when applying on the truck a water proof unit and sealing system for units and aggregates (including fan coupling).

5	6	7	8
- 48	- 46	- 64	40 49
- 860	- 720	900 720	900 720
- 715	- 625	720 590	720 590
10.8		13.0	
36.7 38.5			
33.8 35.0			
0.6 0.55 0.7*5			

Parameter	Ural - 4320 - 10 Ural - 4420 - 10 Ural - 4320 - 0611 - 10	Ural - 4320 - 31 Ural - 43202 - 0351 - 31 Ural - 4420 - 31 Ural - 44202 - 0311 - 31 Ural - 44202 - 0612 - 30 Ural - 4320 - 0611 - 31 Ural - 4320 - 0911 - 30
1	2	3
ENGINE Type, model Displacement, l Rated power, gross, kW (hp) Maximum torque, gross, N.m (kgf m) Speed, min⁻¹: at rated power at maximum torque Crankshaft's sense of rotation as per GOST 22836 - 77		
FUEL FEED SYSTEM Main fuel tank capacity *¹, l		
TRANSMISSION Clutch Gearbox ratios		
Transfer box		
Ratios: high speed low speed		

1	2	3
Cardan drive	Open - type, with four shafts, with joints mounted in needle bearings. An additional cardan shaft with intermediate support is integrated into the intermediate axle drive on the trucks and special chassis featuring an extended wheel base	
Axles	Driving, combined axle case consists of a cast middle part and half-axle casings pressed in it. The front axle is a steering one, with constant velocity joints of disk - type	
Final drive	Dual - drive, tandem - type, spiral - tooth bevel gear couple and helical - tooth spur gear couple. Final drives of all truck axles are interchangeable. Differential: symmetrical, bevel - type, with four satellites. Half-axles: floating, splined joint with hub	
ratio	8.05 or 7.32, or 6.7	
RUNNING GEAR		
Truck frame	Stamped, riveted structure	
Towing devices	In the front: rigid towing hooks, in the rear: double - action towing unit; on bolster trucks: rigid towing hooks and fifth wheel in the rear	
Truck suspension: front	Conventional, on two longitudinal semielliptic springs operating together with four two - way hydraulic shock absorbers	
rear	Conventional, walking - beam type, with torque rods, on longitudinal semielliptic springs*4	

^{**1} Ural - 4320 - 10, Ural - 4320 - 31 trucks, Ural - 44202 - 0612 - 30, Ural - 4420 - 10, Ural - 4420 - 31, Ural - 44202 - 0612 - 30 bolster trucks are provided with a reserve 60 l fuel tank (filling capacity 57.6 l)

^{*2} Ural - 4320 - 10, Ural - 4320 - 0611 - 10 trucks are completed with a 210 l main fuel tank (filling capacity 204 l).

^{*3} The truck can be alternatively equipped with the YAMZ - 182 or YAMZ - 183 hydraulically driven diaphragm clutch of pulling - out type featuring an air - hydraulic booster.

⁴ The Ural - 4320 - 0911 - 30 truck, Ural - 44202 - 0612 - 30 bolster trucks are completed with a reinforced spring of a thicker section

Parameter	Ural - 4320 - 10 Ural - 4320 - 0611 - 10 Ural - 4420 - 10	Ural - 4320 - 31 Ural - 4320 - 0611 - 31 Ural - 4420 - 31	Ural - 43202 - 0351 - 31 Ural - 44202 - 0311 - 31	Ural - 4320 - 0911 - 30 Ural - 44202 - 0612 - 30
Wheels	Divided type disc wheels with semi deep - well rim and toroidal bead seats, centered with chamfers of fastening holes			
Tires* ¹	515 - 254 (254Г - 508) In accordance with truck's delivery scope: a) 14.00 - 20 146G (HC14/PR14), ОИ - 25 model, pneumatic, tube - type, standard shaped, ribbed tires with controlled pressure, max. permissible carrying capacity 30.40 kN (3100 kgf) b) 390/95R20 147J (HC10/PR10) KAMA - URAL, pneumatic, radial, tube - type, standard shaped ribbed tires with controlled pressure, max. permissible carrying capacity 30.40 kN (3100kgf) c) 390R20 149J (HC14/PR14), О - 65 model, pneumatic, radial, tube - type, standard shaped ribbed tires with controlled pressure, max. permissible carrying capacity 32.36 kN (3300 kgf)			
Rated tire pressure, MPa (kgf/cm ²):	514 - 400 (400Г - 508) 1200x500 - 508, 500/70 - 508 (1200x500 - 508), 500/70 - 20 (1200x500 - 508), ИД - П284 model, pneumatic, tube - type, wide - section shaped ribbed tires with controlled pressure			
front axle	a) 0.34 (3.5) b) 0.26 (2.7) c) 0.32 (3.2)	a) 0.31 (3.2) b) 0.28 (2.9) c) 0.34 (3.5)	149F (HC10/PR10) 150F (HC10/PR10) max. permissible carrying capacity 32.36 kN (3300 kgf)	156F (HC16/PR16) max. permissible carrying capacity 39.23 kN (4000 kgf)
rear bogie		a) 0.42 (4.3) b) 0.31 (3.2) c) 0.38 (3.9)	0.34 (3.5)	0.34 (3.5) 0.52 (5.3)

*¹ At customer's request the truck is completed with 12.00R20 Y - 4 ИД - 304 tires, pneumatic, radial, tube - type, standard shaped, with multi - purpose tread pattern, with constant pressure:

- 150/146J (HC16/PR16), max. permissible carrying capacity 32.85 kN (3350 kgf) with corresponding tire pressure of 750 kPa (7.7 kgf/cm²);
- 154/149J (HC18/PR18), max. permissible carrying capacity 36.78 kN (3750 kgf) with corresponding tire pressure of 850 kPa (8.7 kgf/cm²).

The tires are mounted on 8.5 - 20 wheels in case of single tire truck configuration having 120 mm overhang.

Parameters	Ural - 4320 - 10 Ural - 4420 - 10 Ural - 4320 - 0611 - 10	Ural - 4320 - 31 Ural - 43202 - 0351 - 31 Ural - 4420 - 31 Ural - 44202 - 0311 - 31 Ural - 44202 - 0612 - 30 Ural - 4320 - 0611 - 31 Ural - 4320 - 0911 - 30
1	2	3
STEERING		
Drive type	Mechanical, with hydraulic booster	
Steering gear	Double - thread worm and side notched segment	
ratio	21.5	
ratio	The truck can be alternatively equipped with steering type "screw - ball nut - rack - segment" 23.55	
Booster	Hydraulic, double-action type, with slide-type control valve mounted on steering gear case	
Hydraulic booster pump	Blade, double-action, rotor type, driven by engine crankshaft	
Front steerable wheels position	Wheel camber – 1°, side inclination of knuckle pin – 6°, toe-in - 1...3 mm	
BRAKING SYSTEM		
Service brake system	Dual-circuit type featuring combination (air-over hydraulic) actuation method of truck brakes*1. Wheel brakes of drum type	
Stand-by brake system	One of service brake system circuits	
Parking brake system	Mechanical, interlocked with trailer parking brake control valve. Drum-type braking mechanism, mounted on transfer box output shaft	
Auxiliary brake system	Compression type, installed in gas exhaust system. Air operated, interlocked with engine stop.	

^{*1} At customer's request the truck can be completed with anti - lock - braking system (the ABS).

1	2	3
ELECTRICAL EQUIPMENT		
Wiring system	Single - wire, negative terminals of current source are connected with truck frame. Rated voltage 24 V	
Alternator	Г - 288E, or alternatively 1702.3771, waterproof design, rated at 1000 W. The 6582.3701 - 02 al - ternator rated at 2000 W can be used.	
Voltage regulator	2712.3702 or P2712.3702 alternatively semiconductor type, contactless, with two voltage adjustment lev - els. The 6582.3701 - 02 alternator bears an inte - grated regulator relay	
Storage batteries	Two items, 6CT - 190 (6CT - 190A, or 6CT - 190TP, or 6CT - 190TM)* ¹	
Storage batteries switch	1402.3737 with remote control from cab	
Starter	25.3708 - 01, 8.2 kW (11.5 h.p.) with electro - magnetic starting relay with remote control	
Headlamp	401.3711 or (671.3711)* ²	
Side lamps of turn indica - tors	Two items, УП101 - Б1 (511 - 3726010)* ²	
Lamps of road train sign	Three items, УП101 - Б1	
Rear lamps	Two items, ФП133 - АБ (7462.3716 — the right - side one, 7472.3716 — the left - side one), three - sectional, bearing functions of rear marker lamp, turn indicator, rear outline (marker) lamp, stop lamp, reverse lamp, rear fog lamp, reflector light, side marker and side reflector light	
Front lamps	Two items, ПФ133 - АБ, or ПФ130Б, or ПФ130 - АБ - 01* ² two - sectional, with marker and turn in - dicator lamps	
Number plate lamp	Two items, ФП134Б, or ФП131АБ* ²	

* ¹ Optional		
* ² Not waterproof version		

Parameters	Ural - 4320 - 10 Ural - 4320 - 31 Ural - 4320 - 0911 - 30	Ural - 43202 - 0351 - 31 Ural - 4320 - 0611 - 10 Ural - 4320 - 0611 - 31
1	2	3
CAB AND PLATFORM BODY		
Driver's Cab	Three - seater, metal - made, equipped with heater, optionally with self - contained heater* ¹	

1	2	3
Platform body	Metal - made, with tailgate, having re - movable middle bench, tilting side benches, extension sides, removable canopy and top bows	Wood - made, with three drop sides, equipped with extension sides *1
Seating capacity	27 (36) *2	
Platform inside dimensions, mm:		
length	3890 (5,685) *2	4500
width	2330 (2,346) *2	2326
height with basic sides	494	715
height with extension sides	1000	1435
----- *1 Optional. *2 For the Ural - 4320 - 0911 - 30 truck.		

Parameters	Ural - 4320 - 10 Ural - 43202 - 0311 - 31	Ural - 4320 - 31 Ural - 43202 - 0612 - 30
1	2	3
Fifth wheel	50 - 11 type as per GOST 28247 - 89 with two degrees of freedom. Grips of king pin locking device are closed with semi - automatic lock. King pin hole dia. 50.8 mm	

Parameters	Ural - 4320 - 10 Ural - 4420 - 10 Ural - 4320 - 0611 - 10	Ural - 4320 - 31 Ural - 43202 - 0351 - 31 Ural - 4320 - 0611 - 31 Ural - 4420 - 31 Ural - 44202 - 0311 - 31 Ural - 44202 - 0612 - 30 Ural - 4320 - 0911 - 30
1	2	3
SPECIAL EQUIPMENT		
Power take - off from gearbox *1	Mechanical, one - speed, air - actuated in 2 versions: - for mounting the HIII - 32Y - 3A left - hand pump;	

1	2	3
Auxiliary power take - off *2	- with flange for connecting cardan shaft with rear output. Output shaft speed of the power take - off is equal to 0.946 of engine crankshaft speed. Take - off power is 22 kW (30 h.p.), maximum. Power take - off during truck traveling is not allowed.	
Winch*1	Mechanical, air - actuated, engaged via sliding coupling from the transfer box primary shaft. Ensuring up to 40 % take - off of engine maximum output. Power take - off is allowed during traveling with appropriate reduction of traction - and - dynamic properties. The sense of rotation of the auxiliary power take - off shaft is coincident with that of the gearbox output shaft. Drum - type, with worm reduction gear and band brake driven via cardan shaft from the auxiliary power take - off. Rope working length 60 m, rope dia. 17.5 mm. Rope reversing is possible. Pulling power on the third rope winding layer 70 kN (7 tf), on the first layer 100 kN (10 tf)	
Tackle block*1	Rope - type, single - groove	
Tire pressure control system	Ensuring tire air pressure control by means of the valve available in driver's cab.	
*1 Optional. *2 Optional. The truck can be completed with transfer box and power take - off enabling up to 100 % take - off of engine maximum output.		

Parameters	Ural - 4320 - 10 Ural - 4420 - 10 Ural - 4320 - 31 Ural - 4420 - 31	Ural - 4320 - 0611 - 10 Ural - 4320 - 0611 - 31 Ural - 43202 - 0351 - 31 Ural - 44202 - 0311 - 31 Ural - 44202 - 0612 - 30 Ural - 4320 - 0911 - 30
Sealing system	System of outlet pipes connecting the units with atmosphere	Valve breathers are used.

Overall dimensions of the truck are shown in Figs 5 - 9. Dimensions marked with an asterisk refer to trucks powered with the YAMZ - 236M2 engine; those with two asterisks denote a minimum permissible distance of body parts to the driver's cab or the upper flange of truck frame side - member in the wheel zone. Appendices 1 - 9 contain reference data needed in servicing the trucks, while Appendix 10 contains additions relating to truck's design.

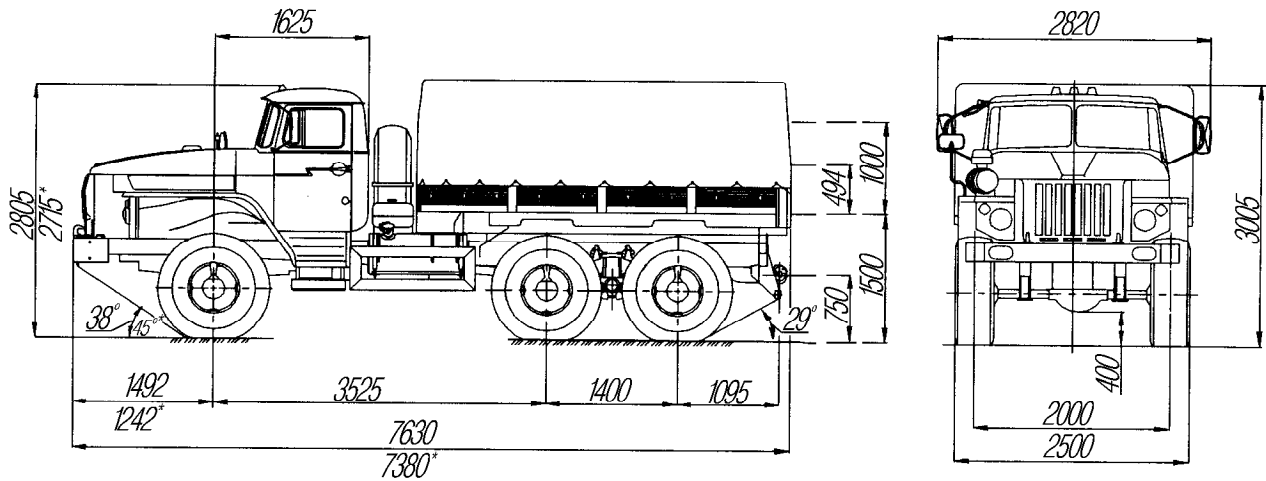


Fig. 5. Overall dimensions of the Ural - 4320 - 31, Ural - 4320 - 10 trucks

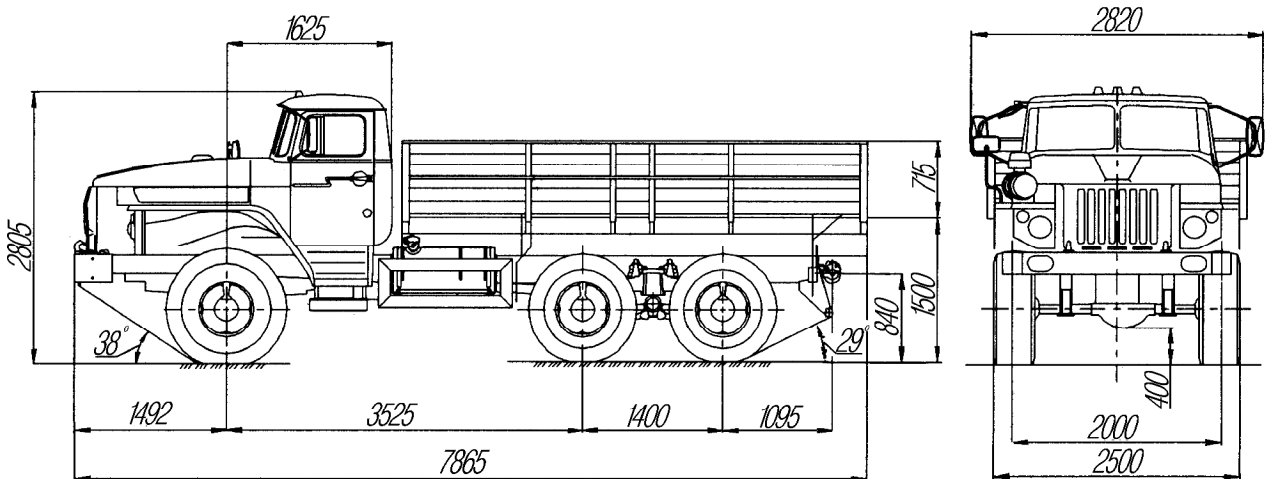


Fig. 6. Overall dimensions of the Ural - 43202 - 0351 - 31 truck

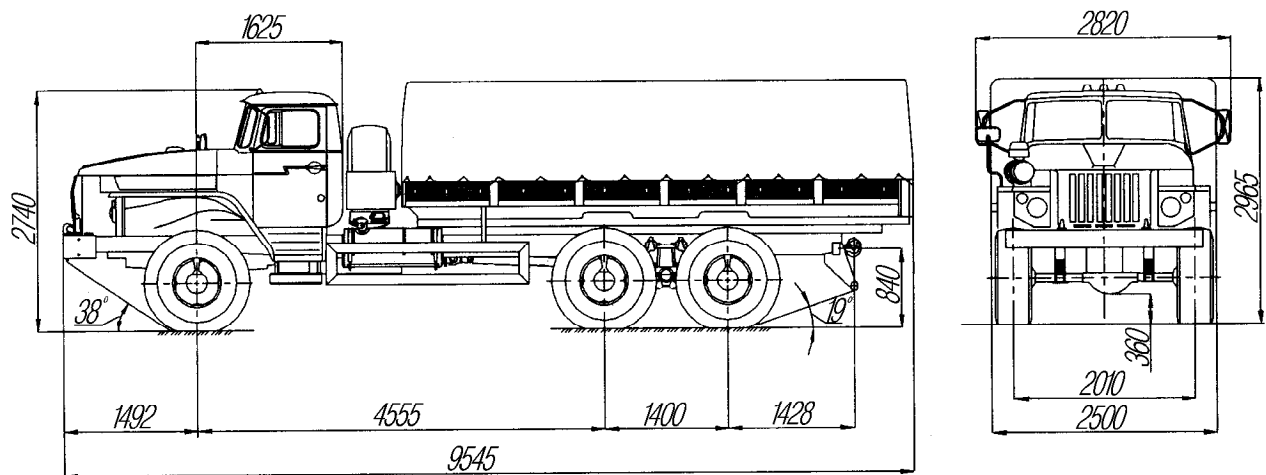


Fig. 7. Overall dimensions of the Ural - 4320 - 0911 - 30 truck

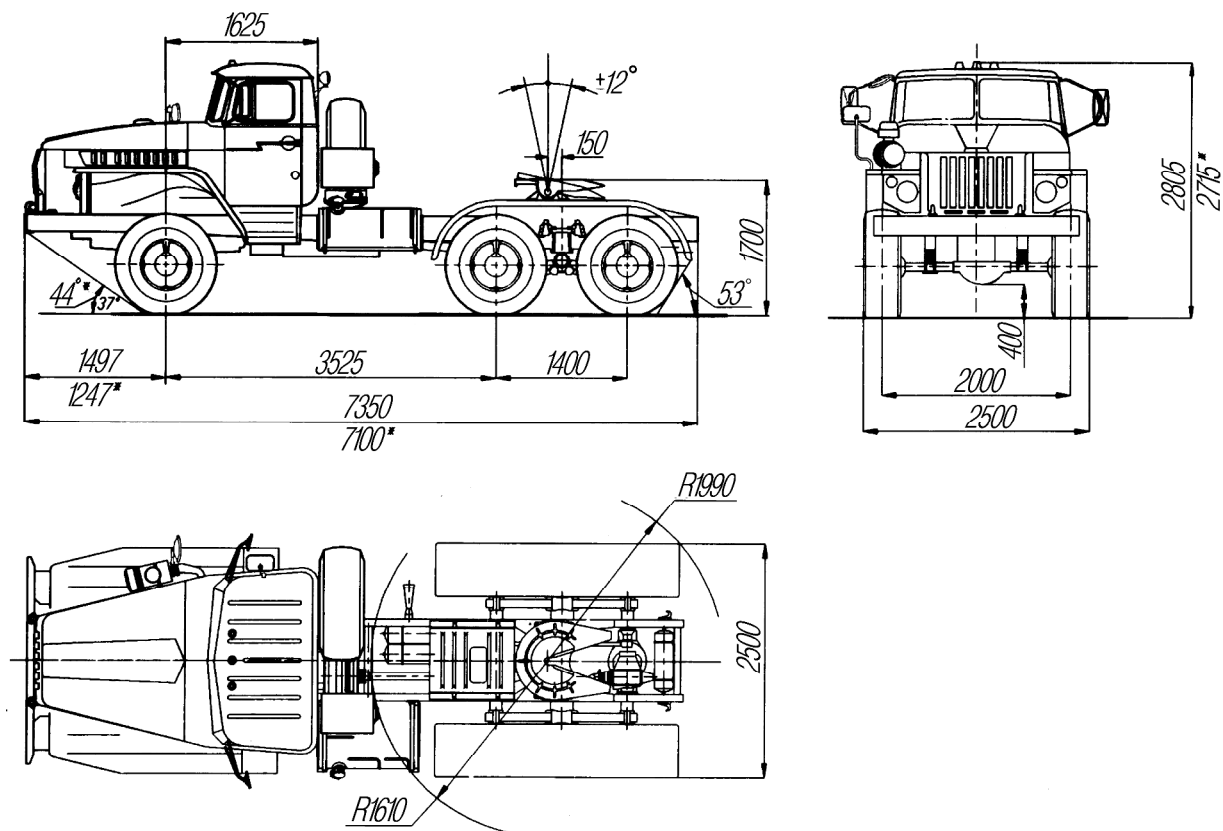


Fig. 8. Overall dimensions of the Ural - 4420 - 31, Ural - 4420 - 10 bolster trucks

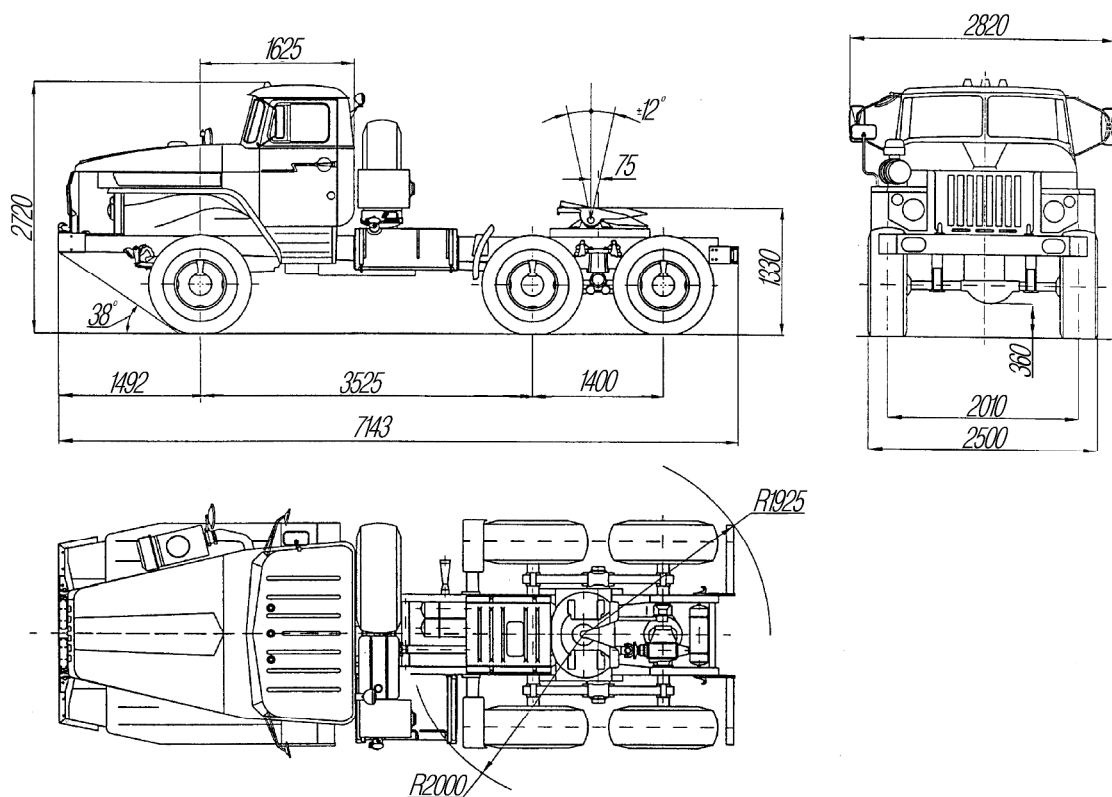


Fig. 9. Overall dimensions of the Ural - 44202 - 0311 - 31 bolster truck

CONTROLS AND INSTRUMENTS

Controls and instruments located inside the cab are illustrated in Fig.10—13.

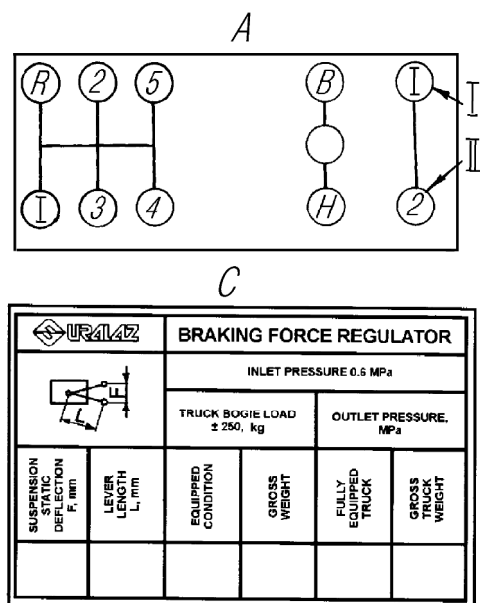


Fig. 10. Instruction Plates Attached Inside the Truck Cab

A – gearbox and transfer box plate located in cab on the right side of the front panel; 1, 2, 3, 4, 5 – gearbox gears; R – gearbox reverse gear; B – high gear ON; H – low gear ON; I – differential unlocked; II – differential locked; C – plate for braking forces regulator data located on interior panel of the cab l.h. door

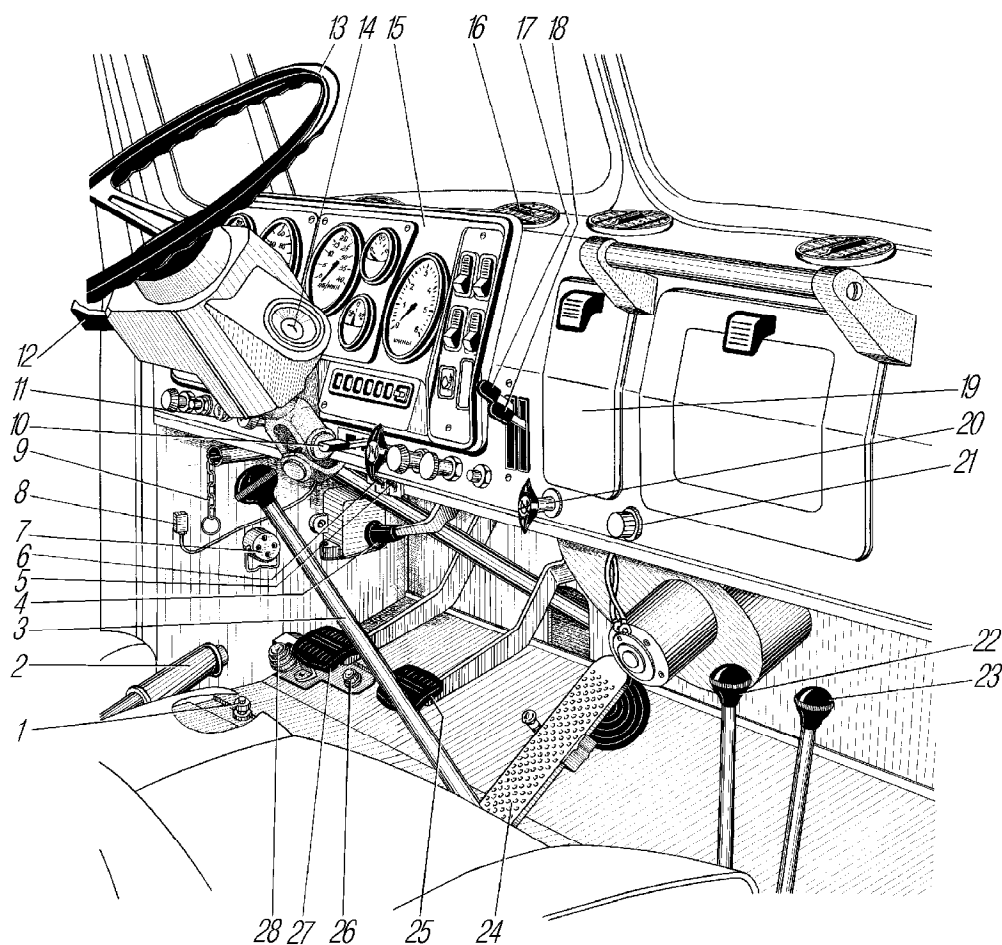


Fig.11. Controls and Instruments

Fig.11. Controls and Instruments:

1 – horn switch; 2 – parking brake lever; 3 – gearshift lever; 4 – outer hatch handle; 5 – power take - off engagement valve; 6 – auxiliary power take - off engagement valve; 7 – portable lamp socket; 8 – air filter clogging indicator; 9 – radiator shutter control chain; 10 – pressure control valve lever; 11 – starter and instruments switch; 12 – turn indicator switch; 13 – steering wheel; 14 – starter and instruments switch*; 15 – dashboard; 16 – deflector; 17 – heating air distributor shutter control lever; 18 – inner hatch lever; 19 – fuse assy hatch cover; 20 – engine manual stop tie rod handle; 21 – trailer brakes disconnecting valve button; 22 – transfer box lever; 23 – transfer box differential interlocking lever; 24 – fuel feed control pedal; 25 – brake pedal; 26 – auxiliary brake control air valve button; 27 – clutch pedal; 28 – head lamp foot change - over switch

Engage the gearbox, transfer box and differential lock as well as the power take - off, auxiliary power take - off according to the plates inside the cab and in accordance with the instructions of the Chapter «Driving Technique».

Pressing button 26 (Fig.11) engages the auxiliary brake, when the foot is taken off the button, braking is stopped. If parking brake lever 2 is shifted up, the truck brakes and the trailer brake system gets engaged.

Handle 4 shifting controls ambient air supply. If lever 17 is set in the upper position, the air is supplied through deflectors for blowing over glasses, in the lower position – for warming driver's and passengers' feet. If lever 18 is set in the upper position, the inner hatch is opened, and in the lower position, it is closed.

For shutting down the engine, pull handle 20 as far as it will go. When switch 12 handle is turned clockwise, the right - turn indicators are switched on, if turned counter - clockwise – the left - turn indicators are switched on.

When switch 28 button is pressed, the head lamp light is changed over (distance light to dimming one and vice versa).

If the truck is outfitted with a central tire control system, a data plate for choosing the tire pressure and travelling speed, depending on the kind of road, is fixed in the cab on the left side of the front panel.

The tire pressure valve control lever can be set in three positions:

- left - hand – for inflating the tires;
- middle – neutral, pressure gauge 11 (Fig.12) indicates the actual air pressure in tires;
- right - hand – for deflating the tires.

The radiator shutter is controlled via chain 9 (see Fig.11). When pulling the chain, the shutter rises.

For switching on or off the truck storage batteries, press button 22 (see Fig.12) on the dashboard.

The engine starting preheater is controlled from the panel mounted under the hood on the radiator left - hand side.

The alarms are switched on by pressing button 18, in so doing all the turn indicators and the button pilot lamp start flashing.

The constant engine speed is set by pulling knob 20; to avoid drive breaking, the fuel feed control pedal should be pressed prior to it. The engine speed is checked by tachometer 7. If the latter gives no readings, switch on any load (the heater, instrument illumination, etc.), in so doing the tachometer will begin to show the engine speed.

* For the trucks delivered for civil needs

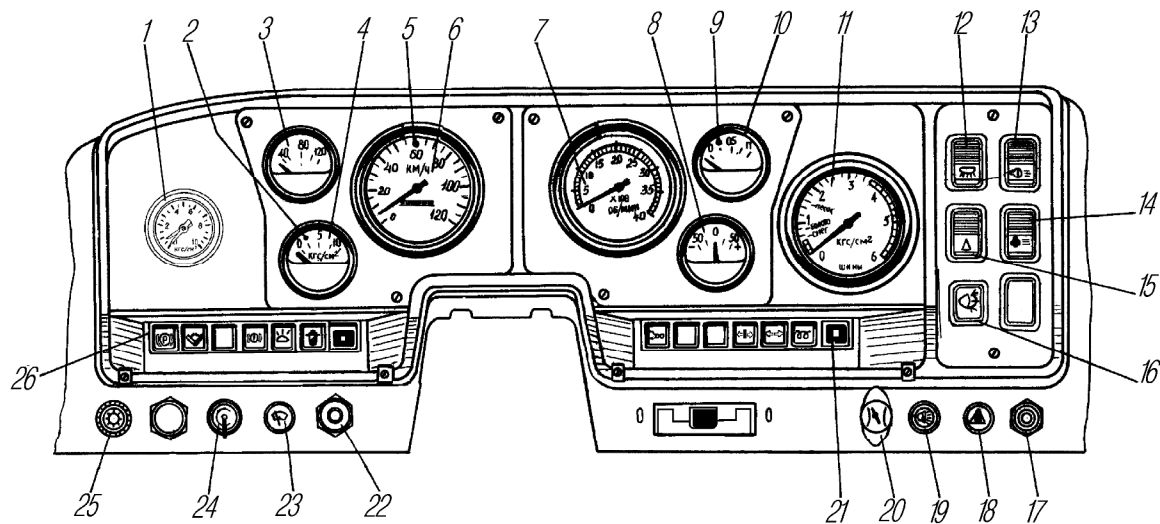


Fig.12. Dashboard:

1 – two–pointer pressure gauge; 2 – oil pressure emergency drop lamp; 3 – coolant temperature indicator; 4 – oil pressure indicator; 5 – headlamp upper beam pilot lamp; 6 – speedometer; 7 – tachometer; 8 – current indicator; 9 – fuel reserve indicator; 10 – fuel level indicator; 11 – tire pressure gauge; 12 – cab roof lamp switch; 13 – flood head lamp switch; 14 – cab heater switch, 15 – road train sign light switch; 16 – rear fog head lamp switch (with built - in alarm); 17 – glow - plug preheater switch button; 18 – light alarms switch; 19 – headlamps master switch; 20 – manual fuel - feed control knob; 21, 26 – r.h. and l.h. pilot lamps assemblies; 22 – storage battery switch button; 23 – wind - shield wiper & washer switch; 24 – starter and instruments switch; 25 – instruments illu - mination rheostat - type switch

The power - supply system operation is checked by current indicator 8. a position of the pointer between marks «0» and « - » indicates storage battery discharge, that between «0» and « + » – charged storage battery.

Air pressure in the brake air system is checked by two - pointer pressure gauge 1; each pneumatic drive circuit has valve outlets which are to be connected with a portable pressure gauge to check the air pressure.

On the trucks supplied for the civil market the starter and instrument switch is located on the steering column and has four positions of its key:

0 – OFF, the position is fixed and the key can not be taken out;

I – the instruments are ON, the position is fixed and the key can not be taken out;

II – the starter is ON, automatic return to position I, the key can not be taken out;

III – parked, the position is fixed and the key can be taken out with the non - running engine and switched off storage batteries..

The starter and instrument switch consists of contact and lock parts. The lock part has an anti - joy ride device and a locking device that prevents a possibility of repeated switching on the starter.

The operation of the anti - joy ride device lies in moving out the locking bar after taking the key out of the lock and the bar enters the steering shaft slot and locks the shaft.

After the key has been taken out of the lock, it is necessary to make sure that the steering has been locked by turning the steering wheel to the right and left. If an increased effort has to be applied, when turning the key from the "Parking" position, the steering wheel should be swung to the left and right.

When the starter and instrument switch is set in position III, the power is supplied to the electromagnet solenoid of the electropneumatic valve; the electromagnet pole core moves and actuates the system of valves in the pneumatic part and the air from the air distributing spider of the brake system is supplied to the engine stop pneumatic cylinder and in so doing it cuts off the fuel feeding to the engine cylinders.

The terminals on the starter and instrument switch are marked as follows: blue – 15/2, blue and black – 15/1, yellow – P, red – 50, brown – 30/1, pink – 30, black – INT.

Starter and instrument switch 24 on the dashboard has three positions:

0 – vertical: the starter and instruments are switched off and the key can be taken out;

I – intermediate: the key is turned clockwise till the first fixed position is reached – the instruments are switched on;

II – extreme: the key is turned clockwise as far as it goes – the instruments and starter are switched on.

When starter & instruments switch 24 is on, oil pressure alarm drop lamp 2 turns on (red colour). After the engine is started and the engine speed exceeds its minimum value, the lamp turns off.

Illumination of the dial can be adjusted by turning the knob of switch 25.

The windshield wiper and washer are switched on by turning switch 23. The switch has four positions: I – switched off; II & III – low and high speeds of wiper blades; IV – high speed of wiper blades & windshield washer pump ON.

The glow-plug preheater operates if button 17 is held pressed. When pilot lamp 8 (Fig.13) turns on, it indicates that the glow-plug preheater becomes ready for starting the engine.

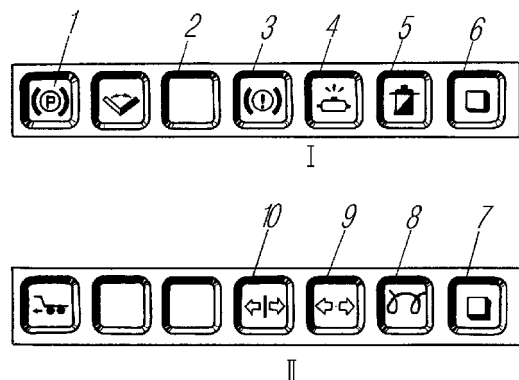


Fig.13. Pilot Lamp Assemblies:

I – left - hand assembly; II – right - hand assembly; pilot lamps: 1 – parking brake; 2 – coolant temperature emergency rise; 3 – brake failure; 4 – pneumatic system minimum air pressure; 5 – oil filter clogging; 6, 7 – pilot lamps test buttons; 8 – glow-plug preheater actuation; 9 – truck turn indicators; 10 – trailer turn indicators

When buttons 6, 7 are pressed, all the pilot lamps of the l.h. or r.h. assemblies, which are in good working order, turn ON.

Pilot lamp 9 gives flickering green light after the truck right- or left- turn indicator has been switched on; pilot lamp 10 goes on after the trailer right - or left- turn indicator has been switched on. These pilot lamps also serve to control the working order of the truck and trailer indicator lamps.

If the air pressure in the bottles drops below 450 kPa (4.5 kgf/cm²), lamp 4 gives red light and the sound alarm is switched on.

If clearances between the brake shoes and drums are increased, and also if the drive hydraulic part fails, when the brake pedal is pressed, lamp 3 gives red light and goes off, after the fault is remedied.

The necessity of maintaining the air filter cardboard filtering element should be determined by the readings of the air filter clogging indicator 8 (see Fig.11), which is located on the side lower distance bar of the cab front.

If resistance in the oil filter rises (clogging of the filtering elements, solidifying of oil at lower temperatures), lamp 5 (see Fig.13) gives red light. The lamp being ON is only admissible when the engine is being started or being warmed. Pilot lamp 2 gives the red light, if the coolant temperature rises above 98 °C. It is allowed to run the engine for a short time (not more than two hours) at a temperature up to 105 °C.

Pilot lamp 1 gives flickering red light when the parking brake is engaged.

Fuel level indicator 10 (see Fig.12) shows the fuel level in the main fuel tank. Fuel reserve indicator 9 is built into the dial of the indicator and goes on when the fuel volume decreases down to 60 l.

Oil cooler cock (Fig.14) is mounted on the left side of the cylinder block in the direction of the truck movement. To cut off the oil cooler turn the cock knob clockwise as far as it will go.

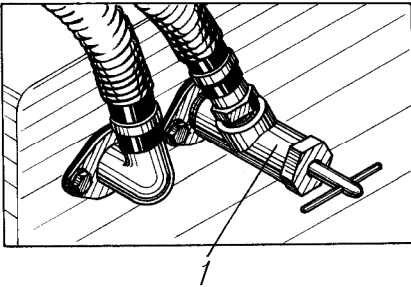


Fig. 14. Oil Cooler Cock:
1 – cock

Auxiliary fuel tank cock. When using the fuel contained in the auxiliary tank, pour over it into the main fuel tank by opening the cock with cock control handle 1 (Fig.15).

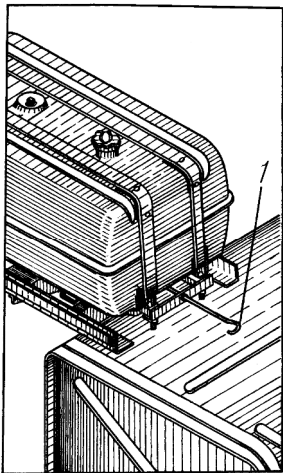


Fig. 15. Auxiliary Fuel Tank:
1 - cock control handle

Manual fuel feed pump is mounted on the low - pressure priming pump casing. For delivering the fuel to the injection pump, while the engine is not running, press down handle 1 slightly (Fig.16), turn it counter - clockwise to release it from the fixed position and reciprocate it up and down. Having pumped in the fuel manually, press the handle and fix it by turning clockwise as far as it will go.

Coupling head (Fig. 17) is intended for connecting the truck air system with that of the trailer or semi - trailer.

Air take - off valve is mounted under the hood on the cab panel. For taking off the air, turn off valve plug 1 (Fig. 18), screw the capture nut of the hose available in the tools kit onto the valve body.

Towing valve (Fig. 19), mounted on the right-hand bracket of the front bumper, is intended for supplying air to the truck brake system, when towing it with the faulty engine.

To connect the towing truck to the truck air line unscrew plug 1 of the towing valve. Connect the air hose with the coupling head available in the driver's tools kit, to the feeding line of the towing truck, (red coupling head) and towing valve of the truck to be pulled.

Winch control levers are shown in Fig. 20. The use of the winch is described in section «Winch».

Storage battery switch (Fig.21) is mounted on the battery box bracket. If the remote control system fails, the switch can be turned on or off by pressing the button under the rubber cover.

External start socket is located on the battery box bracket. Using the plug delivered with each truck, it is possible to start the engine from an external d.c. source.

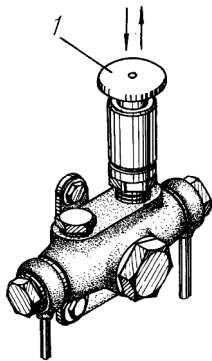


Fig.16. Manual Priming Pump:
1 – pump handle

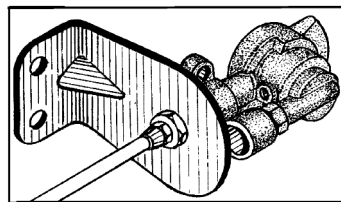


Fig.17. Coupling Head

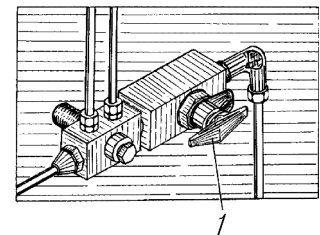


Fig. 18. Air Take – Off Valve:
1 – plug

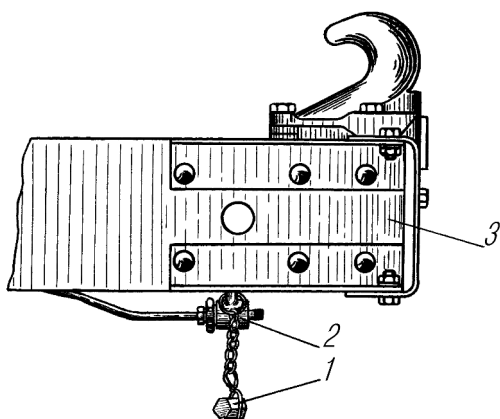


Fig. 19. Towing Valve:
1 – plug; 2 – valve; 3 – r.h. side member

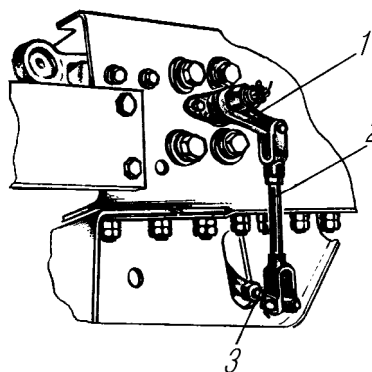


Fig. 20. Winch Control Levers:
1 - control lever; 2 – tie rod; 3 – actuating lever

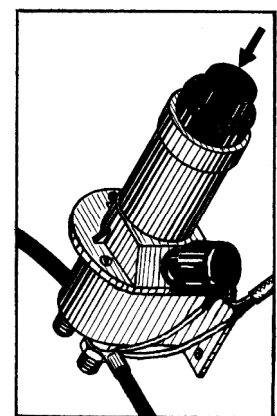


Fig. 21. Storage Battery Switch

DESIGN, OPERATION, ADJUSTMENT AND SERVICING OF TRUCK COMPONENTS (BRIEF DESCRIPTION)

ENGINE

The truck is powered with the engine manufactured by the Yaroslavl Motor Works. Description of engine design as well as instructions for engine operation and maintenance are given in the Operation Manual issued by the Yaroslavl Motor Works, which is supplied with the truck.

Fuel System

Engine Fuel System. Fuel is taken from main fuel tank 1 (Fig. 22) by fuel feed pump 8 and is supplied to injection pump (high - pressure fuel pump - HPFP) 10 via coarse - mesh filter 22 and fine - mesh filter 13.

The injection pump delivers fuel via pipes to the injectors, which inject fuel into the engine cylinders in accordance with the firing sequence. Excessive fuel together with air, which has entered the fuel system, are returned to the fuel tank through the orificed valve of the fine - mesh filter via fuel lines 15 and 17. The fuel, which has oozed through the injector's precision parts is also returned to the fuel tank via pipes 6 and 23. The fuel volume in the main fuel tank is measured by an electrical level gauge installed in the tank and is controlled by the indicator on the dashboard.

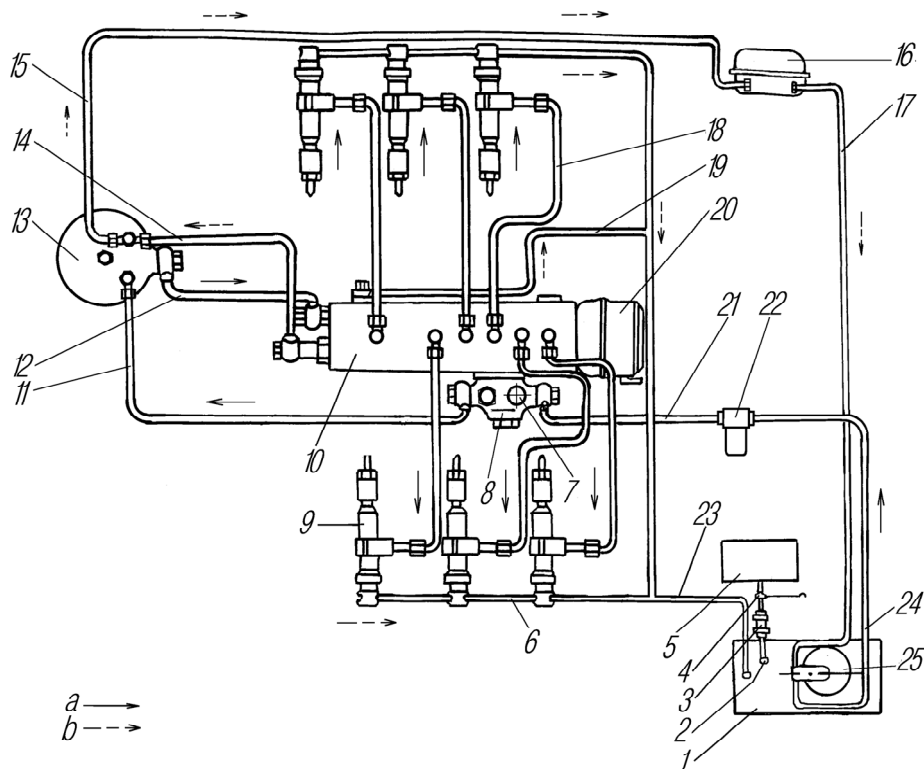


Fig. 22. Fuel System Diagram

Fig. 22. Fuel System Diagram:

1 - main fuel tank; 2,6,14,15,17,19,23 - return fuel lines; 3 - fuel drain hose; 4 - fuel drain cock; 5 - reserve fuel tank; 7 - manuel fuel feed pump; 8 - low - pressure fuel pump; 9 - injector; 10 - injection pump; 11,12,21,24 - low - pressure fuel pipes; 13 - fine - mesh fuel filter; 16 - starting preheater fuel tank; 18 - high - pressure fuel pipes; 20 - speed governor; 22 - coarse - mesh fuel filter; 25 - fuel intake; a - fuel sunction line; b - fuel return line

Fuel Feed Control is of mechanical type, including a pedal, tie rods, control levers and engine stop control.

The pedal being in free position the control lever should thrusts against the minimum idle - speed limiting bolt available on the speed governor, this is obtained by adjusting the tie rod's 2 length (Fig. 23). The pedal being pressed down fully clearance "b" should be 2 - 3 mm at maximum speed.

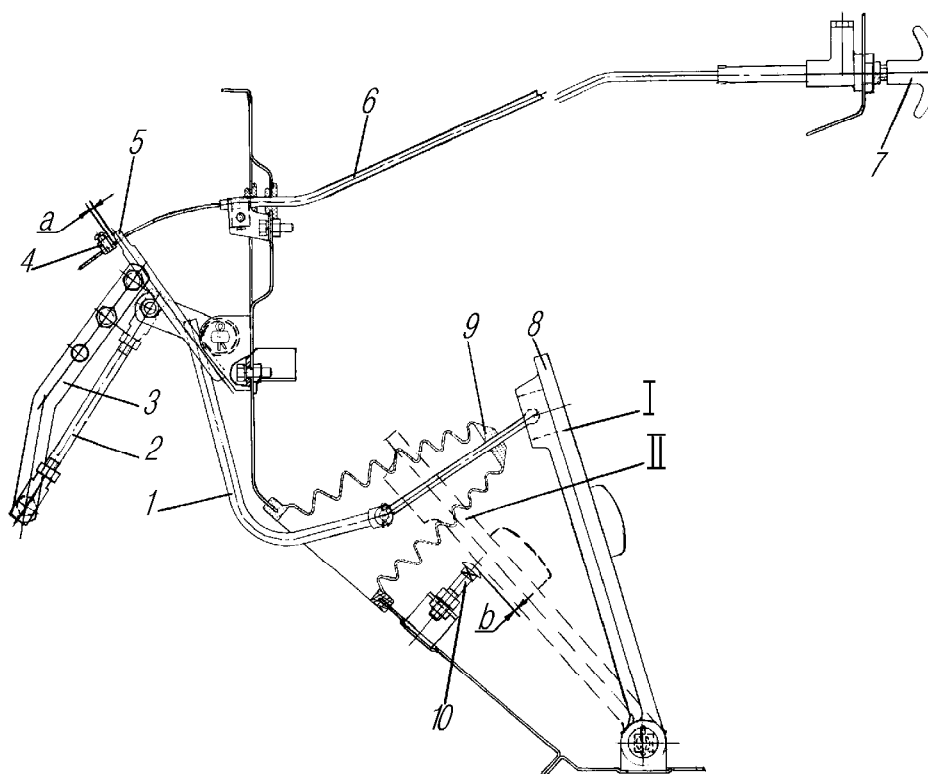


Fig. 23. Fuel Feed Control:

1 - governor control shaft lever; 2 - tie rod; 3 - governor control lever; 4 - rope wire clamp; 5 - linkage hand lever; 6 - manual control tie rod; 7 - tie rod knob; 8 - pedal; 9 - seal; 10 - adjusting bolt; I - pedal position with engine running at minimum idle-speed; II - pedal position with engine running at maximum speed and maximum power; a,b - clearances

When adjusting manual fuel feed control shift tie rod 6 till knob 7 thrusts against the panel and ensure clearance "a" between manual control lever 5 and rope wire clamp 4 within 2 - 3 mm.

To stop the running engine knob 4 (Fig. 24) should be pulled out as far as it will go. When adjusting the engine stop control, shift knob 4 until it thrusts against the panel and ensure clearance "a" between engine stop lever 7 and rope clamp 6 within 2 - 3 mm.

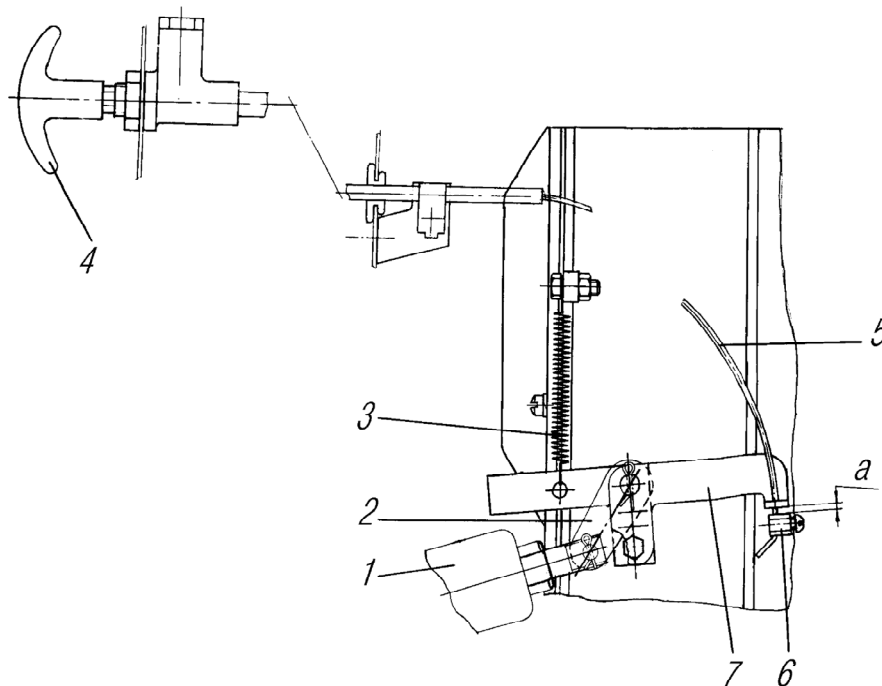


Fig. 24. Manuel Engine Stop Control:

1 - air cylinder; 2 - air cylinder lever; 3 - return spring of engine stop lever; 4 - tie rod knob; 5 - engine stop tie rod; 6 - rope clamp; 7 - engine stop lever; a - clearance

Engine Air System consists of an air filter, inlet pipelines, connecting hoses and fixing elements.

The air filter is fitted on the right-hand truck fender by means of brackets and clips. The inlet pipelines are located on the engine.

A fabrication gauze with gasket is provided between the nozzle (air intake) and the inlet manifolds connecting pipe, the gauze must necessarily be removed after running - in the engine, while the gasket remains.

Air is supplied to the air filter via the air suction pipe. Air received in the filter due flowing through the swirler obtains rotary motion in the annular gap between the housing and filter element; under centrifugal force dust particles are thrown to the housing wall and collected in the dust bin through a slit in the baffle. Then, the preliminary cleaned air flows through the filter element, where it is cleaned finally.

The filter element is provided with a precleaner presenting a nonwoven sleeve fitted on its outer surface on purpose to extend the filter element's service life.

The necessity of filter element maintainance should be determined by the readings of the air filter clogging indicator located in the driver's cab. When maintaining, dust should be removed from the dust bin, the precleaner and filter element should be cleaned.

For maintaining the air filter unlock four catches and remove the cover, unscrew the nut fixing the filter element and take out the cardboard element

Untie the tape and take off the precleaner. Take the plastic swirler out of the filter housing. Inspect visually the filter element. A thin coating of dust on its inner side indicates that the element, or its sealing gaskets are not tight. In this case replace the filter element.

Wash in hot water the plastic swirler taken out of the filter housing.

If need be, dismantle the filter housing from the truck, wash it in hot water and dry.

Dislodge dust from the precleaner by shaking it or blowing through with dry compressed air. If no ash or soot is seen on the element cardboard, (element colour is grey), the element itself bearing no mechanical injuries, blow it through with dry compressed air until dust is blown off completely.

To avoid tearing of the cardboard, the air pressure should not exceed 200 - 300 kPa (2 - 3 kgf/cm²). When blowing, direct the air jet at an angle, adjust its force by changing the hose - to - element distance.

If soot or oil are seen on the cardboard, or if the blow-over with compressed air proves ineffective, wash the element in warm water (40 - 50 °C) with a detergent dissolved in it.

Immerse the element in the solution for half an hour, then rotate or dip it vigorously during 10 - 15 min. After washing in the solution, rinse the element in fresh water and dry. Do not dry it above open fire or in air heated over 70 °C.

After each servicing or fitting a new element a visual inspection of its condition should be made, illuminating it with a bulb.

Replace the element if mechanical injuries, cardboard broken corrugations or ply separations are evident.

When reassembling the air filter check sealing quality by an uninterrupted imprint on the gasket.

The estimated service life of the cardboard filter element is 30 000 km. More frequent cleaning of the filtering element might reduce its service life, since total attempts of element servicing are limited (to 5 - 7 attempts including washing 3 times maximum) because of possible cardboard disruption.

Upon performing maintenance of the air filter set the indicator drum to its working position.

Engine Starting Preheating System

Engine starting preheating system is intended for warming the engine at negative ambient temperatures.

Technical data of starting preheater

Model	ПЖД30Г
Heating capacity, kW (kcal/h)	30 (26 000)
Fuel	as used for engine
Fuel consumption, kg/h	4.2

Engine starting preheating system comprises:

- heat exchanger 12 (Fig. 25) located on the first cross-member of the truck frame;
- pump unit 7 (electric motor, fan, fluid and fuel pumps), located on the right-hand side-member of the truck frame;
- fuel tank 4 with cock 5;
- high-voltage source;
- ignition plug 7 fitted on the heat exchanger;
- preheater control console comprising switches of electric fuel heater, plug, pump unit and solenoid valve. The console is located on the cooling system radiator left side;
- pipelines;
- gas branch pipe 9;
- oil sump casing 8 (not available on certain truck variants).

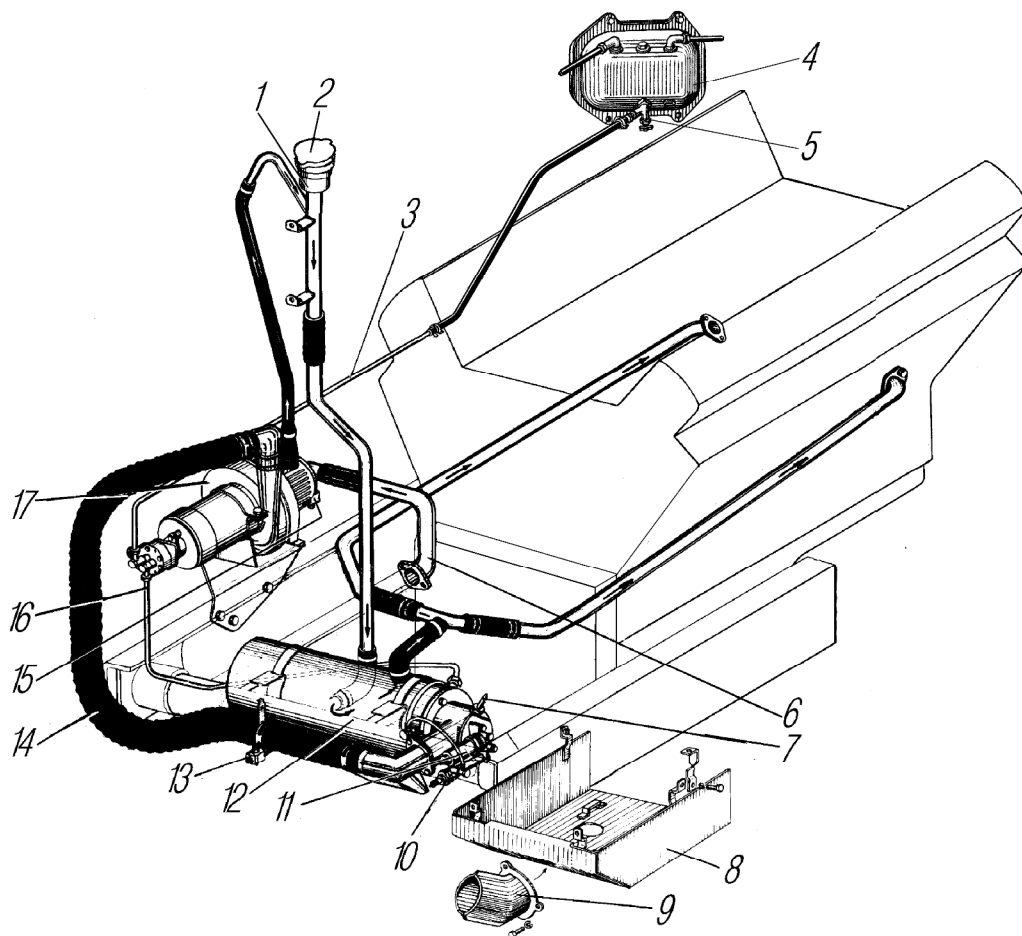


Fig. 25. Engine Starting Preheating System:

1 - filler; 2 - filler cover; 3 - fuel pipe from preheater tank to pump unit; 4 - fuel tank; 5 - straight-through cock; 6 - delivery pipe from water pump; 7 - spark plug; 8 - oil sump casing; 9 - gas branch pipe; 10 - electric fuel heater; 11 - solenoid valve; 12 - starting preheater heat exchanger; 13, 15 - drain cocks; 14 - air line hose of electric fan; 16 - fuel pipe from pump unit to heat exchanger; 17 - pump unit

The removable burner is bolted to the heat exchanger. Plug 7, solenoid valve 11 in assembly with the injector and electric fuel heater 10 are fitted on the burner.

The solenoid valve cuts in and off the fuel to the burner.

The injector fitted in the solenoid valve body sprays fuel needed for combustion.

The electric heater warms the fuel portion before starting the preheater.

The electric spark firing system ensures inflammation of fuel and air mixture during starting.

The fuel tank contains the fuel stock required for preheater operation. It is connected with engine fuel system via fuel lines, and is always filled with fuel when the engine runs. If need be, it can be filled by means of the engine's manual fuel feed pump.

The preheater operates as follows: The fuel pump takes fuel from the preheater tank and injects it into the burner under pressure, with solenoid valve opened. In the burner fuel mixes with air, gets ignited and burns, heating the fluid in the heat exchanger. The fluid is forced by the pump through the pipelines, through cylinder block in the direction shown by arrows in Fig. 25.

Combustion products are directed via the gas branch pipe under the engine oil sump and warm oil in it. Fuel is cleaned when passing the filters provided in the solenoid valve and injector.

Starting Preheater Service. Remember that violating the operation rules as well as operating a faulty preheater may cause fire. See that there are no coolant and fuel leaks through the joints of pipelines, hoses and cocks; see that the clips on the heat exchanger branch pipes and pipelines are tight.

Do not fill water in the overheated (due to fluid lack) heat exchanger so as to preclude its damage; cool down the heat exchanger before filling water.

After truck washing or ford passing remove water which entered the preheater air duct by operating the pump unit during 2 - 3 min.

Take care that the preheater fuel pump is adjusted correctly.

When preparing the truck for winter operation proceed as follows:

- screw the transport plug out of the fuel pump drain hole. When returning to summer operation, screw it in;
- open the cock of the preheater fuel tank and leave it opened throughout the winter period of operation. When returning to summer operation, close the fuel cock;

- check the heat exchanger and pump unit for proper fastening, clean all the instruments of dirt; check the wires for good condition and the control console for proper fastening. Clean the heat exchanger gas duct and combustion chamber. For this purpose disconnect the air supply hose and blow through the heat exchanger, combustion chamber and gas duct. Clean the drain pipe of the heat exchanger burner in order to eliminate fuel accumulation;

- remove carbon deposit from the electrode and insulator of the spark plug. Disassemble and wash in kerosene or acetone the injector and its fuel filter as well as the solenoid valve fuel filter;

- check the preheater fuel pump for correct adjustment. The optimum fuel feed to the combustion chamber is determined in service by a steady preheater operation with no flame ejection out of the heat exchanger.

The fuel consumption should be adjusted by the fuel pump reduction valve (Fig. 26). To change the fuel volume supplied through the injector, screw out cap nut 7 on the fuel pump, unlock adjusting screw 6 and turn the latter to the right for increasing, and to the left for decreasing of the fuel feed.

Preheater operation with naked flame at the outlet is not allowable. On completion of the adjustment lock the adjusting screw with lock nut 5 and screw on cap nut 7.

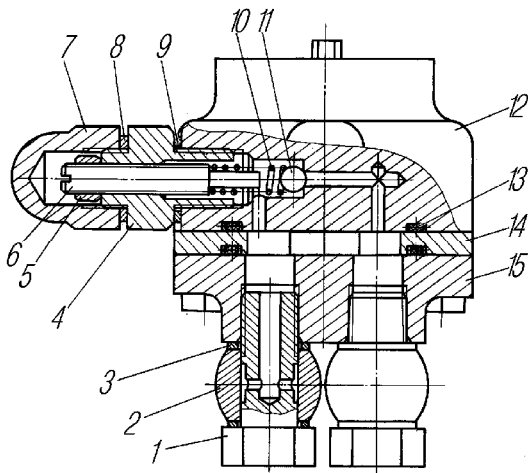


Fig. 26. Fuel Pump Reduction Valve:
1 - fuel line bolt; 2 - swivel elbow;
3,8,9,13 - packing rings; 4 - union; 5,7 - nuts;
6 - adjusting screw; 10 - spring; 11 - ball; 12 - fuel pump body; 14 - spacer; 15 - fuel pump cover

Gas Exhaust System

Gas exhaust system is intended for removal of waste gas and reducing of exhaust noise. Displacements of silencer inlet pipes about the silencer caused by mounting and operating processes are absorbed by compensators 3 (Fig. 27). Reliable operation of the compensators is ensured by their arrangement in one and the same plane. This is obtained by turning silencer 4.

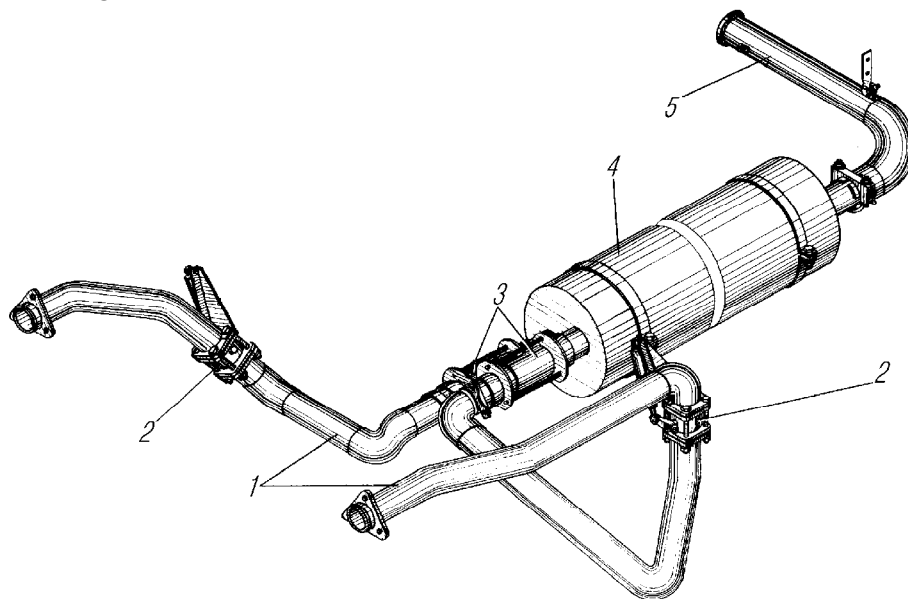


Fig.27. Gas Exhaust System:

1 - inlet pipes; 2 - auxiliary brake; 3 - compensators; 4 - silencer; 5 - exhaust pipe
Cooling System

The engine cooling system is of liquid, closed type, with forced coolant circulation and is designed for operation with low - freezing coolants (Fig. 28).

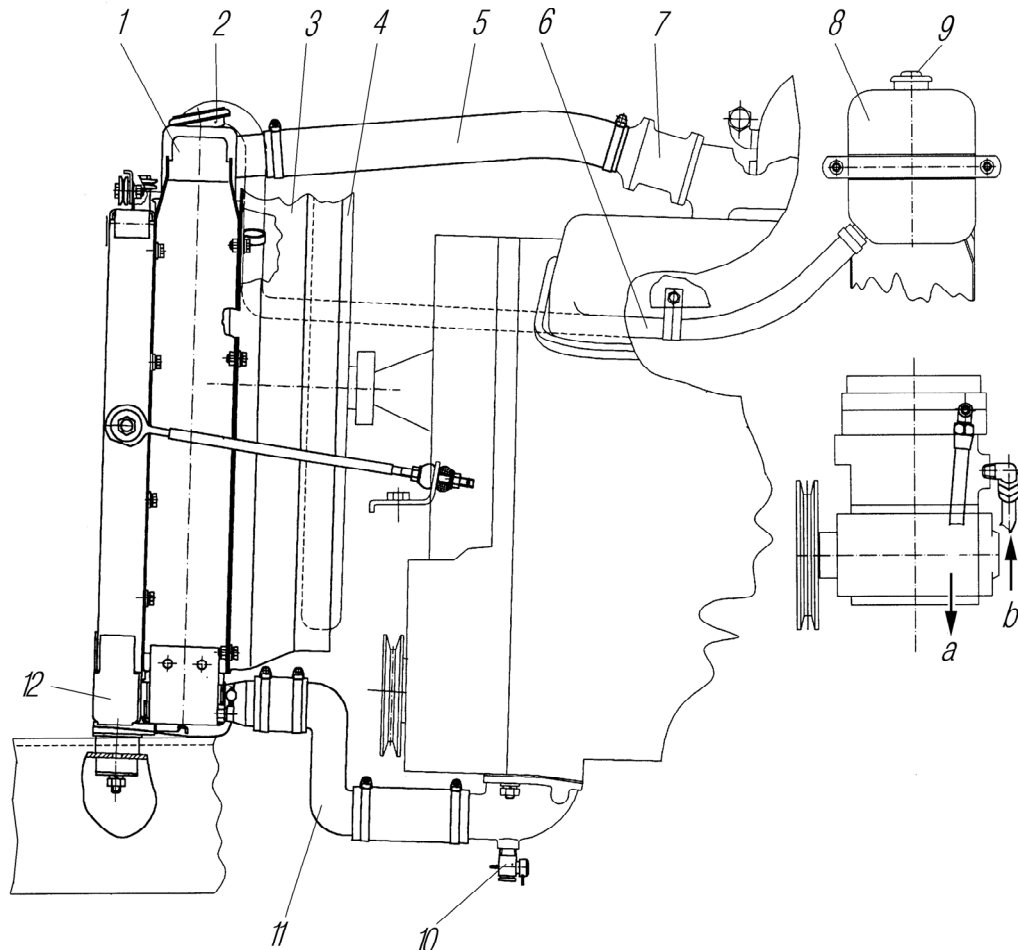


Fig. 28. Cooling System Diagram:

1 - radiator; 2 - filler with plug; 3 - housing; 4 - fan; 5 - water return hose; 6 - bypass hose to expansion tank; 7 - thermostat box; 8 - expansion tank; 9 - expansion tank plug; 10 - drain cock; 11 - water supply pipe; 12 - frame with radiator blade; a - coolant return from compressor; b - coolant supply to compressor

At an ambient temperature down to minus 40 °C use ОЖ - 40 «ЛеНа» coolant, alternatively the ТОСОЛ - А - 40М one. At 20 °C the density of ОЖ - 40 «ЛеНа» coolant should be 1.075 - 1.085 g/cm³ and that of ТОСОЛ - А - 40М, 1.078 - 1.085 g/cm³.

At an ambient temperature minus 40 °C and below use ОЖ - 65 «ЛеНа» coolant, alternatively the ТОСОЛ - А - 65М one. At 20 °C the density of ОЖ - 65 «ЛеНа» coolant should be 1.085 - 1.100 g/cm³ and that of ТОСОЛ - А - 65М, 1.085 - 1.095 g/cm³.

In case of emergent coolant loss it is allowed to use water. Drain water and fill low - freezing coolant at the earliest opportunity.

The coolant temperature in the cooling system should be within 75 – 100 °C.

The radiator is of corrugated – fin, four - row type. A tight plug provided with two valves is fitted on the upper tank filler of the radiator. The gauge pressure in the system being 65 kPa (0.65 kgf/cm²) the outlet valve opens and lets excessive liquid and steam pass to the expansion tank, while the inlet valve opens at a pressure of 1 - 1.2 kPa (0.01 - 0.012 kgf/cm²) and admits liquid from the tank to enter the radiator.

The expansion tank made of plastic is located on the bracket of the right - hand side part of the truck hood and is connected by pipe with the filler of the radiator upper tank. The expansion tank serves to compensate volume changes of coolant as the latter expands from its heating.

Control over coolant temperature in the cooling system is performed by the indicator installed in the dashboard. The indicator sender is fitted in the water - collecting pipe.

When the temperature in the cooling system reaches 98 °C the coolant overheating alarm lights up. This alarm warns that it is necessary to detect the reason of engine overheating and eliminate it.

In special situations it is possible to continue travelling with the lighting alarm provided that the coolant temperature indicator is carefully observed. A short - time temperature rise (for 120 min maximum) up to 105 °C is permissible.

When adjusting tension of the belts driving the water pump proceed as follows:

- drain water from the cooling system;
- disconnect the water supply pump from the water pump;
- unscrew the nuts fastening the pulley side part by turning the pulley. Remove one or two of shims (Fig. 29). Fit the shims on the outer side of the pulley side part and consecutively tighten up the nuts turning the pulley through after tightening each nut.

Then check the belt for correct tension. When replacing the aged belt by a new one fit all the shims between the nub and attached side part of the pulley and adjust belt tension as described above.

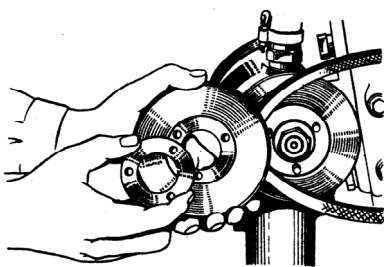


Fig. 29. Removal of Shims

Inspection of low - freezing coolant level. Inspect the coolant level on cold engine because its volume varies at different temperatures (see the Lubrication Chart).

Fill coolant in the cooling system of cold engine through the radiator filler. When priming the system the plugs of preheater's filling pipe and heater's cook shall be open. Before checking the coolant level start up the engine for 1 - 2 min for bleeding air out of the system. On stopping the engine add coolant, if need be.

When priming for the first time put into the filler 23 g of НИИСС-1 sealing powder, Specs. 38.10270 - 78.

After disassembly of any of cooling system's connections add the powder, if necessary.

Water level in the cooling system should be inspected on cold engine. Fill water in the cooling system of cold engine through the radiator filler with the plugs of preheater's filling pipe and heater's cook being open. At temperatures below 0 °C open the heater's cook upon warming the engine only and add water in the radiator up to the filler's upper edge. In cool season disconnect the connection hose from the expansion tank and direct it downwards having fixed the clip under the bolt fastening the fan housing. In warm season do not disconnect the hose from the tank.

To drain the coolant from the cooling system place the truck flat, or inclined forward, and open three cocks available on the heat exchanger, preheater pump unit and water pump inlet branch (on the right - hand side as viewed in the truck travel's direction).

In doing so, the plugs of radiator's filler and preheater's filling pipe shall be open.

The estimated volume of the coolant not drained with the cab heater's cook being open amounts to 2 l.

If water was used in the cooling system then, when draining it, do the following:

- upon draining water from the cooling system and starting preheating run the pump unit for 10 - 15 sec to remove water from the pump in order to avoid freezing - on of the impeller, then close turn off all three drain cooks after the water is drained fully;

- upon draining water from the cooling system do not plug the radiator filler and preheater's filling pipe because they may possibly freeze on.

Do not run engine upon draining the coolant to remove the remaining water from the system. That can cause failure of rubber packing rings of cylinder liners, falling out of valve seats, burning - through and distortion of block hands.

Power Unit Mounting

The power unit is mounted on four resilient supports: front, rear and two centre supports — the right - hand and left - hand ones.

The front and centre supports are of bearing type. The rear support, a holding one, is mounted in unloaded condition using adjusting plates 9 (Fig. 30). The power unit is mounted on beams 3 and 11 with its front and rear supports, and with its centre supports on the brackets, which are secured to the truck frame.

Brackets 2, 7, 12 serve as supports for the power unit. Front support bracket 12 is secured to the engine block front cover, while centre support brackets 2 to the flywheel housing, and rear support bracket 7 to the rear end face of the gearbox.

Cushions 1 of the left - hand and right - hand centre supports are interchangeable.

Also cushions 4 and shock absorbers 5 of the front and rear supports are interchangeable.

0 - 1 mm clearance between cushion 4 and rear support bracket 7 should be maintained to mount the rear support in unloaded condition.

For this purpose perform adjusting in the following sequence of operations:

1. Unscrew nuts 8 and undo bolts 10.
2. Remove adjusting plates 9.

3. Measure the clearance between bracket 7 and cushion 4.
A clearance exceeding 1 mm should be eliminated by using adjusting plates 9.
4. Fit bolts 10 and tighten nuts 8.

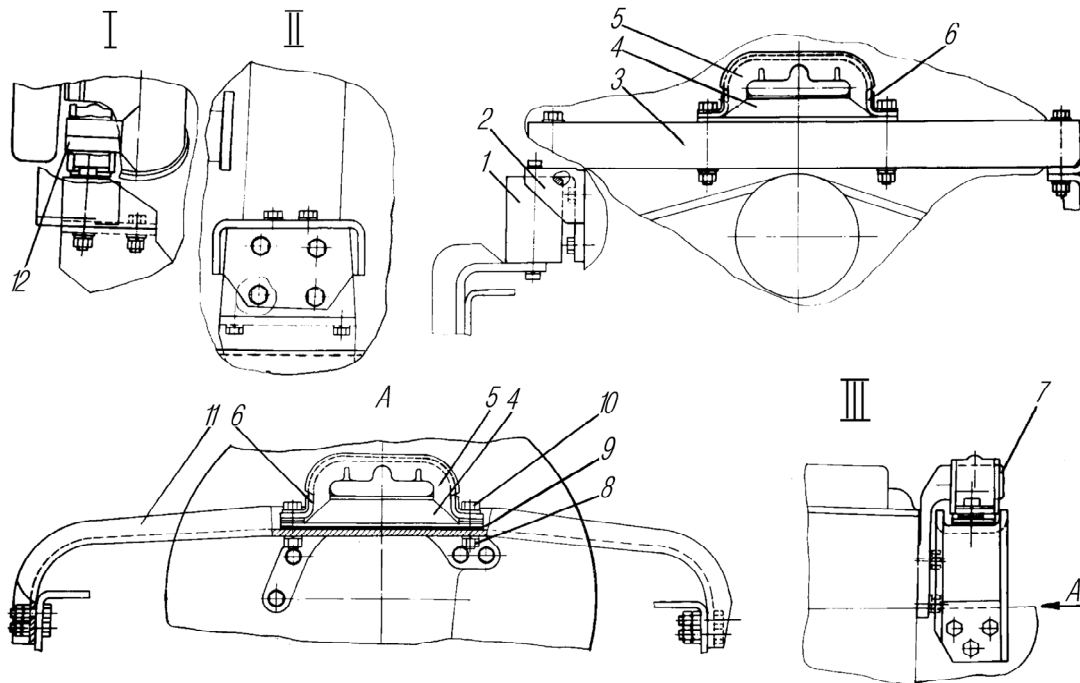


Fig. 30. Power Unit Mounting:

1 - center support cushion; 2 - center support bracket; 3 - front support beam; 4 - front and rear support cushion; 5 - front and rear support shock absorber; 6 - front and rear support clamp; 7 - rear support bracket; 8 - nut; 9 - adjusting plates; 10 - bolt; 11 - rear support beam; 12 - front support bracket; I - front support; II - centre supports; III - rear support

TRANSMISSION

Description of clutch and gearbox design as well as instructions for their operation and maintenance are given in the Operation Manual issued by the Yaroslavl Motor Works.

Clutch Release Control

Clutch release control is of mechanical type, with air booster. Air cylinder 20 (Fig. 31) of the booster is mounted on the gearbox housing and actuates shaft lever 18 of the clutch release fork. The cylinder is controlled by air valve 1, which is fitted on tie rod 4. Hose 8 connects valve 1 with the truck's air system.

When acting on clutch pedal 16, the effort is transmitted via lever 11 and the part of tie rod 9 to the rod of air valve 1, opening it. Compressed air from the truck's air system arrives at cylinder 20 via hose 19, which additionally is acting on lever 18.

To adjust opening moment of the air valve, provided that air is available in air system of the truck, follow this procedure :

- disconnect hose 19 from valve 1;
- unscrew adjusting bolt 3 ensuring clearance between the bolt and valve rod;

- depress clutch pedal 16 so that the effort will increase considerably;
- screw bolt 3 till the valve opens (air gets out of the control line of valve 1);
- complete screwing in of adjusting bolt 3 through 0.5 - 1.0 of a turn and lock it with nut 2.

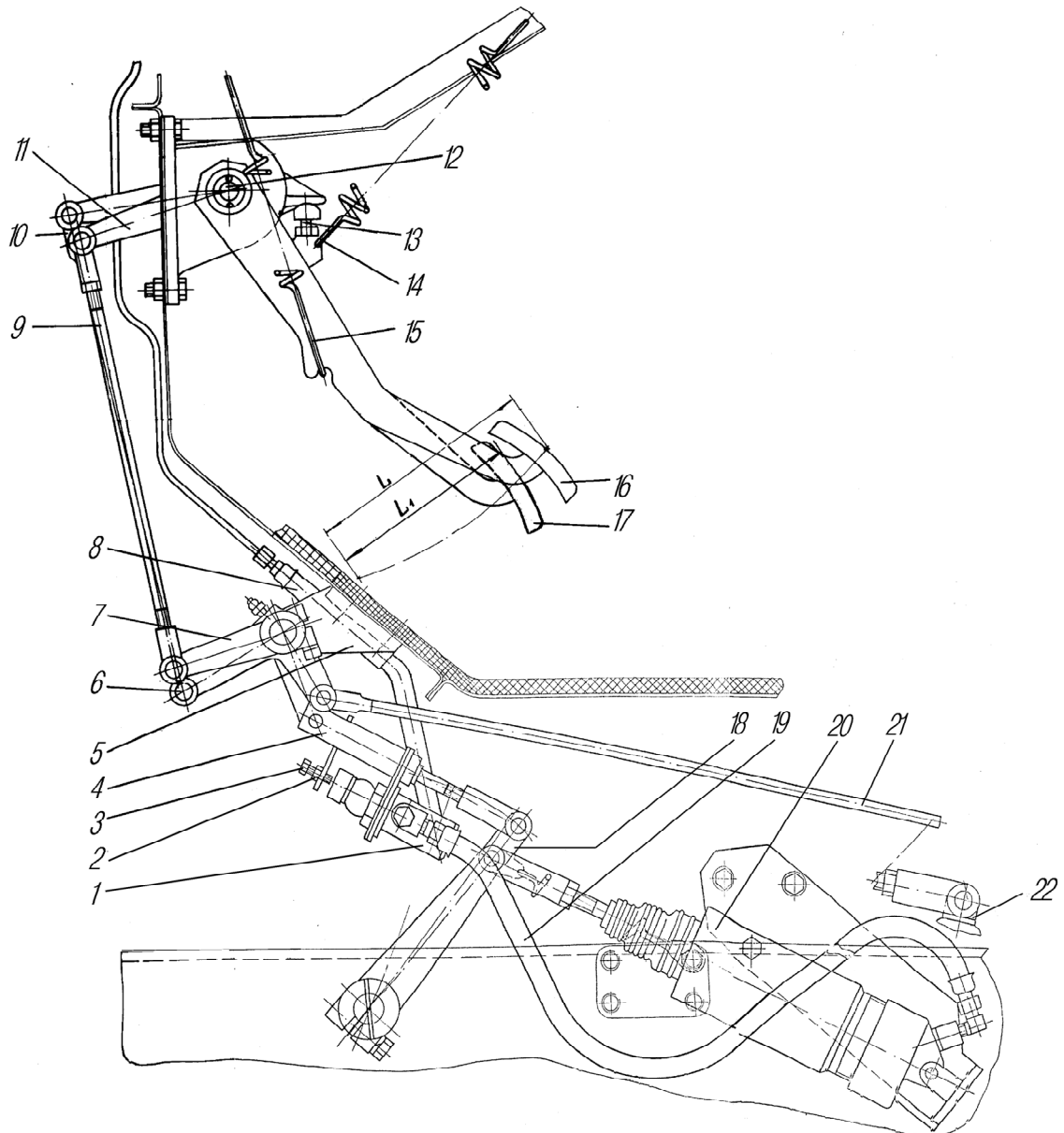


Fig.31. Clutch and Brake Valve Control:

- 1 - air valve; 2 - lock nut; 3 - adjusting bolt; 4 - tie rod with compensator; 5 - bracket; 6, 22 - brake valve levers; 7 - clutch lever; 8, 19 - hoses; 9 - clutch pedal tie rod; 10 - brake pedal tie rod; 11 - clutch pedal shaft lever; 12 - clutch pedal shaft; 13 - clutch pedal limiter; 14 - brake pedal return spring; 15 - clutch pedal spring; 16 - clutch pedal; 17 - brake pedal;

18 - clutch release fork shaft lever; 20 - air cylinder; 21 - brake valve tie rod; L - full stroke of clutch pedal; L_1 - full stroke of brake pedal

Adjustment of Full and Free Stroke of Clutch Pedal

The clutch pedal full stroke should lie within 195 - 220 mm, it is adjusted by the adjusting bolt of clutch pedal limiter 13. The adjustment may be performed with the availability of air pressure in truck air system 0.6 MPa (6 kgf/cm²), minimum.

The clutch pedal free stroke should lie within 50 - 60 mm. The clutch pedal free stroke should be determined by pressing the pedal by hand, provided that no air pressure is available in the truck's air system. The clutch release moment is sensed by a considerable increase in the force.

The clutch pedal free stroke should be adjusted by varying the length of tie rod 9. For this purpose proceed as follows:

- disconnect tie rod 9 from lever 11;
- slacken the lock nut of the tie rod fork and screw the fork out to increase the free stroke, or screw it in to decrease this;
- couple the tie rod with the lever and tighten the fork lock nut so that the length of threaded connection remains not less than the thread diameter;
- check the pedal for free stroke. If the threaded length of the tie rod is unsufficient, reset lever 18 through one slot anti-clockwise, having additionally adjusted tie rod 4.

Transfer Box

The transfer box (Fig. 32) is a mechanical, two-speed type, with non-symmetrical interaxle differential. It is mounted on the truck frame in four rubber cushions.

The differential is of planetary type, having four satellites, sun 30 and crown 29 gears. Torque is transmitted from sun gear 30 to front axle drive shaft 35, and from crown gear 29 to rear axle drive shaft 21.

With the differential being in operation (unlocked), an equal traction of all axles is ensured, and extra loads in transmission are eliminated. Depending on road conditions the differential can be disengaged (locked), in this case the front and rear axle drive shafts rotate together as a unit.

Oil scraper rings 23 are available on the front and rear axle drive shafts. Spiral grooves are cut in outer surface of the oil scraper rings. When the shafts run oil is directed from the collars to the case through these grooves. The spiral grooves are cut in opposite directions, the left-hand for the front axle drive shaft, and the right-hand for the rear axle drive shaft. Marks "П" (front) and "З" (rear) are stamped on the oil scraper rings respectively.

When reassembling the transfer box, see that oil scraper rings are fitted correctly; otherwise oil leaks through the collars are inevitable.

The transfer boxes of the Ural - 43202 - 0351 - 31, Ural - 4320 - 0911 - 30 trucks, the Ural - 4420 - 10, Ural - 4420 - 31, Ural - 44202 - 0311 - 31, Ural - 44202 - 0612 - 30 bolster trucks differ from the transfer box of the Ural - 4320 - 10, Ural - 4320 - 31 trucks in the speedometer drive gears.

The transfer box, which a high-efficient auxiliary power take-off is mounted on, features an extended primary shaft and a housing modified in the area of fixing of auxiliary power take off.

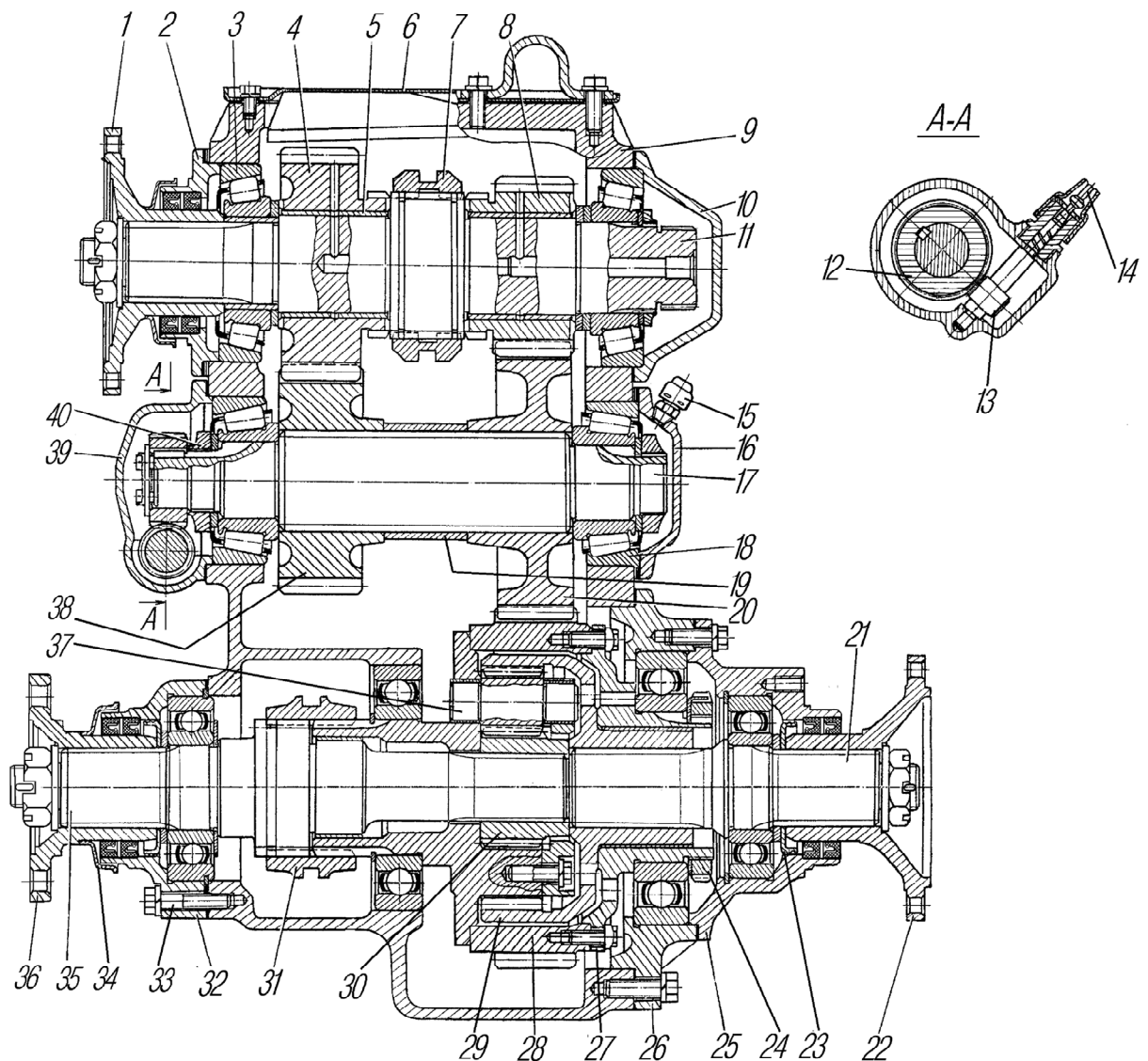


Fig. 32. Transfer Box:

1,22,36 - flanges; 2,10,16,25,32,39 - bearing caps; 3,18 - tapered roller bearings; 4,38 - high-speed gears; 5 - bushing; 6 - upper inspection hole cover; 7 - gear engagement clutch; 8,20 - low-speed gears; 9 - transfer box housing; 11 - primary shaft; 12,13 - speedometer driving and driven gears; 14 - speedometer flexible shaft; 15 - breather; 17 - intermediate shaft; 19 - spacing sleeve; 21 - rear axle drive shaft; 23 - oil scraper ring; 24,40 - bearing nuts; 26 - differential rear bearing housing; 27 - differential rear holder; 28 - differential holder with lower shaft gear; 29 - crown gear; 30 - sun gear; 31 - differential interlocking coupling; 33 - bolt; 34 - flange deflector; 35 - front axle drive shaft; 37 - satellite

The parameters of speedometer drive gears depend on final drive ratio of the driving axle and on the size of the tires applied. This dependence and the gears features as well are given in Table 1.

Adjustment of the transfer box and of its control. Tapered bearings should be adjusted by varying the number of shims under the covers after dismantling the

transfer box from the truck. Before adjusting set the box so that the upper inspection hole is positioned horizontally, then take off its cover. Check axial displacement of the shafts using a dial indicator.

Table 1

Relationship between the parameters of speedometer drive gears and final drive ratio and tires size

Final drive ratio of driving axle	Size and model of tires	Driven gear (in intermediate shaft cover)			Driving gear (on intermediate shaft)		
		teeth number	outer dia., mm	mark	teeth number	outer dia., mm	mark
8.9	14.00 - 20, ОИ - 25 model	25	35.17	-	5	62.29	-
8.05	390/95R20 KAMA - URAL	22	30.13	one annular groove on shaft	5	67.33	one face groove
7.32	390R20, О - 65 model	20	27.60	-	5	69.85	-
6.69		22	30.13	-	6	67.27	-
8.9	1200x500 - 508 ИД - П284 model	32	42.92	-	6	54.54	-
8.05		24	32.65	two annular grooves on shaft	5	64.82	-
7.32	500/70 - 508 (1200x500 - 508) ИД - П284 model	22	30.13	one annular groove on shaft	5	67.33	face groove
6.69	500/70 - 20 (1200x500 - 508) ИД - П284 model	20	27.60	-	5	69.85	-
	12.00R20 У - 4, ИД - 304						

To adjust the primary shaft bearings proceed as follows:

- check tightness of the nut fastening the flange and, if need be, tighten it up (torque being less than 200 N m (20 kgf m);
- set the indicator on the plane of the inspection hole cover so that its foot thrusts against the spline end face in the middle part of the primary shaft;
- using the tire iron as a lever, shift the primary shaft via the gear until the indicator pointer stands still; smoothly reduce the axial force applied to the lever along the length of 0.5 m to 2 - 5 N (0.2 - 0.5 kgf) and note down the indicator readings;
- applying force axially in the opposite direction, note down the indicator readings in a similar manner.

The total indicator foot displacement should not exceed 0.03 - 0.08 mm; if otherwise, remove the shims from under the bearing front cap.

To adjust the intermediate shaft bearings proceed as follows:

- remove the rear cap of the intermediate shaft bearings;
- unlock and tighten the nut fastening the intermediate shaft bearing so that the spacing sleeve of the gears is clamped tightly;
- lock the nut and remount the cover;
- check axial displacement of the intermediate shaft in a similar manner as that of the primary shaft, in doing so thrust the indicator foot against the end face of one of the gears; the total indicator foot displacement should lie within 0.03 - 0.08 mm;
- adjust the bearings by removing the shims from under the intermediate shaft rear cover.

To eliminate errors in measuring check axial displacement of the shafts two-three times before and after adjustment, having first cranked the shafts.

Check and, if need be, adjust the position of the differential interlocking coupling and gear engagement clutch. Adjust the position of differential interlocking coupling 31 (see Fig. 32) by rotating the rod. When checking the coupling position set the rod to its front fixed position and turn through the front axle drive shaft by its flange. If the coupling does not contact the differential front holder, it is positioned correctly. Should the coupling contact the holder, move it forward rotating the rod clockwise.

The position of gear engagement clutch 7 should be adjusted by selecting a pack of shims 11 (Fig. 33). The clutch position is considered normal if, with the gear shift fork rod being in its fixed neutral position, the difference in free length of the splines in the center part of the primary shaft on the carriage's both parts does not exceed 1 mm.

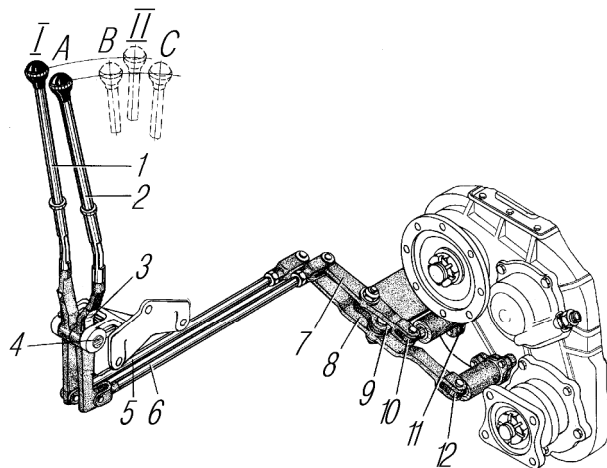


Fig. 33. Transfer Box Control:

- 1 - differential interlocking lever; 2 - gear shift lever; 3 - pressure spring; 4 - lever shaft; 5,6 - tie rods; 7,8 - carriers; 9 - bracket; 10 - gear shift fork rod; 11 - shims; 12 - differential interlocking fork rod of transfer box; I - differential unlocked; II - differential locked; A - lever's front position (high gear engaged); B - lever's middle position (neutral); C - lever's rear position (low gear engaged)

Transfer box control should be adjusted by varying the length of tie rods 5 and 6 by means of adjusting forks, so that with the rod being in its center position corresponding to the neutral position of the gear engagement clutch, lever 2 should be in the middle of the cab floor opening. With the high gear engaged and the differential unlocked levers 1 and 2 should lie in one and the same plane. Upon adjusting check the gears for easy shifting, then cotter the pins and tighten the lock-nuts of the forks.

Cardan Drive

Torque is transferred from the gearbox to the transfer box and truck driving axles via cardan shafts (Fig. 34). The cardan shafts are of open type, having a complex packing (Fig. 35) of needle bearings in the joints.

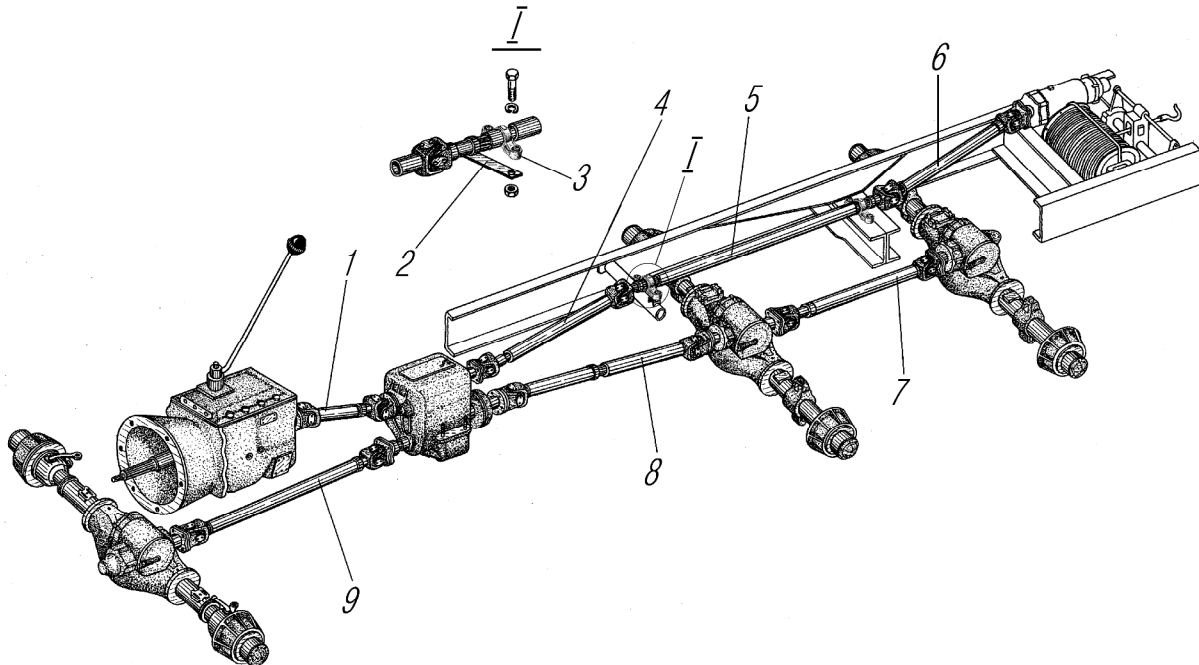


Fig.34. Layout Diagram of Transmission Cardan Shafts and Winch

Drive Shafts for the Ural - 4320 - 10, Ural - 4320 - 31 Trucks:

1 - intermediate cardan shaft; 2 - supporting plate; 3 - centre support; 4,5,6 - winch drive cardan shafts; 7,8,9 - axle drive cardan shafts

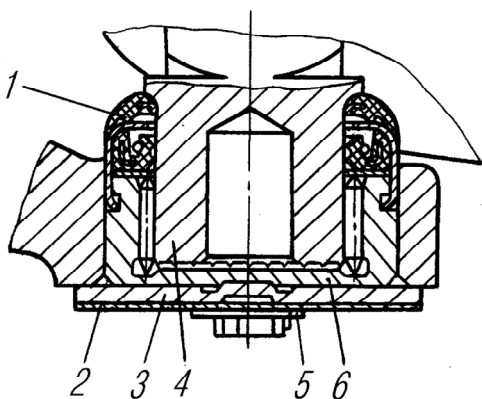


Fig. 35. Needle Bearing Complex Packing:

1 - end packing; 2 - balancing plate; 3 - cover; 4 - spider; 5 - lock plate; 6 - needle bearing

The front and rear axle drive cardan shafts are similar in design differing by the length and by the dimension on the flange attached, namely from the axis of the bearing holes to the mating surface. Design of the intermediate cardan shaft is shown in Fig. 36.

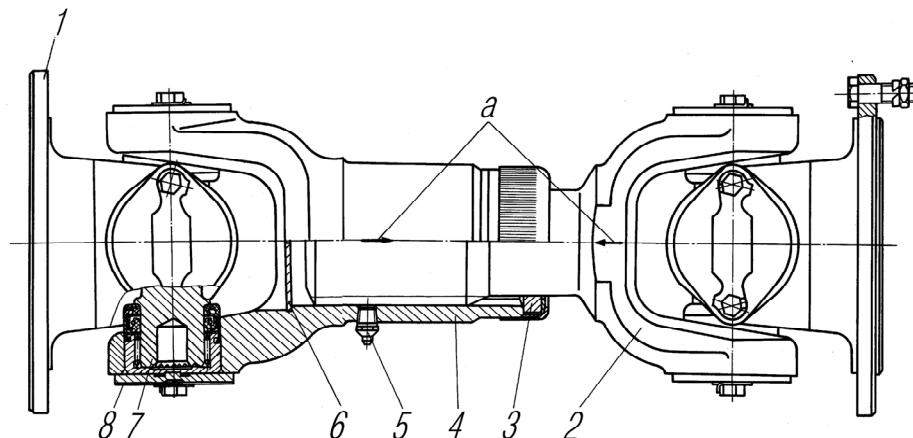


Fig. 36. Intermediate Cardan Shaft:

1 - flange; 2 - intermediate cardan shaft; 3 - packing ring; 4 - sliding fork; 5 - grease nipple; 6 - stopper plug; 7 - spider; 8 - balancing plate; a - positioning arrows

When operating the truck:

- check regularly the fastening of the cardan shaft flanges;
- should radial clearance in the spider bearings exceed 0.25 mm, and end clearances 0.35 mm, disassemble the cardan joints and replace the bearings and crossarms, if necessary. When disassembling, take care not to damage the packings; replace the damaged packings.

Before reassembling the joints, pack lubricant between working edges of the end packing. After reassembling the spiders should turn in the bearings smoothly, without jamming.

Check periodically the clearance in the spline joint. Should the clearance exceed 1.2 mm (front axle drive shaft) and 0.55 mm (intermediate shafts and rear axle drive shaft), replace the shafts.

When reassembling the cardan shaft, see that the arrows stamped on the tube shaft and sliding fork are positioned one opposite another, and the flanges, forks and balancing plates 8 are in the same position they had before disassembling. To provide that, mark the parts of the cardan shaft prior to its disassembling.

Upon replacing the flanges, welded and sliding forks, the cardan shafts should be dynamically balanced repeatedly. Disbalance causes their vibration, which effects adversely transmission functioning.

Prior to mounting the cardan shaft on the truck, lubricate the mating surfaces of the flanges with sealing paste.

Cardan drive of trucks and special chassis-cabs featuring long wheel base differs from that of the Ural - 4320 - 10 and Ural - 4320 - 31 trucks by modified drive of the intermediate axle consisting of intermediate cardan shaft 2 (Fig. 37), center support 3 and intermediate axle drive cardan shaft 4 of an extended length.

Maintenance of cardan shafts is the same as that for the Ural - 4320 - 10 and Ural - 4320 - 31 trucks.

Fill oil into the centre support through inspection hole 8 (Fig.38) up to the inspection hole level.

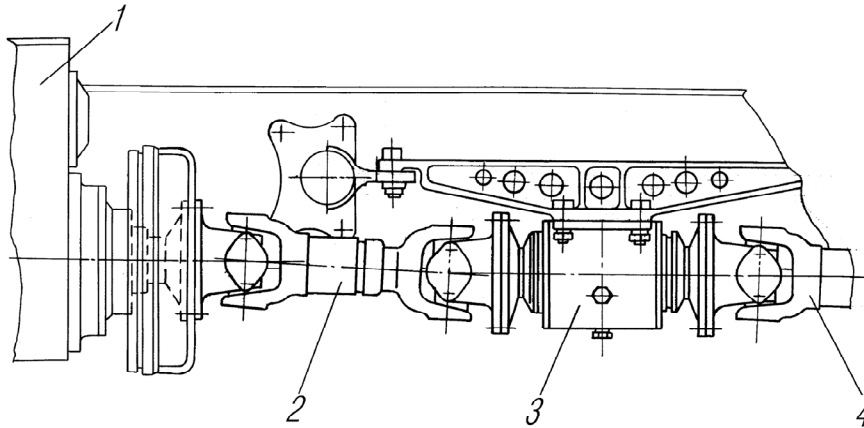


Fig. 37. Cardan Drive of Trucks and Special Chassis - Cabs Featuring Long Wheel Base:
1 - transfer box; 2 - intermediate cardan shaft; 3 - center support; 4 - intermediate axle cardan shaft

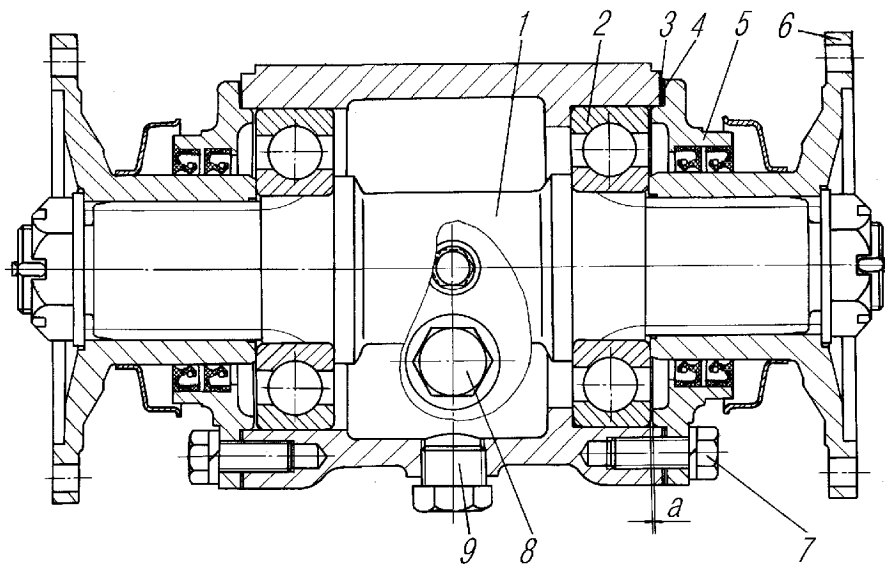


Fig.38. Centre Support:

1 - centre support shaft; 2 - centre support bearing; 3 - shims; 4 - gaskets (2 pcs., on both sides of shim pack); 5 - bearing cap; 6 - flange; 7 - cap bolt; 8 - inspection hole plug; 9 - drain plug; a - axial clearance

Oil grades to be used, as well as oil level inspection intervals, and oil replacement intervals are like to those specified for the transfer box of the the Ural - 4320 - 10, Ural - 4320 - 31 trucks.

When changing oil, check axial displacement of shaft 1. For this purpose:

- disconnect the cardan shafts from flanges 6 of the centre support;
- when shifting shaft 1 axially, measure its maximum displacement about the centre support housing.

Should the displacement exceed 0.8 mm, replace the bearings of the centre support.

To adjust axial clearance "a" in case of replacement of centre support bearings 2, proceed as follows:

- reassemble the centre support without fitting the pack of shims 3 (both sealing gaskets 4 should be fitted), screw home bolts 7 fastening cover 5, but do not tighten them;
- measure clearance between gaskets 4;
- reassemble the center support, fit the pack of shims 3 with a thickness exceeding by 0.3 - 0.4mm the value of clearance available between gaskets 4.

Upon reassembling and adjusting the centre support fill oil into it in accordance with the Lubrication Chart.

Check the centre support for tightness when operating the truck. Oil leaks through the packing glands, gaskets and threaded connections are not allowed.

Driving axles

The truck's driving axles are of tandem type with top arrangement of the final drive.

The axle's final drive is of dual type, comprising a couple of spiral-tooth bevel gears 1 and 14 (Fig. 39) and a couple of helical-tooth spur gears 4 and 32. A symmetrical bevel-type differential with four satellites is bolted to the driven spur gear.

Depending on Truck Specifications the final drives have ratios as follows: 7.32; 6.7; 8.9 and 8.05.

To recognize the final drives they are marked with plates bearing ratio indication, which are placed under the bearing body cap bolt of the driving spur gear. The final drives with 8.9 ratio have no mark plates. Final drive gears differ by the marks on the driving and driven spur gears (Tabl. 2).

Table 2

Ratio	Marks on driving spur gear face at bevel gear side	Mark on driven spur gear
6.7	Two dia. 10 mm drillings 2 mm deep at 12 mm distance from edge	Chamfers on both sides under gear rim
7.32	Dia. 10 mm drilling 2 mm deep	Chamfer under gear rim
8.05	Dia. 52 mm cylindrical groove	Mark on dia. 290 mm face
8.9	None	None

The final drive is mounted onto axle case 10 (Fig. 40) via 0.8 mm thick paronite gasket 9, secured thereon with thirteen bolts and two studs. Eleven bolts and the studs are located outside, and two bolts in the bevel gear space. The inner bolts become accessible only after removing side cover 6. Spring washers are fitted under the outer bolts and stud nuts. The inner bolts are cotted with wire.

Final drive gears and bearings are lubricated with oil filled into the axle case and final drive case up to the inspection hole level. Oil is entrapped by gears, splashed over, gets into bevel gear space of the final drive case via roller bearing 2 (see Fig. 39), and then flows down to the axle case.

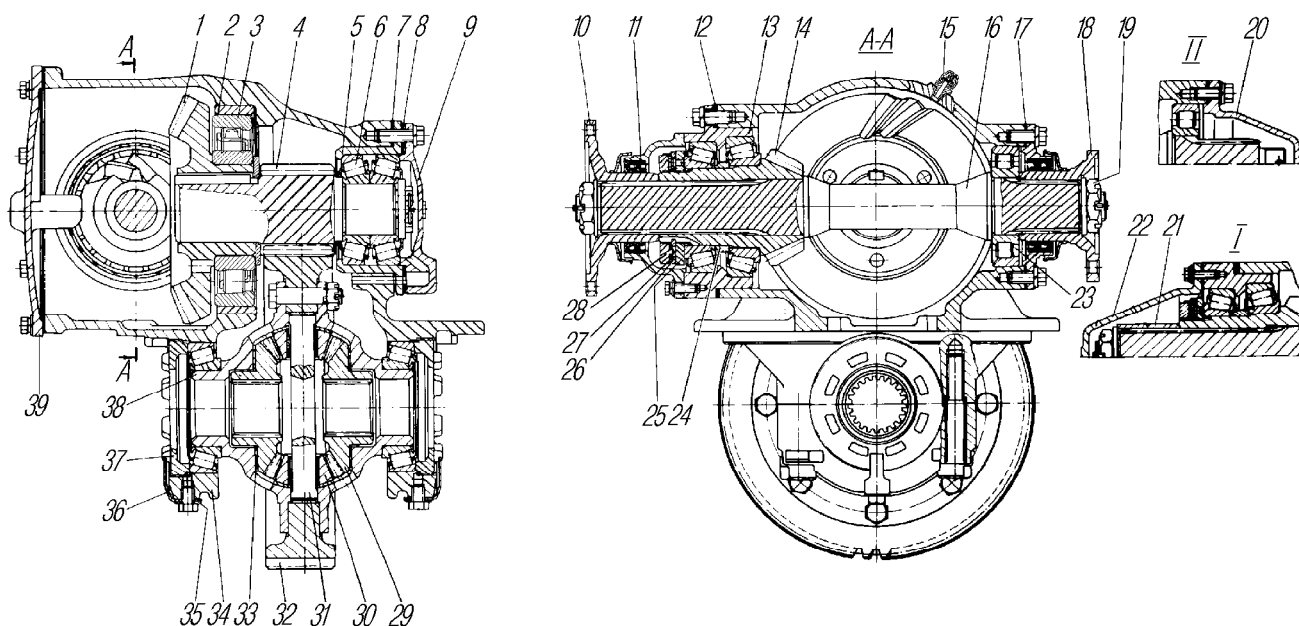


Fig. 39. Final Drive:

1 - driven bevel gear; 2,23 - cylindrical roller bearings; 3 - final drive case; 4 - driving spur gear; 5 - bearing body; 6 - taper roller bearing; 7,8,12 - shims; 9 - bearing body cap; 10 - rear axle drive flange; 11 - collar; 13 - bearing body of driving bevel gear; 14 - driving bevel gear; 15 - breather; 16 - driving gear shaft; 17 - gasket; 18 - rear axle drive flange; 19 - flange nut; 20 - rear bearing cap; 21 - spacing sleeve; 22 - front bearing cap; 24 - adjusting washer; 25 - nut; 26 - lock washer; 27 - locking washer; 28 - lock nut; 29 - half-axle gear; 30 - differential satellite; 31 - differential spider; 32 - driven spur gear; 33 - bearing washer; 34 - differential bearing cap; 35 - lock plate; 36 - locking plate; 37 - differential bearing adjusting nut; 38 - differential pinion cage; 39 - case cover; I - for front axle; II - for rear axle

The driving bevel gear bearings are lubricated with oil from the bevel gear space, which is supplied to the bearing body via a pocket in the case cover and oil supply union.

The final drives of front and rear axles differ from that of the intermediate axle by drive flanges. Sleeve 21 with cap 22 is fitted on the front end of the front axle driving gear shaft, while flange 18 on the rear end. The rear axle final drive has a flange at the driving bevel gear side. Splines may be unavailable on the opposite end of the driving gear shaft.

Axle cases 10 (see Fig. 40) are combined of cast middle part and tubular half-axle casings pressed therein. The half-axes are full floating, splined with the hub.

The truck's front axle is a driving, steerable unit. Design of the steerable wheels drive of the front driving axle is shown in Fig.41. Torque is transferred to the front driving wheels via half-axes and constant velocity joints (Fig. 42).

To ensure reliable and long-life operation of the driving axles use oils in accordance with the Lubrication Chart and maintain the required oil level in the cases. To replace the lubricant in the half - axle hinges of the front axle dismantle the wheel, brake drum in assy with the hub, support and slewing journal. Remove the lubricant and wash the parts of the constant velocity joint.

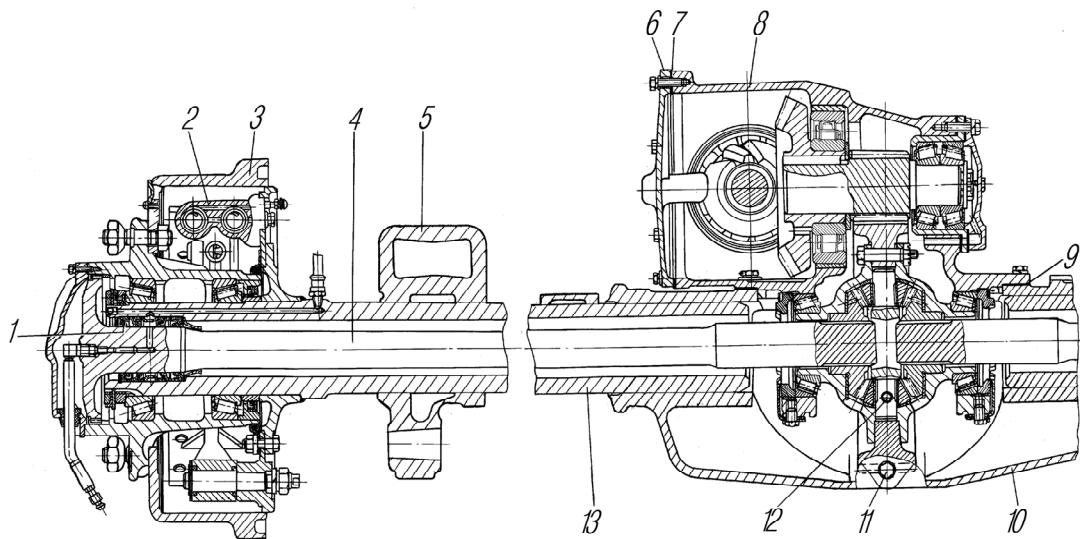


Fig.40. Intermediate (Rear) Driving Axle:

1 - air supply collars; 2 - wheel cylinder; 3 - brake drum; 4 - half-axle; 5 - spring supporting bracket; 6 - case cover; 7,9 - gaskets; 8 - final drive; 10 - axle case; 11 - drain plug; 12 - inspection plug; 13 - half-axle casing

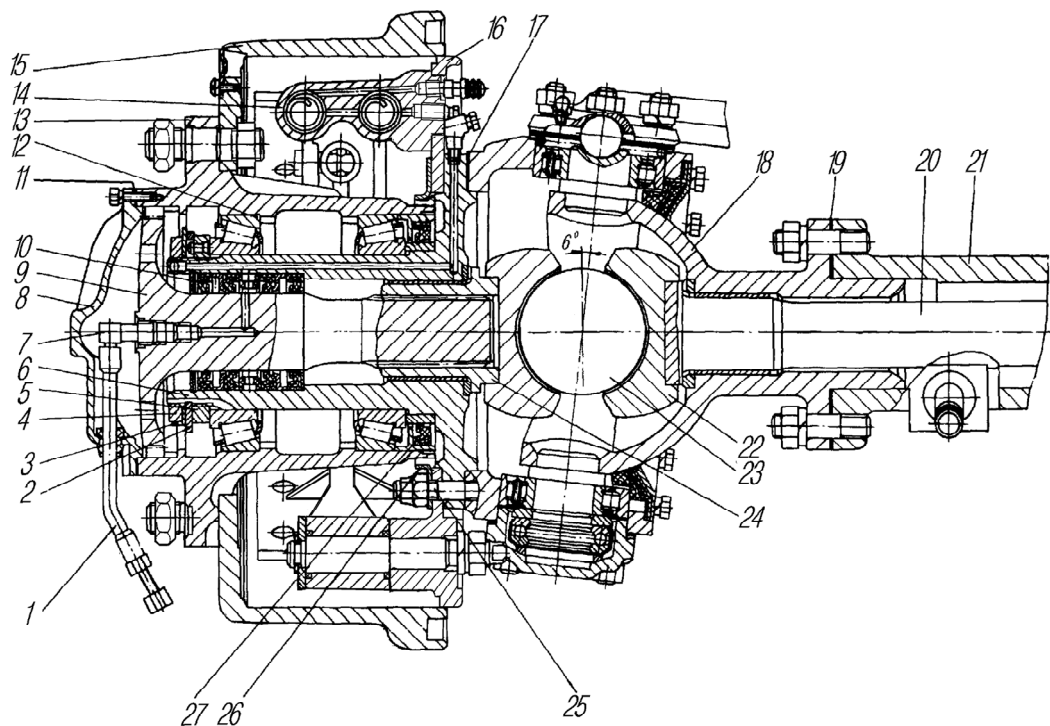


Fig.41. Drive to Steerable Wheels of Front Driving Axle:

1 - air supply hose; 2 - lock washer; 3 - retaining ring; 4 - lock nut; 5 - wheel bearing nut; 6 - journal; 7 - air supply elbow; 8 - wheel hub cover; 9 - outer half-axle; 10 - collars unit; 11,17,19 - gaskets; 12 - bearing; 13 - hub; 14 - wheel brake cylinder; 15 - brake drum; 16 - brake support; 18 - ball support; 20 - inner half-axle; 21 - half-axle casing; 22 - hinge knuckle; 23 - hinge disc; 24 - outer half-axle fork; 25 - stud; 26 - baffle; 27 - collar

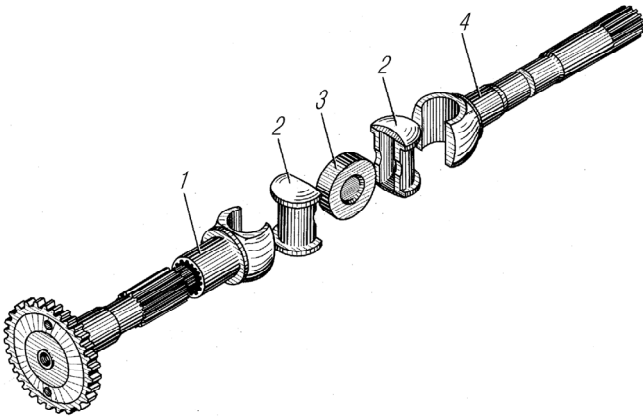


Fig. 42. Constant Velocity Joint:
1 - fork; 2 - knuckle; 3 - disc; 4 - inner half - axle

Should the need arise to dismantle the ball support out of the front axle case, then use the puller bolts available in the large tool bag. For this purpose fit them into threaded holes of the ball support flange and when screwing them in iniformly disengage the ball support's tail from the half - axle casing.

Check regularly the tightness of the bolts fastening the final drive to the axle case. Bolts slackening may result in case bending.

When adjusting the final drive, adjust the taper bearing preload and check the contact pattern in the final drive bevel gearing. For adjustment remove the final drive from the truck. Check the preload by the torque required for cranking the shaft. Determine resistance torque by means of a dynamometer.

Measure the torque smoothly rotating the shaft in one sense after at least five full revolutions. Remember, maladjustment of bearings may cause damage not only of the bearings, but also of the final drive gears.

When adjusting the final drive, proceed as follows:

1. Fit the final drive in the fixture, remove the differential and flanges. Unscrew the bolts fastening the body of the driving bevel gear bearing. Take out the driving gear shaft together with bearing body and gear.

Clamp the driving gear in the vice by its gear rim. Unscrew the bolts fastening the cover and remove the latter. Unlock the lock nut and unscrew it. Remove the lock washers. Tighten up the nut with a torque 450 - 500 N m (45 - 50 kgf m).

Fit the indicator and measure clearance in the bearings. Do not readjust the bearings in body, if no clearance is sensed after tightening up the nut.

Estimate thickness reduction of adjusting washer 24 (see Fig. 39) (runout value plus 0.03 - 0.05 mm preload). Unscrew the nut, remove the bearing and adjusting washer. Grind or select the washer to meet the required size, fit the washer and reassemble the bearing unit of the driving bevel gear. Torque for tightening the nuts is 450 - 500 N m (45 - 50 kgf m). Lock the lock nut by bending out one washer edge. Torque required for cranking the driving bevel gear in the bearings should be 0.6 - 1.4 N.m (0.06 - 0.14 kgf.m). Force on the dynamometer, when uncoiling the cord from the body surface, is 7.5 - 17.5 N (0.75 - 1.75 kgf) (Fig. 43).

2. Adjust preload of the driving spur gear bearings. Adjust the bearings by selecting a pack of shims 8 (see Fig. 39) to be placed under cap 9 of body 5. The torque required for cranking through the intermediate shaft should be within 0.9 - 1.5 N m (0.09 - 0.15 kgf m).

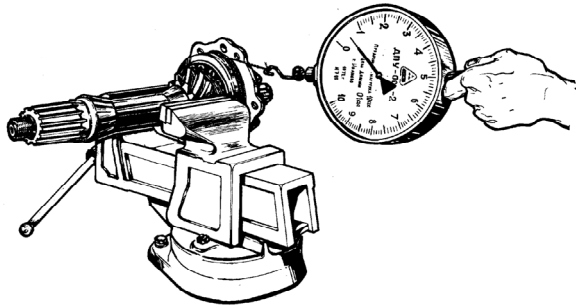


Fig.43. Checking Adjustment of Driving Bevel Gear Bearings

When using the dynamometer for measuring the torque, coil the cord on the spur gear rim; the dynamometer readings should be as indicated in Table 3.

Table 3

Final drive ratio	Dynamometer readings, N (kgf)
6.7	16.5 - 27.6 (1.65 - 2.76)
7.32	17.6 - 29.3 (1.76 - 2.93)
8.05	18.8 - 31.3 (1.88 - 3.13)
8.9	20 - 33.4 (2.0 - 3.34)

Remember, that when shims are removed from under the body cap, when adjusting the bearings, the driven bevel gear is shifted towards reduction of the backlash; therefore, add shims under bearing body 5 to maintain the backlash.

3. Mount the body with the driving bevel gear into the final drive case. Torque the body fastening bolts to 60 - 80 N.m (6 - 8 kgf.m). Check the correct meshing of the bevel gears using the paint contact pattern. The pattern length should be 60 %, minimum, of the tooth length (Tabl. 4).

The pattern should be offset by 5 mm, minimum, from the tooth narrow end, the backlash (at the tooth root) being within 0.1 - 0.4 mm. For changing the backlash in the bevel gears without disturbing the contact shift both gears to a distance, which is proportional to the number of teeth of each gear, i.e. shift the driven bevel gear 2.2 times (24:11) farther than the driving one.

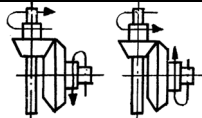
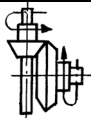
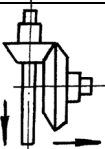
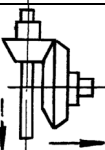
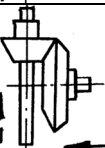
4. Mount the differential and adjust the differential bearings. Tighten the bolts fastening the differential bearing caps to 250 - 320 N m (25 - 32 kgf m). Adjust the differential bearing using nuts 37 (see Fig. 39). Upon tightening the nuts the distance between the differential bearing caps should increase by 0.04 - 0.14 mm. When adjusting, turn the differential through for self-adjusting of rollers in the bearings. The driven spur gear rim should be positioned symmetrically about the driving gear rim.

Due to improved method of manufacturing the differential gears, the tooth profile of half-axle gears and satellites has changed. The changed gears are not interchangeable with the gears manufactured before, and are to be replaced in set only. To distinguish them, marks are introduced at the small module side, namely a dia. 90 mm groove on the half-axle gear and a stepped end on the satellite.

When reassembling the final drive fit the inner ring and cage of roller bearing 2 of the driven bevel gear as shown in Fig. 39.

Table 4

Adjustment of Contact in Bevel Gear Meshing of Final Drive

Allocation of contact pattern on tooth of driven bevel gear		Methods of adjustment of correct meshing	Direction of shifting of bevel gears
Forward running	Reverse running		
		Correct contact	
			
		Shift driven gear closer to the driving one. If backlash becomes insufficient, shift driving gear away	
		Shift driven gear away from the driving one. If backlash becomes excessive, shift driving gear closer	
		Shift driving gear closer to the driven one. If backlash becomes insufficient, shift driven gear away	
		Shift driving gear away from the driven one. If backlash becomes excessive, shift driven gear closer	

Adjust the bearings of steering knuckle pins when performing the sixth M - 2 (every 96 000 km) in the following sequence of operations:

- dismantle the wheels and place the stops under the steering knuckle lower covers;
- remove the arm of the left - side steering knuckle and the upper cover of the right - side one;
- remove two shims out of the pack under each arm: one 0.05 mm thick and the other 0.1 mm thick. Pack 50 g of ЛИТОЛ - 24 grease into the arm space and refit the arm and cover; torque the nuts to 160 - 280 N m (16 - 28 kgf m);
- take away the stops and remove the lower covers;
- remove a pack of shims 0.15 mm (0.05 + 0.1) mm thick from under each cover;
- refit the covers and torque the nuts to 160 - 280 N m (16 - 28 kgf m);
- refit the wheels.

To adjust the wheel hub bearings proceed as follows :

- jack up the axle on the side of the wheel to be adjusted;
- remove the cap;
- using a puller disengage the half-axle splines from the hub and take out the half-axle;
- unscrew the outer nut and remove the lock washers;
- turning the wheel by hand make sure that no friction is sensed between the brake drum and shoes;
- torque the nut to 200 - 250 N m (20 - 25 kgf m). When tightening the nut, turn through the hub for self-adjusting of rollers in the bearings, then back off the nut to about a 1/5 - 1/6 a turn. Refit the locking washer.

If the nut pin fails to match with slots in the locking washer, it is allowed to slacken the nut by a value not exceeding the distance between two adjacent slots. Refit the lock washer, torque the lock nut to 400 - 500 N m (40 - 50 kgf m) and lock it.

To ensure connection of the wheel inflating hose to the wheel valve mount the half-axle with hub cap in such a way that the inflating hose is positioned symmetrically between the wheel studs.

On completion of the assembly check the wheel bearings for proper adjustment, when running 10 - 20 km. In case of proper adjustment the hub should be cold or slightly warm. If the hub is heated considerably when touched by hand, check the bearing adjustment.

RUNNING GEAR

Frame

The truck frame is a riveted structure consisting of two stamped variable-section side-members interconnected by six cross-members and a bumper in front.

Frame servicing lies in inspection of bolted and riveted connections. See that frame configuration and strength of its elements are not impaired. If the rivets are loose, cut them off and replace by the new ones. It is allowed to replace loose or cut off rivets by bolted connections using the 8.8 bolts and nuts with lock nuts.

The towing unit is secured in a special cross-member. When servicing the towing unit, grease and clean it from soil. Rod guides of the towing hook are greased by means of lubricators, when servicing the truck. The hook should be turned freely by hand in the support of housing 2 (Fig.44) and in bushing 6.

Axial displacement of the hook in the housing should not exceed 0.5 mm. To ensure it tighten nut 1 until a clearance is formed between housing 2 and pressure ring 3 due to elastic element's deformation (to be determined by free displacement of the towing hook). Then, unscrew the nut until eliminating axial displacement of the hook and lock it with retaining strip and bolt. Retaining strip 10 together with bolt 11 turned into its hole and the hook rod may move within amount of clearances in the connection.

Fit locking cotter pin 8 when operating the truck with trailer.

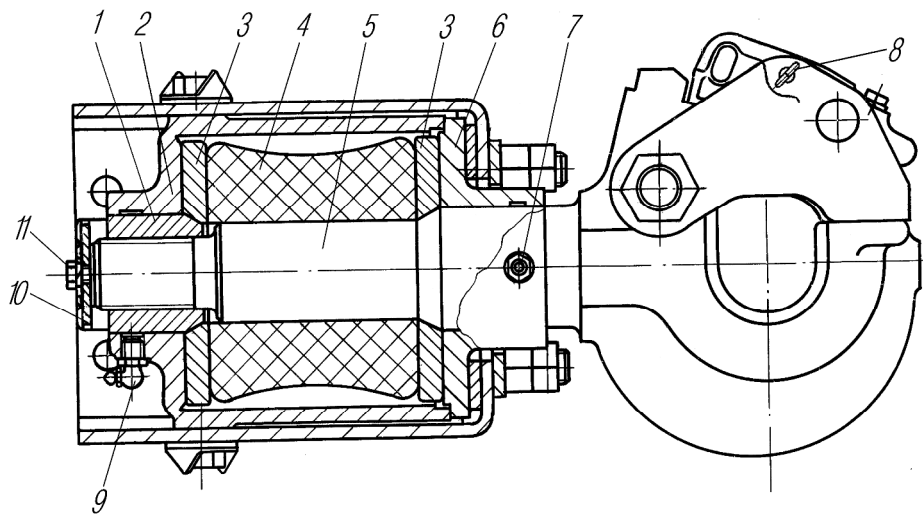


Fig. 44. Towing Unit:

1 - nut; 2 - housing; 3 - pressure ring; 4 - elastic element 5 - towing hook; 6 - guide bushing; 7,9 - grease nipples; 8 - locking cotter pin; 10 - retaining strip; 11 - bolt

Truck Suspension

The front suspension (Fig. 45) consists of two longitudinal semielliptic springs, which operate in conjunction with two two-way hydraulic shock absorbers of telescopic type. Upper eyes of the shock absorbers are fastened via rubber bushings to the clamps of brackets 5, while the lower eyes to brackets 17, which are welded to the axle case.

In their middle part the springs are secured on the axle case by means of the U-bolts. Rubber buffers 2 retain the axle's upwards travel and are secured in spring pads 20 and holders 13 of the auxiliary buffers. Holder 13 is connected with bracket 6, which is secured to the frame side-member. Besides, the auxiliary buffers reduce tension in the springs when abruptly braking, thus limiting twisting of the springs.

Eyes 22 are secured onto the spring front ends by means of U-bolts 21 and bolts 24. Through the eye the springs are connected with front brackets 1 by pins 19, which are locked in the brackets by wedges 23.

The spring rear ends enter freely the eyes of rear brackets 8. The axle's downwards travel is retained by catching the bending of the spring's third leaf end on lower bolt 11, which fixes the the brace of the spring rear bracket, on which spacing sleeve 12 is fitted.

To reduce tension in the frame side-members, the spring rear brackets in the area of the second cross-member are connected by brace 16, which is bolted to the brackets. The bolts are locked by plates 15.

The front suspension of the trucks powered with the YAMZ - 238M2 engine features a reinforced spring. The third and forth leaves of the spring are 12 mm thick while the other ones, 10 mm thick, do not differ from the spring leaves used on the trucks powered with the YAMZ - 236M2 engine.

Hydraulic shock absorbers (Fig. 46) are intended for damping vibrations resulting from elastic deformation of the truck suspension parts when travelling on rugged road. The principle of operation of hydraulic shock absorbers is the

following. With relative displacements of sprung and non-sprung parts of the truck, the fluid contained in the shock absorber flows over from one space to the other through small holes, so hindering the vertical movement of the rod and damping the truck vibrations.

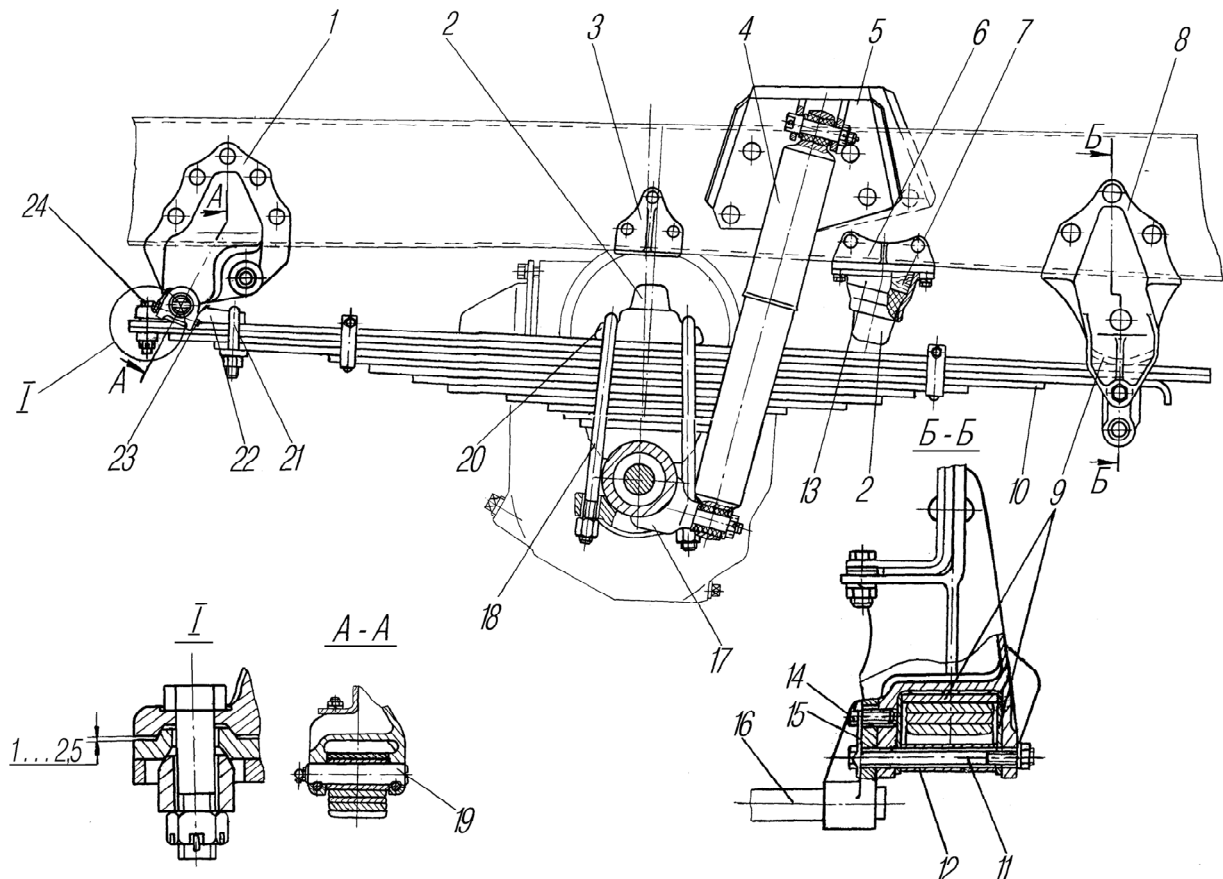
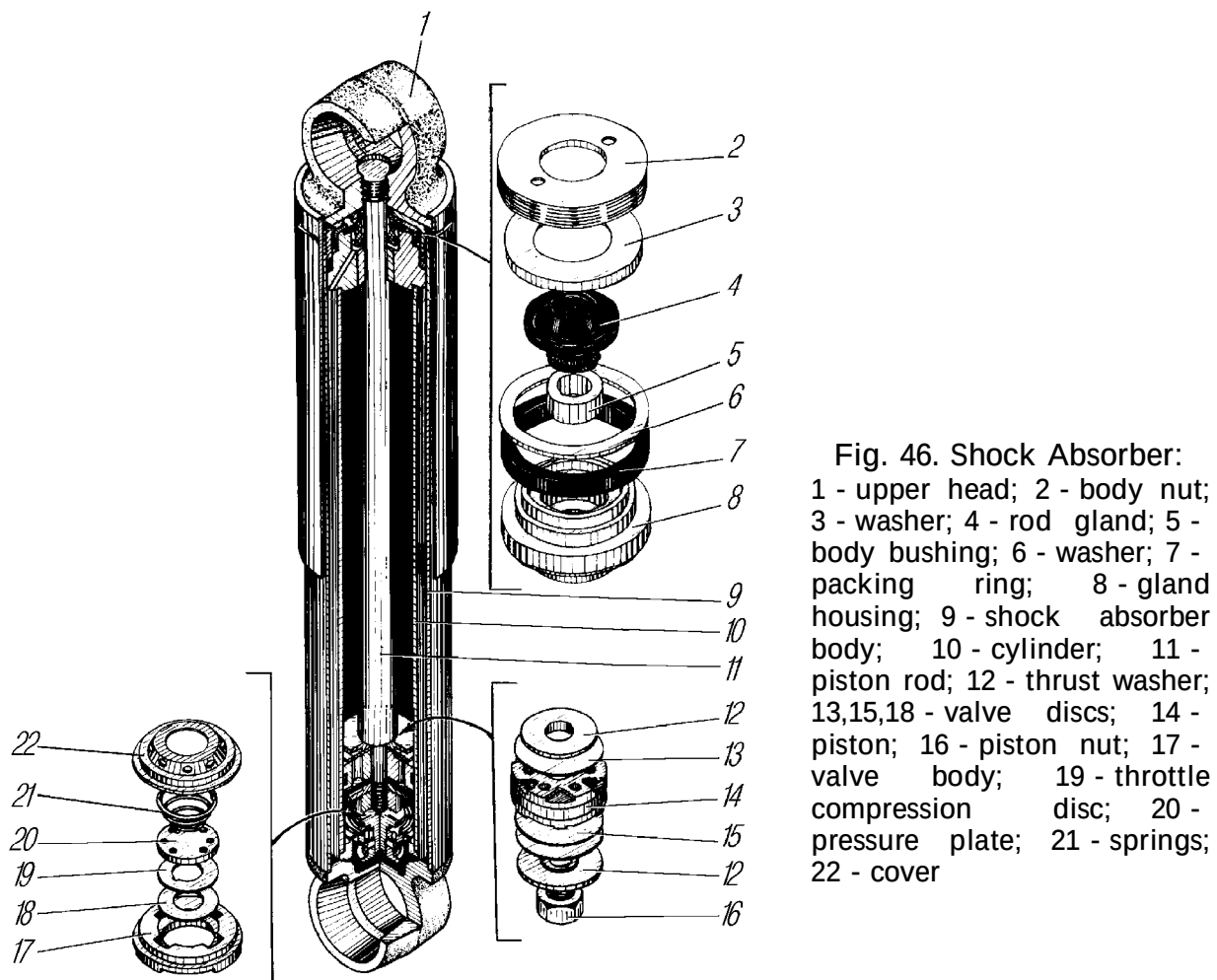


Fig. 45. Front Suspension:

1,8 - brackets (front and rear); 2 - spring buffers; 3 - buffer thrust bracket; 4 - shock absorber; 5,17 - shock absorber brackets; 6 - auxiliary buffer bracket; 7 - pad; 9 - inserts; 10 - spring; 11 - lower bolt of brace fastening; 12 - spacing sleeve; 13 - auxiliary buffer holder; 14 - upper bolt of brace fastening; 15 - lock plate; 16 - rear bracket brace; 18 - spring U-bolt; 19 - U-bolt eye pin; 20 - pad; 21 - eye U-bolt; 22 - spring eye; 23 - wedge; 24 - bolt

The rear suspension is fully articulated, the spring ends enter the eyes of supporting brackets 8 (Fig. 47).

The springs are secured by U-bolts 2 to beams 25, which rock on walking-beam axle 21. Onto the axle are pressed brackets 22, through them axle 21 is secured to walking-beam brackets 20 by bolts 17. Pushing and braking forces are transferred from the axles to the truck frame via two upper torque rods 7 and four lower ones 9. Side forces are transferred via the springs.



The torque rod joints are of ball type. The pins with shortened taper fitted in the upper torque rods on the axles' side are held against turning through in the brackets by means of Woodruff keys. The torque rod head is sealed on the one side by a gasket fitted under the cover, while on the other side by packing ring 23.

Buffer 9 serves to damp impacts of the axles on the frame when the truck wheel runs over an obstacle. The axle's move downwards is limited by jamming the spring end in supporting bracket 8.

The suspension of the trucks having a load of 12 000 kg on the rear bogie features reinforced springs (with thicker leaves) and correspondingly extended U - bolts.

Maintenance. To prevent shearing of the front spring center bolt and centering protrusion of the rear spring in due time torque the U-bolt nuts on a loaded truck. When squeaking is sensed in the springs, jack up the truck against its frame and pack grease into the gaps formed between the leaves. Once disassembling the springs lubricate the leaves after removing the aged grease, soil and rust. Wash and lubricate the eyes and pins of the front springs.

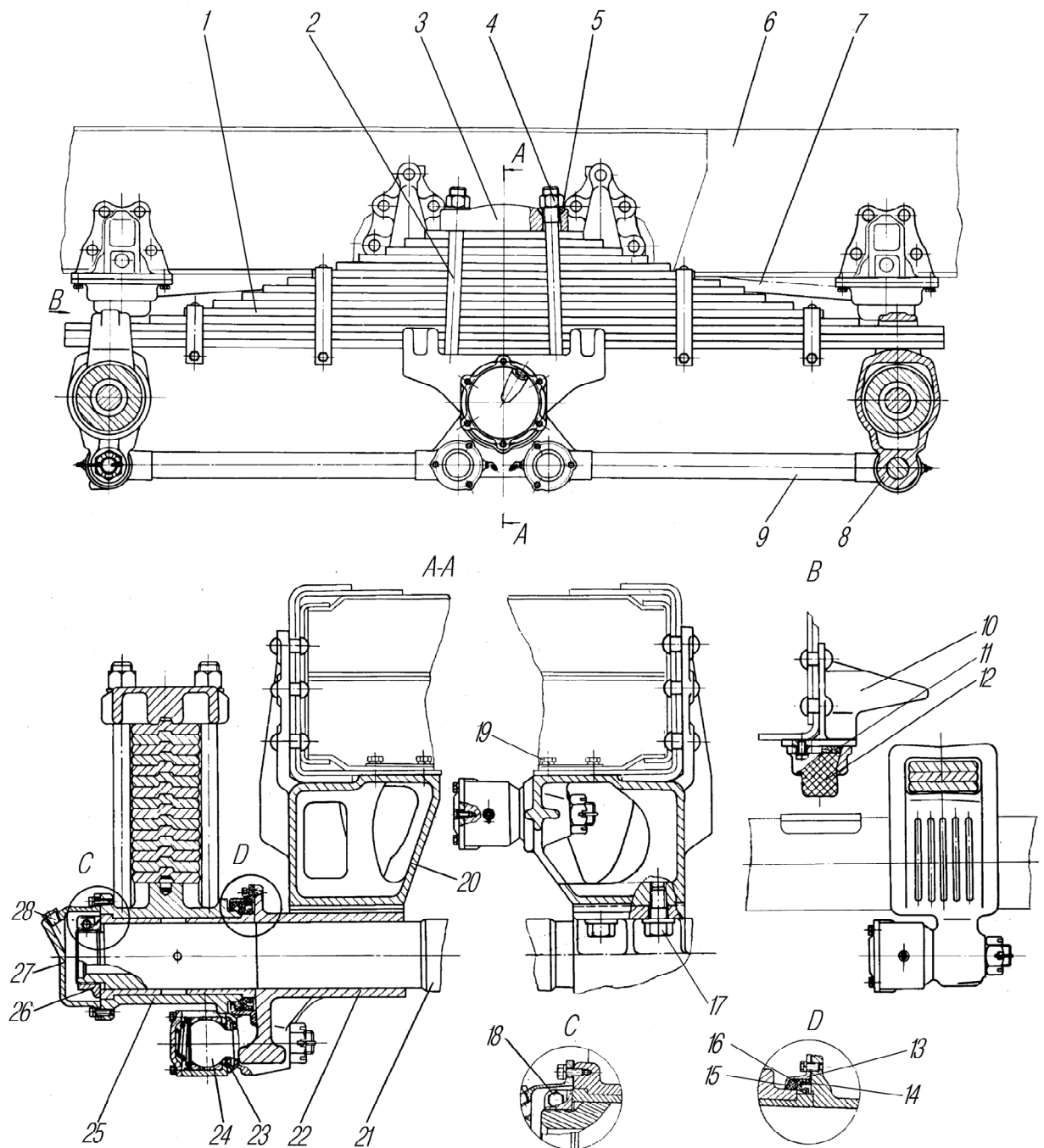


Fig. 47. Intermediate and Rear Axle Suspension:

1 - spring; 2 - U - bolt; 3 - spring pad; 4 - U - bolt nut; 5 - ball washer; 6 - truck frame; 7,9 - torque rods (upper and lower); 8 - spring supporting bracket; 10 - buffer bracket; 11 - buffer pad; 12 - buffer; 13 - collar housing; 14 - collar; 15 - felt packing ring; 16 - spacer ring; 17 - walking beam axle bolt; 18 - coupling bolt; 19 - bolts fastening walking - beam bracket to the fifth cross - member; 20 - walking - beam bracket; 21 - walking - beam axle; 22 - axle bracket; 23 - packing ring; 24 - ball pin; 25 - walking beam; 26 - nut; 27 - walking - beam cap; 28 - filling hole plug

Tighten the U - bolt nuts in accordance with Fig. 48:

- front springs: first with a torque of 200 - 250 N m (20 - 25 kgf m) and finally to 400 - 500 N m (40 - 50 kgf m);
- rear springs: first with a torque of 250 - 300 N m (25 - 30 kgf m) and finally to 580 - 660 N m (58 - 66 kgf m).

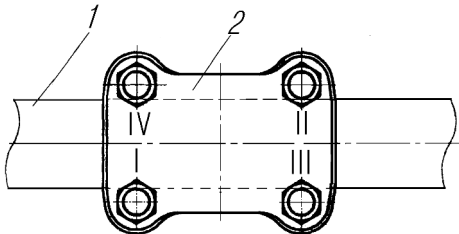


Fig. 48. Tightening Diagram of Spring
U - bolt Nuts:
1 - spring; 2 - rear spring pad (front axle beam clamp); I - IV - U - bolt nuts tightening order

When reassembling lubricate the U - bolts' threading with graphite grease or ТСГПП - type grease

Tighten the nuts of U - bolt 21 (see Fig. 45) fixing the front spring plate eye on a loaded truck in the following sequence of operations:

- screw the nut home;
- back off the nut by 1.5 - 2 turns;
- punch the threading in two opposite points on each stem.

Complete tightening of the front spring U - bolt nut is not allowable, because it would hinder movement of the leaves and cause quick damage of the U - bolt and eye fasteners during operation. If there is no clearance (less than 0.2 mm) between the eye and upper leaf, repair or replace the eye.

Should the spring be dismantled from the truck, torque the nuts of U - bolt 21 to 20 - 28 N m (2.0 - 2.8 kgf m) and punch in two opposite points. See that the bolt 24 fastening the plate eye is properly tightened. Torque the nuts to 280 N m (28 kgf m). If the cotter pin hole in the bolt and the nut slots fail to match, tighten up the nut and cotter it.

If the brace is slackened on the front spring rear brackets, tighten up the brace bolts. For upper bolt 14 apply a torque of about 120 - 160 N m (12 - 16 kgf m), and for the lower bolt nut, 180 - 220 N m (18 - 22 kgf m). Lock the bolts by bending the retaining strip on the heads.

Should the first leaf ends of the rear spring be worn by half of their thickness interchange the first and second leaves. It is not recommended to interchange the leaves on the trucks having a load of 12 000 kg on the rear bogie.

To dismantle U - bolts 2 (see Fig. 47) without decoupling the torque rods jack the truck up, place a stand under the walking - beam axle or under the truck frame. Unscrew the U - bolt nuts and take off the spring pad. Lower the truck onto the stand in such a way that a gap is available between the spring and walking beam. Turn the walking beam by a small angle and remove the U - bolt.

To eliminate axial displacement of the walking beam unload the walking beam by hanging the truck frame in such a way that the spring ends are not jammed in the supporting brackets. Remove cap 27 of the walking - beam. Slacken coupling bolt 18, unscrew nut 26, wipe dry the thread of the walking - beam nut and axle and lubricate with УТ-6 sealant (alternatively with Loktite - 243 or Loktite - 573). Screw home nut

26, then back off by $1/6 - 1/4$ a turn. The sealant squeezing - out into the gap between the end faces of the walking - beam nut and bushing is not allowed. Upon adjustment torque coupling bolt 18 to 44 - 56 N m (4.4 - 5.6 kgf m). Replace the damaged cap gasket having lubricated it on either side with YH - 25 sealant (alternatively with Loktite - 573).

Fill lubricant into the walking - beam hubs up to the filling hole level available in the cap. Eliminate lowering of oil level below the mark available on the walking - beam caps.

As the oil filled into the walking - beam hubs when reassembling gradually packs the gaps in joints and is absorbed by the wooden plugs, which are pressed into the axle pipe on both sides, an insignificant lowering of oil level is possible.

When preparing a new truck for operation check lubricant level in the walking - beam hubs and bring it up to the filling hole level in the caps, if need be.

Torque the torque rod pin nuts to 600 N m (60 kgf m). If the cotter pin holes fail to match with nut slots, tighten up the nut into coincidence and cotter it. Pack grease into the torque rod hinges until fresh grease is squeezed out, or the rubber packing rings begin to be deformed. In this case the grease needs not be squeezed out.

Loosing of bolt connections of suspension parts is not allowed.

If working fluid leaks out of the shock absorber, tighten up nut 2 (see Fig. 46). The shock absorber should exhibit uniform resistance being expanded or compressed. The rebound effort must be within 5.9 - 8.0 kN (595 - 800 kgf), while the compression effort, 1.5 - 2.2 kN (152 - 228 kgf). For effort testing use the press with a rod stroke of 100 mm and a speed of 100 strokes per minute. If the shock absorber rod travels freely, it indicates that the unit is faulty.

The shock absorber should be disassembled and reassembled in workshops keeping required cleanliness. Polished surfaces of the rod, operation cylinder, compression rings and piston should be protected from dents and other injuries.

When changing the working fluid, proceed as follows:

1. Clamp the shock absorber in the vice by its lower head and pull out the rod completely.
2. Fit a special wrench in a slit formed between the casing and body and unscrew the body nut.
3. Slightly rocking the rod at its upper end, take it in assembly with the piston out of the operation cylinder.
4. Take the operation cylinder out of the container and drain the working fluid completely.

Every time, when disassembling and also when replacing the fluid, wash all the parts of the shock absorber in kerosene and dry them. Lubricate the collar inner faces with shock absorber fluid in accordance with the Lubrication Chart. If the fluid is unsufficient the shock absorber is not capable of exerting force, if excessive, it may break down. It is not permitted to use other fluids as shock absorber ones. Insert the piston in assembly with rod into the cylinder, fit the gland housing, packing ring, washer, move all other parts and torque the body nut to 120 - 150 N m (12 - 15 kgf m).

On the shock absorber with a plastic casing being extended the access to the body nut is cut off. To tighten up the body nut remove the shock absorber from the truck and thrusting against the casing end press the latter off to the upper head's side. Having tighten up the body nut reset the casing on its original place.

Wheels and tires

The wheels are separable, and consist of rim bases 2 (Fig. 49), bead rings 5, lock rings 4 and lock ring limiters 3.

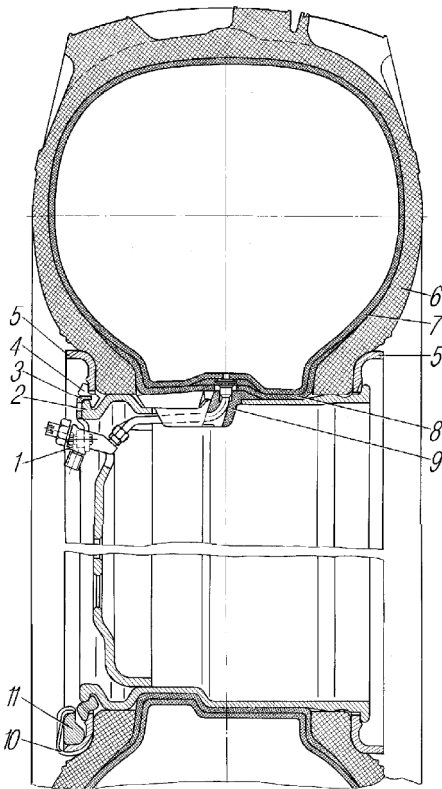


Fig. 49. Wheel and Tire Assembly:
1 - wheel valve; 2 - rim base with disk; 3 - lock ring limiter; 4 - lock ring; 5 - bead ring; 6 - tire casing; 7 - inner tube; 8 - flap; 9 - valve slot seal; 10 - balance weight spring; 11 - balance weight

The rim bases incorporate the toroidal seats, which the tire beads rest on, the mounting grooves, which allow mounting the tires onto the rims and dismantling them, the disks, which serve to fix the wheels on the truck hubs. The 400Г - 508 wheels can be used both with detachable and nondetachable bead edges on the side opposite to the lock part.

The bead and lock rings of the 254Г - 508 and 400Г - 508 wheels are interchangeable and are mounted on these wheels in a strictly determined position with the help of the lock ring limiters welded to the rim and pressed out pieces on the lock rings, which enter the appropriate recess (slot) on the bead rings. The second slot on the bead rings is used, when dismantling the wheels. On one of the lock ring ends a slot for gripping the ring, when taking it out of the rim lock groove, is made.

The lock ring limiters serve to prevent turning the rings over, when the truck travels with reduced tire pressure, and at the same time they are the brackets, which wheel valves 1 are fastened to, and additional supports for protection hoods of air supply hoses.

On the 254Г - 508 wheels, the wheel valve is mounted on the outer side of the limiting bracket, on the 400Г - 508 wheels – on the inner side.

Rubber seals 9 of the wheel valve slot do not allow mud inside the tires and ensure that the inner tube valves are set in a certain position.

The wheels with tires can be balanced. Balancing of the wheels is performed with the help of balancing weights 11, which are fastened by spring 10. The nuts and studs, fastening the wheels on the left and right sides, have a right-hand thread.

Care of wheels and tires

The longest service life of the wheels and tires and safety of their operation can only be reached, if the regular care of them is conducted, and operational requirements for truck tires, traffic regulations and safety regulations relating to vehicle transport are observed.

The following general requirements should be used as guidance:

- strictly observe norms of tire internal pressure;
- avoid overloading of the tires by cargo weight;
- perform maintenance of the wheels and tires in due time;
- keep units of the running gear, steering and brakes in good working order;
- stick to rules and use rational technique of driving, taking into account road conditions, strictly observe the rules of using controllable - pressure tires at reduced air pressure, set forth in Subsection «Truck Driving».

Maintenance. Every day before your departure check up the tire pressure and, if required, bring it to norm.

When conducting the daily maintenance, check up the condition of the tires, wheels and their fastening parts. The tires should not have any damages, unrepaired local damages (punctures, cuts), local separation of tread and sidewall, and the wheels should not have mechanical injuries, rust and cracks on their parts. The tires in terms of their wear should be suitable for operation. Remove alien objects stuck in the tread and sidewall. The valves of the tire inner tubes should always be in good working order.

Make sure no fuel, oil and other petroleum products contact the tires, because it puts them out of order quickly.

When discovering faults relating to the tires and wheels, take measures to remedy them, repair or replace them.

Slacking of the wheel fixing and operation of the truck is not allowed even if a single nut or stud fastening the wheel is missing or fastening holes in the disks are worn - out.

When conducting the second maintenance, check up tightening of the nuts fastening the wheels. During the first run of 1000 km tighten up the nut fastening the wheels for the first time after the run of 100 - 150 km and for the second time — after 200 - 300 km, the same procedure should be followed every time, when mounting a wheel on the hub irrespective of the reason of its removal.

When conducting the second maintenance of the truck on the whole, it is required to check condition of the wheels and tires, and if any fault has been discovered, repair or replace, balance or rearrange them, tighten up the nuts fastening the wheels, if the wheels assembled with tires could not have been removed from the truck. Besides that, while conducting the second maintenance, check up the adjustment of wheel convergence and angles of setting the front wheels, blow through all the lines and hoses of the tire pressure control system.

If intensive and uneven wear of the tire tread, which as a rule is not only a result of improper driving, but that of the faulty running gear, steering and brakes, has been discovered, its reasons should be found and the faults should be eliminated irrespective of the truck run.

Tire mounting and dismantling. When mounting and dismantling the tires, the following rules should be observed:

- mount and dismantle the tires at the site specially equipped for these purposes, use specialized equipment, fixtures and tools; in the field use tools available in the driver's kit, in so doing it is required to take steps, which prevent penetration of sand and mud into the tire;

- the tire casings, inner tubes and flaps should be clean and dry;
- the tires, which have been stored at a temperature below zero, are recommended to be warmed up in a warm room to a temperature above zero;
- direction of wheel rotation should coincide with that of the tread pattern (for tire casings having a directed pattern);
- rims and their elements should not have damages, bends, cracks, sharp edges and burrs, corrosion both on the exterior and interior sides and in the points of contact with tires, worn-out fastening holes;
- when mounting the tires at a workshop, check the rim for radial and axial wobbling that should not exceed 4 mm.

Before assembling the wheel check up technical condition of the tire casing, inner tube, flap, lock and bead rings.

Examine the exterior and interior of the tire casing with the help of a bead expander, remove alien objects (sand, small stones, etc.) from its interior part, wipe the inner and setting surfaces of the tire casing, eliminate damages and galling of the beads, cut the rubber projections and fins flush-mounted with the main surface of the bead rubber. Powder the tire casing interior and the inner tube and flap exterior with talc.

To make the assembly easier and ensure the complete setting of the tire onto the setting surfaces of the rim it is recommended to apply soap solution, glycerin or liquid paraffin onto the tire casing beads. Do not use mineral oil (solid oil, engine oil, etc.) as a lubricant.

If manufacturing or operational defects have been detected, it is not allowed to use the tires for mounting.

Check the inner tubes and valves for sealing; do not use the inner tubes with separation in the joint and the damaged valve.

Remove mud, rust and the rest of rubber from the wheel surface, especially from the surface of the rim, bead and setting rings, which faces the tire. Paint trimmed spots and the spots, where paint is damaged, with a fast-drying enamel, having eliminated burrs and metal scores first.

Check setting of the locking ring on the rim and on the control cylinder having the same diameter:

- clearance in the seam between the ring ends should be 45 - 55 mm, loosening of the ring ends from the rim — 1.5 mm, along the arc up to 50 mm;
- local clearances between the lock ring and rim should not exceed 1.5 mm and smoothly decrease to both sides along the arc not more than 1/4 of circle;
- twisting of the lock ring should not exceed 15 mm.

If the clearances and twisting of the lock ring exceed the said numbers, the ring is not suited for assembling and should be fluted and squeezed or replaced by a new one.

The wheel parts, which have infringed shape and cracks, should be rejected as well.

The wheels and tires, which are only in good working order, are subject to mounting (operation).

When mounting and dismantling tires, the safety regulations should be observed as follows:

- do not remove and do not put the wheel with tire onto the truck, if you are not convinced that the wheel has been hung up securely. Slack off and tighten the nuts on the truck that is not hung up and is braked;
- do not remove a faulty wheel (cracks in the area of welded seams, damages or incorrect position of the lock ring on the rim, bent bead ring, wheel wobbling

more than 6 mm, tire cuts, which bare its cord, etc.) from the hub without complete deflating of the tire; besides that, make sure that the tire has been completely deflated before you start to dismantle the tire from the rim;

- do not mount the cross - ply tires together with the radial ones on the vehicle; tires of different size, models and load - carrying capacity are not allowable;
- do not use sledge hammers, pinch bars, faulty installation tools and the tools, which are not provided by technical documentation, and can deform or cause mechanical damages of wheel components, cuts and breaks of the tire casing beads, injuries of the inner tube and flap;
- do not mount the tire onto the rim that does not conform to these tire sizes;
- do not use the bead and lock rings from a different type of wheel, because they can have different design dimensions (regarding diameter and profile), even with the same model of trucks, which have been produced on different dates and have got different design of their wheels;
- do not set additional bead rings onto the rim to reduce its width;
- do not use the rims, bead and lock rings, which are noncircular and have damaged surfaces, local dents, cracks as well as mud, rust and excess paint;
- do not use the tires, which have maximum wear of their tread pattern (residual depth of protrusions less than 1 mm) or tires with ply separation of the tire carcass, peeling of the tread pattern or sidewall, non - repaired local damages, cuts or breaks, which reach the cord, and through punctures or injuries of the metal bead rings of the tire casings;
- do not allow to mount the tire casings, which have excess rubber, pressed - out rubber and flashes on the edge, scores and damages, which obstruct mounting;
- when mounting or dismantling tires, do not apply rough force to tire irons; the force applied should not result in their sliding off or break of tire iron ends;
- first, make sure that the lock ring occupies its proper position in the rim base groove, which corresponds to the inflated wheel, and then inflate the tire;
- do not inflate the tire outside a special protection enclosure, and the tire to be inflated should not be mounted on the truck; in the field use the safety devices, which prevent ejection of parts, if spontaneous dismantling or wheel break occurs;
- do not inflate the tires from the bottles with compressed air or gas as it will cause tire destruction and injure the people, who stand nearby.

Remember that the operations performed properly, when dismantling and mounting the tire, ensure safety and reduces the labour consumption, when doing the job, allow to extend the service life of the tires, wheels and installation tools.

Inflate the tire from the compressor, it is recommended to mount the tire horizontally.

Align the lock and bead rings if necessary. Inflate the tire up to pressure of 0.05 - 0.1 MPa (0.5 - 1 kgf/sq.cm) and check the position of the lock ring: if the lock ring has been set incorrectly, it is required to let the air out of the tire, correct the ring position and repeat the procedure.

Examine the tire – blisters and deformations are not allowable.

Inflate the tire up to pressure which allows tire beads on the seats (0.45 - 0.50 MPa (4.5 - 5.0 kgf/sq.cm)) and then set the required pressure.

If tire beads do not seat tight, upon air inflating, it is required to let the air out of the tire, dismantle it and eliminate the reason that has caused the loose seating of the tire beads; after that re-mount the tire onto the rim, inflate it and check, how tight the bead seating is.

Wheel disassembling

1. Place the wheel on an even, clean site with its lock part upwards, deflate the tire completely, for the controllable - pressure tires disconnect the valve from the wheel valve and recess it together with the seal into the hollow of the tire casing, remove the wheel valve. Apply marks indicating the position of the balancing weights onto the rim and tire of the balanced wheel and remove the weights.

2. Remove the tire bead from the bead seat. For this purpose insert the flat end of the short tire iron into the dismantling slot between the bead and lock rings and press out the bead ring downwards, and insert the flat end of the second tire iron into the gap appeared (Fig. 50, I). Pressing both irons and rearranging them by turns around the circle at a distance of 50 – 100 mm from each other, upset the bead ring to some extent downwards together with the tire bead, and then, using the hook - like end of the large tire iron, completely remove (upset) the tire bead along its whole length from the bead seat.

If it is difficult to remove the tire bead from the bead seat after long use as well as when removing it on the side of the bead fixed edge with 400Г - 508 wheels, the bead should be removed from the bead seat, directly catching the bead with the tire irons. For this purpose:

- insert the flat end of the short tire iron between the tire bead and the wheel bead ring as deep as possible, press out the tire iron downwards;

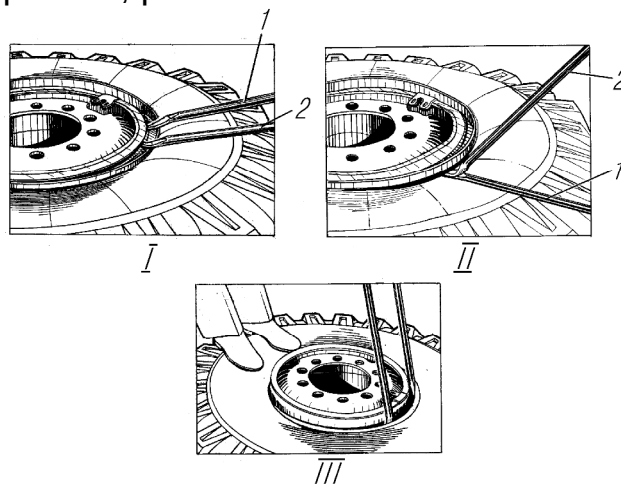


Fig. 50. Wheel Disassembling:

I, II - removing of tire bead from bead seat; III - dismantling tire bead from rim; 1, 2 - tire irons

- then, between it and the bead edge (bead ring) insert the hook - like end of the large tire iron so that the flat end of the short tire iron locates in its slot (it is permitted to use a hammer) and rest the second tire iron on the first one, having caught the bead ring by its hook - like end, pressing out both tire irons simultaneously (Fig. 50, II), upset the tire bead downwards;

- repeat this procedure, gradually moving around a circle, remove the tire bead from the bead seat. The distance between the points, where the tools are inserted at the initial moment, should not exceed 100 mm.

The toroidal shape of the setting surface of the rim does not allow to perform local removal of the tire casing beads; that is why labour input and time of disassembling reduce significantly, when upsetting the tire casing bead gradually by two - or three - stage application of efforts along a circle.

3. Remove the lock ring. For this purpose insert the flat end of the short tire iron into the dismantling slot of the lock ring and press its end out of the rim; then move the lock upwards, using the second iron, and completely release the lock from the rim by pressing it out of the rim and gradually moving along the wheel circle.

4. Remove the bead ring from the rim.

5. Dismantle the tire bead:

- stand on the tire on the side opposite to the inner tube valve, upset the tire casing down to the mounting groove and insert a part of the tire bead in it;

- insert flat ends of the tire irons between the tire rim and bead in the valve area at a distance of 200 - 250 mm from each other (Fig. 50, III) and pressing them, move a part of the bead through the bead seat upwards (take it to the outside of the rim). In so doing the opposite side of the tire bead must be in the mounting groove of the rim;

- holding the dismantled part of the tire bead with one of the irons, completely move the bead along its whole length upwards, using the other iron, inserting sequentially its flat end between the rim and tire at a distance of 70 - 100 mm to the right and left of the place, where the tire bead goes to the outside. To avoid the bead injury insert the tire irons for the whole width of the bead.

6. Turn over the tire and the wheel with the lock part facing downwards and remove the tire bead from the second bead seat, following the procedure described in paragraph 2.

7. Take the rim out of the tire:

- set the wheel with the tire in the upright position with the lock part away from you so that the inner tube valve is at the bottom, recess the valve with the seal to the inside of the tire;

- holding the tire by hand in the upright position and leaning it against a support, pull the rim by the other hand, avoiding skewing, so that the tire bead at the bottom enters the mounting groove;

- taking hold of the disk or upper part of the rim, extract the rim out of the tire, preventing its falling down.

If the flap is stuck, separate it with the tire iron.

Wheel assembling

1. Put the inner tube and flap in the tire casing and pump up the inner tube a little so that it takes its natural shape; in so doing it should not be tight against the tire casing. For the controllable-pressure tires put the inner tube in the tire casing, taking a direction of wheel rotation into account, put the seal on the valve so that its stem is in the seal body.

2. Put one of the bead rings with its edge downwards on the rim set with its lock part, facing upwards.

3. Put the tire on the rim:

- put the tire inclined on the rim so that its bottom part with the valve, facing upwards, is spaced from the rim. Align the valve with the seal strictly opposite to the valve slot of the wheel and insert the valve and nut in the valve slot, moving the tire to the rim or away from the rim, if required;

- lift up the bottom part of the tire on the side of the valve slot and move it on the rim so that the lower bead enters the mounting groove; in so doing the tire by its own weight will be put on the rim. If the tire hangs on the bead seat, upset it by swinging, and make sure that the valve is not skewed in the valve slot, and the flap is not pinched;

- slightly recess the lower part of the seal inward the tire by a tire iron first and then insert the guide part of the seal with the valve in the rim slot.

4. To mount the second bead of the tire onto the rim stand onto the tire on the side opposite to the valve, recess this part of the tire casing bead into the mounting groove; in so doing the tire bead in the zone of limiter should be at the top, above the rim. If any difficulty occurs, upset a part of the tire bead behind the bead seat with the help of the tire irons as shown in Fig. 51.

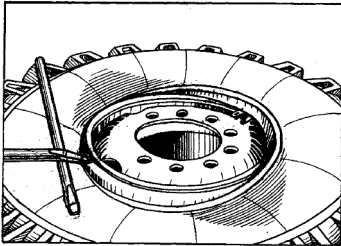


Fig. 51. Inserting Tire Bead in Rim Mounting Groove

Hold the bead by the short tire iron first in the zone of bracket, keeping it from movement towards the centre, then manipulating by the other tire iron in the rim groove, using a flat or hook-like end of the iron by turns and beginning from the side opposite to the bracket, displace the bead along its whole length through the bead seat. Upset a part of the bead in the zone of valve in the last turn, a little bit lower than the rim edge, down to the level, which ensures the installation of the lock ring, otherwise, the valve slot seal will be displaced, and further assembly will be impossible.

5. Mount the bead and lock rings, having aligned stamped-out mark «B» (Fig. 52) on the lock ring of the constant-pressure tires with one of slots «A» on the bead ring and having ensured that the cut of bead ring coincides with the limiter on the rim.

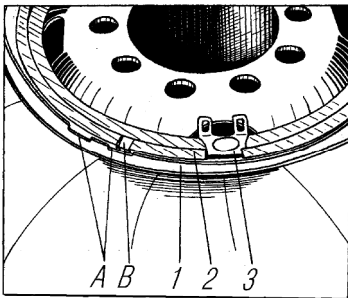


Fig. 52. Position of Lock and Bead Rings of 254Г-508 and 400Г-508 Wheels:
1 - bead ring; 2 - lock ring; 3 - bracket;
A - slots on bead ring; B - stamped-out mark on lock ring

6. Check position of the valve and seal in the valve slot and if required, adjust them; connect the inner tube valve with the wheel valve. Mount the valve on the outer and inner side of the locking ring limiter, depending on wheel design, and upon connecting the valve and inflating the tires, fasten the valve as far as possible from the wheel centre.

7. Inflate the tire, observing the following order:

- centre the bead and lock rings relative to each other;
- inflate the tire up to pressure of 50 kPa (0.5 kgf/cm²) and make sure that the lock and bead rings have not been displaced relative to their working position. It is advisable to inflate the tire, when the wheel is set in its horizontal position.

If the wheel is set in a wrong position, deflate the tire, correct the position of the rings and re-inflate the tires up to pressure of 50 kPa (0.5 kgf/cm²). When

deflating the tire, disconnect the air supply hose not from the wheel, but from a source of compressed air. It is allowed to disconnect the hose from the wheel only after deflating the tire completely.

If the rings have been reinstalled incorrectly, replace defective parts, make sure that the bead and lock rings are installed properly (at a pressure of 50 kPa (0.5 kgf/cm²), inflate the tire up to the pressure that ensures setting of the tire beads on the bead seat, and then inflate the tire up to its nominal pressure.

Contrary to the wide - spread design of wheels with conical bead seats, setting of the tire beads onto the toroidal bead seats under increasing inner pressure does not happen gradually, but instantly, usually at a pressure of 450 - 500 kPa (4.5 - 5.0 kgf/cm²), which exceeds nominal pressure to some extent.

8. Balance the wheel with the tire.

9. Mount the wheel onto the hub and fasten it, the tightening torque of the nuts fastening the wheels should be 400 - 500 N.m (40 - 50 kgf.m).

To connect the wheel inflation hose to the wheel valve mount the wheel relative to the hub cap so that the inflation hose is symmetric between the studs, fastening the wheel on the side of the wheel valve.

When mounting the wheel, tighten the nuts, fastening the disk to the hub in the following order:

- screw all the nuts onto the studs manually;
- first tighten the nuts by a wrench with the wheel being lifted. In so doing screw the nuts, alternating them or crosswise. When screwing in the first five nuts, make sure that the nuts are centered with their spherical chamfers in the spherical chamfers of the fastening holes of the wheel disks. The nuts should be tightened securely, because their insufficient and uneven tightening can result in lateral runoff of the wheels assembled with tires.

Balancing of 254r-508 wheels assembled with tires. The permissible unbalance is 5.2 kg.cm. In the course of operation, as the tires are wearing and by other reasons (remounting of the tires) the initial balance infringes; therefore, when the truck travels, oscillation and vibration, especially those of the front wheels, can occur.

The unbalance causes rapid wear of the treads, wear of the steering and suspension components as well as makes the control over the truck more difficult. It is recommended to perform static balancing of the wheels assembled with tires. Unbalance can be remedied by means of mounting the balancing weights, which are held on the bead ring by a plate spring. The mass of the single balancing weight is 0.38 kg. To remedy unbalance from 5.2 to 15.2 kg.cm, mount one weight, from 15.2 to 25.2 kg.cm — two balancing weights; from 25.2 to 35.2 kg.cm — three balancing weights, from 35.2 to 45.2 kg.cm — four balancing weights.

Prior to balancing remove mud and alien objects from the wheel and tire.

The tire pressure should be nominal. The wheel and tire on a special device is based over the plane of the disk and over spherical chamfers of the fastening holes, when balancing it.

The order of installing the balancing weights is as follows:

1. Deflate the tires.
2. Press the tire bead out of the bead ring with a tire iron, where the balancing weight is placed, until a clearance of 1 - 2 mm appears.
3. Mount the weight with the spring onto the bead ring, holding them by hand, set the spring beyond the bead ring edge, slightly hammering it, and upset it completely. If the spring is set incorrectly, it can slip off the bead ring abruptly, therefore, be careful.

4. Inflate the tire to its nominal pressure.

5. Reset the balancing weights, if they have displaced regarding perimeter or got out across the bead ring radius.

To remove the balancing weights insert a screwdriver between the spring and weight, press the spring out of the bead ring until releasing the weight, remove the weight and spring.

Balance and remount the wheels as required. The tire replacing diagram is shown in Fig. 53.

In the course of the tire operation observe the «Rules of Vehicle Tire Operation» («Khimiya» Publishers, Moscow, 1983).

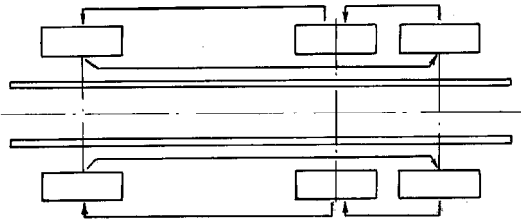


Fig. 53. Truck Wheel Rotation Diagram

Spare wheel holder

The spare wheel holder on the trucks can be mounted in an upright or horizontal position.

The design of the upright holder is shown in Fig. 54. The base of the spare wheel holder and tilting bracket are made of rolled profiles welded to each other.

The spare wheel holder is lifted and lowered down with the help of a worm reduction gear. The spare wheel is fixed in its transportation position by braces 9 (Fig. 54) and bolts 11. When lowering down the spare wheel, release the fastening of tilting bracket 8 from braces 9, having checked fixation of rope 1 to the tilting bracket first. Put the detachable handle on the reduction gear shaft.

Turning the handle, lower down the tilting bracket with the spare wheel. When the spare wheel has been lowered down, remove rope 1 from it, not disconnecting it from tilting bracket 8 without necessity, and roll out the wheel.

The spare wheel should be lifted and fixed for transportation in the reverse order, after that the rope tensioning is slacked off.

Maintenance of the spare wheel holder lies in checking of the spare wheel holder fixing to the truck frame and fixation of the wheel in the holder.

The design of the horizontal spare wheel holder is shown in Fig. 55. In the transportation position tilting bracket 7 with the spare wheel is fastened to the truck frame with nuts 8.

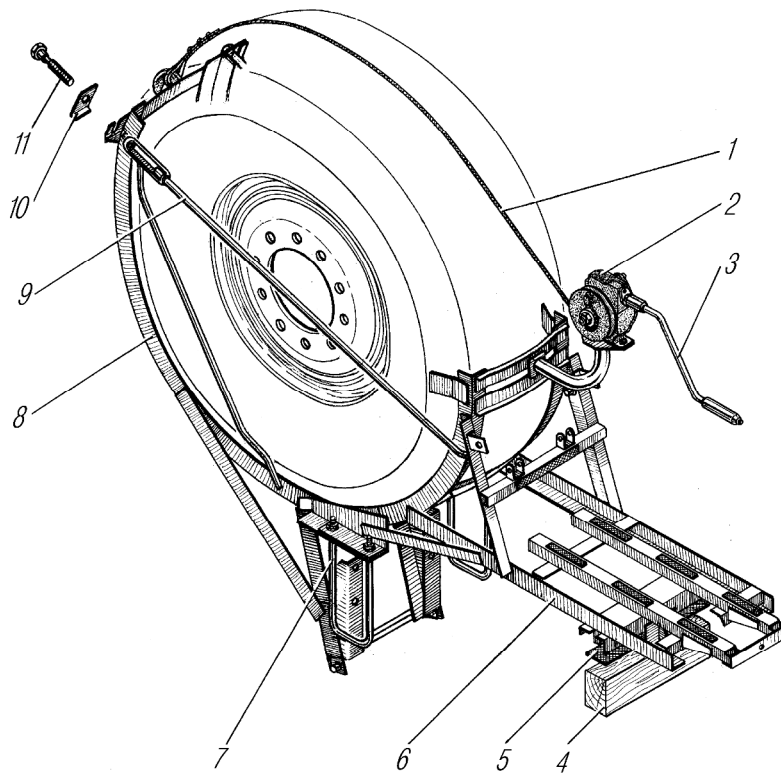


Fig. 54. Upright Spare Wheel Holder:

1 - rope; 2 - reduction gear*;
3 - handle; 4 - base bar; 5 -
bar gasket; 6 - holder base; 7
- U - bolt; 8 - tilting bracket;
9 - brace; 10 - clamp; 11 -
bolt

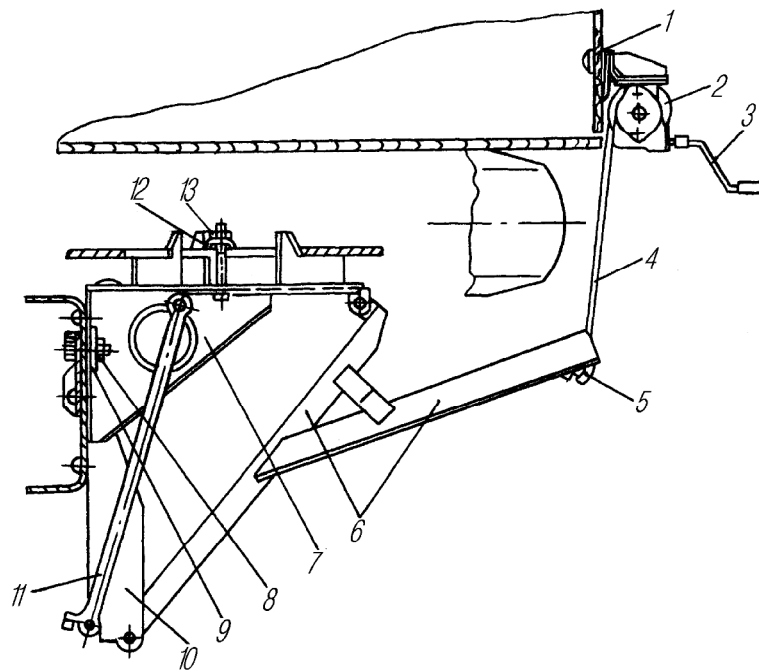


Fig. 55. Horizontal Spare Wheel Holder:

1 - bracket fastening reduction gear to truck platform; 2 - reduction gear; 3 - han -
dle; 4 - rope; 5 - rope catch; 6 - lever; 7 - tilting bracket; 8, 13 - nuts; 9, 12 -
straps; 10 - fixed bracket; 11 - pillar

* The reduction gear is mounted under the holder base on URAL - 44202 -
0311 - 31 and URAL - 44202 - 0612 - 30 bolster trucks.

When lowering down the spare wheel, it is required to hang reduction gear 2 on platform side bracket 1, and fix rope 4 loop to catch 5 located on lever 6.

For your safety pull on the reduction gear rope by turning detachable handle 3. Undo nuts 8 and remove straps 9 fastening tilting bracket 7 to the frame. Slightly slack off the rope tensioning and disengage tilting bracket 7 from the pawl.

Lower down the spare wheel holder by turning handle 3 of reduction gear 2.

Slack off the rope, remove reduction gear 2 from the platform side and without disconnecting rope 4 from rope catch 5, remove the spare wheel from the tilting bracket. The spare wheel should be lifted and fixed for transportation in the reverse order.

The pawl for fixing the tilting bracket is located on the truck frame to the right of the spare wheel holder.

STEERING

Steering comprises steering column, steering gear, steering linkage and hydraulic booster.

Two variants of steering can be applied on the trucks: with steering gear of "worm - side segment" type, or of "screw - ball nut - rack - segment" type. In this case cardan shafts 7 (Fig. 56) and 10 (Fig. 57) differ in length.

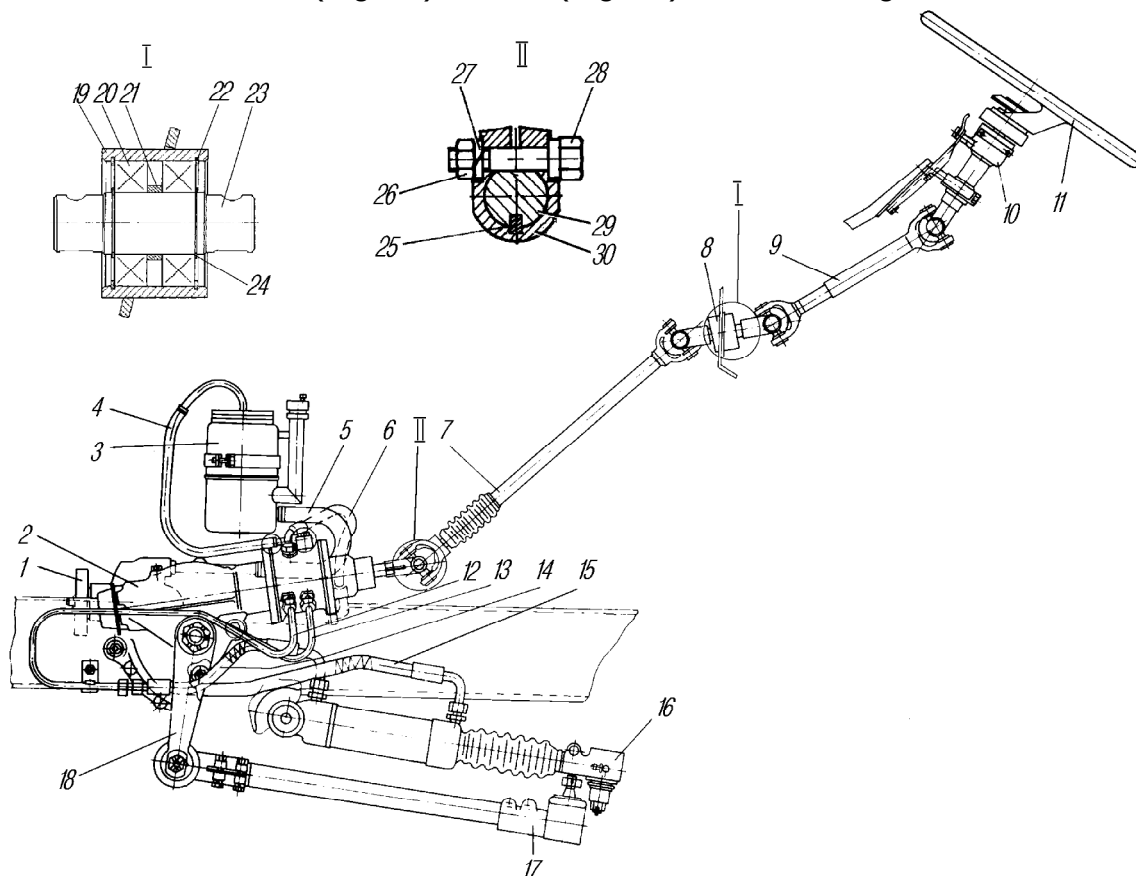


Fig.56. Steering with Steering Gear of "Worm - Side Segment" Type:

1 - pump; 2 - steering gear; 3 - oil tank; 4,5 - low-pressure hoses; 6,14,15 - high-pressure hoses; 7,9 - steering cardan shafts; 8 - centre support; 10 - steering column; 11 - steering wheel; 12,13 - high-pressure pipes; 16 - booster; 17 - pitman arm rod; 18 - pitman arm; 19 - body; 20 - bearings; 21 - spacing sleeve; 22,24 - retaining rings; 23 - shaft; 25 - key; 26 - nut; 27 - washer; 28 - bolt; 29 - shaft; 30 - cardan fork

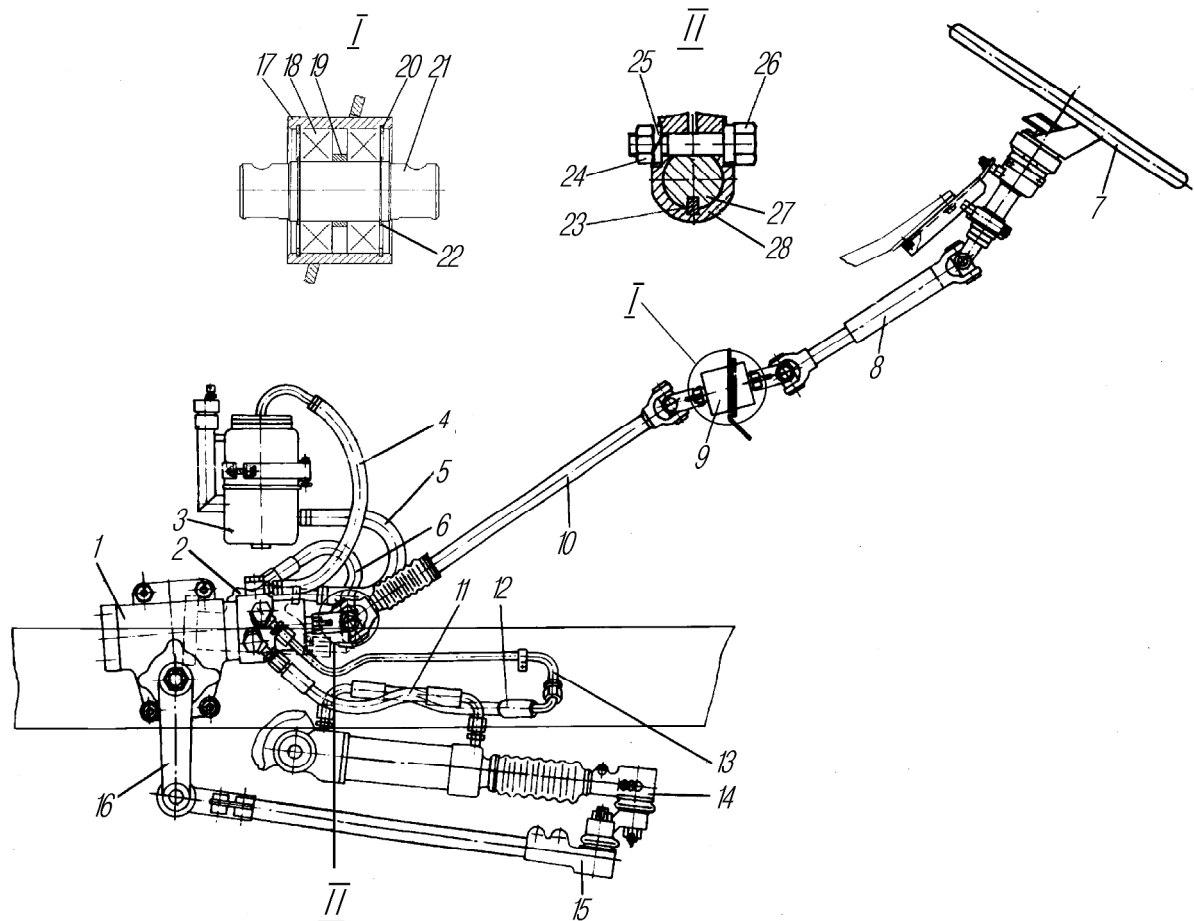


Fig.57. Steering with Steering Gear of “Screw - Ball Nut – Rack - Segment” Type:
 1 - steering gear; 2 - pump; 3 - oil tank; 4,5 - low - pressure hoses; 6,11, 12 - high - pressure hoses; 7 - steering wheel; 8,10 - steering cardan shafts; 9 - centre support; 13 - high - pressure pipe; 14 - booster; 15 - pitman arm rod; 16 - pitman arm; 17 - body; 18 - bearings; 19 - spacing sleeve; 20,22 - retaining rings; 21 - shaft; 23 - key; 24 - nut; 25 - washer; 26 - bolt; 27 - shaft; 28 - cardan fork

The slide valve body of the steering gear has a blind drill hole with dia. 12 mm, 5 mm deep, between the lower unions, which serves as a distinguishing mark. Do not use steering gears missing this drill hole for steering with a hydraulic booster that is secured to the left-hand frame side-member.

The steering column is connected with the steering gear by cardan shafts via center support 8 (see Fig. 56). Lubrication - free bearings of closed type are applied in the center support design.

The steering gear with booster control valve comprises worm 3 (Fig. 58) and worm segment 5 featuring spiral teeth. Steering pitman arm 25 is connected to the segment shaft through a taper splined joint. The segment thrusts against side case cover 18 via shims 19.

The segment is limited in sagging by pin 17 fitted in the case cover.

The booster control valve of slide type is mounted on the steering gear case.

The valve body is connected with the booster pump and cylinder via pipes. The truck moving straight, the slide valve is in its neutral position. Now oil flows from the pump into the slide valve body and then, through gaps between the

slide valve and its body, via drain pipe to the tank. In this case the booster cylinder chambers are under equal pressure, and the piston does not move.

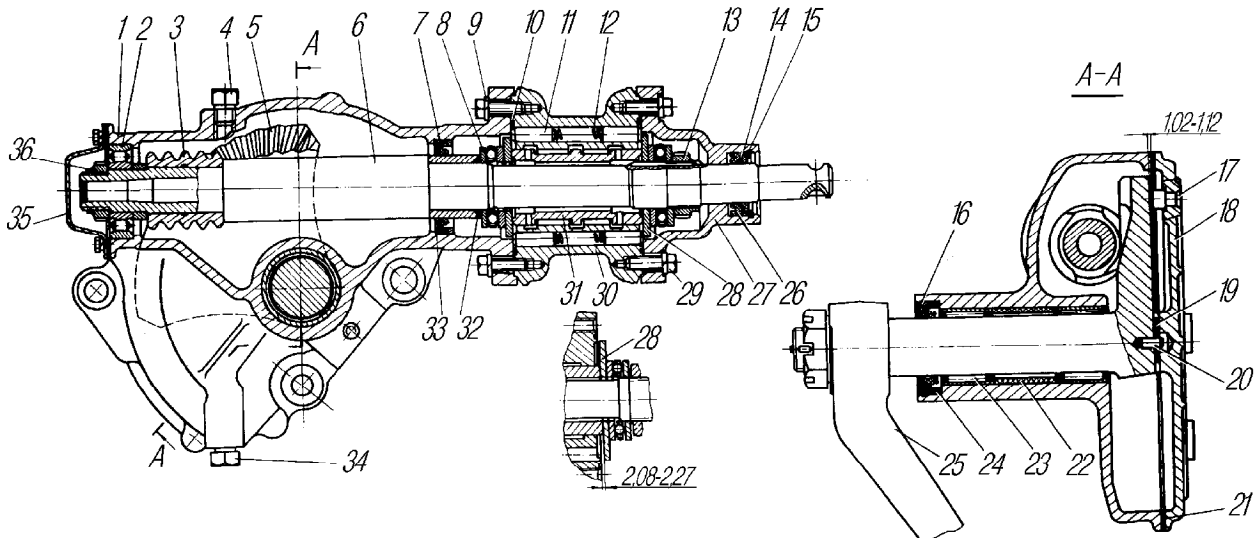


Fig.58. Steering Gear (Worm - Side Segment Type):

1 - steering gear case; 2 - radial roller bearing; 3 - worm; 4,34 - plugs of filler and drain holes; 5 - steering segment; 6 - steering wheel shaft; 7,24,26 - collars; 8 - thrust bearing; 9 - spring washer; 10 - packing ring; 11 - plunger; 12 - spring; 13 - slide valve nut; 14 - packing ring; 15,16 - retaining rings; 17,20 - pins; 18 - side case cover; 19 - shims; 21 - gasket; 22 - spacing sleeve; 23 - needle bearing; 25 - steering pitman arm; 27 - slide valve body cover; 28 - movable plunger ring; 29 - bolt; 30 - valve body; 31 - slide valve; 32 - packing ring; 33 - thrust washer; 35 - cover; 36 - worm nut

When turning the steering wheel, due to reactive forces appearing in "worm - segment" pair the worm and steering shaft with the slide travel axially. The displacement required is obtained by bearing's 2 design. As the slide travels about fixed slide body 30, one of the booster cylinder spaces gets connected with high - pressure line, while the other with drain line. Due to it, the cylinder rod of the booster moves until the steering wheel ceases to turn. The rod motion is transferred to the steerable wheels via ball pin and steering knuckle arm. When turning the steering wheel to the left or to the right, the oil flow in the booster is changed.

Steering gear with distributor (Fig. 59) comprises screw 7 and ball nut - rack 8 engaged with segment 1. Semicircular spiral grooves available on the screw and nut - rack form a channel. During assembly of the steering gear the channel is filled with high - accuracy balls 6.

Splined segment 1 is mounted in bearings 18, which are pressed into bushings 21 featuring a number of holes on their faces provided for meshing adjustment.

Axis of bearings' 21 outer surfaces are offset about the holes of bearings 29 by an amount of eccentricity "e", which makes possible to adjust meshing "segment - nut - rack".

The mark available on the splined face of segment 1 matches with the mark on the pitman arm end face.

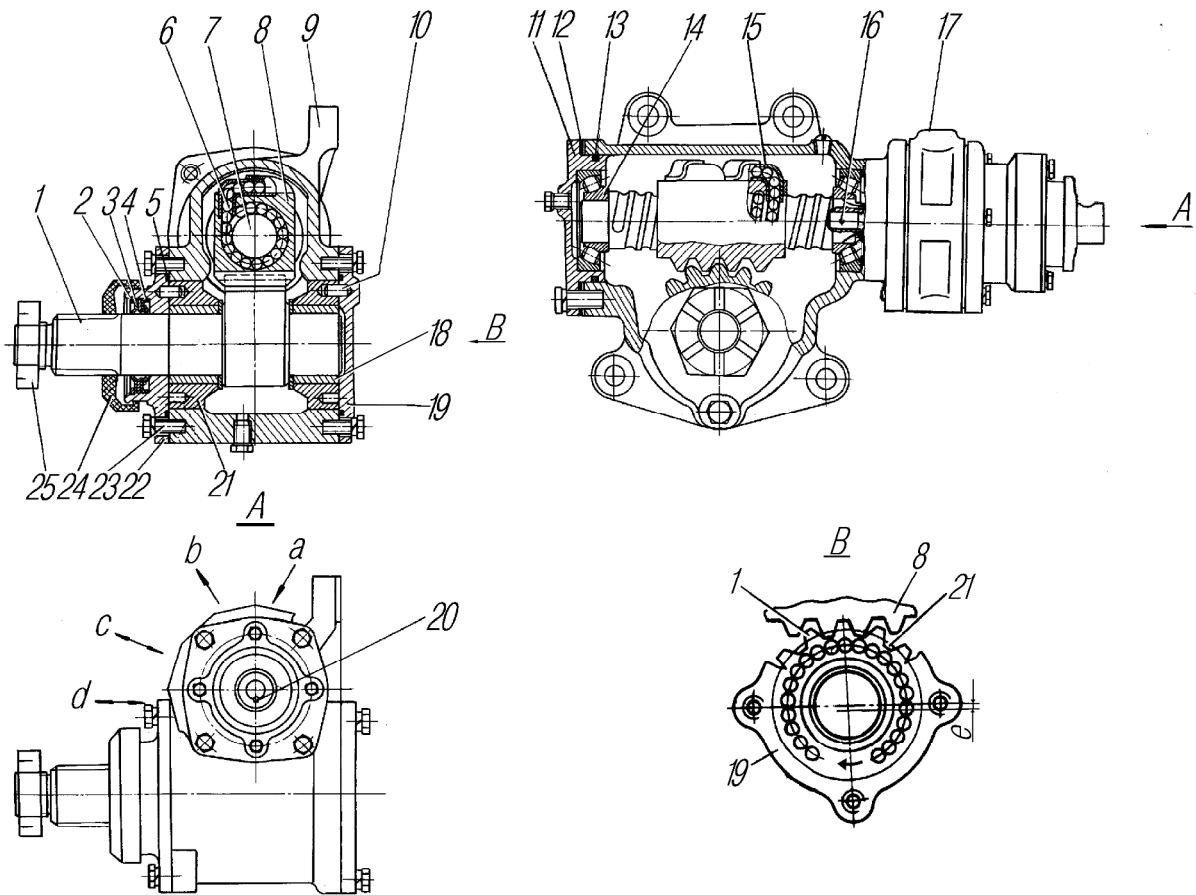


Fig. 59. Steering Gear ("Screw - Ball Nut - Rack - Segment" Type):

1 - segment; 2 - retaining ring; 3 - protective ring; 4 - collar; 5,13 - packing rings; 6 - balls; 7 - screw; 8 - nut - rack; 9 - case; 10 - fixing; 11,19,22 - covers; 12 - shims; 14 - bearings; 15 - guide; 16,20 - pins; 17 - distributor; 18 - bearings; 21 - insert; 23 - bolt; 24 - seal; 25 - nut; a - from pump; b - drain; c,d - to power cylinder

The distributor (Fig. 60) is mounted on the steering gear. Three annular grooves "e", "k" and "f" are available in slide valve body 5. The center groove "e" is connected with channel "a" to supply the working fluid from the pump, while the outer grooves "k" and "f" with channel "b" to return the working fluid for drain.

Plungers 21 are fitted in the three reaction chambers of body 5 so that they can move axially in their channels.

Slide valve 22 is fixed on bushing 9 via bearings 3 by nut 2. Bushing 9 is connected via splines with steering gear screw 24 without backlash providing the possibility of axial movement, and via a screwed joint with input shaft 15.

Input shaft 15 is connected via torsion 17 with screw 24 of the steering gear. Retaining valve 6 is screwed into the channel of center groove "e".

Steering Operation. As the truck travels straightforward and no force is applied to the steering wheel, the slide valve takes neutral position in its body.

The working fluid arrives at the center groove "e" (see Fig. 60). As in this slide valve's position grooves "e", "k" and "f" are interconnected, the oil, by filling the grooves and reaction chambers, drains from the distributor into the oil tank through outer grooves "k" and "f" and hole "b".

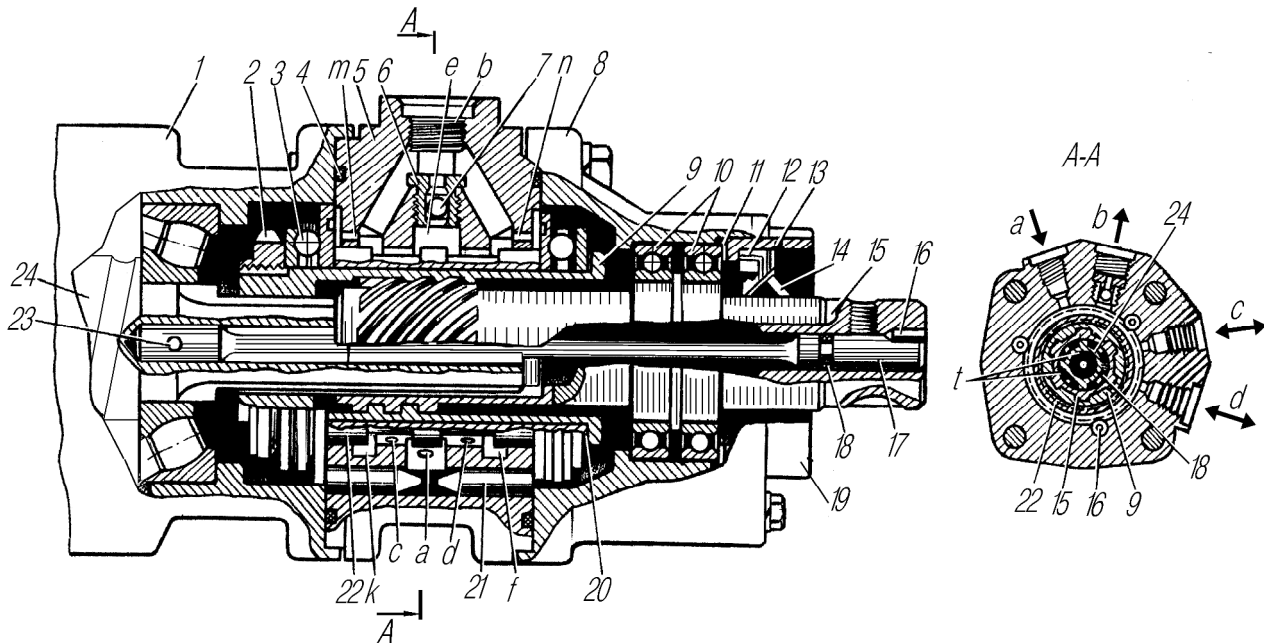


Fig. 60. Distributor of Steering Booster:

1 - steering gear case; 2 - nut; 3,10 - bearings; 4 - packing rings; 5 - slide valve body; 6 - retaining valve; 7 - ball; 8 - distributor cover; 9 - bushing; 11,20 - shims; 12 - collar; 13 - retaining ring; 14 - ring; 15 - shaft; 16,23 - pins; 17 - torsion; 18 - packing ring; 19 - cover; 21 - plungers; 22 - slide valve; 24 - screw; a - channel to supply working fluid from pump; b - channel to return working fluid from pump; c,d - channels to deliver/return working fluid to distributor spaces; e,k,f - annular grooves; m,n - bores for connecting spaces in distributor case and cover with drain; t - clearance

When turning the steering wheel, for example, to the right, bushing 9 and slide valve 22 fitted on it are shifted axially to the left (to steering gear) due to screwed joint. Early in the movement as pressure in the hydraulic system is not high the force on the steering wheel is produced by torsion twisting, which is acting directly onto shaft 15. In so doing, the screwed joint is shifting the slide valve being practically unloaded. When the slide valve is displaced by an amount limited by backlash "t" in the splined joint, the working fluid supply to annual groove "f" is cut off. The fluid is delivered from the pump to the centre groove "e" and then via channel "d" in the body and pipes gets into the other than rod chamber of booster 14 (see Fig. 57).

The force from the booster is transferred to the steering knuckle arm of the front steerable axle. The steerable wheels turn to the right.

From the rod chamber of the booster the fluid gets via pipes, distributor channel "c" (see Fig. 60) into annual groove "k" and then via hole "b" drains into the tank.

As steerable wheels' resistance to the turn is increasing, the pressure in the hydraulic system, consequently in reaction chambers, grows and cause proportional force increasing on the steering wheel.

The driver so gets information about resistance increasing of the steerable wheels to turn.

When stopping to turn the steering wheel (force is relieved from it), torsion 17 and plungers 21 bring the slide valve in its neutral position. The fluid is not getting into the other than rod chamber of the booster any more, and the truck moves in the circle of a preset radius.

When turning the steering wheel to the left bushing 9 and slide valve 22 are shifted axially to the right (from the steering gear). The fluid is forced from the pump via groove "e", channel "c" into the booster rod chamber.

The hydraulic booster being faulty retaining valve 6 provides for oil bypassing from one chamber of the booster to the other to ease truck steering.

Steering Booster

The booster damps impacts transferred to the steering wheel when the truck drives on an uneven road, improves safety of traffic and enables in main - taining the initial direction of movement, when a front wheel tire is punctured; it also reduces the effort required for turning the front wheels.

The booster is articulated with the frame and the arm of the front axle steering knuckle. The rod length is adjusted within the limits ensuring the front wheel turn by specified angles. For changing the rod length, free bolt 14 (Fig. 61) of the rod end clamp, take protective coupling 12 off the rod end and turn the rod in this or that direction using a wrench. If leaks are seen on the rod, tighten the gasket by means of nut 11.

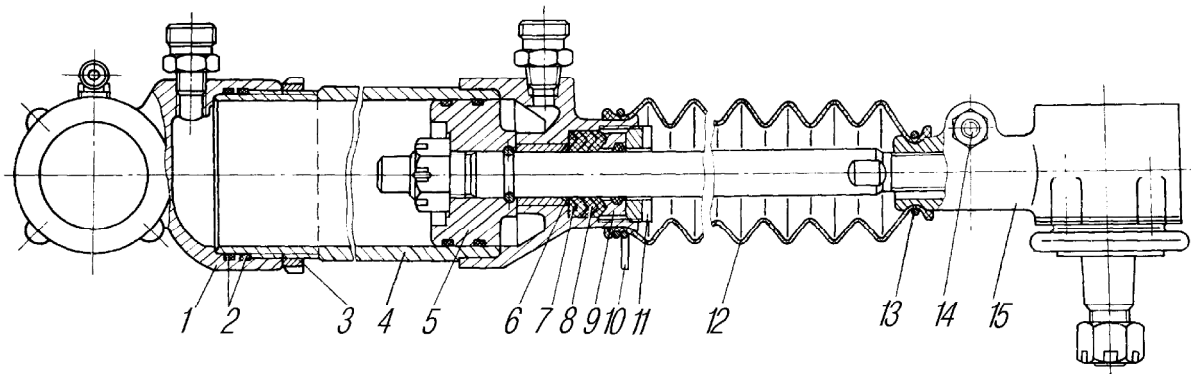


Fig. 61. Steering Booster:

1 - cylinder end; 2, 6 - packing rings; 3 - end nut; 4 - cylinder; 5 - piston in assembly with rod; 7 - supporting ring; 8 - collar; 9 - pressure ring; 10, 13 - clips; 11 - nut; 12 - protective coupling; 14 - bolt; 15 - rod end

Steering Booster Pump

Booster pump (Fig. 62) is a blade-type double action unit. When the pump shaft rotates, the vanes are pressed to the stator curved surface under centrifugal force and under pressure of the oil flowing under the stator. In the suction chambers the oil flows in-between the blades, being then forced out of the delivery chamber when the rotor turns.

The end faces of the pump body and distributor disc are ground. Dents or burrs on them as well as on the rotor, stator and blades are not allowed. Two valves are provided in the pump cover. The by-pass valve limits the oil value supplied by the pump to the power cylinder. The safety valve housed into the by-pass one limits the oil pressure in the system; it opens at 7500 - 8500 kPa (75 - 85 kgf/cm²).

When checking the belt tension of the booster pump, apply an effort of 40N (4kgf) in the middle of the belt run in direction of arrow "b". In doing so, the permissible sagging should lie within 7 - 13 mm. The belt tension should be adjusted using square-shank bolt 18.

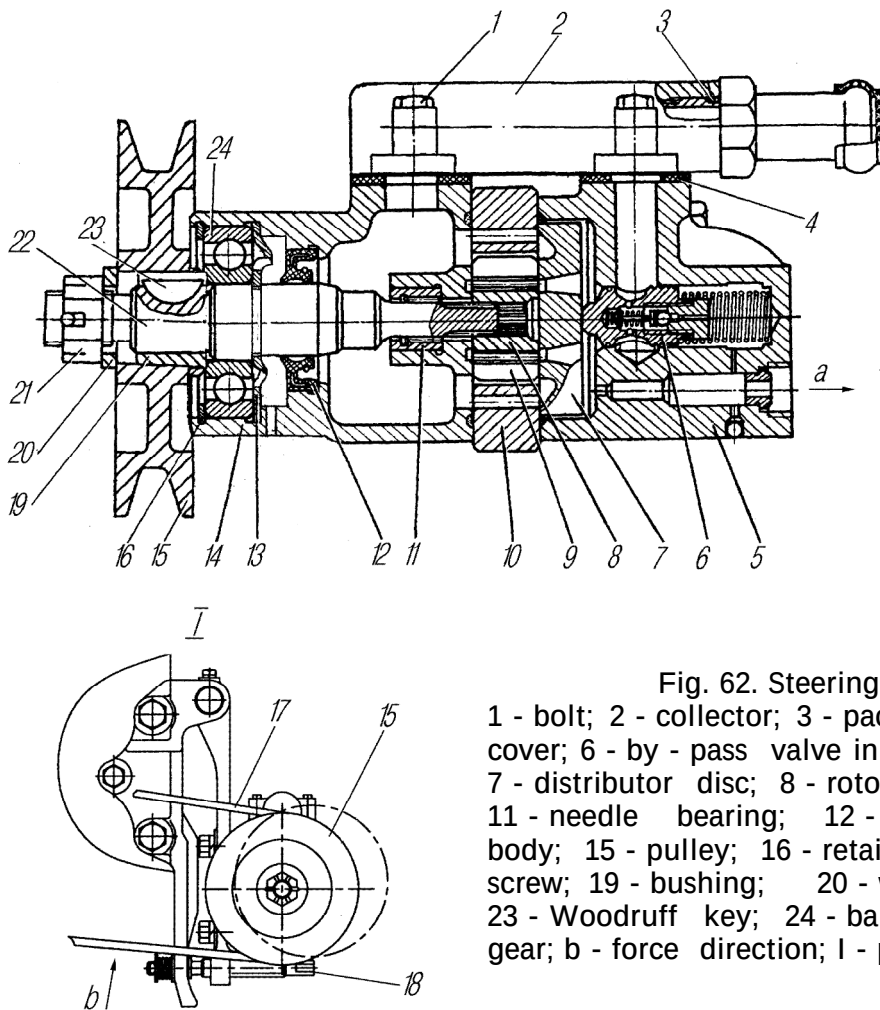


Fig. 62. Steering Booster Pump:

1 - bolt; 2 - collector; 3 - packing ring; 4 - gasket; 5 - cover; 6 - by - pass valve in assembly with safety valve; 7 - distributor disc; 8 - rotor; 9 - blade; 10 - stator; 11 - needle bearing; 12 - collar; 13 - spacer; 14 - body; 15 - pulley; 16 - retaining ring; 17 - belt; 18 - screw; 19 - bushing; 20 - washer; 21 - nut; 22 - shaft; 23 - Woodruff key; 24 - ball bearing; a - to steering gear; b - force direction; I - pump assembly

Steering Oil Tank

The tank is located separately from the pump. The tank is provided with filler filter 3 (Fig. 63). Returning to the tank oil passes through filter 2. The filter elements being clogged, valve 8 opens. The oil level in the tank should be within plain section on the dipstick and is measured by means of the dipstick with plug 4 being unscrewed.

To wash the tank filter, unscrew the filter bolts, take out and disassemble the filter. Wash the filter elements with diesel fuel, reassemble and refit the filter.

Steering Rods

The rods of pitman arm and steering trapezium are adjustable in length. The hinges of the steering rods and those of the booster have ring inserts 9 and 10 (Fig. 64). The hinges are not readjusted in the course of operation. For new hinges the total play of 0.3 mm in the direction perpendicular to pin axis is allowed. Service life of the hinges depends on the condition of protective couples 12. Therefore the couplings damaged in operation are to be replaced.

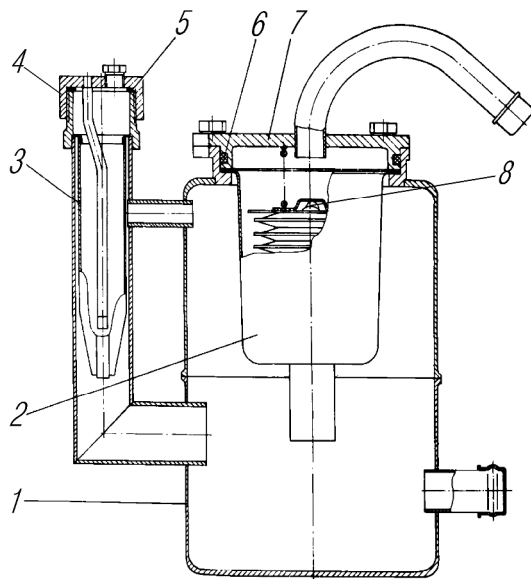


Fig.63. Steering Oil Tank:
1 - body; 2 - filter; 3 - filler filter; 4 - filler plug with dipstick; 5,6 - packing rings; 7 - filter cover; 8 - by - pass valve

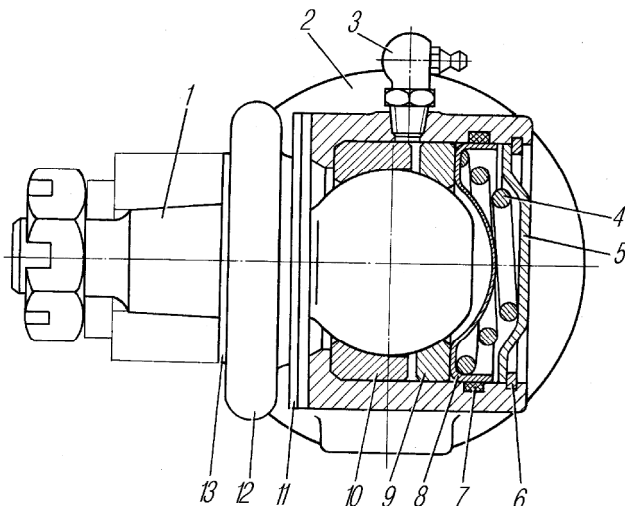


Fig.64. Steering Hinge:
1 - ball pin; 2 - rod end; 3 - grease - nipple; 4 - spring; 5 - stopper; 6 - retaining ring; 7 - seal; 8 - spring holder; 9 - lower insert; 10 - upper insert; 11 - strap; 12 - protective coupling; 13 - washer

Maintenance of Steering

Steering maintenance consists of regular inspection of fixing of steering gear, pipes, protective coupling of the booster rod; checking that the steering wheel turns freely; also servicing the units of the hydraulic system. Disassemble and reassemble the units, when it need be, only under conditions of complete cleanness. If rubber rings are stiffened or faulty, replace them.

Prior to diassembling the pump, mark the distributor disc position about the stator, also the stator position about the pump body (the arrow marked on the stator points to the sense of rotation of the pump shaft).

Stator, rotor and blades of the booster pump are fitted individually one to another, as well as the by - pass valve and the pump cover; therefore, do not disturb their complete set.

If minor scores are seen on the end faces of the rotor, body, and distributor disc, lap one to the other. When disassembling the pump, see that

the rubber packing rings are in good repair. Prior to reassembling, wash parts of the pump, booster and control valve in kerosene or gasoline, dry them (without wiping over) and oil.

When packing grease in the steering hinges, see that the protective coupling is not deformed noticeably under lubricant pressure.

Changing of oil in steering hydraulic system:

1. Warm the engine; the oil temperature in the steering hydraulic system should be not lower than 20 °C.
2. Jack up the front axle.
3. Turn the wheels to the right as far as they will go.
4. Disconnect the booster hoses from the pipe lines off the steering gear.
5. Remove cover 7 (see Fig. 63) of the oil tank, filter 2, and wash the filter.
6. Drain oil from the steering booster; for this purpose turn the steerable wheels to the left as far as they will go.
7. Connect the booster hoses to the steering gear lines.
8. Remove the remaining oil out of the pump tank; refit the gauze filter and tank cover.
9. Wash the hydraulic system, for this purpose:
 - fill 1.5 l of pure oil in the tank;
 - start the engine and add oil up to the upper mark of the measuring rule; then turn the steerable wheels either side as far as they will go (two or three times) with the engine running idling; and set the wheels in the extreme right-hand position; furthermore perform work as per Items 4, 6, 7.
10. Fill oil in the hydraulic system as follows:
 - fill 1.5 l of pure oil in the tank;
 - start the engine and add oil up to the upper mark; then, as the engine runs idling, bleed air out of the hydraulic system by turning the steering wheel either side as far as it will go (till air stops bubbling in the tank);
 - stop the engine;
 - check the oil level in the tank and add it, if need be;
 - fit the filler plug of the tank back.

Testing for free wheeling. Angular play of the steering wheel should be checked rocking the steering wheel to this and that side till the steerable wheels begin to turn.

Perform checking on a completely equipped truck the engine running idling. The truck should be placed on an even ground with dry, hard surface (asphalt, concrete). The steerable wheels position must correspond to the straightforward travel of the truck. The steering hydraulic system should be filled, and air evacuated out of the working fluid.

Angular play of the steering wheel should not exceed 25°.

Should free wheeling exceed this amount and plates in steering linkage are eliminated, it is necessary to adjust steering gear's meshing. Prior to adjustment drain oil from the steering gear.

Adjustment of steering gear's meshing (see Fig. 58) should be carried out after complete assembly of the booster control valve. If the booster control valve is assembled correctly the clearance between the valve body face and that of the movable plunger ring shall be 2.08 - 2.27 mm. When checking this clearance by means of a gauge, engage the segment with the worm and apply a torque of 17 - 19 N·m (1.7 - 1.9 kgf·m) on the worm shaft.

The total move of the slide valve about its body amounts to 4.16 - 4.54 mm.

The meshing is made in such a way that axial clearance between the teeth of the worm and segment the latter being in its middle position is a minimum one and is increasing gradually when turning the segment either side.

In a new steering gear axial travel of the segment in its extreme positions lies within 0.30 - 0.65 mm, while in its middle position, within 0.05 - 0.10 mm.

When adjusting the meshing set axial travel of the segment in its middle position as minimum as possible (not less than 0.01 mm); in doing so, axial travel of the segment in its extreme positions should be larger. The meshing is adjusted by selecting shims 19; in doing so, gasket 21 under the case side cover shall retain its thickness of 0.8 mm. The correct adjustment of axial clearance on the assembled steering gear check using an indicator by the amount of axial travel of the segment shaft.

Upon adjustment of the steering gear see that the steering wheel shaft rotates freely without seizure. Marks are available on the segment face opposite the second tooth and on the worm. When reassembling match these marks so that alignment of the worm and segment is not disturbed.

In the steering gear (see Fig. 59) adjust preload in bearings 14 and clearance of meshing of nut - rack 8 with segment 1.

Screwed joint (screw 7, balls 6, nut - rack 8) and the distributor need no adjustment in operation. It is not allowed to disturb the set of these parts made during the factory assembling.

1. Prior to adjustment of preload in bearings 14 grip the steering gear in the vice by the case ears and disconnect cardan joint 28 (see Fig. 57). Cranking shaft 15 (see Fig. 60) bring nut - rack 8 (see Fig. 59) and segment 1 in one of extreme positions. Determine the torque needed for cranking through shaft 15 (see Fig. 60) from the extreme position to the middle one (crank the shaft by an angle of about 30 °). Should the torque be less than 0.9 N m (0.1 kgf m), so adjust preload in bearings 14 (see Fig. 59) by reducing the number of shims 12. After adjustment the torque needed for cranking through shaft 15 (see Fig. 60) should lie within 0.9 - 1.5 N m (0.1 - 0.15 kgf m).

2. For checking whether a clearance is available in the meshing bring the nut - rack and segment in their mid - position by cranking shaft 15 (the complete number of shaft's 15 turns should be divided in two).

Rocking the pitman arm from side to side determine, if the clearance is available (knock in the meshing indicates its availability). Clearance availability can be also determined by cranking shaft 15 to the left or to the right until torsion 17 begins to twist the segment being fixed. To adjust the meshing remove the pitman arm, covers 19 (see Fig. 59) and 22 and turn inserts 21 together with bearings 18 clockwise (when viewing on the side of the segment shaft) by one and the same angle to eliminate meshing clearance. After turning the inserts one of the insert holes should lie in the plane passing through the opposite threaded holes in case 9 for fastening covers 19 and 22. Fit the covers in such a manner that catches 10 enter the holes in inserts 21 and lie opposite each other. Should the catches fail to match with the holes insignificantly, turn the inserts to one or the other side until matching the catches and the holes. See that no clearance is available in the meshing. Upon adjustment when fitting covers 19 and 22 the latter may be turned by 90 °, 180 ° and 270 ° about their previous position.

After the covers are fitted the torque needed for cranking through shaft 15 (see Fig. 60) in its mid - position should lie within 2.7 - 4.1 N m (0.27 - 0.41 kgf m).

Adjustment of the front wheel toe-in. For checking the toe-in of the front wheels, see that the tires have been inflated to the rated pressure and measure difference in distance B_1 and B (Fig. 65) across the wheel rims.

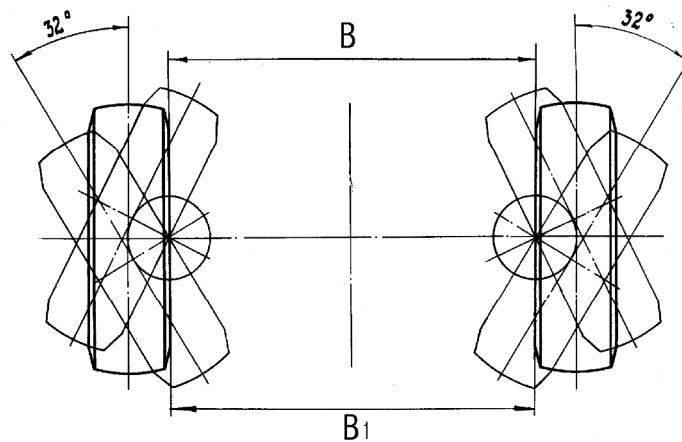


Fig.65. Positions of Steerable Wheels

For checking proceed as follows:

- place the truck on an even hard-paved horizontal site, so that the front wheels are positioned for the straightforward travel of the truck;
- using a measuring rule, check distance B_1 between the wheel rim beads in the rear section at the level of wheel centers and mark these points. Roll the truck, so that these marks are in front and check distance B . In front the distance must be 1 - 3 mm less than that in the rear. If the difference of the distances measured between B_1 and B is beyond the limits, readjust by changing the length of the lateral steering rod after slackening the bolts on the steering rod ends. Upon readjusting the toe-in, tighten the rod end bolts. Angles of turn are limited by constant non-adjustable thrusts. The amount of these angles is given in Fig. 65.

BRAKE SYSTEMS

The truck is equipped with separate brake systems – service, stand-by, parking and auxiliary ones.

Service brake system

The service brake system should ensure speed reduction and the truck stopping irrespective of its speed, load and road slopes, which it is designed to.

The drive of the brake gears is of combined type (pneumohydraulic), two-circuit, with separate braking of the front axle wheels and those of the two rear axles.

The brakes are controlled by the pedal in the driver's cab, connected with the double-unit valve by levers and tie rods.

The service brake gear is of drum type with inner shoes 5 (Fig. 66), which are interchangeable for all the wheels. Each brake gear has two hydraulic cylinders 1 installed into the same housing. The brake shoes are mounted on the anchor pins 7.

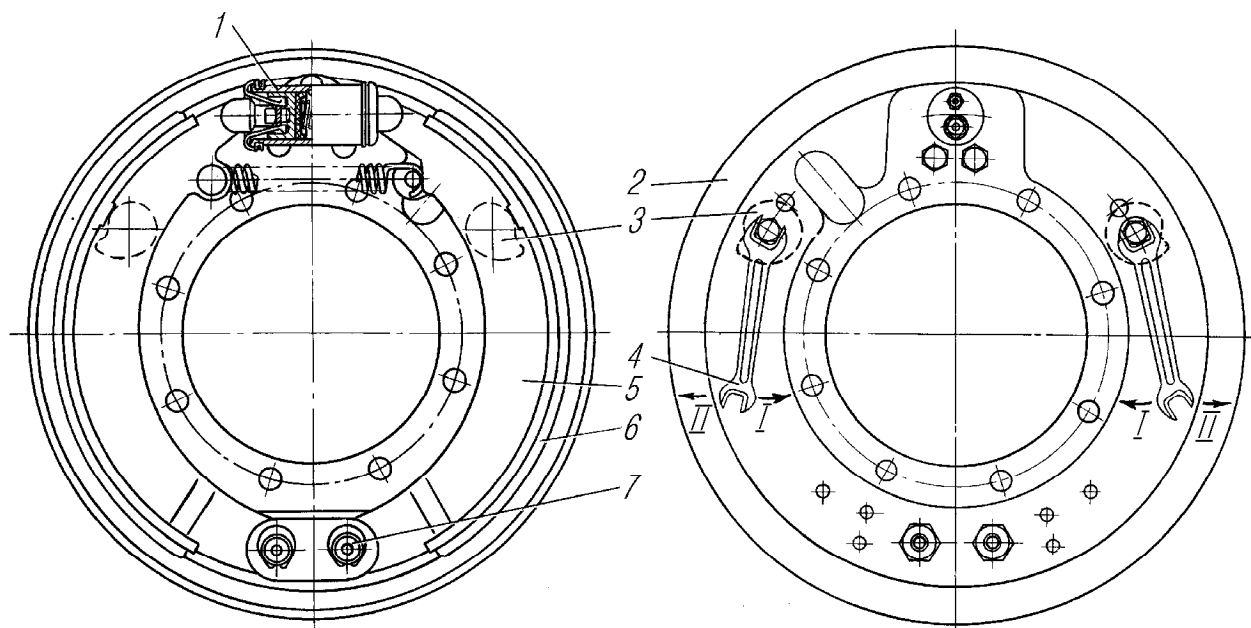


Fig. 66. Service Brake Gear:

1 - wheel cylinder; 2 - brake shield; 3 - adjusting cam; 4 - wrench; 5 - brake shoe; 6 - friction lining; 7 - brake shoe anchor pin; I - clearance decrease; II - clearance increase

The service brake gear should be adjusted as the linings wear by decreasing the clearance between the lining and drum with the help of adjusting cams 3.

Adjust the brakes as follows:

- turn the brake shoe adjusting cams with a 22 mm wrench, as far as they will go, turning the r.h. adjusting cam (on the side of shield) clockwise, and the l.h. one – counter-clockwise;

- release the cams by turning them back through, approximately, 30 °, that corresponds to turning of the cam axle head through half of face.

Upon following this procedure for all the wheels, check if the brake drums heat, when the truck is travelling.

When adjusting the brakes, do not infringe original setting of brake shoe anchor pins 7.

Adjust clearances between the brake shoe and drum with the help of the anchor pins only, when replacing of the friction linings and shoes assy.

In so doing set the shoe pins so that the marks on the ends face each other first. Fit a clearance gauge, 0.2 mm thick, 200 mm long, between the drum and shoe at a distance of 30 mm from the lower edge of the lining. Slightly clamp the gauge by turning anchor pin 7. Remove the gauge, turn the drum and set a clearance of 0.35 mm between the shoe and drum at a distance of 30 mm from the upper edge of the lining, using another clearance gauge and adjusting cam 3. Fasten the anchor pins and check the clearances between the shoe and drum again.

If the linings have worn down to the rivet head plane, replace them.

If the linings are oiled, rinse them with gasoline.

If the brake drum is worn and circular grooves, more than 2 mm deep, are seen, bore the drum working surface with reference to hub bearing outer races. Runout of the drum working surface should not exceed 0.25 mm, and the drum diameter - 424.38 mm.

Combined (pneumohydraulic) drive of service brakes

The two - circuit drive of the service brakes with the combined or two - line drive of the trailer.

The drive gives a possibility to connect brake systems of pull-type motor transport means, which have single-line or double-line brake drives. The schematic diagram of the brake drive is shown in Fig. 67.

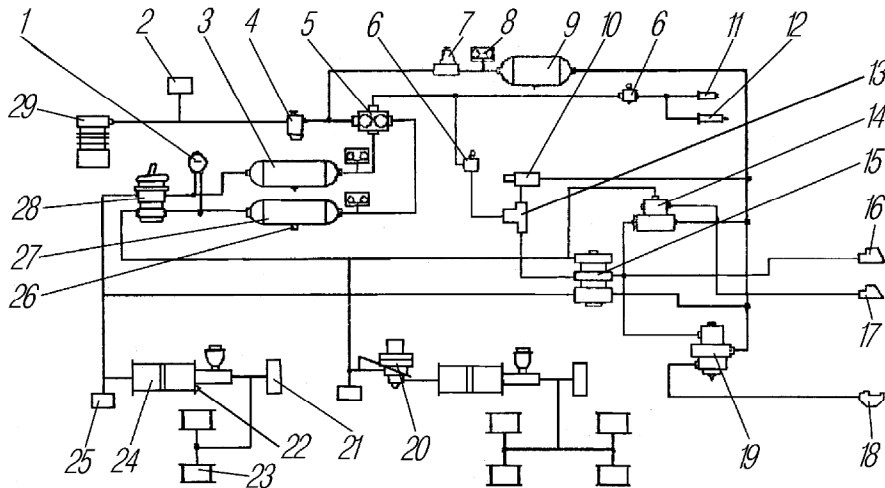


Fig. 67. Schematic Diagram of Service Brake Drive and Trailer Brake Combined Drive:

1 - two-pointer pressure gauge; 2 - towing valve; 3, 9, 27 - air bottles; 4 - pressure regulator; 5 - triple safety valve; 6 - trailer brake disengagement air valve; 7 - single safety valve; 8 - emergency pressure senders; 10 - trailer parking brake control valve; 11 - fuel cut-off air cylinder; 12 - exhaust pipe flap closing air cylinder; 13 - two-way valve; 14 - safety valve; 15 - valve for control over trailer brakes with double-line drive; 16 - automatic control coupling head (yellow); 17 - automatic feeding coupling head (red); 18 - coupling head, «A» type*; 19 - control valve for single-line drive trailer brakes*; 20 - braking force regulator; 21 - braking signal engagement senders; 22 - brake failure senders; 23 - wheel cylinders; 24 - brake air booster; 25 - check outlet valves; 26 - condensate drain cocks; 28 - brake valve; 29 - compressor

Compressor 29 supplies compressed air through pressure governor 4 to the assembly of the safety valves. The assembly comprises triple safety valve 5 and single safety valve 7, which distribute and fill in air valves 3, 9 and 27 of independent circuits:

- the brake gear drive of the front wheels;
- the brake gear drive of the intermediate and rear wheels;
- combined drive of the trailer wheels brake gears.

The first main circuit comprises air valve 3, upper unit of brake valve 28, air booster 24 and wheel cylinders 23, and second main circuit - air bottle 27, and lower unit of brake valve 28, braking force regulator 20, air booster 24, and wheel cylinders 23.

The third circuit comprises air bottle 9, the trailer brake control valves: 19 - with the single-line drive and 15 — with the double-line drive, coupling head 18, «A» type, for connecting trailers with a single-line brake drive, automatic coupling heads 16, 17 for connecting trailers with double-line brake drives.

*It is not installed in the trucks with a double-line trailer drive supplied to the civil market.

The air intended for engaging the electric signal senders and other consumers is taken off air bottles 3, 27 through triple safety valve 5.

If it is required to check up the air pressure, check outlet valves 25, which it is possible to connect a portable pressure gauge to, are installed in each circuit.

If the truck travels with the trailer, which has a single-line brake drive, the truck is articulated with the trailer with the help of coupling head 18, the trailer with a double-line brake drive – with coupling heads 16, 17.

Pressing the brake pedal engages the first and the second circuits of the truck brake drive as well as the third circuit of the trailer brake drive.

If one of the circuits is out of order, the rest remain efficient.

To brake the truck with a trailer at a parking place the parking brake lever should be set in its top fixed position: in so doing control valve 10 lets the compress air out of outlet II (see Fig. 75) of valve 15 (see Fig. 67) and actuates the trailer brake gears.

The alarm system and that of control over the brakes condition is available with the truck (See Chapter «Controls and Instruments»). Minimum air pressure senders are installed in the air bottles. Service brake failure senders (braking fluid leakage or large clearances between the brake shoes and drum) are installed in the air boosters.

The equipment relating to the brakes pneumatic drive serves to generate a reserve of the compressed air and to actuate the truck and trailer brakes.

The compressor (Fig. 68) is a piston-type, indirect-flow, two-cylinder, single-stage unit.

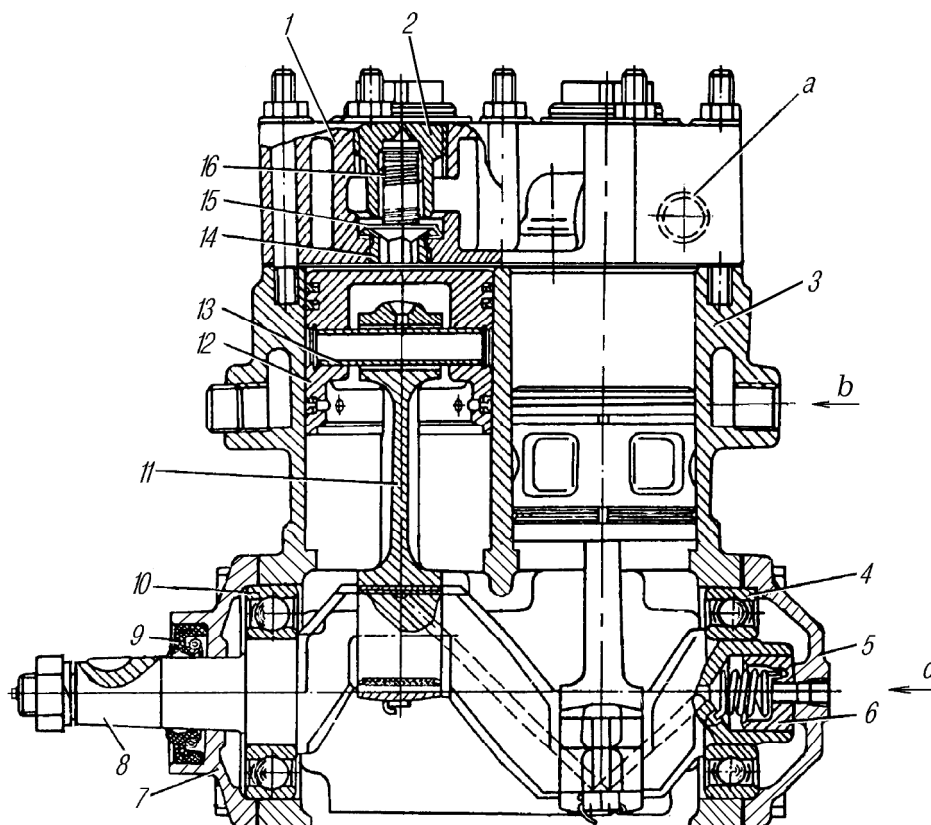


Fig. 68. Compressor:

1 – block head; 2 – delivery valve plug; 3 – block case; 4, 10 – bearings; 5, 7 – case covers; 6 – seal; 8 – crankshaft; 9 – crankshaft collar; 11 – connecting rod; 12 – piston; 13 – piston pin; 14 – delivery valve seat; 15 – delivery valve; 16 – valve spring; a – coolant outlet; b – coolant inlet; c – oil inlet

Air flows from the engine air filter to the compressor cylinders via reed - type inlet valves. The air compressed by the pistons is forced out to the pneumatic system via reed - type delivery valves located in the cylinder head.

The block and head are cooled by the coolant supplied from the engine cooling system. The compressor cooling system is only filled in while the engine is running.

The oil is supplied to the compressor friction surfaces via a pipe from the engine oil line to the rear cover of the compressor case and through the seal, via the crankshaft channels to the connecting - rod bearings.

Compressor maintenance. The valves, which can not keep tightness, should be set to their seats, worn - out or damaged ones should be replaced.

Set new valves to their seats until continuous ring contact is reached, then checking it with the help of paint.

Tighten the nuts fastening the block head studs in pairs, starting from the intermediate diametrically located pair. Tighten the nuts in two steps: the final tightening torque should be 12 - 16 N·m (1.2 - 1.6 kgf·m).

Signs of compressor failure: noise and rattle, increased heating, excess oil in condensate, which is usually a result of wear of the piston rings and crankshaft rear end seal, that of the connecting - rod bearings. Compressor drive belt tightening control and adjustment should be carried out according to YAMZ - 236M2, YAMZ - 238M2 Operation Manual

The pressure regulator is intended to adjust pressure of the compressed air supplied from the compressor. The compressed air is delivered from the compressor through outlet IV (Fig. 69) filter 2, duct 12 to circular duct 9. The compressed air is delivered to outlet II through return valve 10 and then to the truck air bottles. Simultaneously, the compressed air flows via duct 8 to hollow A under piston 7, which is loaded by equalizing spring 5. In so doing outlet valve 4 is opened, and inlet valve 11 is closed.

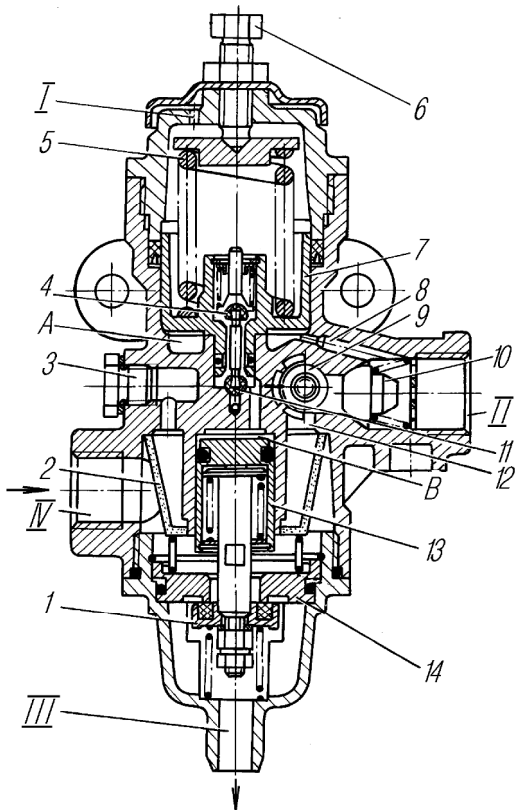


Fig. 69. Pressure Regulator:

1 - relief valve; 2 - filter; 3 - air take-off duct plug; 4 - outlet valve; 5 - equalizing spring; 6 - bolt; 7 - equalizing piston; 8, 12 - ducts; 9 - circular duct; 10 - return valve; 11 - inlet valve; 13 - relief piston; 14 - relief valve seat; A - hollow under equalizing piston; B - hollow above relief piston; I, III - outlets to atmosphere; II - outlet to pneumatic system; IV - inlet from compressor

Under the action of the spring relief valve 1 is closed. With the governor in such a state the pneumatic system is filled with compressed air from the compressor. When the pressure in hollow A equals 800 kPa (8.0 kgf/cm²), piston 7 overcomes the force of spring 5 and goes up, valve 4 gets closed, inlet valve 11 gets opened, and the compressed air from hollow A is delivered to hollow B.

Under the action of the compressed air relief piston 13 goes down, valve 1 gets opened, and the compressed air from the compressor via outlet III is let out to the atmosphere together with the condensate accumulated in the hollow; in so doing return valve 10 gets closed.

When the pressure at outlet II and in hollow A drops to 637 kPa (6.5 kgf/cm²), piston 7 under the action of spring 5 goes down, valve 11 gets closed, outlet valve 4 connects hollow B with the atmosphere through outlet I. In so doing relief piston 13 gets closed under the action of the spring, and the compressor resumes to charge the compressed air into the pneumatic system.

Relief valve 1 serves also as a safety valve. If the regulator fails to operate at the pressure of 800 kPa (8.0 kgf/cm²) and the pressure increases up to 1000 - 1300 kPa (1.0 - 1.3 kgf/cm²), then valve 1 gets opened, and the system gets free from the excess pressure.

The regulator is adjusted with bolt 6: when it is being screwed in, the pressure is growing, when being screwed out – the pressure is decreases. The pressure, when the safety valve comes into action, is adjusted by changing a number of the shims mounted under valve 1 spring. To determine if the pressure regulator operates properly, you should regularly observe values of the air pressure with the help of the two - pointer pressure gauge on the dashboard in the course of engine running and check how often the governor comes into action.

The two - unit brake valve (Fig. 70) is designed for control over the actuating mechanisms of the truck service brake system as well as for control over the trailer brake drive valve.

The brake valve consists of the upper and lower casings. The lever mechanism of the valve is fastened to the upper casing. The lever body is protected from mud and moisture by the hood.

Small piston 14, which is pressed to large piston 23 by spring 21, is installed in lower casing 15. Valve 24 in the upper unit of the brake valve is pressed to the seat in the lower casing by spring 16.

V₁ and V₂ outlets are connected with the air bottles of two separate circuits of service brake drive. The compressed air flows from Z₁ outlet to the air booster of the front axle brake circuit and it flows from Z₂ outlet to the braking forces regulator and air booster of the intermediate and rear axle brake circuit.

When pressing the brake pedal, the effort is transmitted via the system of levers and drive tie rods to lever 1 of the brake valve and then via lifter 6, head 8 and the elastic element to follower piston 25. Moving down, piston 25 first closes the outlet hole of valve 24 of the brake valve upper unit, and then detaches valve 24 from the seat in upper casing 11, opening the passage to the compressed air from V₁ outlet or Z₁ outlet and further to the actuating mechanisms of one of the circuits. Pressure at Z₁ outlet is being increased until the force of pressing lever 1 has been equalized by the force established by the pressure onto upper follower piston 25. Thus, the action of the follower is performed in the upper unit of the brake valve.

At the same time as the pressure grows at Z₁ outlet, the compressed air through hole «a» gets into hollow above large piston 23 of the brake valve lower unit. Moving down, the large piston closes the outlet hole of valve 17 and detaches

it from the seat in lower casing 15. The compressed air from V_2 outlet arrives at Z_2 outlet and further to the actuating mechanisms of the service brake second circuit.

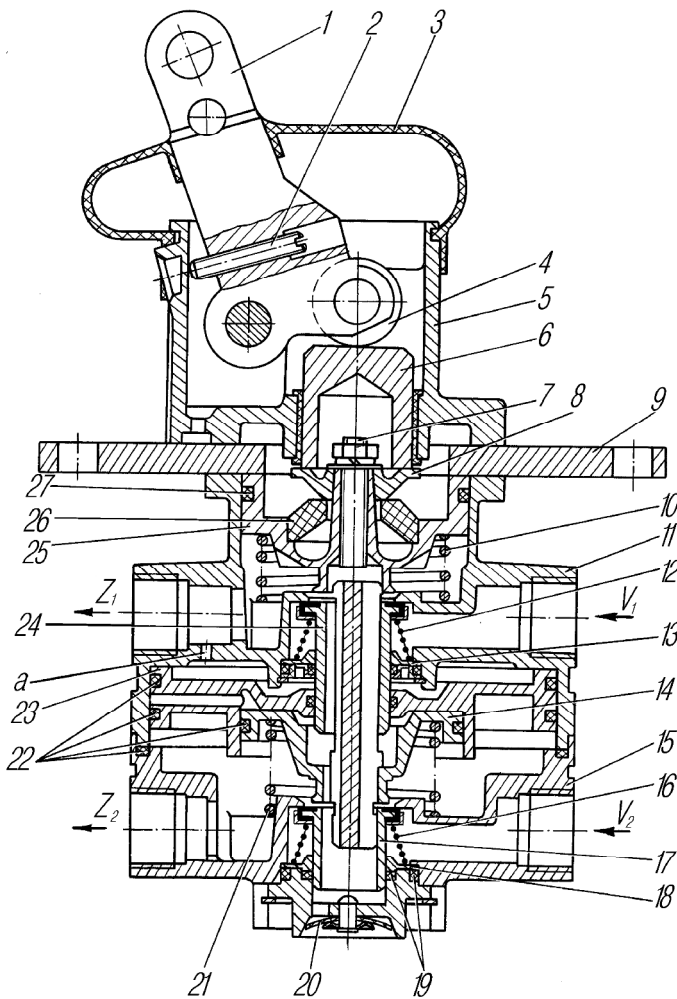


Fig. 70. Brake Valve:

1 - lever; 2 - thrust screw; 3 - protecting hood; 4 - roller; 5 - lever body; 6 - valve lifter; 7 - stud; 8 - valve head; 9 - flange; 10, 12, 16, 21 - springs; 11 - upper casing; 13, 18 - supporting rings; 14 - small piston; 15 - lower casing; 17 - lower-unit valve; 19, 22, 27 - packing rings; 20 - atmosphere outlet valve; 23 - big piston; 24 - upper-unit valve; 25 - upper follower piston; 26 - elastic element; Z_1 - outlet to air booster of front axle brake circuit; Z_2 - outlet to air booster of intermediate and rear axle brake circuit; V_1 and V_2 - outlets to air bottles; a - hole

Coincidentally with the increase of the pressure at Z_2 outlet, the pressure under pistons 14 and 23 increases, and the force, that acts on piston 23 from the top, is equalized as a result. As a consequence of it, the pressure that corresponds to the force on the brake valve lever is also established at Z_2 outlet. Thus, the action of the follower is performed in the lower unit of the brake valve.

If the upper unit of the brake valve fails, the lower unit will be controlled mechanically via stud 7 and the lifter of small piston 14, keeping completely its ability to operate.

If the lower unit of the brake valve fails, the upper unit operates as described above.

Care of the double-unit brake valve lies in its regular examination, cleaning it from mud, checking for tightness.

Care should be taken to the condition of the brake valve protective rubber hood and its tight contact with the casing, because mud getting onto the valve lifter and friction surfaces can cause failure of the brake valve.

The tightness of the brake valve is checked with the help of soap emulsion in two states, when the brake is engaged, and when it is released. Air leakage through the brake valve outlet to atmosphere, when the brake is released, shows non-tightness of the inlet valve of one of the brake valve units and if the air leakage

occurs, when the brake is engaged, it indicates non - tightness of the outlet valve of one of the brake valve units. When the leakage occurs, replace the brake valve.

The brake valve drive is mechanical. Brake pedal 17 (see Fig. 31), installed with the bracket in the cab, is connected via tie rod 10 with lever 6, that is mounted with bracket 5 on the cab floor panel. The other end of the lever is connected via adjustable tie rod 21 with the brake valve lever 22, mounted on the l.h. side member of the truck frame. Adjustment of the brake valve drive is required to ensure free travel of the brake valve lever, to which the free travel of the brake pedal 20 - 30 mm corresponds, and to ensure the full travel of the lever, corresponding to the full travel of the pedal 150 - 180 mm, which is necessary to establish the working pressure in the pneumatic system of the brakes.

Free travel of the brake pedal is adjusted by changing of the tie rod length. For this purpose slack off the lock nut, uncotter and remove the pin, and turning the fork to one direction or another, set the required length of the tie rod and tighten the lock nut.

The value of the brake pedal free travel should be determined at the nominal air pressure in the truck pneumatic system by pressing the pedal, before one of pressure gauge 1 pointers start to move (see Fig. 12).

Full travel of the brake pedal is provided by the drive design and is not adjusted.

The brake air boosters with the master brake cylinders are mounted under the cab: the first one – on the l.h. side member, the second – on the fuel tank bracket. When pressing the brake pedal, the valve in the brake valve opens, and the air via the air line arrives under pistons 8 and 12 (Fig. 71) of the air booster.

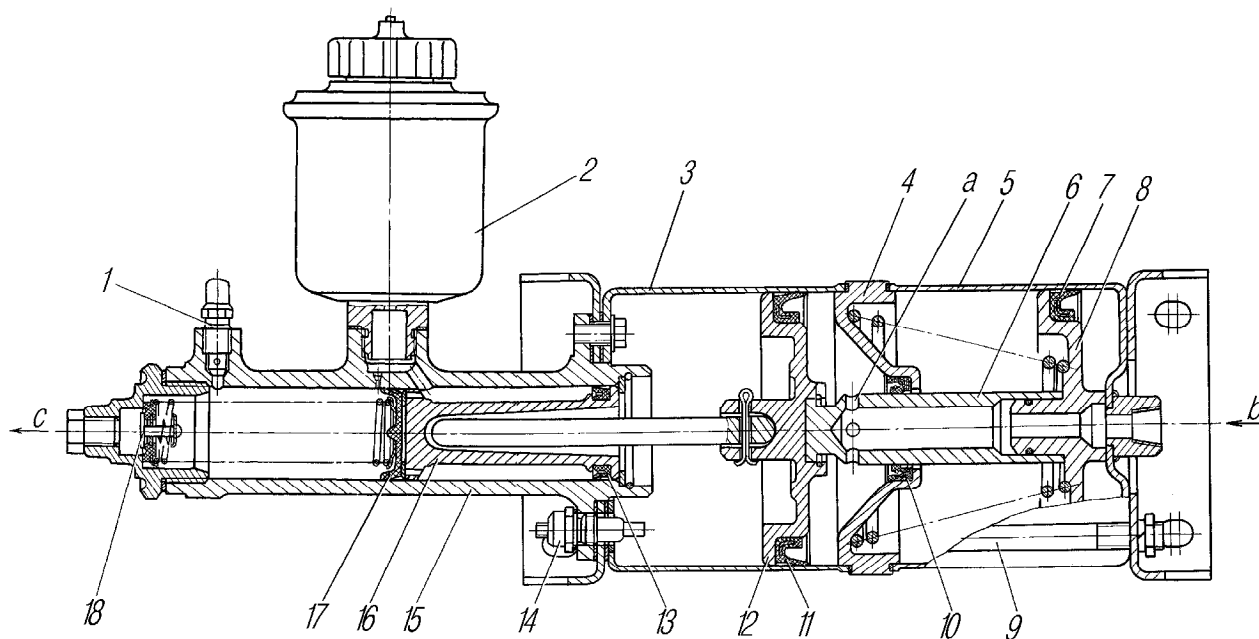


Fig. 71. Air Booster with Brake Master Cylinder:

1 - bypass valve; 2 - tank for brake fluid; 3,5 - air cylinders; 4 - spacer; 6 - rod; 7, 10, 11, 13, 17 - collars; 8, 12, 16 - pistons; 9 - brace; 14 - brake failure alarm switch; 15 - brake master cylinder; 18 - return valve; a - radial hole; b - from brake valve; c - to brake system

Under the air pressure the rod with the pistons moves and via the pusher acts on the piston 16 of the brake master cylinder, which forces out the fluid to the brake main.

When the brake is released, the air from the air booster goes out through the brake valve to the atmosphere. The pistons of the brake master cylinder and air booster under the action of the springs are returned to their initial position.

If the tightness of the air booster is infringed, replace worn-out or injured collars.

When assembling the air boosters, do not tighten the nuts of braces 9 with a torque exceeding 8 - 12 N·m (0.8 - 1.2 kgf·m) to avoid deformation of the covers. Check the air booster for tightness under the air pressure of 600 - 700 kPa (6 - 7 kgf/cm²), supplying it through the air booster union.

The single safety valve (Fig. 72) is intended to prevent a loss of the compressed air from the truck brake system, while feeding the trailer brake circuit. The valve is installed into the pneumatic system as per the arrow applied on valve cover 6 and indicating the direction of the air bypassing.

Adjusting screw 5 that is locked by the locked nut is installed in the cover.

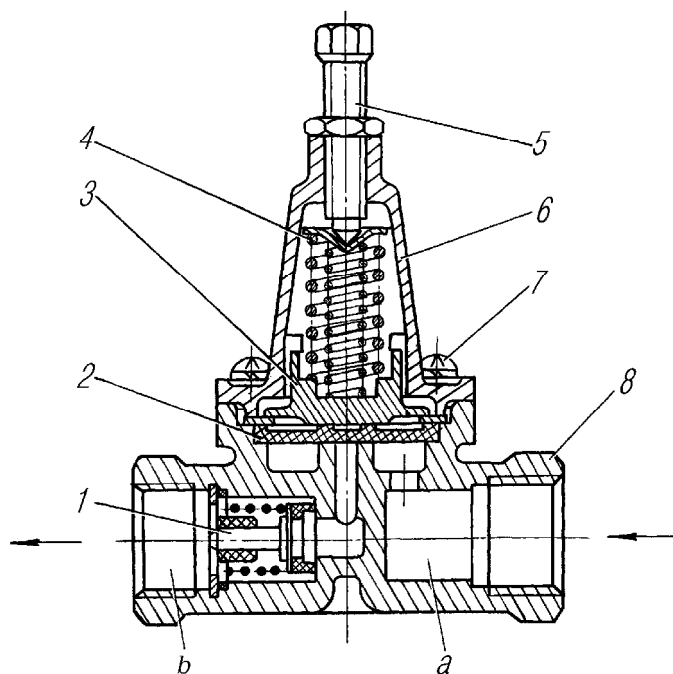


Fig. 72. Single Safety Valve:
1 - return valve; 2 - diaphragm;
3 - piston; 4 - spring; 5 - ad -
justing screw; 6 - cover; 7 -
screw; 8 - body; a - input duct;
b - output duct

The force of the spring is changed with the help of the adjusting screw, by adjusting a value of the bypass pressure; when screwing it in, the value of the by - pass valve increases, when screwing it out - the value decreases.

The compressed air through duct «a» arrives under diaphragm 2, which is pressed by the springs to the valve seat, shutting off the air access to the pre valve hollow. When pressure of 530 - 550 kPa (5.3 - 5.5 kgf/cm²) is reached, the compressed air lifts up diaphragm 2, overcoming the force of spring 4, and having opened return valve 1, arrives at the bottle. When the pressure in duct «a» falls lower than the bypass pressure, the diaphragm descends onto the seat under the action of the spring and disconnects the ducts.

The triple safety valve (Fig. 73) is intended to separate the compressed air, arriving from the compressor to two main and one additional circuits, to disengage automatically one of the circuits, if its tightness is disrupted, to keep the com -

pressed air in all the circuits in case of injuring or disrupting the tightness of the supplying main, and to feed the additional circuit from the two main ones.

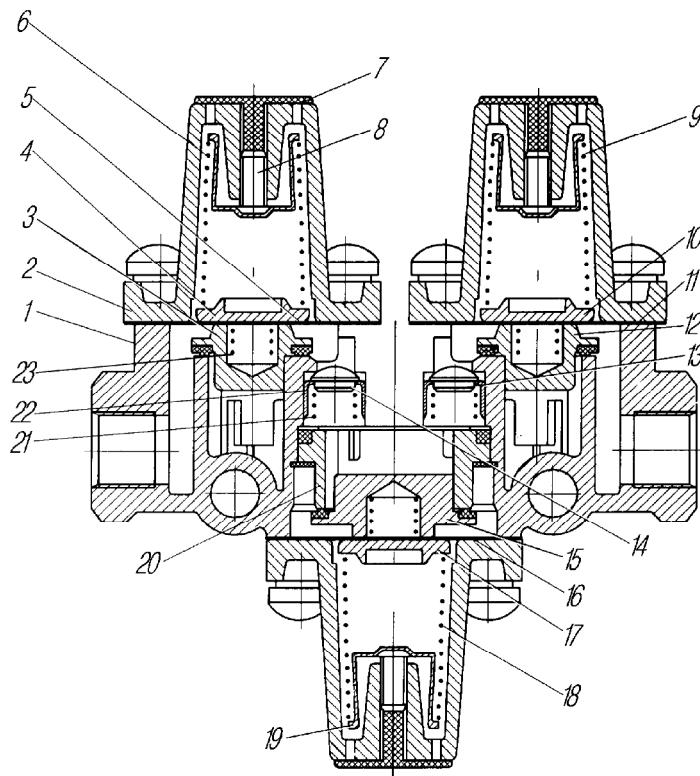


Fig. 73. Triple Safety Valve:
1 - body; 2 - cover; 3, 12, 15 - valves; 4, 10, 17 - spring guides; 5, 11, 16 - diaphragms; 6, 9, 18 - springs; 7 - protective cap; 8 - adjusting screw; 13, 14 - return valves; 19 - spring head; 20 - guide; 21 - return valve spring; 22 - return valve spring head; 23 - valve spring

When the compressed air delivered to the triple safety valve from the supply - ing main reaches the predetermined working pressure of opening, established by the force of springs 6 and 9, it opens valves 3 and 12 and is delivered to the two main circuits through outlets. At the same time the compressed air acts on diaphragms 5 and 11 and lifts them. Upon opening return valves 13 and 14, the compressed air opens valve 15 and is delivered to the additional circuit through the outlet.

If one of the main circuits is out of order, the pressure inside it and body hol - low drops, the valve of the circuit, which is in good working order, and the return valve of the additional circuit are being closed, preventing the pressure dropping in the main and additional circuits. When the air pressure is reduced in the valve hol - low down to its limit, the valve of the faulty circuit is closed. The compressed air from the compressor fills in the circuit, which is in good working condition, through return valve 13 or 14. The air is not delivered into the faulty circuit. When the air pressure at the valve inlet is above the predetermined level, the valve of the faulty circuit is opened and the excess air flows via it to the atmosphere. In so doing the pressure is kept constant and the air is not delivered into the circuits, which are in good working order.

Further filling of the circuits, which are in good working order, with the com - pressed air happens only after the pressure in these circuits has dropped, when the air is consumed. The valves in the circuits, which are in good working order, open only under the pressure of the compressed air in the hollow under the valves. Thus, in the circuits, which are in good working order, the pressure, corresponding to the pressure of opening the valve of the faulty circuit, is kept and excessive compressed air flows out via the faulty circuit.

If the additional circuit is out of order, the pressure in the two main circuits and in the body hollow drops until valve 15 of the additional circuit is closed. If a further delivery of the compressed air to the triple safety valve occurs, the pressure of opening the additional circuit valve will be kept in the main circuits. If the delivery of the compressed air to the triple safety valve has stopped, valves 3 and 12 of the main circuits are closed, preventing by so doing the pressure drop in all the three circuits.

The trailer brake control valve shown in Fig. 74 is intended for control over the single-line system of the trailer brakes drive as well as for limiting the pressure of the compressed air, which is delivered to the trailer brake pneumatic system, to the predetermined level. The compressed air from the air bottle is supplied to outlet I and flows via duct A to the hollow above stepped piston 8. When the brake is released, spring 14, acting on washer 15, holds diaphragm 16 together with pusher 19 in the lower position.

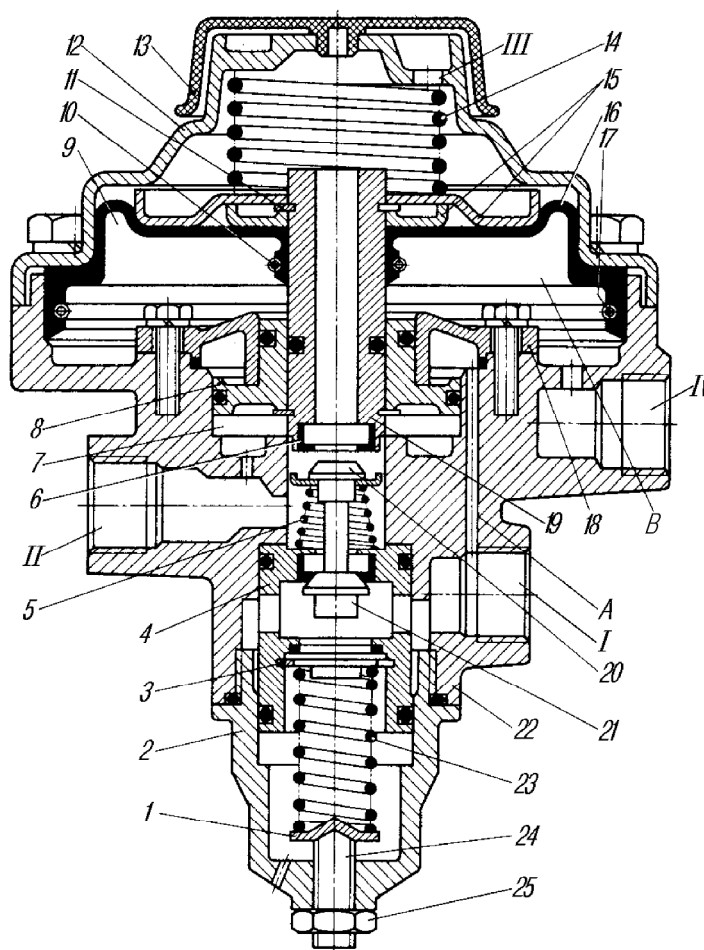


Fig. 74. Trailer Brake Control Valve:

1 – spring plate; 2 – lower cover; 3, 11 – thrust rings; 4 – lower piston; 5 – valve spring; 6 – valve outlet saddle; 7 – follow chamber; 8 – stepped piston; 9 – working chamber; 10, 17 – circular spring; 12 – upper cover; 13 – protective cap; 14 – diaphragm spring; 15 – washer; 16 – diaphragm; 18 – support; 19 – pusher; 20 – outlet valve; 21 – inlet valve; 22 – body; 23 – spring; 24 – adjusting screw; 25 – lock nut; I – outlet to air bottle; II – outlet to trailer connecting main; III – outlet to atmosphere; IV – outlet to control valve of double-line drive trailer brake; A – supplying duct; B – under-diaphragm hollow

In so doing outlet valve 20 is closed, and inlet valve 21 is opened, and the compressed air flows from outlet I to outlet II and further to the trailer connecting main. When the pressure in outlet II reaches a certain value set with the help of adjusting screw 24, piston 4 overcomes the force of spring 23 and lowers down; as a consequence of it inlet valve 21 sits down onto the saddle in piston 4. Thus, in the released position of the trailer main the pressure, which is less than that in the towing truck pneumatic drive, is maintained automatically.

When braking the towing truck, the compressed air is delivered to outlet IV and fills in under - diaphragm hollow B. Overcoming the force of spring 14, diaphragm 16 goes up with pusher 19. Inlet valve 21 closes, then outlet valve 20 opens the air from the trailer connecting main flows out to the atmosphere via outlet II, pusher 19 and outlet III in cover 12 until the pressure in hollow B under diaphragm 16 and that in hollow 7 under stepped piston 8 is balanced by the pressure in the hollow above the stepped piston.

When further reduction of the pressure at outlet II occurs, piston 8 lowers down and moves down pusher 19, which closes outlet valve 20, as a consequence of it the air flowing out from outlet II is stopped. Thus, the follower action is performed.

The trailer (semi - trailer) is braked with the efficiency in proportion to the value of the compressed air supplied to outlet IV. Further pressure growing at outlet IV results in the complete evacuation of the compressed air from outlet II and by so doing – in the most efficient trailer braking. When releasing the trailer brake, i.e. when the pressure drops at outlet IV and in hollow B under diaphragm 16, the latter under the action of spring 14 returns to its initial position. Pusher 19 lowers down with the diaphragm. In so doing outlet valve 20 closes and inlet valve 21 opens. The compressed air from outlet I flows to outlet II and then to the trailer connecting main and as a consequence of it the trailer (semi - trailer) brake is released.

The control valve of the trailer brakes with the double - line drive is shown in Fig.75. The air is continuously supplied to outlets II and V of the control valve; the air, acting on diaphragm 11 from the top and on medium piston 10 from the bottom, holds rod 12 in the lower position. In so doing outlet IV connects the trailer brake control main with atmosphere outlet VI through the central hole of valve 3 and piston 12.

The trailer is braked, when the air is delivered through outlet IV into the trailer main, when the air is supplied to outlets I and III as well as when the pressure drops at outlet II (the truck braking with the help of the parking brake).

When delivering the air to outlet III, pistons 4 and 7 move downwards, inlet valve 3 opens, and the air from the bottle through outlet V, opened inlet valve 3 is supplied to outlet IV, which is connected to the trailer control main with the help of coupling head 16 (see Fig. 67) as well as the air is simultaneously flows to the control valve of the trailer brakes with a single - line drive.

The action of the follower begins, when the forces acting on piston 7 (see Fig.75) from below and above are balanced. Under this condition the pressure of the air, flowing to outlet IV, is proportional to the pressure of the air, flowing to outlet III.

When the braking is stopped, the air is run out of outlet III to the atmosphere through the brake valve. Pistons 4 and 7 are returned back to their initial position (by spring 8 and air pressure at outlet IV), intake valve 3 gets closed. That moment outlet IV is in communication with the atmosphere through the hole in valve 3, piston 12 and outlet VI.

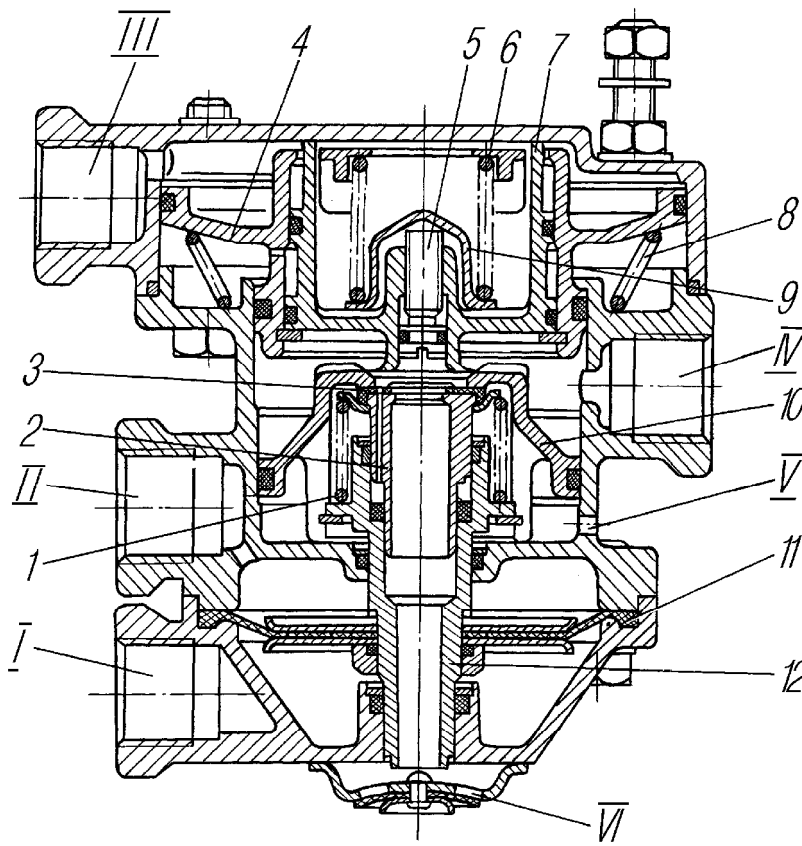


Fig. 75. Control Valve of Trailer Brakes with Double - Line Drive:

1, 8 – springs; 2 – relief valve; 3 – inlet valve; 4 – large piston; 5 – adjusting screw; 6 – equalizing spring; 7 – small piston; 9 – spring plate; 10 – medium piston; 11 – diaphragm; 12 – lower piston; I, III – outlets to brake valve unit; II – outlet to trailer brake control valve; IV – outlet to trailer brake main; V – outlet to air bottle; VI – outlet to atmosphere

When the air is delivered to outlet I, diaphragm 11 with pistons 10, 12 and valve 3 moves upwards. Valve 3 reaches the seat in small piston 7, cuts off the outlet to the atmosphere, and when medium piston 10 moves further, the valve comes off its inlet seat. The air is delivered from outlet V connected with the air bottle to outlet IV and further to the trailer brake control main.

The action of the follower starts, when the forces, acting on diaphragm 11 from below and on piston 10 from above, are balanced.

When the braking is stopped, and the air from outlet I is let out to the atmosphere through the brake valve. Diaphragm 11 with pistons 10 and 12 occupy their initial position; in so doing inlet valve 3 gets closed. The air from the trailer control main via outlet IV, hole in valve 3, piston 12 and outlet VI is let out to the atmosphere.

If the air is simultaneously delivered to outlets I and III, the order of operation is similar to the one described above.

When braking with the help of the parking brake, control valve 10 (see Fig. 67) is engaged, in so doing the air from outlet II (see Fig. 75) through the control valve is let out to the atmosphere. Simultaneously with the air discharge from outlet II and the hollow above the diaphragm, pistons 10 and 12 under the action of the pressure of the air, flowing through outlet V from the bottle, move upwards, opening valve 3, thus, the air supply through outlet IV to the trailer control main is provided.

The action of the follower starts, when the forces, acting from the air pressing onto diaphragm 11 at the top and piston 10 at the bottom are balanced. Screw 5, which prechanges the force of spring 6, is turned in piston 7 to provide the advanced trailer braking relating to the truck braking. When the force of spring 6 increases, the air pressure at outlet IV gets higher in comparison with the pressure of the air supplied to outlets I and III within 20 - 100 kPa (0.2 - 1.0 kgf/cm²). And due to it the advanced trailer braking is reached.

The protection valve is intended for automatic braking of the trailer, if the control (brake) main is broken.

When no truck braking occurs, the compressed air delivered to outlet I (Fig. 76) through the upright channels in lower body 1, flows freely to outlet II and further to the trailer feeding main. Lifter 5 under the action of spring 6 is set in the upper position. When braking the truck with the trailer feeding and control mains in good working order, the pressure from the trailer brake control valve through the double-line drive is transferred to outlet III, and to outlet IV – the pressure from the brake valve. As the pressure numbers are close enough to the pressure delivered to outlet I, lifter 5 under the action of spring 6 will be in the upper position. The compressed air flows from outlet I to outlet II.

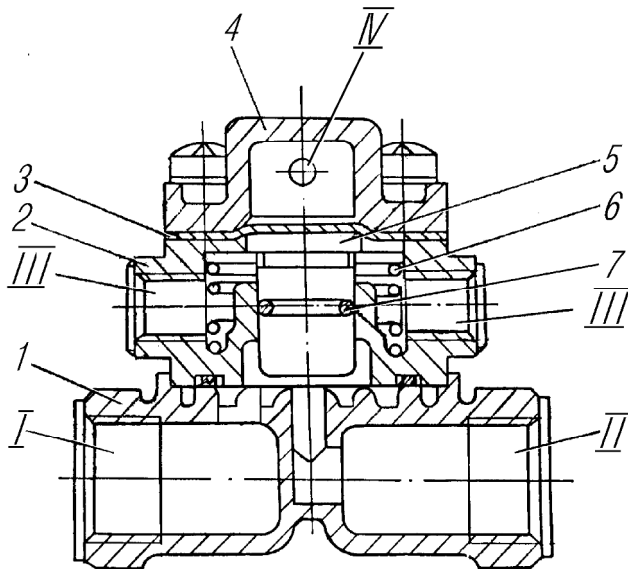


Fig. 76. Protection Valve:

1 – lower body; 2 – intermediate body; 3 – membrane; 4 – upper body; 5 – lifter; 6 – spring; 7 – packing ring; I – compressed air inlet; II – outlet to trailer feeding main; III – outlet to trailer control main; IV – outlet from trailer service brakes

In case of breaking the trailer control (brake) main, the pressure at outlet III equals zero, while braking, and at outlet IV it is kept at the same level as before. Acting on lifter 5 via membrane 3, the pressure at outlet IV moves the lifter downwards. The central hole in lower body 1 gets closed. Delivery of the compressed air from outlet I to outlet II is stopped. Pressure dropping at outlet II (of the trailer feeding main) causes automatic braking of the trailer.

The braking force regulator (Fig. 77) is mounted on the fifth cross member of the truck frame (Fig. 78) and has mechanical connection with the rear bogie axles. The braking force regulator (BFR) automatically adjusts the pressure of the compressed air delivered to the actuating mechanisms of the rear bogie (rear bogie air booster) depending on the axial load.

In order to set the lever length slack off the bolt, fastening the lever on the regulator, set the coupling joint centre at a distance of 155 mm from the lever turning axis and tighten the bolt.

To adjust the braking force regulator of the empty truck bring the air pressure in the pneumatic system to 0.6 MPa (6 kgf/cm²), (as per pressure gauge in the cab), when the brake pedal is pressed, and changing the length of upright tie rod 8 (see Fig. 77) by means of moving the coupling along it, set the estimated pressure at the outlet from the braking force regulator as per instruction plate of the braking force regulator (see Fig. 10) depending on the truck complete set.

The pressure at the outlet is checked with the help of portable pressure gauge, connected to the check outlet valve in the air supplying main to the air booster of the axle bogie.

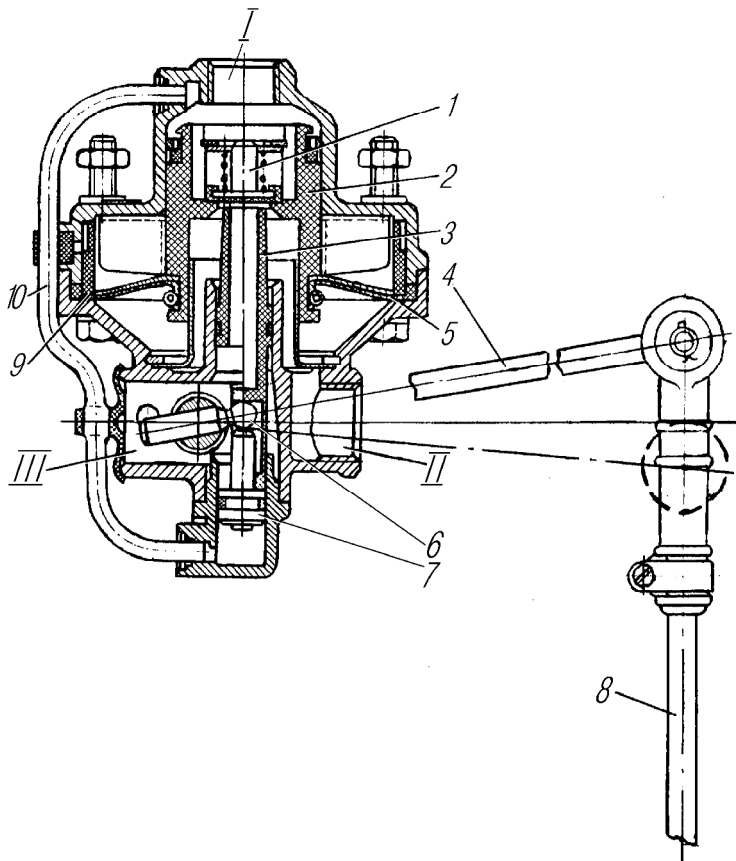


Fig. 77. Braking Force Regulator:

1 – valve; 2 – piston; 3 – lifter; 4 – lever (position for unloaded truck); 5 – membrane; 6 – ball journal; 7 – fixing piston; 8 – adjusting tie rod; 9 – ring with fixed ribs; 10 – connecting pipe; I – inlet from brake valve; II – outlet to brake circuit air booster of intermediate and rear axles; III – outlet to atmosphere

Check stability of the pressure established by the braking force regulator by filling in the pneumatic system with air three times and letting it out of the pneumatic system. After that tighten the clamps on the coupling. Tie rod 8 connecting the regulator lever with the elastic element, should be mounted in the upright position.

The trailer brake disengagement valve is located in the cab on the dashboard and serves for driver's checking the ability of the towing truck parking brake system to hold the road train on the slope. For this purpose it is necessary to brake the truck with the help of parking brake, press the button of the trailer brake disengagement valve; in so doing the air is let out of the trailer brake chambers. Continuing to hold the button pressed, make sure that the road train is held on the slope securely for a few seconds. Release the button.

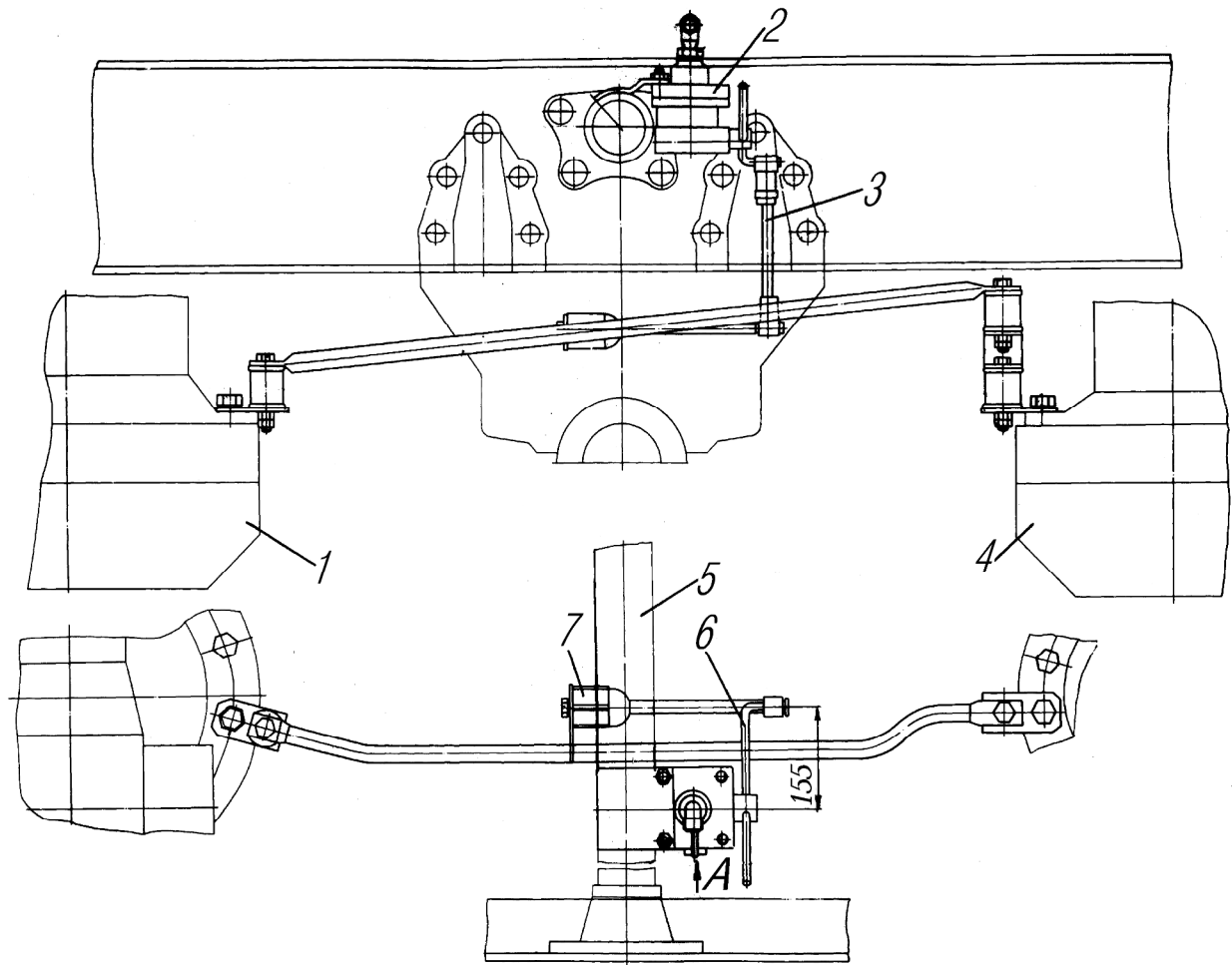


Fig. 78. Braking Force Regulator (BFR) Mounting:

1 – intermediate axle; 2 – braking force regulator; 3 – adjusting tie rod; 4 – rear axle; 5 – cross member No.5; 6 – BFR lever; 7 – elastic element; A – from brake valve

Two - main valve (Fig. 79) serves to deliver the air to the trailer valve, when using the button of the trailer brake disengagement valve.

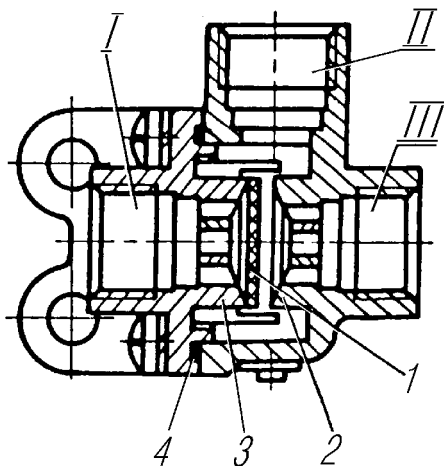


Fig. 79. Two - Main Bypass Valve:

1 - seal; 2 - body; 3 - cover; 4 - pack - ing ring; I, III - outlets to control mains; II - outlet to actuator

The parking brake control valve (Fig. 80) is intended for control over the trailer brakes, when braking the truck with the help of the parking brake and is mounted on cross - member № 3 of the chassis frame. It is connected with the tie rod of the parking brake lever via a spring - type extension piece.

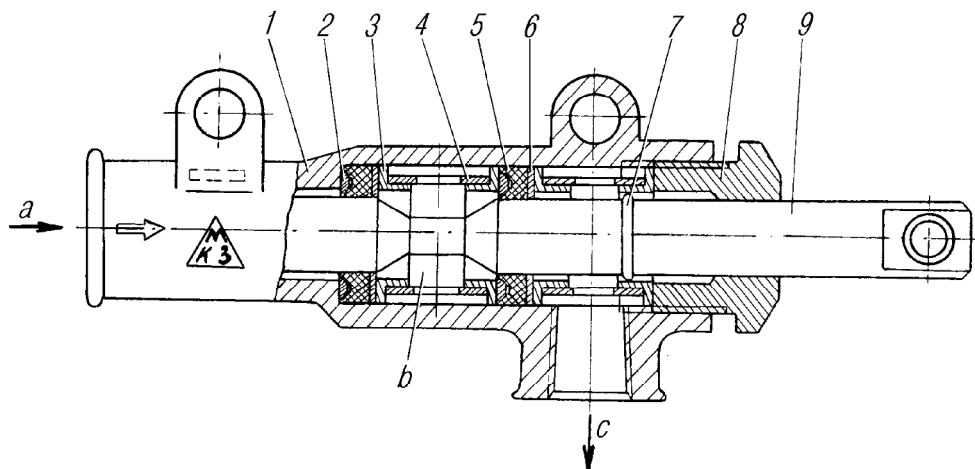


Fig. 80. Parking Brake Control Valve:

1 - body; 2 - collar spacing ring; 3 - bushing; 4 - centering washer; 5 - collar; 6 - supporting washer; 7 - lock ring; 8 - slide valve guide; 9 - slide valve; a - from air bottle; b - to trailer brake control valve; c - to atmosphere

When the parking brake lever is lowered, the air from the bottle is delivered to outlet II of the double - line drive trailer brake control valve via control valve outlet «b». When the parking brake is engaged, the slide valve of the control valve moves and connects outlet II with the atmosphere through outlet «c»; further the trailer brake drive operates as it is said above. To check the installation of the control valve set the parking brake lever in its lower position. Rotating fork 3 (Fig. 81), mate the holes of the fork and the eye of tie rod 1 mount pin 2 and lock fork 3, providing dimension $L = 122 - 124$ mm.

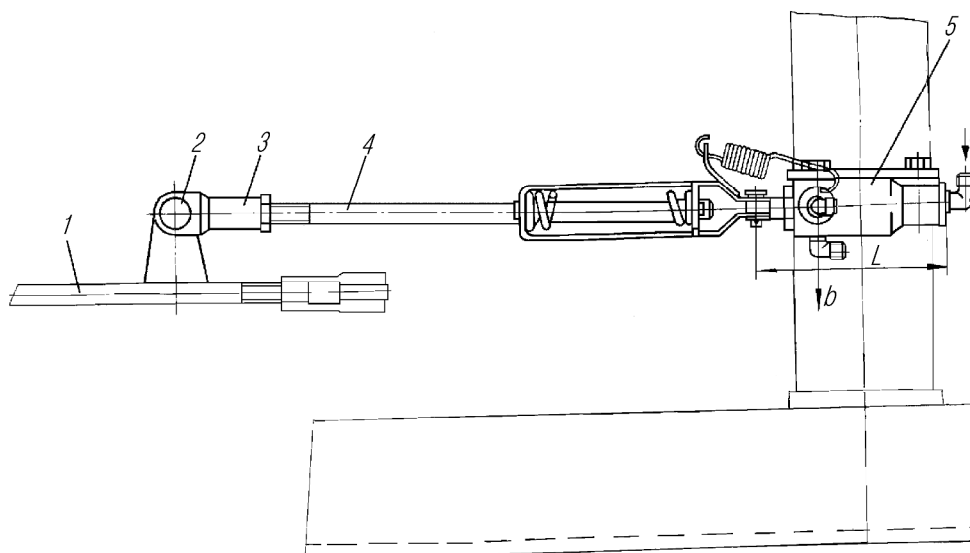


Fig. 81. Parking Brake Control Valve Installation:

1 - drive tie rod; 2 - pin; 3 - fork; 4 - control valve drive tie rod; 5 - parking brake control valve; a - from air bottle; b - trailer brake control valve

Coupling heads. The covers, which keep dust and mud away from the system, are available on the coupling heads. Coupling head 18 (see Fig. 67) is painted black. The cover of feeding head 17 is painted red, and that of control head 16 is yellow. To connect the trailer brake system properly the heads should be coupled in conformity with their colour. First, the (yellow) control head is connected and then the (red) feeding head is. Disconnect the trailer pneumatic drive in the reverse sequence.

If emergency disconnecting of the trailer from the truck happens when it moves, the coupling heads disengage the pneumatic system automatically; in so doing the trailer brake system is actuated.

The check outlet valves (Fig. 82) are intended to determine output parameters of the air pressure in the circuits with the help of the check pressure gauges. For connecting to the valve the hoses with the captive nut M16x1.5 and the pressure gauges having a measurement range of 0 - 1000 kPa (0 - 10 kgf/cm²) and accuracy rating of 1.5 should be used. The check outlet valves are installed in:

- the front axle service brake circuit on the front air booster of the brakes in the direction of the truck travelling;
- the rear bogie service brake circuit on the second air booster of the brakes;
- the trailer brake circuit on the third air bottle (mounted outside on the frame r.h. side member).

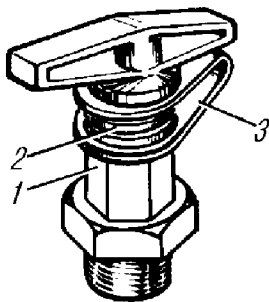


Fig. 82. Check outlet valves:
1 – body; 2 – cap; 3 – loop

Maintenance of the pneumo-hydraulic drive. The equipment of the brake pneumohydraulic drive does not require special maintenance and adjustment.

In case of their failure only qualified specialists can disassemble them in authorized workshops.

Tightness of the air system should be checked against pressure dropping on the two-pointer pressure gauge. In so doing the pressure in the system should not be less than 700 kPa (7 kgf/cm²). After the engine has been shut down and the brake pedal has been released, movement of the both pressure gauge pointers should not be noticed. The same thing should occur, when the brake pedal is pressed as far as it will go and is held pressed within 15 - 20 sec. Simultaneously, tightness of the brake system hydraulic part should be checked.

The air leakage from the joints of the air lines is eliminated by torquing the connecting nuts to:

- 13 – 18 N·m (1.3 – 1.8 kgf·m) – for air lines, diameter 6 mm;
- 20 – 35 N·m (2.0 – 3.5 kgf·m) – for air lines, diameter 10 mm;
- 30 – 45 N·m (3.0 – 4.5 kgf·m) – for air lines, diameter 14 mm.

To avoid breakage of connecting bosses on the brake equipment the tightening torque of unions and plugs should not exceed 30 – 50 N·m (3 – 5 kgf·m)

The working order of the stop signal should be checked by pressing the brake pedal, if the air pressure is available in the pneumatic system.

Operation of the brakes failure alarm should be checked as follows:

- check if the pilot lamp (alarm) 3 (see Fig. 13) is in good working order;
- slack off the nuts fastening the wire to BK503 brakes failure alarm switch;
- screw the switch out of the air booster and tighten the nuts fastening the wires;
- turn on the instruments and ground the switch body on the truck, press the button as far as it will go;
- pilot lamp 3 should go on, that indicates the good working order of the alarm;
- follow the same procedure for the second switch. If the switch is faulty, replace it.

The working order of the air drive should be checked as follows:

- connect the check pressure gauges to the check outlet valves;
- fill in the pneumatic system with air until the pressure governor actuates. In so doing the pressure in the working circuits of the brake drive should be 650 - 800 kPa (6.5 - 8.0 kgf/cm²) on the two-pointer pressure gauge in the driver's cab. The pressure should be the same on the check pressure gauge mounted on the third bottle;
- when the brake pedal is pressed all the way down, the air pressure in the check pressure gauges mounted on the brake air boosters and that in the pressure gauge of the first circuit should be equal to the pressure in the system; the pressure in the pressure gauge of the second circuit should be equal to the pressure of braking force regulator actuation.

Working order of the brake equipment should be checked as follows:

1. Check the pressure at the outlet from both units of the brake valve and operation of the triple safety valve. For this purpose connect the check pressure gauges to the main from the brake valve to the air booster, and when the air pressure in the pneumatic system equals 650 - 800 kPa (6.5 - 8.0 kgf/cm²), press the brake pedal as far as it will go. The air pressure on the check pressure gauges should be equal to the pressure in the system (on the two-pointer pressure gauge).

If the check pressure gauge does not show the pressure equal to that in the bottle of this circuit, when pressing the brake pedal, check and adjust free and full travel of the brake pedal.

After that bring the pressure in the system to 800 kPa (8.0 kgf/cm²) – when the pressure regulator actuates, then shut down the engine and evacuate the air from the bottle of the front axle brake circuit. When the pedal is pressed, the air pressure on one check pressure gauge should be equal to the air pressure in the system, and on the other one it should be equal to zero. Then pressing the brake pedal several times, drop the pressure on the pressure gauge down to 500 kPa (5.0 kgf/cm²) and start the engine. At the pressure of 560 - 600 kPa (5.6 - 6.0 kgf/cm²) the air pressure in the bottle of the front axle brake circuit should grow. Follow the same procedure with the brake circuit of the intermediate and rear axles.

2. Check operation of the single safety valve. Connect the check pressure gauge to bottle 9 (see Fig. 67), having let all the air out of all the three bottles first. Then fill in the bottles with compressed air, comparing readings of the two-pointer pressure gauge. The compressed air should go into bottle 9 after the air pressure reaches 550 kPa (5.5 kgf/cm²).

3. Check the pressure value on the coupling heads. For this purpose connect coupling head of «B» type, which is included in the set of spare parts, tools and

accessories, with the check pressure gauge to coupling head 18, «A» type. Fill in the brake system with the compressed air until the pressure, when the compressor disengages, is reached. The air pressure on the check pressure gauge should be 500 - 520 kPa (5.0 - 5.2 kgf/cm²). Then press the brake pedal and engage the parking brake. In so doing the check pressure gauge should read zero.

Check the pressure value on control coupling head 16 and feed coupling head 17 of the double-line drive. The air pressure in the feed coupling head should be equal to the pressure in the system, and the pressure in the control coupling head should be equal to zero. When pressing the brake pedal and engaging the parking brake, the air pressure in the control head should be equal to the pressure in the system.

To ensure the proper operation of the pneumatic drive, drain the condensate from the air bottles. Follow this procedure, if the air is available in the pneumatic system. During a cold period drain the condensate when the truck leaves a warm garage. After draining the condensate from the bottles fill in the system with the compressed air until the rated pressure is reached.

If the ambient temperature is below 0 °C, and if the trucks are stored out of doors, a special care should be taken to drain the condensate from the air bottles. If the condensate has been frozen, it is required to warm up the frozen areas with hot water or steam.

Do not heat the units by exposing them to the open flame (torch, a soldering lamp, etc.).

Fill in the hydraulic drive system with fluid and pump through the brakes when the air pressure is available in the truck pneumatic system. Prior to filling in the system remove mud from the brake master cylinders and tanks. Then having removed the sealing pipe and screwed off the filler plug, fill in the tanks with braking fluid and remove the air from the hydraulic system.

The order of pumping through the brake master cylinders and wheel cylinders of the service brakes should be as follows:

- remove the rubber cap from the bypass valve of the master cylinder; put the valve on the pipe available in the set of tools; immerse the open end of the pipe into the braking fluid poured in a glass vessel, having a capacity, minimum 0.2 l. Fill in the vessel with the braking fluid up to half its height;
- screw out the bypass valve through 1/2 - 3/4 of a turn and then press the brake pedal several times (press quickly, release slowly). Press the pedal repeatedly until no air bubbles come out of the pipe immersed in the vessel with the braking fluid. When pumping through the cylinders, add fluid into the tanks to prevent the air penetration in the system;
- hold the pedal pressed, screw in the cylinder bypass valve tight, remove and put on the cap;
- pump through the wheel brake cylinders, keeping the following order: the intermediate l.h., rear l.h., rear r.h., intermediate r.h., front r.h., front l.h. cylinders;
- upon pumping through all the cylinders add the fluid into the tanks up to the level of 15 - 20 mm lower the filler upper edge and screw on the filler plug.

When changing the braking fluid, disassemble the wheel and master cylinders, flush the working surfaces of the parts. When assembling the wheel cylinders, apply the braking fluid onto the piston and cylinder inner surface. To enhance the corrosion resistance of the wheel cylinders apply 4 - 5 g of $\Delta T - 1$ grease onto the cylinder face under each wheel cap.

Emergency brake system

The functions of the emergency brake system are performed by one of the service brake system circuits. If one of the circuits is out of order, the emergency brake system ensures braking the truck efficiently enough.

Parking brake system

The parking brake system is intended to fix the truck on slopes. The parking brake control is mechanical. The brake is controlled by the lever located to the right of the driver's seat.

The parking brake is of drum type with two shoes and self-boosting.

When braking, the effort is transferred from adjusting lever 11 (Fig. 83) through lever 10, shackle 12 to expansion lever 13.

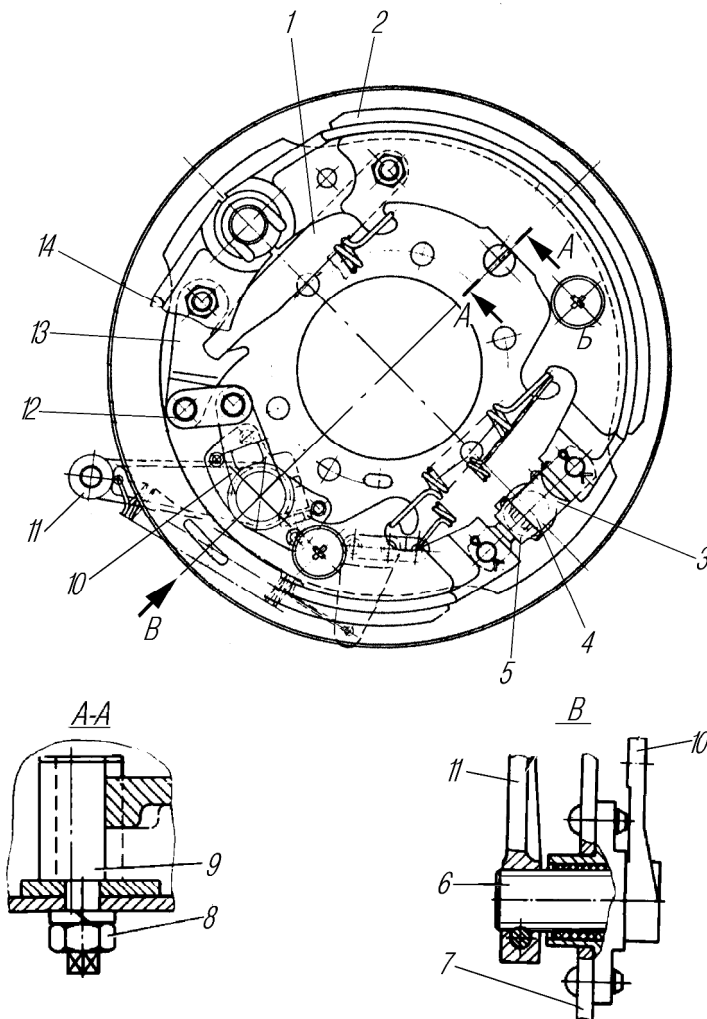


Fig. 83. Parking Brake:

1 – rod; 2, 14 – brake shoes (l.h. and r.h.); 3 – adjusting device; 4 – stopper; 5 – sprocket; 6 – shaft; 7 – shield; 8 – lock nut; 9 – eccentric pin; 10 – lever; 11 – adjusting lever; 12 – shackle; 13 – expansion lever

When the brake drum rotates clockwise, the drive effort is transferred from lever 13 via rod 1 to r.h. shoe 2. The shoe goes off the supporting pin and presses to the brake drum. In so doing, the shoe, owing to friction, is caught by the drum, shifted in the direction of rotation and via adjusting device 3 presses l.h. shoe 14 to the supporting pin and drum.

When the brake drum rotates counter-clockwise, lever 13, resting on rod 1, transfers the drive effort to l.h. shoe 14. The shoe goes off the supporting pin and is pressed to the brake drum. The shoe, owing to friction, is caught by the drum, is

shifted in the direction of rotation and via the adjusting device presses r.h. shoe 2 to the supporting pin and drum.

As the linings are being worn, travel of lever 1 (Fig. 84) increases and the brake efficiency can decrease. If lever 4 is mounted on the 12 th tooth of the segment, it is required to adjust clearances between the linings and drum with the help of eccentric and sprocket. Adjust the brake as follows:

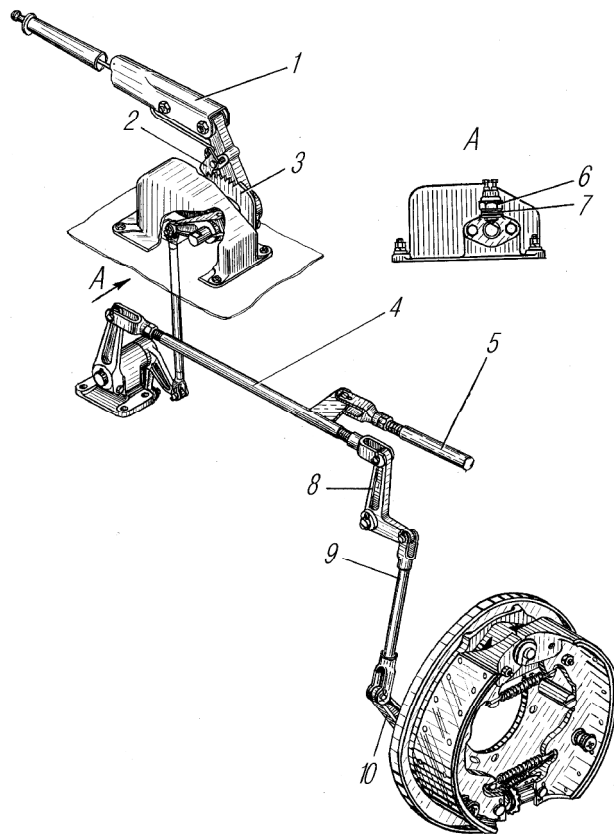


Fig. 84. Parking Brake Control:
1 - parking brake control; 2 - pawl; 3 - segment; 4, 9 - control tie rods; 5 - tie rod to trailer brake control valve; 6 - parking brake alarm switch; 7 - shims; 8 - lever; 10 - adjusting lever

1. Lower down the control lever 1 in the cab as far as it will go.

2. Disconnect the tie rod 4 from lever 8 on the transfer box.

Do not adjust the clearances between the linings and drum by changing tie rod 4 length, because it results in the parking brake failure.

3. Adjust the clearance between the r.h. shoe and drum. For this purpose slack off lock nut 8 (see Fig. 83) on eccentric pin 9 on the side of shield by half a turn, and turning the pin by a wrench clockwise, set a clearance of 0.3 - 0.5 mm. Check the clearance with the help of checking probe through the slit in the brake baffle. Tighten the lock nut, preventing the pin turning.

4. Adjust the clearances between the l.h. shoe and drum. For this purpose remove stopper 4. Set a clearance of 0.3 - 0.5 mm through the hole in the brake shield, turning sprocket 5 by a screwdriver from the top down. Install the stopper.

5. Select free travel of lever 8 (see Fig. 84) on the transfer box, turning it counter - clockwise until the effort to be applied increases appreciably, and check if the hole in tie rod 4 fork coincides with the hole in lever 8. If required, match the holes by rotating the fork of tie rod 4. Install the pin and cotter it.

If the effort applied on the lever in the cab is 350 - 400 N (35 - 40 kgf), the pawl of lever 1 should be mounted on the 4 th - 8 th tooth of segment 3. When the pawl has passed the 2 nd - 4 th tooth of the segment, the pilot lamp of the parking

brake engagement on the dashboard should turn on. To adjust the moment of its turning on, change the number of shims 7 under alarm switch 6.

Auxiliary brake system

The compression - type auxiliary brake is intended to reduce the truck traveling speed, when moving downhill for a long time. Braking is performed by establishing counter - pressure in the exhaust gas lines when cutting them off by flaps. The brake consists of body 3 (Fig. 85) and a flap. The flaps are driven by air cylinders 1 fixed with the help of a bracket on the auxiliary brake body.

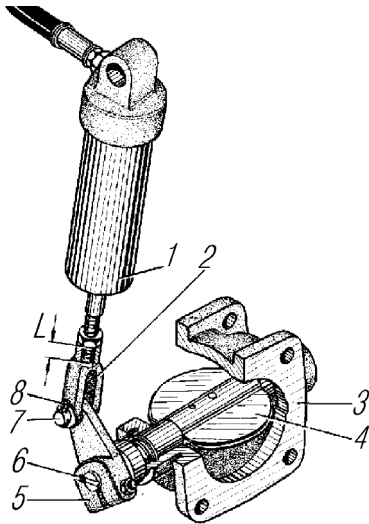


Fig. 85. Auxiliary Brake:

1 - air cylinder; 2 - drive tie rod fork; 3 - body;
4 - flap; 5 - flap shaft lever; 6 - key; 7 - pin; 8 -
cotter pin

If it is required to brake the truck, press the button of the auxiliary brake control air valve located on the cab floor. The compressed air is supplied to the air cylinders, the pistons move, closing the flaps. Simultaneously, the signal to the trailer brake drive is transmitted and its light braking occurs.

When the valve button is released, the air goes out of the cylinders to the atmosphere; the rods under the action of the return spring turn the levers and flaps to their initial position.

The locked drive, synchronous with engaging the auxiliary brake, cuts off the fuel feed. The design of the air cylinder, cutting off the fuel feed, is similar to that of the auxiliary brake air cylinder.

When travelling with the auxiliary brake engaged:

- the engine speed should not exceed 2100 min^{-1} ;
- do not shift the gears in the gearbox from the high to low one at the engine speed close to 2100 min^{-1} .

If required, reduce the engine speed with the help of the service brake and engage the low gear.

If flap 4 of the auxiliary brake turns with difficulty, remove the brake body with the flap, rinse in kerosene, blow through with the compressed air. If the air cylinder rods or air valve seize, disassemble the assembly units, rinse in kerosene, replace the faulty parts, apply lubricant onto the friction surfaces and put them into place.

To adjust the position of the flaps, change the length (L) of screwing off the air cylinder rod with fork.

If the flap is installed properly, the key is located alongside the intake pipe axis, with the air cylinder piston in its extreme r.h. position.

ELECTRIC EQUIPMENT

The system of electric equipment is single - wire, the negative terminals of power - supply sources and consumers are grounded to the truck body. The negative terminal of the storage battery is connected with the «ground» by a distance switch.

The power - supply sources are two storage batteries, connected in series, and a generator that operates in combination with a voltage regulator. The units and instruments relating to the electric equipment are connected by P.V.C. - insulated conductors of various sections. The wires, which are a constituent part of the bunches, have a particular color for detecting and assembling them easily. Single wires can be of any color. The wire color can be marked by the first letter of the colour name on the collars mounted on both ends of the wire.

The wires are connected to each other and with the instruments by plug and socket joints. The colors of the truck wires are given in Appendix 4.

A mechanically - driven speedometer, electronic instruments and systems: a tachometer, an alternator with a rectifying unit, etc. are available with the truck.

To prevent breakage of ГВ300 - 05 speedometer flexible shaft, when mounting or dismantling the dashboard, it is required to lay the shaft so that the mark applied with paint on the shaft sheathing is located outside the cab right after the sealing bush of the flexible shaft through hole; in so doing it is necessary to lay the flexible shaft without any loops behind the dashboard.

To ensure reliable operation of the said instruments and systems, care should be taken to condition of the fuses installed in assemblies. Avoid the use of non - standard fuses in the form of bended wires, bolts, washers, because it will result in immediate failure of the electronic items if a short - circuit occurs. A blown - out fuse should be replaced by the one having the same value of working current.

Fifth wheel headlight – projector is installed in the URAL - 4420 - 10, URAL - 4420 - 31 and URAL - 44202 - 0612 - 30 bolster trucks cab rear panel.

Unglight lighting devices are installed in the URAL - 43202 - 0351 - 31 and URAL - 44202 - 0311 - 31 bolster trucks; a cab heater capacitor, the capacitor filter 11.7904, a preheater motor capacitor, a tire pressure gauge with an illumination light are not installed.

The electric circuit diagram for URAL - 4320 - 10, URAL - 4320 - 31 trucks both for defence and civil needs is shown in Fig. 86 (see the insert). Definitions to Fig. 86 are given in Table 5.

Table 5

Electric devices for Ural - 4320 - 10, Ural - 4320 - 31 trucks

Item, Fig.86	Description	Type or item number
1	R.h. front lamp	ПФ133АБ (ПФ130Б or ПФ130 АБ - 01)* ¹
2	R.h. turn indicator repeater	УП101 - Б1 (511 - 3726010)* ¹
3	R.h. head lamp	401.3711 (671.3711)* ¹
4	R.h. connecting panel	17.3723
5	R.h. fog head lamp	ФГ152А* ²
6	Starting preheater motor	МЭ252

Item, Fig.86	Description	Type or item number
7	Capacitor	КБП - С
8	Low - tone sound signal	С306Δ
9	High - tone sound signal	С307Δ
10	L.h. fog head lamp	ФГ152А*2
11	L.h. connecting panel	17.3723
12	L.h. fog head lamp	401.3711 (671.3711)*1
13	L.h. turn indicator repeater	УП101 - Б1 (511 - 3726010)*1
14	L.h. front lamp	ПФ133 - АБ (ПФ130Б or ПФ130 АБ - 01)*1
15	Windshield wiper	16.3730
16	Windshield washer	1112.5208000 - 14 or 1212.5208000 - 12
17	Sound signal relay	901.3747
18	Underhood lamp	ПД308Б
19	Sound signal switch	2802.3829 or ΔЕ - Т or ММ125Δ
20	Solenoid valve of glow plug device	11.3741
21	6A fuse	ПР119 - 01
22	Glow plug	11.3740
	Senders:	
23	- coolant temperature indicator	ТМ100А
24	- oil filter clogging	-
25	- oil pressure emergency drop	2602.3729 or ΔЕ - М or ММ111Δ
26	- oil pressure	ММ370
27	Starting preheater spark plug	СН423
28	Coolant overheating sender	ТМ111 - 01
29	Alternator	Г288Е or 1702.3771
30	High - voltage source	ТК107А or 9301.3734
31	Starting preheater fuel heater	11.3741060
32	Starting preheater solenoid valve	ПЖΔ30 - 1015501 - 04
33	Starter	25.3708 - 01
	Switches:	
34	- starting preheater motor	46.3710
35	- starting preheater spark plug	ВН45М
36	- fuel heating	ВН45М
37	- starting preheater solenoid valve	46.3710
38	Change - over switch	1602.3769
39	Voltage regulator	2712.3702 or P2712.3702
40	Capacitor filter	11.7904
41	Voltage regulator relay	901.3747
42	Glow plugs relay	901.3747
43	Resistor with bimetallic contact of "thermostart" system	12.3741
44	Storage battery switch locking relay	901.3747
45	Thermal bimetallic fuse	291.3722
46	Portable lamp socket	47К
47	Head lamp foot changeover switch	П53 (П39)*1
48	Turn indicator relay	РС951А or ПП24М
49	Starter relay	738.3747 - 20

Item, Fig.86	Description	Type or item number
50	Portable lamp socket	ПC400
51	Flood head lamp	171.3711* ³
52	Auxiliary brake relay	901.3747
53	Auxiliary brake switch	2802.3829 or ΔE - T or MM125Δ
54	Fuse assy	ПP120
55	Rear fog lamp switch	3842.3710 - 02.04
56	Heater motor resistor	CЭ300
57	Heater motor	MЭ226 - B
	Switches:	
58	- cab roof lamp	BK343.01.08
59	- flood head lamp	BK343.01.06* ³
60	- road train sign lamps	BK343.02.16
61	Cab heater change - over switch	П147.03.11
62	Fog lamps switch	BK343.01.03* ²
63	10A Fuse	ПP119Б - 01
64	"Thermostart" - system switch	11.3704 - 01
65	Emergency visual alarm switch	32.3710 or 245.3710 - 01 or 249.3710
66	Tire pressure gauge	MΔ101
67	Cab roof lamp	ПK - 201Δ
68	Road train sign lamp	УП101Б1
69	Pilot lamps assy	ПΔ511E
	Alarms:	
70	- trailer turn indicators	-
71	- tractor truck	-
72	- readiness to start	-
73	Central light change - over switch	П305
74	Fuel level indicator	УБ170 - 01 or 34.3806010
75	Fuel reserve alarm	-
76	Turn indicator change - over switch	П110A or П110B - 01
77	Current indicator	АП171A
78	Speedometer	161.3802
79	Distant light alarm	-
80	Tachometer	253.3813
81	Starter and instrument switch	BK353 or BK354 (2109.3704010)* ¹
82	Oil pressure indicator	УK170 - 03
83	Oil pressure drop alarm	-
84	Storage battery switch button	11.3704 - 01 (1402.3737)* ¹
85	Coolant temperature indicator	УK171 - 01
86	Instrument light rheostat	BK416Б - 01
87	Two - pointer pressure gauge	1901.3830010
88	Starter locking relay	2612.3747 or RBS - 1k
89	Sound buzzer	733.3747
90	L.h. pilot lamps assy	ПΔ512E
	Alarms:	
91	- parking brake	-
92	- semi - trailer folding angle	-
93	- coolant temperature emergency rise	-

Item, Fig.86	Description	Type or item number
94	- brakes failure	—
95	- air bottles pressure drop	—
96	- oil filter clogging	—
97	Parking brake alarm switch	BK403A or BK403Б
98	Parking brake relay	PC493
99	Storage battery	6CT - 190 (6CT - 190A or 6CT - 190TP or 6CT - 190TM)* ²
100	Storage battery switch	1402.3737
101	External assistance starting socket	ПС315 - 100 or ММММ685121002
102	Reversing light switch	BK403A or BK418A or BK403Б
103	Braking signal switch	BK12Б
104	Brakes failure sender	BK503
105	Signal from body switch	BK322
106	Electromagnet circuit switch	BK403A or BK403Б
107	Fuel level sender	5202.3827010
108	Air bottles pressure drop sender	2702.3829 or ДЕ - В or ММ124Д
109	Trailer socket	ПС300 - А3
110	Body illuminating lamp	ФП103Г
111	Connecting panel	17.3723
112	Rear r.h. lamp	ФП113 - АБ
113	Rear fog lamp	2412.3716010
114	Reversing lamp	2112.3711
115	Number plate lamp	ФП134Б
116	Rear l.h. lamp	ФП133АБ
117	Side clearance lamp	431.3731
118	Trailer socket	ПС326 - 150 or СНЦ125 - 7/45В034 - 01
119	Trailer socket	ПС325 - 150 or СНЦ124 - 7/45В034 - 01
120	Rear r.h. lamp	7462.3716* ¹
121	Number plate lamp	ФП131АБ* ¹
122	Rear l.h. lamp	7472.3716* ¹
123	Front clearance lamp	264.3712* ¹
124	Dim light corrector	ЭМКФ35
125	Clearance lamps relay	901.3747
126	Distant light alarm	901.3747
127	Engine shutdown solenoid valve	5320 - 3721500 or ЭМ - 1
*1 Non - tight version *2 Optional *3 For military - application vehicles		

ALTERNATOR

The water - proof alternator (Fig. 87) is designed as a 12 - pole synchronous electric machine having a built - in rectifying unit, type ВБГ - 7Г or БПВ7 - 100 with input ventilation.

The alternator has the following terminals:

- « + » - for connecting with the storage batteries and load;
- two terminals marked « III » — for connecting with terminal « III » and « + » of the voltage regulator, terminal « III » is made as two - pin jack connector;
- « - » - for connecting with the voltage regulator body;
- « ~ » - for connecting to the tachometer.

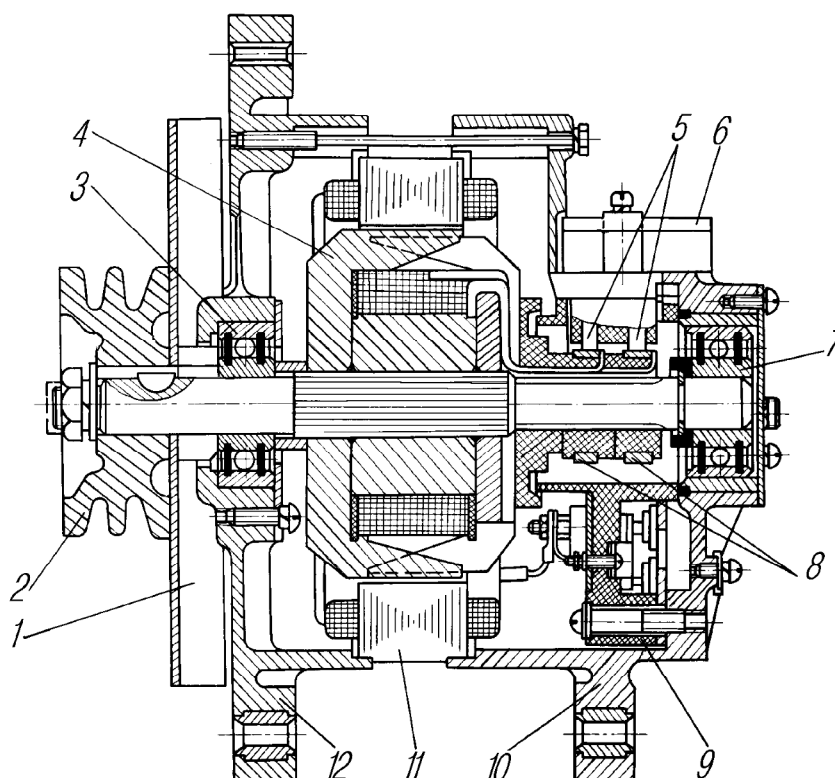


Fig.87. Alternator:

- 1 - fan; 2 - pulley; 3,7 - ball bearings; 4 - rotor; 5 - brushes; 6 - brush holder cover; 8 - collector rings; 9 - rectifying unit; 10 - cover on the side of collector rings; 11 - stator; 12 - cover on the side of drive

Technical data
at ambient temperature of (15 - 35) °C

Rated voltage, V	28
Rated current, A	47
Rated output, W	1000
Rotor speed at 28 V, min ⁻¹ :	
- without load	1180
- loaded with 30 A, maximum	1900
Maximum rotational speed, min ⁻¹	8000
Exciting current, A	1.5 - 1.7

To avoid the alternator failure the following things are not allowed:

- engine running with the switched off storage batteries;
- disconnecting the wire conductors from the positive and negative terminals and unmaking the plug and socket joints of the alternator and voltage regulator with the engine running;
- checking the alternator installation by closing the jumper of the «+» and «-» plug and socket joint lead wires of the alternator and voltage regulator with the engine running;
- checking the alternator working order with the help of the pilot lamp or megger;
- switching on the storage battery with the reversed polarity of its terminals or connecting the positive terminal of the alternator with the negative one of the storage battery;
- short - circuit of «+» and «III» terminals of the voltage regulator.

Keep the alternator clean to ensure its good working order. When checking the alternator, refer to readings of the current indicator. At the engine average speed the current indicator should read the charging - current value that goes down on restoring the storage - battery charge. If the storage battery is in good working order and charged completely, the alternator is in good working order and level of the controlled voltage is selected properly, the current indicator pointer should read zero.

Remove the dust from the alternator by blowing it through with compressed air. The alternator should be repaired by an authorized repair workshop.

For checking condition of the brush assembly, remove the brush holder. Check if the brushes slip easily in the holder. Replace the brushes, if they project above the brush holder channel less than 5 mm. The effort of pressing the brushes to the commutator, if the spring is compressed to 17.5 mm, is about 0.19 - 0.25 N (19 - 25 kgf). If wear of the collector rings exceeds 0.5 mm in diameter, turn them on lathe. The minimum permissible diameter of turning is 29.3 mm.

The ball bearings are made tight and packed with grease sufficient for their entire service life. In case of jamming or loud noise replace the bearings.

To check the alternator on the truck, a d.c. voltmeter of at least 1.5 class of accuracy is required. Connect the voltmeter between «+» and «-» terminals of the alternator. The check is carried out after the storage batteries have been connected, when the engine speed is, approximately, 2000 min⁻¹. After 10 min of the engine operation, switch on the distance light of the head lamps and check the voltmeter readings, which should be 26.6 - 29.2 V.

Test the alternator on a special bench, which provides smooth change of the alternator rotor speed to 5000 min⁻¹, and has a measurement instruments of at least 1.5 class of accuracy. The circuit diagram for bench check of the alternator is shown in Fig. 88. If the alternator is in good working order, its parameters should conform to the specifications.

The alternator breakdown can occur because of the rectifying unit failure. The latter must be tested, when the alternator has been disassembled and the stator winding is disconnected (Fig. 89).

For testing the rectifying unit, connect the storage battery to rectifying unit terminals via a pilot lamp. For checking the «plus» diodes connected to the rectifying unit «plus» bus bar, connect the storage battery wire and the other wire via the pilot lamp in sequence - to the diode terminals. For checking the «minus» diodes, connect the storage battery to the «minus» bar and the pilot lamp - to the diode terminals.

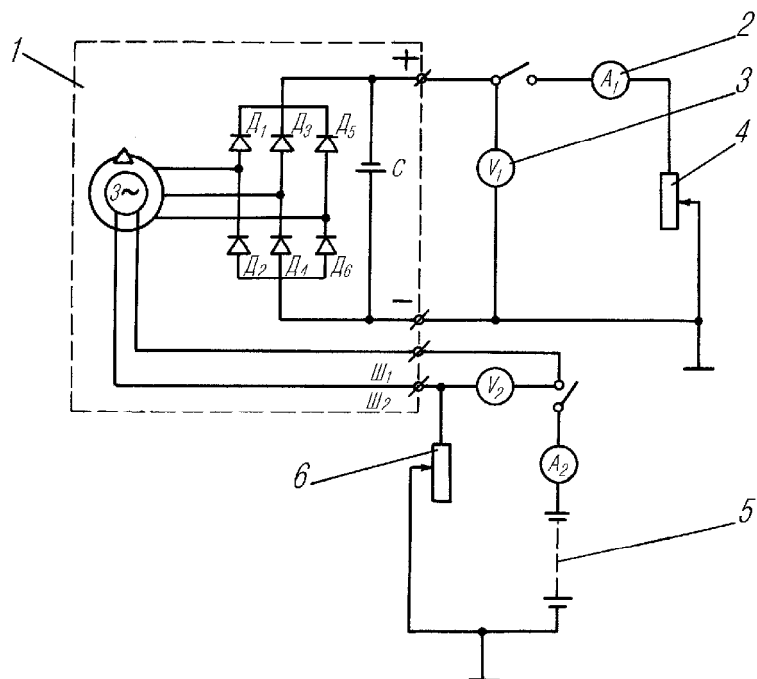


Fig. 88. Circuit Diagram for Bench Test of Alternator

Electric Parameters:

- 1 - alternator; 2 - current indicator; 3 - voltmeter; 4 - load; 5 - storage battery; 6 - ballast resistor

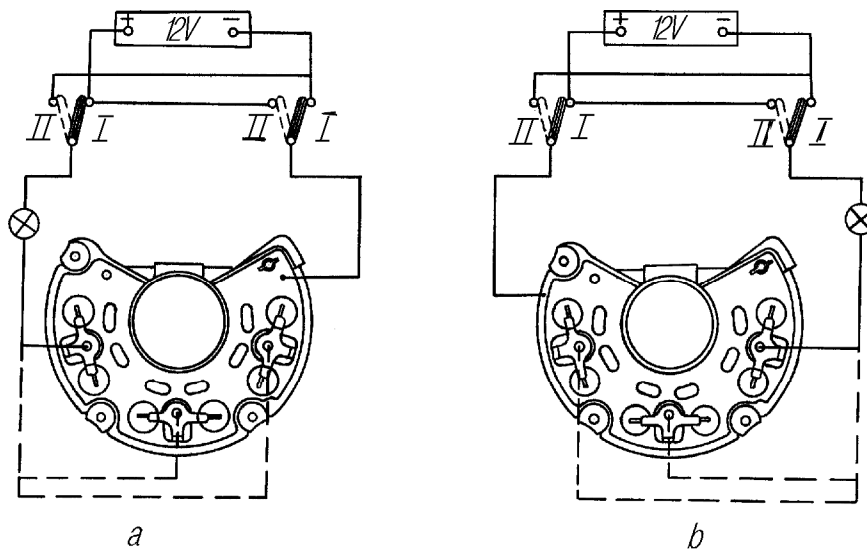


Fig. 89. Circuit Diagram for Check of Rectifying Unit:

- a - checking of «plus» diodes; b - checking of «minus» diodes; I - diodes are connected for non - conducting; II - diodes are connected for conducting

Mind, that the rectifying unit diodes in good working order conduct current in one direction only, consequently, the lamp is on, only if the diodes are connected in the conducting direction. If the pilot lamp is switched on in both directions and in both cases it goes ON or OFF, it means that the rectifying unit diodes are faulty. If any fault of diodes is discovered, replace the rectifying unit.

Do not test the rectifying unit connected to:

- a voltage source of more than 24 V;
- an a.c. source.

When mounting the alternator onto the engine, keep in mind that the rear bolt fastening the alternator to the bracket is fixed in a split - type support, and the foot of the alternator front cover is fixed without any clearance.

Therefore, when mounting the alternator, before tightening its fastening bolts, slack off the bracing bolt of the split - type support, tighten the bolts fastening the alternator and only then tighten the bracing bolt of the alternator rear support.

When disassembling the alternator, follow the procedure described below:

- turn out the two screws, which fasten the brush holder, and remove the holder;
- screw out the bracing bolts and remove the cover on the side of collector rings together with the stator;
- screw the nuts, which fasten the phase wires, off the rectifying unit and separate the stator from the cover;
- undo the nut that fastens the pulley and remove the pulley, fan and supporting bush. Remove the cover from the shaft.

The alternator should be reassembled in the reverse order.

Check and adjust tightening of the alternator belts according to the Operation Manual of YAMZ - 236M2, YAMZ - 238M2 engines.

Voltage regulator

The contactless voltage regulator with three levels of adjustment is designed to maintain constant voltage in electric circuits of the truck. It is an electronic device with semi - conductor elements.

To adjust voltage use switch located on the regulator front cover (Fig. 90). Positions of the switch arm correspond to voltage as follows: horizontal right - hand position (intermediate), horizontal left - hand position (maximum) and upright position (minimum).

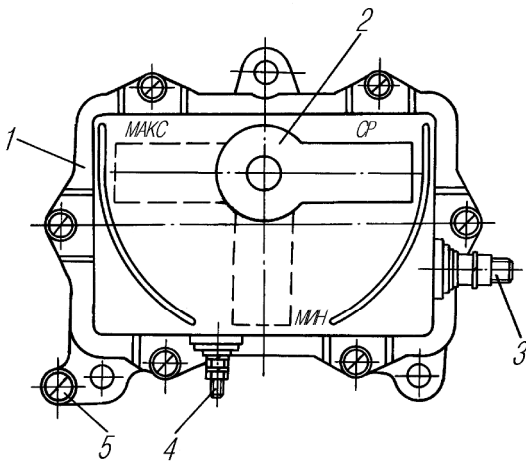


Fig.90. Voltage Regulator:
1 - body; 2 - changeover switch; 3, 4, 5 - terminals

The voltage levels are marked on the regulator front cover. Originally the regulator is adjusted by manufacturers for the intermediate level.

If the ambient temperature is 0 °C or lower, shift the switch arm to «МАКС» (max. position) to prevent the short charge of the storage batteries. At the temperature of 0 °C and higher shift the switch arm to «МИН» (min. position) to prevent the electrolyte boiling out. When the battery is short - charged or the electrolyte has boiled out, shift the arm to «СР» (intermediate position).

To avoid the voltage regulator failure do not interconnect «+» and «III» terminals. Connect the wires in conformity with the marks applied on the generator and regulator.

If it is required to check up controlled voltage:

- connect a voltmeter, not less than 0.5 class of accuracy with the dial 0 - 30 V between the «+» terminal and the regulator body;
- start the truck engine and set a medium engine speed;
- switch on distant light of the headlamps as a load and read the adjustable voltage on the voltmeter.

The voltage kept by the regulator at 15 - 35 °C should be 26.5 - 27.9 V at the minimum level, 28.1 - 28.7 V at the intermediate level and 28.7 - 30.1 V at the maximum level.

When checking the adjustable voltage V on the bench (Fig. 91), the rotor speed should be 3500 min^{-1} and load current – 18A. If voltage exceeds that in the technical specifications, replace the regulator.

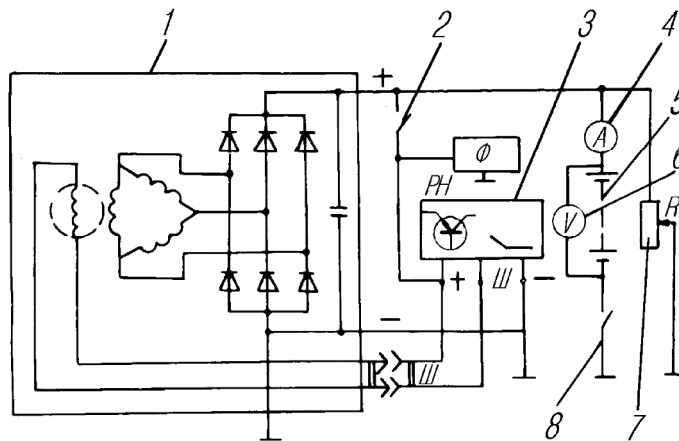


Fig. 91. Connecting Diagram for Voltage Regulator and Generator for Checking Voltage Regulator on Bench:

1 - alternator; 2 - ignition switch; 3 - voltage regulator; 4 - current indicator; 5 - storage battery; 6 - voltmeter; 7 - load; 8 - «ground» switch

Storage batteries

The storage batteries are designed to start the engine with the help of starter and operate in combination with the alternator at maximum loads.

The storage batteries filled with electrolyte are installed in the truck. Dry - charged storage batteries, which are capable to keep their original charge within a year from the moment of their charging, can be installed upon a special request.

Basic technical data of storage batteries

Rated Voltage, V	12
Ah Capacity at 20 Hrs Rate & electrolyte temperature + 25 °C	190
Discharge Current at 20 Hrs Rate, A	9.5
Total Acid Volume in Battery, l	12
Charging Current, A	19
Wet Battery Weight, kg	71

Storage battery fastening. Storage batteries 1 (Fig. 92) are installed in box 10 on two side supports and an intermediate support. Upon their installing into the box, the batteries are fastened by two upper clamps 13 and front stop 4. Upper clamps 13 are fixed by front and rear wedge stops 9 and 12. Front wedge stops 9 are adjustable and fastened on box cover 6 by bolts 8. Rear stop 12 is welded to the upper rear part of box 10. Guides 11 are welded on the upper panel of box 10 for proper setting of clamps 13 relative to stops 9 and 12. Front stop 4 is fastened on box cover 6 by bolts 8. Front wedge stops 9 are adjustable and fastened on box cover 6 by bolts 8. Rear stop 12 is welded to the upper rear part of box 10. Guides 11 are welded on the upper panel of box 10 for proper setting of clamps 13 relative to stops 9 and 12.

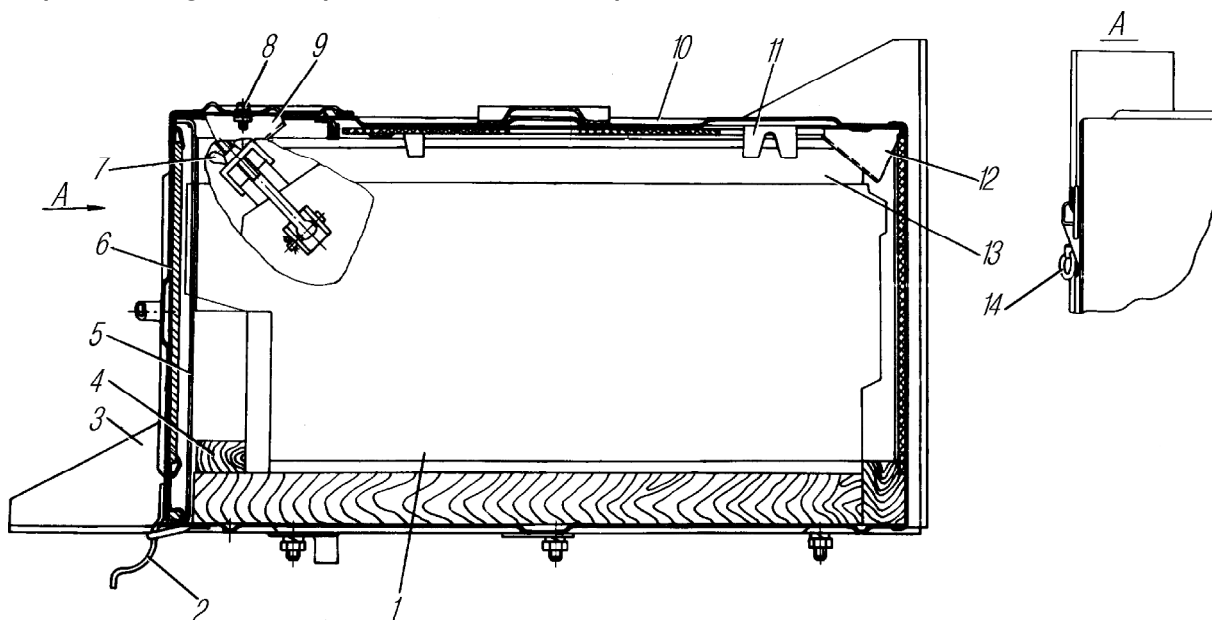


Fig. 92. Installation of Storage Batteries:

1 - storage battery; 2 - clip; 3 - storage battery brackets; 4 - front stop; 5 - box rein - forcer; 6 - box cover; 7 - winged nut; 8 - bolt; 9, 12 - front and rear wedge stops; 10 - box; 11 - guides; 13 - upper clamp; 14 - lock ring

To perform technical maintenance of the storage batteries without their re - moving from the truck, follow the procedure:

- disconnect the storage batteries from the truck on - board electric network with the help of «ground» switch;
- remove spring ring 14 of cover 6 locks and open the locks;
- lift up cover 6 and tilt it onto bracket 3. Make sure that cover 6 is fixed securely in horizontal position;
- slack off fastening of the wires and jumper to the batteries, having removed batteries terminals protection covers if any;
- take front stop 4 out of box 10, lifting one end of stop 4 until it goes from behind reinforcer 5;
- take upper clamps 13 out of box 10. If the clamp is jammed between battery 1 and rear wedge stop 12, use a screw driver or drift inserting them into the hole on the clamp end;
- move out the batteries onto hinged cover 6 of the box.

To remove the batteries from the truck follow the procedure described above, except that cover 6 should be removed from the box, the wires should not be slackened, but disconnected from the battery terminals. Alternately moving out the batteries onto bracket 3, remove them from the truck.

When moving batteries 1 out of box 10 onto bracket 3 and removing them from the truck, observe precautions to avoid falling down the unfastened batter - ies.

Install the batteries into the truck and fix them in the reverse order.

Make sure that the upper clamps are inserted in guides 11. Otherwise, clamp 13 will not be in close contact with stops 9 and 12, and the battery will not be fastened, that can cause its breaking. Avoid deformation of guides 11, when mounting and fastening the battery.

Avoid pinching and sharp bending of the wires leading to the starter and «ground» switch as well as harmful contacts of the wires with metal parts of the box, when installing and fastening the batteries.

After the batteries have been installed into the truck, adjust position of front wedge stops 9; for this purpose slack off tightening of the bolts 8, fastening stops 9 to cover 6, push stops 9 alongside the extended holes of cover 6 as far as they will go, and tighten bolts 8. Adjust position of front wedge stops 9 on closed cover 6 of box 10 upon installing batteries 1 and upper clamps 13 into the box.

Preparation of dry storage batteries for operation. The procedure of batteries preparation to make them serviceable is as follows:

- put off the protection hood and cover, remove dust from the batteries and lubricant from the terminal bolts;
- screw out the filler plugs, remove the sealing gaskets and scour the ventilation holes in the plugs;
- cut off the projections available on the polyethylene plugs, and clean the ventilation ducts;
- pour the electrolyte into the batteries; its density is given in Tabl. 6.

Table 6

Electrolyte density

Climatic zones and regions. Mean ambient temperature in January, °C (GOST 16350 - 70)	Season	Electrolyte density given for 25 °C, g/cm ³	
		to be filled	fully charged battery
Cold zone with climatic re - gions: - very cold (from - 50 to - 30) - cold (from - 30 to - 15)	Winter	1.28	1.30
	Summer	1.24	1.26
	All year round	1.26	1.28
Temperate zone (from - 15 to - 8) Hot zone (from - 15 to + 4) Warm and humid zone (from 0 to + 4)	All year round	1.24	1.26
		1.22	1.24
		1.20	1.22
Note. Permissible deviation of electrolyte density from figures given in the Table is <u>±</u> 0.01 g/cm ³ .			

Prepare the electrolyte by diluting the sulphuric acid as per GOST 667 - 73 Standard (but not the process acid) in distilled water as per GOST 6709 - 72 Standard. In so doing use Tabl. 7 for your guidance.

When preparing the electrolyte, pour the acid into the water and not vice versa. The temperature of the electrolyte to be poured into the batteries should be 15 - 30 °C. Upon saturating within 2 hours, bring the electrolyte level up to 10 - 15 mm above the safety shield. Right before switching on the battery the temperature of the electrolyte should not exceed 30 °C.

Table 7

Preparation of 1 litre of Electrolyte Having Required Density

Electrolyte density for 25 °C, g/cm ³	Water quantity, l	Amount of sulphuric acid, 1.83 g/cm ³ at 25 °C	
		l	kg
1.20	0.859	0.200	0.360
1.22	0.839	0.221	0.404
1.24	0.819	0.242	0.444
1.26	0.800	0.263	0.484
1.28	0.781	0.285	0.523
1.40	0.650	0.423	0.776

Charge the battery with a current of 19 A until copious evolution of gas occurs in each battery and the voltage and electrolyte density remain constant within 2 hours.

In the course of charging the acid temperature should not exceed +45 °C. When the temperature of +45 °C has been reached, the charging current should be reduced twice and correspondingly, the charging time should be extended or charging should be stopped until the electrolyte temperature reduces down to 30 - 35 °C. In the course of charging the electrolyte density grows, and by the end of charging it reaches the number specified in Tabl. 6, taking into account temperature correction as per Tabl. 8.

Table 8

Electrolyte Density Dependence on Temperature Correction

Electrolyte temperature, °C	Correction for densimeter readings, g/cm ³
from +46 to +60	+ 0.02
from +45 to +31	+ 0.01
from +30 to +20	0.00
from +19 to +5	- 0.01
from +4 to -10	- 0.02
from -11 to -25	- 0.03
from -26 to -40	- 0.04
from -41 to -55	- 0.05

If at the end of charging the electrolyte density, measured taking into account the temperature correction (see Table 8), differs from its norm, correct the electrolyte density by adding distilled water, when the density exceeds its norm, or by adding the electrolyte having a density of 1.40 g/cm³ when its density is lower than the norm. Upon correcting, continue charging (for mixing the electrolyte) within 30 - 40 min.

Half an hour after the charging has been finished, set the electrolyte level of 10 - 15 mm above the safety shield, screw in the plugs, wipe the battery surface with a piece of cloth moistened in 10 % ammonia solution or that of soda ash, then wipe it with a piece of cloth moistened in water and after that wipe it dry. Put the cover and protection hood.

In special cases, when it is required to put the dry - charged battery into operation quickly, it is permissible to mount them onto the truck without electrolyte

density checking, 20 min after their saturation, provided that the batteries have been stored not more than a year, and they are being made serviceable at the temperature of the batteries and electrolyte to be poured + 15 °C minimum.

If it is required to put into operation the dry - charged batteries, which are stored at negative temperatures, down to - 30 °C, urgently, fill them with the electrolyte, having a density of 1.26 - 1.28 g/cm³ and a temperature of 38 - 42 °C.

In so doing prepare the electrolyte in two stages as per Tabl. 9. Fill in the batteries with the electrolyte, leave them for an hour and then mount onto the truck.

Table 9

Preparation of 1 litre of electrolyte having required density

Procedure description	Density of received electrolyte	Quantity of added sulfuric acid, density 1.83 g/cm ³
Preliminary diluting should be performed in advance, taking into account the time required for electrolyte cooling down to + 15 °C and it should be stored in a heated room.	1.20 - 1.21 at + 15 °C	0.24 litre per litre of water
Final preparation is made right before filling.	1.26 - 1.28 at + 40 °C	0.13 litre per one litre of diluted electrolyte

The electrolyte level should be 10 - 15 mm above the safety shield. Charge the batteries, when the nearest opportunity occurs, and bring the electrolyte density to its norm.

Order of battery operation. In the course of operation do not connect the battery terminals to each other to test them for sparking.

Determine, how much the battery is charged (Tabl. 10) by the electrolyte density, taking into account the temperature correction. The battery discharged by more than 25 % in winter and more than 50 % in summer should be removed and charged.

Table 10

Determining of Permissible Battery Discharge

Climatic zones and regions. Average ambient temperature in January, °C	Seasons	Electrolyte density for battery charged for 100 %, g/cm ³	Permissible reduction of electrolyte density for batteries discharged for	
			50 % in summer, g/cm ³	25 % in winter, g/cm ³
Cold, with climatic regions:	All year round			
- very cold from - 50 °C to - 30 °C		1.30	1.22	1.26
- cold from - 30 °C to - 15 °C		1.28	1.20	1.24
Temperate: from - 15 °C to - 8 °C		1.26	1.18	1.22
Hot: from - 15 °C to + 4 °C		1.24	1.16	1.20
Warm, humid: from 0 °C to + 4 °C		1.22	1.14	1.18

Add water in winter right before starting the engine. If the electrolyte level reduces, when splashing out, add it. In so doing the density of the electrolyte to be added should conform to its density in the battery. If the electrolyte has fallen on the battery surface, remove it with a piece of clean cloth moistened in 10 % ammonia solution or that of soda ash. Then wipe the surface with a piece of cloth moistened by water and after that wipe it dry.

Store the dry - charged batteries at an ambient temperature in the storing room from - 40 °C up to + 60 °C.

The plugs with sealing disks should be screwed in the batteries tight, the bolts and nuts to the terminals should be covered with a thin layer of a lubricant.

Main faults of the storage batteries and methods of their elimination are given in Chapter «Possible Troubles and Methods of Trouble - Shooting».

Lighting and alarm system

The lighting and alarm devices comprise two main head lamps, front and rear lights, a number plate light, a flood head lamp, reversing light, a roof lamp, underhood lamp and instrument illumination lamps, pilot lamps located on the dashboard.

The front lights*¹ perform functions of front clearance lamps and front turn indicators, the rear lights perform functions of rear clearance lamps, rear turn indicators and a stop signal.

The front lights*² perform functions of front clearance lamps and front turn indicators, the rear lights perform functions of rear clearance lamps, rear turn indicators, a stop signal, reversing lights, a light - reflecting device and side light - reflecting devices.

The head lamps are engaged by central changeover switch 19 (see Fig. 12) in position II, the distance or dim light is engaged by a foot changeover switch.

When the central changeover switch is set in position I or II, the clearance lamps and instrument illumination lamps are turned on correspondingly.

The flood head lamp is engaged by a separate switch only in position I on the central changeover switch.

When installing a truck body roof lamp, connect it to the chain of the illumination light located under the truck body.

The sound alarming is performed by high - and low - tone electric signals. The alarms are engaged by the switch that is inserted in the air valve. Air is supplied to the air valve from the pneumatic system via the air take - off valve.

Turn and braking alarming. The turn indicators are engaged by the changeover switch mounted on the steering column. When turning the changeover switch handle clockwise, the r.h. turn signalling lamps installed in the front light, the side repeater and in the rear light, are turned on. When turning the handle counter - clockwise, the l.h. turn pilot lamps are engaged. The changeover switch is returned in its original position automatically.

The transistor breaking relay provides the flashing light. If one of the lamps, installed in the lights, is faulty, the pilot lamp of the turn indicators on the dashboard does not go ON. When pressing the brake pedal, the stop signal lamps of the rear lights are switched on.

*¹ For military - application vehicles

*2 For civil - application vehicles

A special switch should be turned ON to make all the turn indicators be flashing (truck emergency state); in so doing a pilot lamp in the handle is turned on. The other sound and light alarms are turned on by corresponding senders or switches.

Head lamps. The direction of the head lamp beam is adjusted by two screws located under the head lamp moulding. Screw 10 (Fig. 93) is designed to adjust the light direction in the upright plane (upwards and downwards), and screw 9 — in the horizontal plane (to the left and to the right).

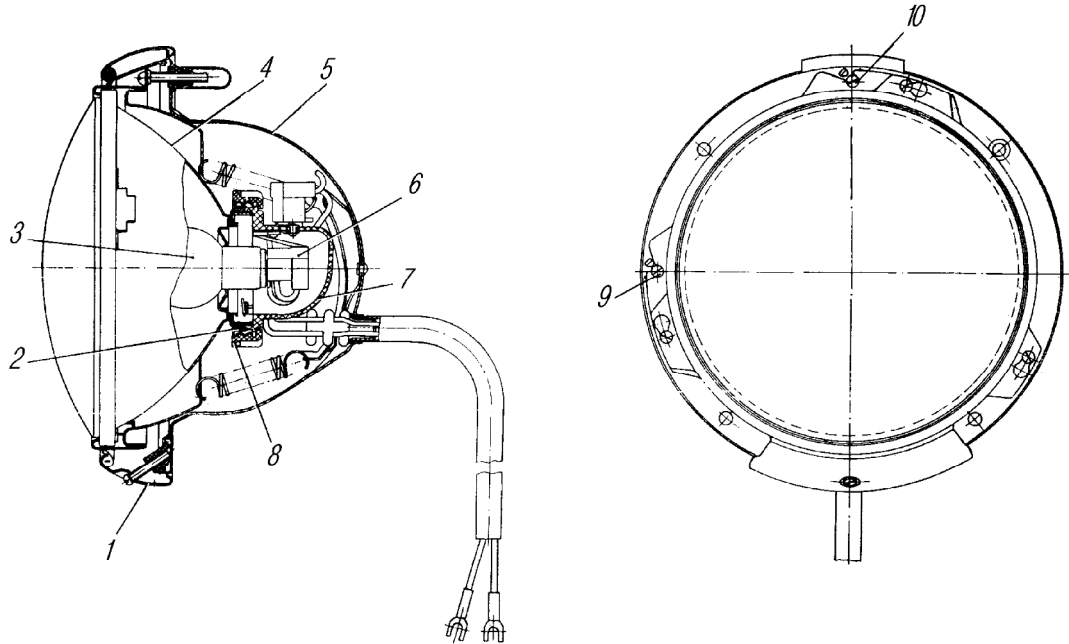


Fig. 93. 401.3711 (671.3711) Headlamp:

1 - moulding; 2 - gasket; 3 - bulb; 4 - sealed - beam unit; 5 - head lamp body; 6 - adapter; 7 - housing; 8 - housing holder; 9,10 - adjusting screws

Head lamp adjusting. How to set initial inclination of headlamp lower beam.

Adjust and check the adjustment with the help of a screen. The screen can be either stationary or portable. The surface of the screen should be flat and mat. The width of the screen should be 2.5 m minimum.

The screen should be marked out. For this purpose apply three vertical lines (Fig. 94). The intermediate axial line conforms to the crossing of intermediate longitudinal plane of the screen, the two lines from the right and left of it are the lines on which the centres of the head lamps are projected. The horizontal line A - A is also applied onto the screen. The distance «h» from the line A - A to the site onto which the truck is put equals the distance from the centre of the headlamp to the surface of this site.

The screen plane must be perpendicular to the site surface. The deviation from the perpendicularity must not exceed 5 mm per meter. The site where the measurements are to be performed must be even and horizontal with a height of uneven places 5 mm maximum and a deviation from the plane not more than 5 mm per meter. The measurements should be performed in darkness (for example, in a dark room). The ambient temperature, when measuring, should be within +10 to +30 °C.

The headlamps are to be adjusted with a fully equipped truck, namely it should be fully primed and equipped by all auxiliary accessories and tools.

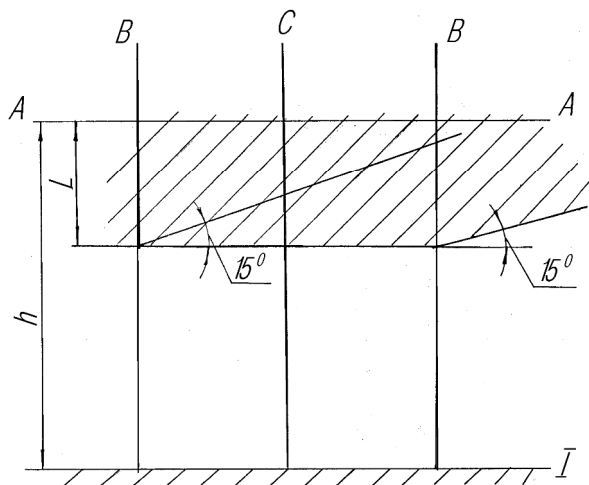


Fig. 94. Marking of Screen for Headlamp Adjusting:

A – horizontal line of screen; B – headlamps centres projection lines; C – crossing line of screen intermediate line; I – site surface line; L = 190 mm

The wheel tires should be inflated so that their pressure corresponds to the full load. The truck should be conditioned at the above - said temperature for 8 hours. To obtain precise results it is admissible to remove lenses from the headlamps.

The headlamp adjustment lies in setting an initial inclination of headlamp lower beam of 1.9 %.

Place the truck prepared, as described above, so that its longitudinal axis of symmetry is perpendicular to the screen plane and the line of crossing the screen plane coincides with the intermediate vertical line on the screen. The distance between centres of the headlamps and the screen should be 10 m.

Adjust the headlamps alternately; the headlamp which is not adjusted should be covered by opaque material.

After the headlamp lower beam has been turned ON, it gives a light zone in the lower part of the check screen and a dark zone – in its upper part. The line dividing the light and dark zones should be parallel to the line A - A in the l.h. part of the screen and is directed upwards at an angle of 15 ° from the point of crossing with the vertical lines of the headlamps centres in the r.h. part of the screen.

Offset the line dividing the light and dark zones by turning adjusting screws so that it occupies a position 190 mm below the line A - A. Following the procedure above means fulfillment of the requirements for setting of initial inclination of the headlamp lower beam.

Upon completing the adjustment re - set the headlamp lenses.

The lower beam of the headlamps may be adjusted with the help of special devices designed for these purposes in accordance with Operation Manuals for those devices. Check such an adjustment by adjusting the inclination of the head - lamp lower beam with the help of the screen and if necessary, make corrections in the technique of the headlamp lower beam adjustment with the help of special de - vices.

How to adjust headlamps depending on truck load (if a lower beam electro - mechanical adjuster is available). The lower beam electromechanical adjuster is in - stalled for adjusting the angle of headlamp lower beam depending on the load. The adjuster control unit is installed in the cab. The adjuster shift handle, which should be set in "0" position with the fully equipped truck, is located on the control unit.

For the URAL - 4320 - 10 & URAL - 4320 - 31 trucks, the URAL - 4420 - 10 bolster trucks, the URAL - 44202 - 0311 - 31 & URAL - 0612 - 30 trucks the adjuster shift handle should be set in "0" position, when travelling in darkness with a weight

of transported cargo up to 75 % of max. cargo weight. When travelling with the max. cargo weight, shift the handle to "I" position and it will provide enough lighting and prevent the possibility to blind drivers who travel the traffic counter flow.

Adjust the inclination of the headlamp lower beam with the help of the adjuster on the vehicles based on the URAL chassis - cabs in conformity with the UN ECE Regulations № 48 - 01. In so doing the positions of the shift handle of the adjuster control unit may differ from the specified above.

Assemble and disassemble the adapters which connect actuating mechanisms and control units if only the truck "ground" is switched OFF.

Blackened bulbs of the head lamps should be replaced before they burn out. When replacing the burnt - out bulb, restore tightness of the sealed - beam unit. The bulbs used with the truck and their technical data are specified in Appendix № 7.

Replacing the bulbs in the headlamps, proceed as follows: undo the bolts fastening the headlamp rubber moulding, loosen the screws fastening the sealed - beam unit retaining ring, remove the retaining ring and the sealed - beam unit, remove the spring fixing the bulb and replace the latter. Perform the assembly in the reverse order.

Safety fuses

The preheater supply circuit is protected against short - circuits by bimetallic a 30 A fuse, type 291.3722.

The upper fuse assy (Fig. 95) protects:

- 1 (link) - fog lights circuit;
- 2 (link) - flood headlamp circuit;
- 3 (link) - circuit of portable and underhood lamps, power circuit of pilot lamps assy;
- 4 (link) - circuit of cab roof lamp, road train sign lamps and stop lamps;
- 5 (link) - circuit of heater motor and reversing lamp;
- 6 (link) - instruments and sound buzzer power - supply circuit.

The lower fuse assy protects:

- 1 (link) - left - hand turn indicator circuit;
- 2 (link) - right - hand turn indicator and instruments illumination circuit;
- 3 (link) - left - hand headlamp lower beam circuit;
- 4 (link) - right - hand headlamp lower beam circuit;
- 5 (link) - left - hand headlamp high beam circuit;
- 6 (link) - right - hand headlamp high beam circuit.

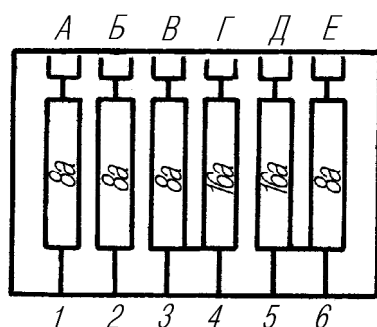


Fig. 95. Safety Fuse Assy Circuit Diagram:
1 to 6 - links

CAB, HOOD AND FENDER ASSEMBLY AND TRUCK PLATFORM

Cab

The truck cab is closed, three-seat, with fixed windshield and heat insulation, located behind the engine and equipped with rear-view mirrors on the left and right sides, a wide - angle mirror fixed on a special bracket on the r.h. fender and a side - view mirror on the r.h. door.

Adjust the spherical mirrors to provide the visibility zones as per Fig. 96, 97, 98, having slackened the bolts which fasten the spherical mirrors and then fix the bolts securely.

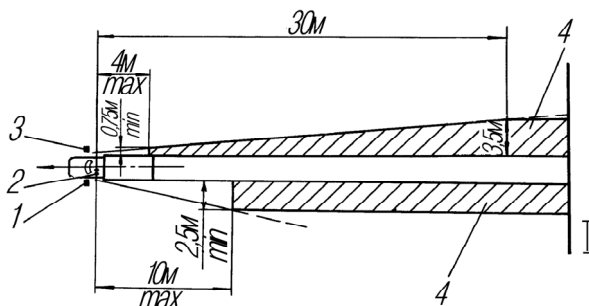


Fig. 96. Visibility Zones Through Rear - View Outside Mirrors:
1, 3 – (l.h. & r.h.) rear-view mirrors; 2 – driver's eyes points; 4 – visibility zone of road surface; I – horizon line

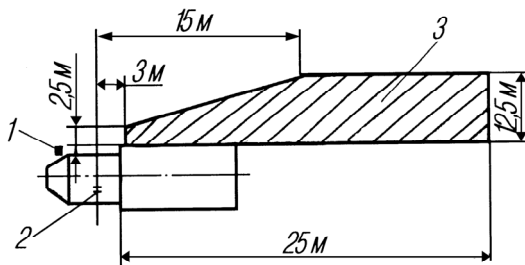


Fig. 97. Visibility Zone Through Wide - Angle Mirror:
1 – wide - angle mirror; 2 – driver's eyes points; 3 – visibility zone of road surface

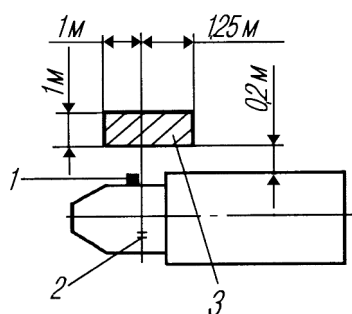


Fig. 98. Visibility Zone Through Side - View Mirror:
1 – side - view mirror; 2 – driver's eyes points; 3 – visibility zone of road surface

The cab is equipped with fastening points of driver's & passengers' seat belts.

The cab is fastened to the chassis frame in four points on rubber pads. When the chassis frame deformation occurs, the flexible fastening protects cab parts from over - strain.

The cab doors are equipped with locks and window raisers. When closing the door, pawl 12 (Fig. 99) of the truck comes in touch with door striker 11, and turning,

locks the door. In this position the pawl is fixed by latch 13 and catch 14. Simultaneously, upper guide prong 9 of the lock enters the slot in the striker and protects the door against sagging.

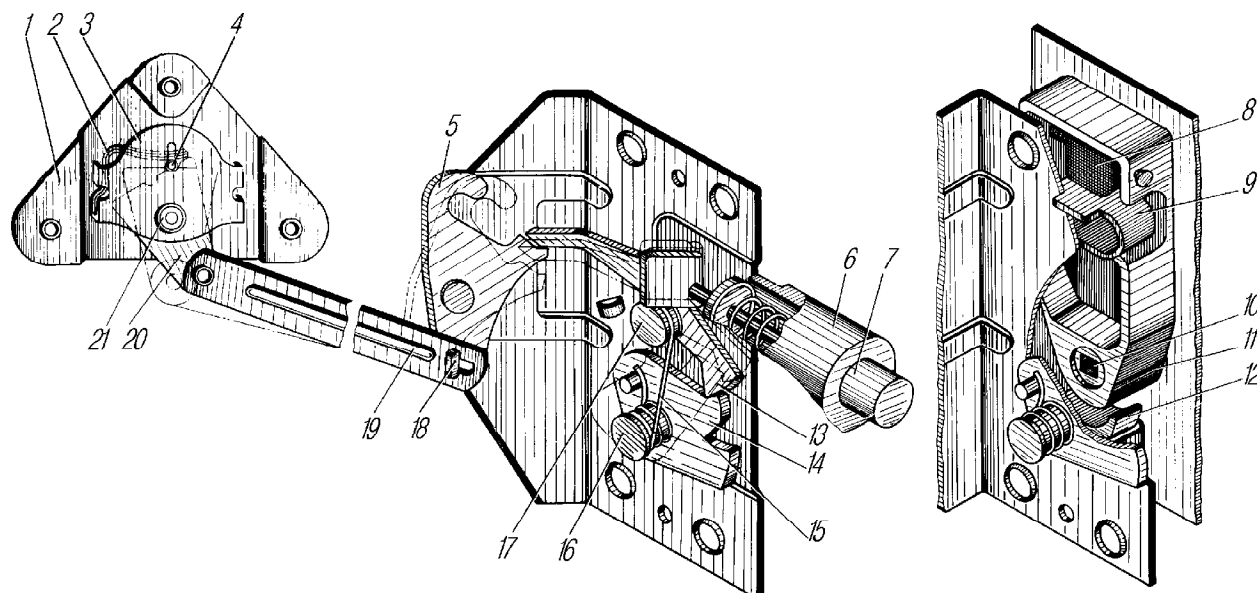


Fig. 99. Door Lock:

1 – control body; 2 – control spring; 3 – control bracket; 4 – roller; 5 – lock dog; 6 – door outside handle; 7 – button; 8 – striker slide block; 9 – guide prong; 10 – bolt; 11 – striker; 12 – pawl; 13 – latch; 14 – latch catch; 15 – spring; 16 – pawl pin; 17 – latch pin; 18 – control tie rod pin; 19 – control tie rod; 20 – control ratchet; 21 – control pin

The door lock drive handles should be positioned horizontally and directed forward.

The door locks can be blocked to prevent its opening from the outside by turning the lock drive inner handle down. When the lock is blocked, lock dog 5 stops the latch, holding it engaged with the catch. Besides that, the l.h. door lock can be blocked from the outside by the key.

To open the door lock, turn the lock drive handle upwards or press the button on the outside handle. In so doing the latch releases the catch and the pawl returns into its initial position under the action of spring 15. The door striker is fastened on the lock post with a screw and two bolts, which allow to adjust it in height and depth.

When adjusting, check that the lock prong 9 enters the slot in striker 11 correctly. If the striker has been adjusted correctly in height, the door should not lift or lower down. Adjusting it in depth allows to achieve tight fitting of the striker lower projection to pawl 12 and at the same time to avoid excessive efforts, when closing the door.

Adjust in depth, meaning for minimum deformation of the door aperture packing parts, which provides the tight fitting and no rattling when the truck travels. If the door closes with difficulty, move out the striker, or if the door rattles, move it inside the cab. When the truck travels, the doors should be closed tight.

If the door packing parts are damaged, adhere them using 88HT glue, upon scraping them with an abrasive cloth and wiping with clean cotton cloth moistened with gasoline.

The door windows are equipped with lowering and swinging glasses. The door glasses are raised and lowered down with the help of lifting mechanisms. The glasses should move in the guides freely, without seizing.

Lubricate all the friction surfaces of parts of locks, window raisers, hinges, fasteners and spring pins with the LITOL - 24 grease or solid oil, when disassembling.

Windshield washer and wiper. The cab is equipped with a windshield washer and wiper. The two - speed electric windshield wiper comprises an electric drive, two tie - rods, brushes' levers and two brushes. The windshield wiper is turned ON by a change - over switch on the dashboard. When the wiper is switched off, the brushes are automatically put down alongside the glass lower edge.

The windshield washer tank with a pump and a motor is mounted on the hood l.h. side. The tank volume is 2 l. A washing fluid is supplied to the glass via hoses through two jets.

The delivery of the washing fluid is engaged by pressing the windshield washer control button located on the dashboard to the left of the steering wheel.

When ambient temperature exceeds +5 °C, filtered water is used for filling in the tank. At the ambient temperatures from +5 °C down to –40 °C it is recommended to use a distilled water solution and sulfanol solution in isopropyl spirit (НИИСС - 4 fluid) in the ratios specified in Table 11.

Table 11

Concentration of НИИСС - 4 Water Solution
Depending on Ambient Temperature

Ambient temperature, °C	Composition by volume in portions	
	НИИСС - 4 fluid	Water
Up to + 5	0	10
From + 5 to - 5	1	9
From - 5 to - 10	1	5
From - 10 to - 20	1	2
From - 20 to - 30	1	1
From - 30 to - 40	2	1

Do not use the НИИСС - 4 fluid without diluting it by water, because the combined effect of the concentrate, atmospheric contamination and ultraviolet rays cause change of the truck paint - and - vanish coating.

Rinse the glasses by engaging of the windshield wipers simultaneously. Change the direction of the fluid spurt by turning the guide in the jet.

Cab heating. The cab is heated by the air warmed up in the heater which is connected with the engine cooling system. The air delivery is adjusted on the outside with the help of exterior hatch cover 12 (Fig. 100) and in the cab – with the help of interior hatch cover 7. If the heater fan is engaged, the heated air flows into warm air distributor 3 and then is spreaded around the cab by means of controlled flaps.

The flaps are controlled by lever 4. If the lever is set in its upper position, air is delivered via deflectors 13 to blow the glasses, in the lower position – to warm driver's and passengers' feet. If the lever position is changed relative to the extreme positions, the quantity of the air supplied to blow the glasses and warm the driver's and passengers' feet changes correspondingly.

Interior hatch cover 7 is controlled by lever 5. If the lever is set up in its upper position, the hatch is opened, in lower position the latch is closed.

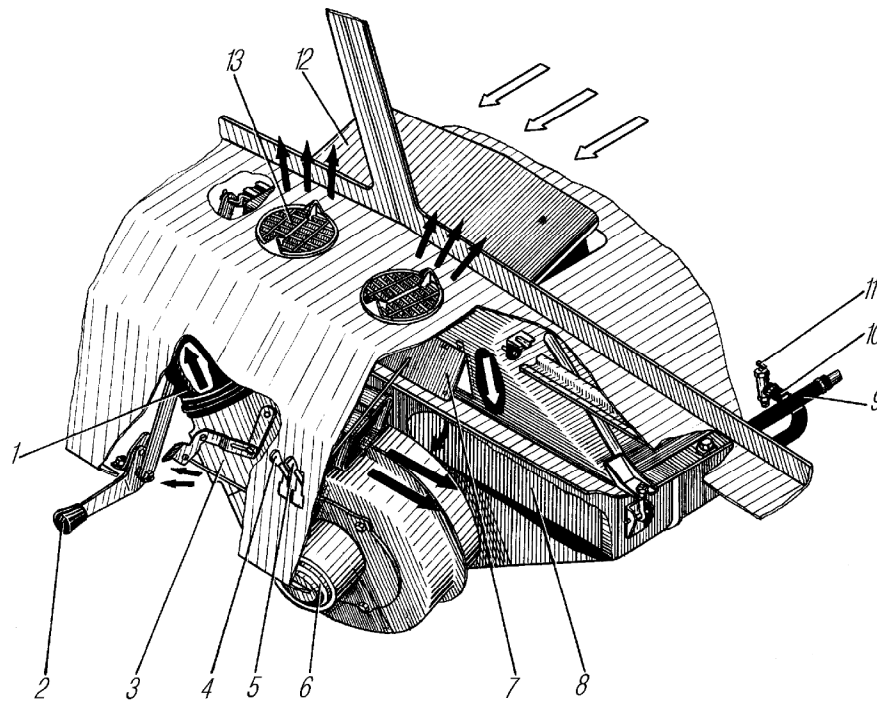


Fig. 100. Cab Heater and Windshield Blowing Diagram:

1 – warm air supply branch pipe for windshield blowing; 2 – exterior hatch control lever; 3 – warm air distributor; 4 – warm air distributor flap control lever; 5 – interior hatch control lever; 6 – electric motor and fan assembly; 7 – interior hatch cover; 8 – heater radiator; 9 – heater radiator water outlet pipe; 10 – water supply pipe; 11 – cock; 12 – exterior hatch cover; 13 – deflector

Optimum location of the heater controls is as follows: simultaneous intake of the air from the outside through hatch adjusted by cover 12, from the cab through interior hatch closed by cover 7, and supply of the heated air onto the windshields, the driver's and passengers' feet by setting lever 4 in the middle position. The fan switch is available on the dashboard.

Cock 11 mounted in the engine r.h. water pipe should be opened, when the truck is used at negative ambient temperatures. In summer the heater should be disconnected from the cooling system by closing cock 11.

If water is used as a coolant at negative ambient temperatures, the heater cock should be closed before filling in the cooling system in order not to allow cold water in the heater radiator and to avoid its freezing.

The cab is equipped with an independent heating unit (IHU) for additional heating. The independent heating unit is located on the floor under the passenger's seat in the cab. The IHU arrangement as well as its operational instructions are set forth in the IHU technical description attached hereto.

The cab is ventilated through hatches of the heating system, apertures of turning and lowering window glasses on the doors. If the natural cab ventilation is not sufficient, open the exterior hatch and switch ON the fan.

The driver's and passengers' seats are separate, having rubber belts and foam rubber cushions as shock-absorbing elements. The position of the driver's seat can be adjusted by moving it forward or backward.

The limit of adjustment is 110 mm. Handle 4 (Fig. 101) located on the left side of the seat support (Fig. 101, I) or on the right side of support (Fig. 101, II) fixes the seat in the desired position. The driver's seat has a mechanism designed to change the cushion tilt and the seat position by height with an adjustment limit of 80 mm. To change the position of the seat by height, turn out two front screws 3 available on the left and right sides of the seat. Upon setting the desired height of its front part, turn up these screws by a few revolutions, but not tight, slacken the fasteners of the seat rear part by turning out two screws 2 by four or five revolutions.

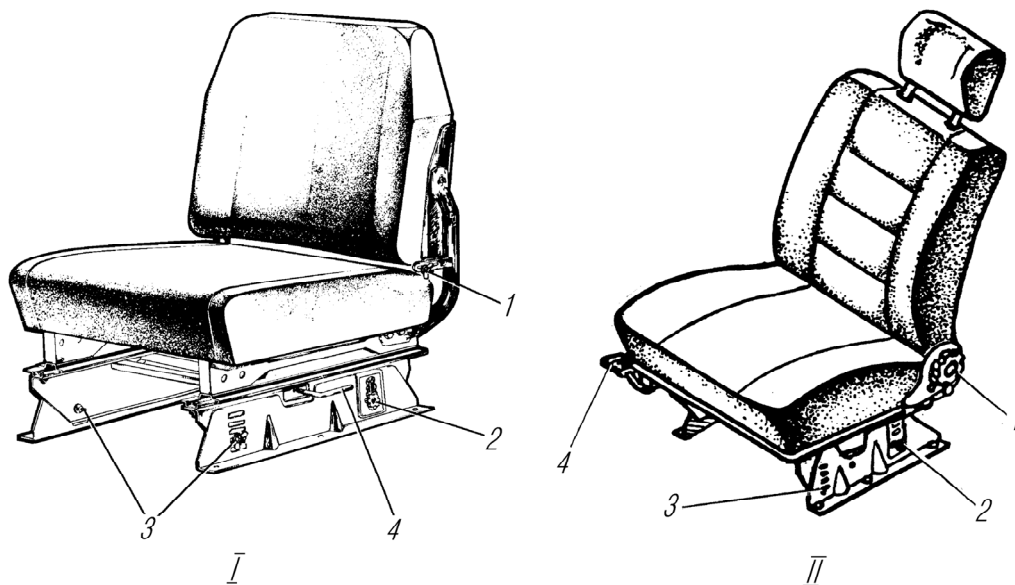


Fig. 101. Driver's Seat:

1 – winged nut (I), backrest tilt adjusting handle (II); 2, 3 – seat height and tilt adjusting screws; 4 – seat forward or backward moving handle; I – for military trucks; II – for civil trucks

Upon finishing the adjustment of the seat position, fix the screws securely. The tapered part of the screw should be fixed in one of the five tapered recesses.

The tilting angle of the driver's seat backrest can be adjusted. To change the backrest angle, screw out nuts 1 (Fig. 101, I) on the l.h. and r.h. seat sides by two-

three revolutions, and having selected the desired backrest position, screw them in securely or use handle 1 (Fig. 101, II) on the left side of the seat.

Hood and fender assembly

Some units of hood and fender assembly are made separable for convenient maintenance and repair of the engine. The hood and fender assembly is fastened to the truck frame via a rubber supporting pad and to the cab, via rubber buffers. The hood is of alligator type, having an opening angle of 90 degrees.

Truck platform body

The platform body of the URAL-4320-10, URAL-4320-31 and URAL-4320-0911-30 trucks is equipped with a tailgate. The general view of the platform body and the platform - to - frame fastening elements are shown in Fig. 102.

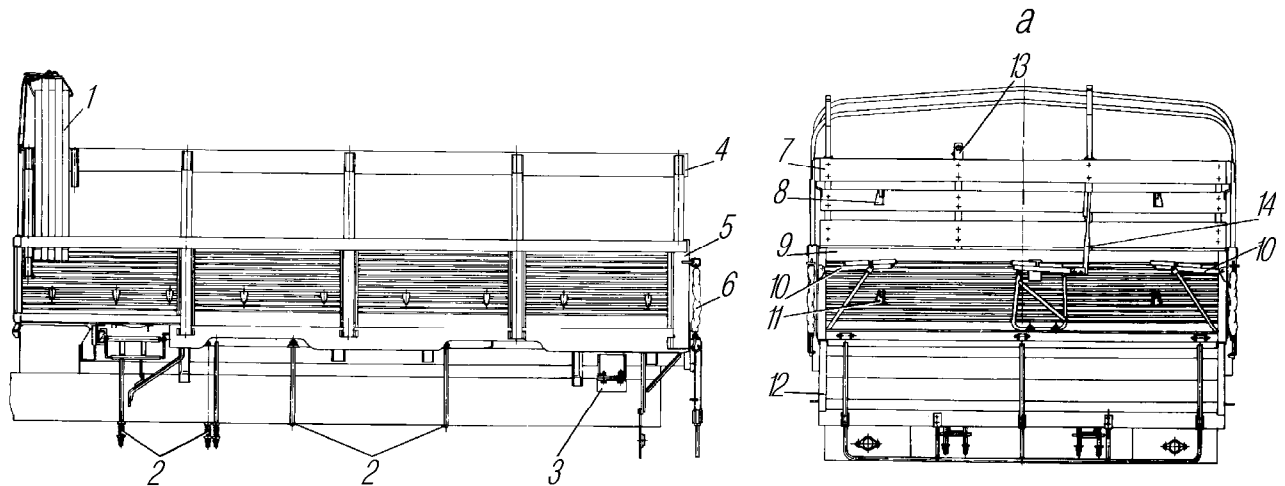


Fig. 102. Platform Body Fastening on Chassis Frame:

1 – canopy bows in transportation position; 2 – U-bolts; 3 – platform-to-chassis frame fastening bracket; 4 – l.h./r.h. extension side; 5 – l.h./r.h. main side; 6 – tailgate locking chain; 7 – front extension side; 8 – front middle seat fastening bracket; 9 – front side; 10 – side seats of platform body; 11 – rear middle seat fastening bracket; 12 – tailgate; 13 – alarming button to driver; 14 – middle seat of platform; a – rear view

The platform body is equipped with seats for carrying people, extension grills for the front and r.h./l.h. sides, and top bows with braces. The middle seat can be removed and fixed on the front side (Fig. 103); the side seats can be folded up to provide space for carrying cargoes. The truck is completed with a canopy.

The mounted canopy is shown in Fig.104. The procedure of canopy folding sequence is shown in Fig. 105. It is required to dry the canopy prior to its folding.

The platform body of the URAL-43202-0351-31, URAL-4320-0611-10, URAL-4320-0611-31 trucks is wooden with three hinged sides. The r.h./l.h. sides are connected by a brace of two chains in the middle.

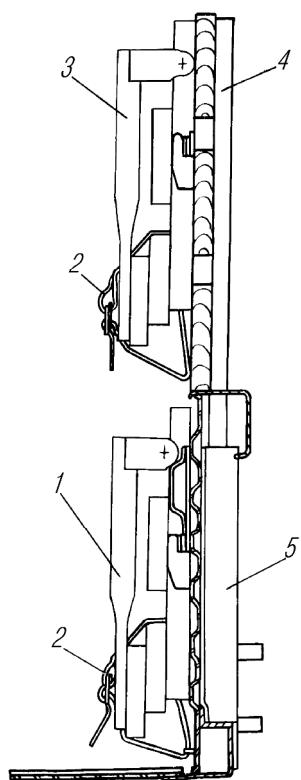


Fig. 103. Middle Seat Folding:
1 – rear middle seat; 2 – fastening belt; 3 – front middle seat; 4 – platform front grill; 5 – platform front side

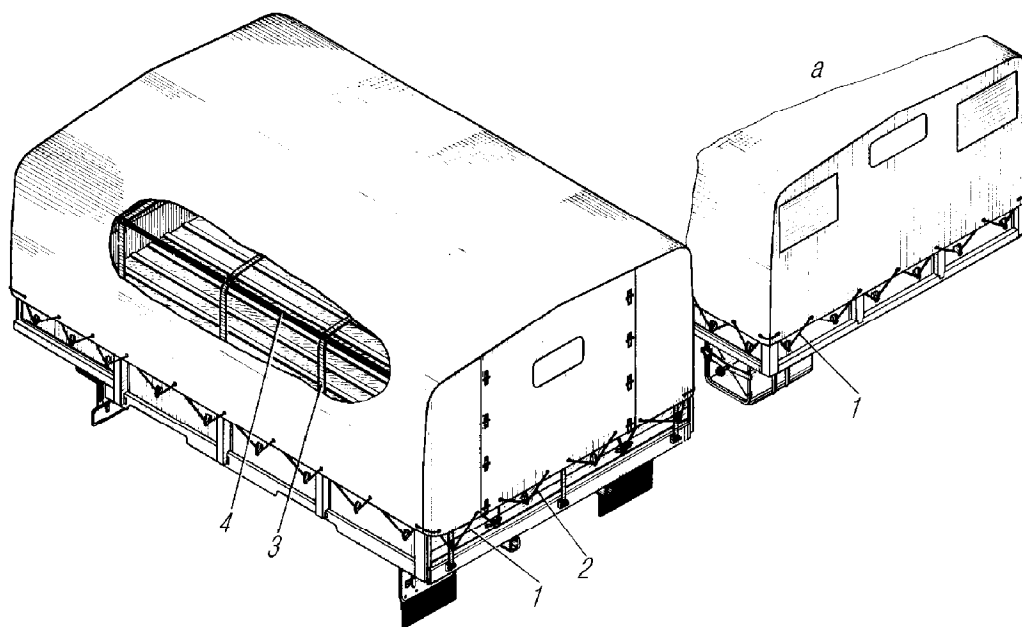


Fig. 104. Truck Platform Body with Canopy:
1 – canopy fastening rope; 2 – rope fastening rear panel of canopy; 3 – canopy bow; 4 – bow distance pipe; a – front view

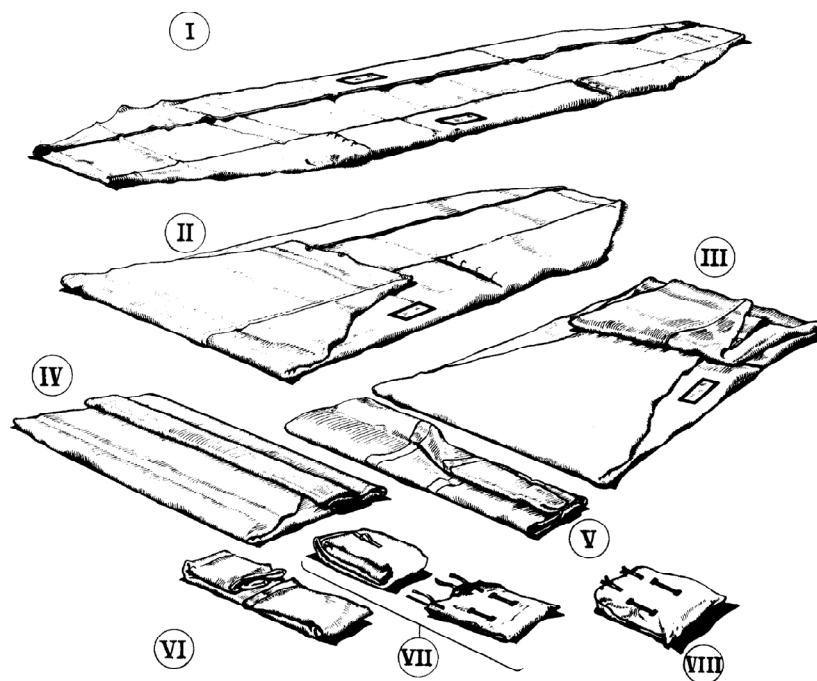


Fig. 105. Canopy Folding Method:
I – VIII – folding steps

When the truck is in service, regularly check bolt joints of the parts relating to the cab, hood and fender assembly, platform body and their fastening to the chassis frame. If cracks have been discovered in the parts, weld up and paint them. If it is necessary to perform welding, remove old paint - and - varnish coating from surfaces of the parts.

Before touch - up painting of the damaged spots (mechanical injuries, cracks, chipping, rust, welding fly ash, splashes) it is required to scrape the old paint coating with a fine or water - proof emery cloth.

Wipe the scraped surface with a piece of cloth moistened in gasoline or solvent, dry and paint it by enamel with the help of a sprayer or a soft brush, using the same colour of the enamel and applying two layers of the enamel with an interval of 5 - 10 min.

Regularly remove and dry the cab floor mat, because the wet mat loses its heat - insulating properties and promotes floor rusting.

FIFTH WHEEL

The fifth wheel with a lock hole in catches, diameter 50.8 mm, is mounted on truck tractors. The fifth wheel is designed to articulate the truck tractor with a semi - trailer that has a standard coupling pin.

The fifth wheel is fastened to the chassis frame with the help of brackets 13 (Fig. 106). The saddle is fixed to brackets 13 with the help of brackets 14. The saddle brackets rest on saddle cushions 15 which are located in the saddle recesses.

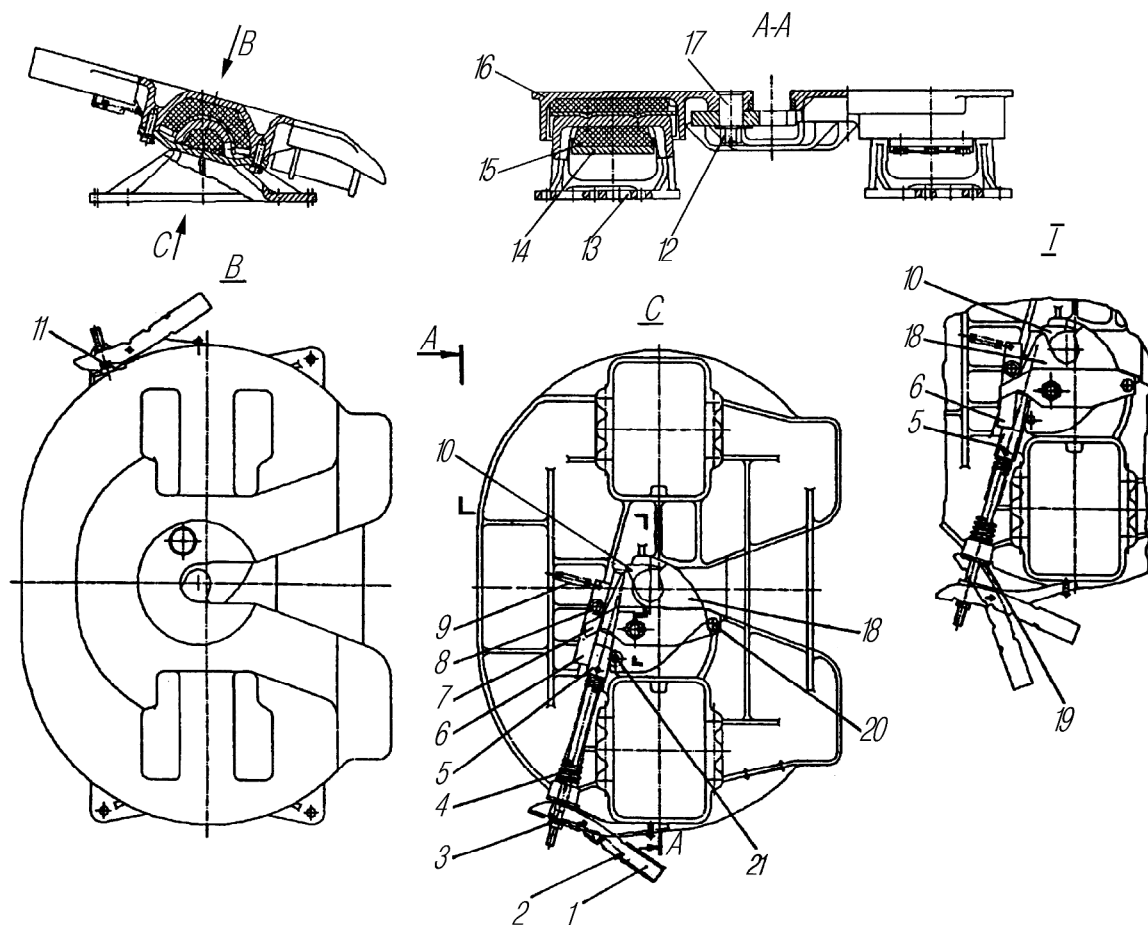


Fig. 106. Fifth Wheel:

1 – handle; 2, 4, 9 – springs; 3, 12 – nuts; 5 – locking cam; 6 – latch; 7 – cover; 8, 11, 20 – bolts; 10 – front catch; 13, 14 – brackets; 15 – cushion; 16 – saddle; 17 – pin; 18 – rear catch; 19 – rotary support; 21 – rotary support; I – handle position before uncoupling

The release - and - coupling mechanism, which consists of rear catch 18, front catch 10 and locking cam 5, which has two positions: opened and closed, is located under the saddle. Spring 4, which holds the cam in its closed position, is set on the rod of locking cam 5. Handle 1, which is fixed by nuts 3, is available on the rod end for opening (moving) the cam. Nuts 3 serve to adjust the clearance between the catches and the pintle of the semi - trailer. The cam in the opened position is held with the help of springs 9 by latch 6.

Rear catch 18 rotates on pin 17 closed by cover 7 fastened by nut 12. Safety strip 19, which is fastened to the saddle by bolt 11, serves to prevent accidental opening of the cam. Spring 4 presses the rod of locking cam 5 with the fixing fillet to the hole wall.

Rotary support 21 is installed into the catch to avoid non - tight fitting of rear catch 18 end to cam 5.

The design of the fifth wheel foresees adjusting the diameter of the hole for the pintle to eliminate the clearances between the catch and the pintle.

To eliminate the clearances in the course of operation unscrew nuts 3, drive the road train for 100–200 m, braking it until the clearances disappear and after that tighten the nut until it gets in touch with handle 1 that should be in contact with the saddle. Then screw up through half a turn more and lock it.

To couple the towing truck with a semi - trailer turn handle 1 to you by hand (or with the help of the tire iron inserted in the handle end) until the locking cam 5 is fixed in the pulled - out position by latch 6. In so doing the rod of locking cam 5 is released automatically, its locking fillet enters the guiding hole of the saddle boss. Simultaneously, safety strip 19 is moved aside by the projection on handle 1.

If it is difficult to pull the handle (the force applied to the handle is 0.25 - 0.40 kN (25 – 40 kgf)), it is recommended to move the handle upwards/downwards repeatedly and simultaneously turn it to you. In so doing latch 6 will bear up against the end of locking cam 5 and hold it in the opened position. When the truck starts movement, the semi - trailer pintle turns rear catch 18 relative to pin 17; in so doing catch 18 presses latch 6 with its end, turns it and releases locking cam 5, which moves under the action of spring 9, bears up against the end of rear catch 18 and holds it in the opened position.

The bolster truck is coupled with the semi - trailer automatically. Upon coupling, make sure that the safety strip is in the upright position. It indicates that the bolster truck has been coupled with the semi - trailer.

Fifth wheel maintenance

Before a departure check whether the fifth wheel is fixed to the chassis frame securely and verify fastening of the catch lock. Check the condition of the catches, locking cam and latch spring.

Worn and deformed components should be replaced by the new ones.

Coupling and uncoupling of bolster truck and semi - trailer

Before coupling make sure that the fifth wheel and its fastening are in good working order; the saddle is free from dirt, and that there are no foreign objects on it; if need be, clean the fifth wheel top plane from soiled grease and coat it with a thin layer of fresh grease. Brake the semi - trailer with the help of the parking brake and set it on the supporting device so that the semi - trailer supporting plane is at the same level with the fifth wheel of the bolster truck, or maximum 10 mm lower than it.

Couple and uncouple the semi - trailer on an even horizontal hard - surface site. In so doing the longitudinal axes of the bolster truck and semi - trailer should locate along the same straight line.

If the catches are in the closed state, turn handle 1 to you; in so doing the handle should be held pulled aside by latch 6. Then turn catch 18 counter - clockwise until the front end of the catch leaves the zone of the semi - trailer pintle travel. When turning, the catch acts on the latch, turns it and releases the locking cam that moves, rests on the catch and holds it open.

For coupling follow this procedure:

- drive the bolster truck by reversing at a low speed to the semi - trailer so that the pintle of the latter enters the catches of the saddle. The bolster truck and the semi - trailer are coupled automatically;

- apply the parking brake of the bolster truck. Then make sure that the safety latch 19 has occupied the upright position and blocks the travel of the handle to you;
- lift the supporting device of the semi - trailer in the top extreme position and fasten it securely;
- plug in the semi - trailer power cable;
- connect the coupling hoses of the bolster truck brake pneumatic drive with the coupling heads of the semi - trailer;
- release the parking brake of the semi - trailer;
- drive the road train for some distance, make sure that the truck and semi - trailer have been coupled properly and the semi - trailer brakes and electric appliances function efficiently.

When coupling the bolster truck with the semi - trailers of different brands, adjust the distance between the clips on the hoses to prevent their breakage because of the friction on the outward - projecting parts of the bolster truck, as well as make sure there are no clearances or tension in the pintle - to - catches connection. If required, adjust the clearances between the catches the pintle as described above.

Choose an even site to park the semi - trailer prior to coupling.

For uncoupling proceed as follows:

- brake the semi - trailer with the parking brake;
- lower down the semi - trailer supporting device up to the stop at the ground, having relieved the leaf springs of the bolster truck. In case of emergency uncoupling on loose ground put pads under the supporting device of the semi - trailer;
- plug out the semi - trailer power cable;
- disconnect the coupling heads of the brake pneumatic drive (first – the feed - ing main, then – the control main) and close them by protective caps. Fasten the coupling heads with the hoses on the bolster truck plate;
- turn handle 1 to you, in so doing safety strip 19 will be drawn aside, and latch 6 will rest on the end of locking cam 5 and hold it open;
- engage the first gear and move the bolster truck forward at a low speed until the latter and the semi - trailer uncouple completely.

SPECIAL EQUIPMENT

Lay - out of auxiliary units, their drives and power take - off modes should be agreed upon with the manufacturers. The cardan shafts installed by a customer to drive any auxiliary units should have an unbalance not more than 40 g·cm and the effort of travels in the splined connections not more than 150 N (15 kg·f).

Power take - off

The power take - off (PTO) is single - speed and fastened to the right side of the gearbox housing and is designed to drive auxiliary units. Two versions of the power take - off: with a pump (Fig. 107) and with a flange (Fig. 108) are manufactured.

Engage the power take - off, when the pressure in the truck pneumatic system is not less than 500 kPa (5 kg·f/cm²) and the clutch is disengaged. Shims are installed between flanges of the gearbox and power take - off cases. The side clearance in the gearing is adjusted (for noise) with the help of the shims. If it is required to change the old shims for the new ones, their thickness should be kept unchanged.

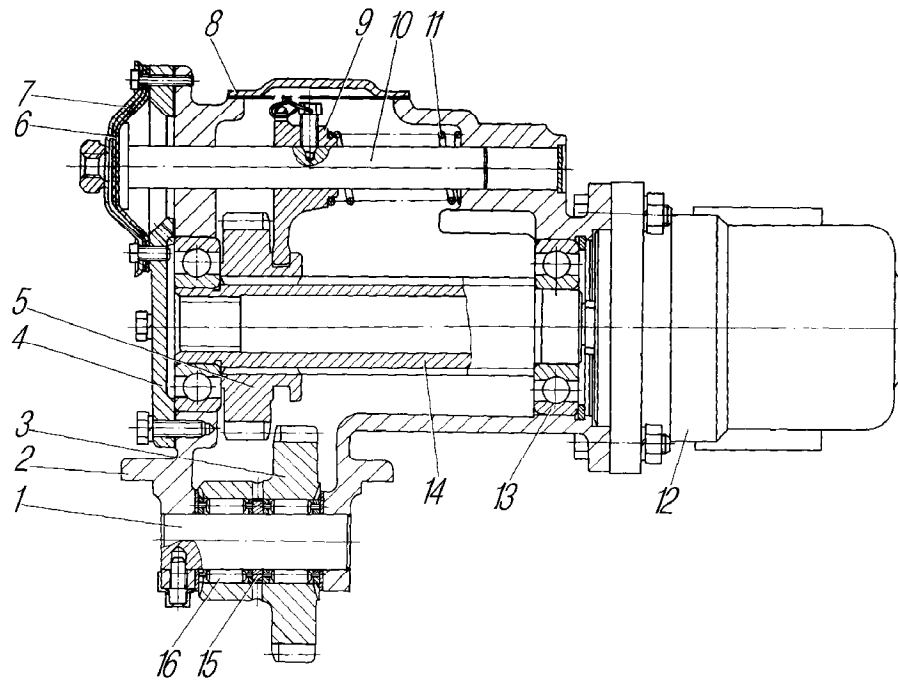


Fig. 107. Power Take - Off with Pump:

1 – drive gear axle; 2 – housing; 3 – drive gear; 4 – housing cover; 5 – output shaft gear; 6 – engagement chamber diaphragm; 7 – engagement chamber cover; 8 – cover; 9 – fork; 10 – engagement fork rod; 11 – spring; 12 – pump; 13 – ball bearings; 14 – output shaft; 15 – spacing ring of bearings; 16 – roller bearings

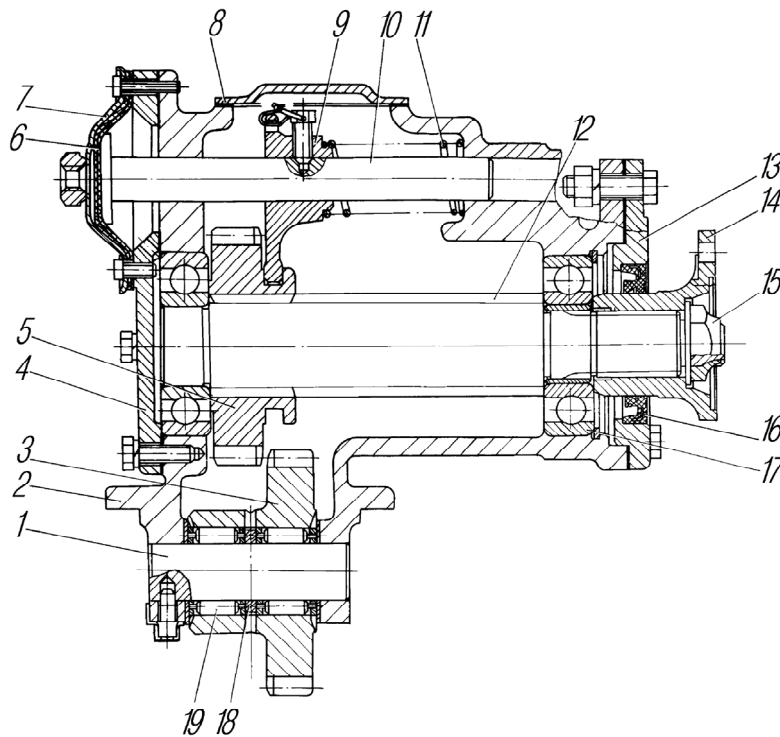


Fig. 108. Power Take - Off with Flange:

1 – drive gear axle; 2 – housing; 3 – drive gear; 4 – housing cover; 5 – output shaft gear; 6 – engagement chamber diaphragm; 7 – engagement chamber cover; 8 – cover; 9 – fork; 10 – engagement fork rod; 11 – spring; 12 – output shaft; 13 – cover; 14 – flange; 15 – nut; 16 – collar; 17 – ball bearings; 18 – spacing ring of bearings; 19 – roller bearings

The control over the power take-off is remote, pneumatic and consists of the control valve, engagement mechanism and air lines.

The control valve for remote engagement of the power take-off is mounted on the bracket located on the lower edge of the dashboard, to the right of the driver in the cab.

When the power take-off is disengaged, lever 8 (Fig. 109) is in its upper position, rod 7 in the r.h. position. Valve 3 under the action of spring 2 is pressed to seat 4 and air does not flow through the valve. When engaging the power take-off, valve 8 lever is moved to its lower position. Rod 7 moves to the extreme l.h. position, presses on valve 3 and moves it aside from seat 4. The compressed air is supplied to the diaphragm chamber of the engagement mechanism via air lines. Diaphragm 6 (see Fig. 107) via rod 10 with fork 9 meshes output shaft gear 5 with drive gear 3. When disengaging the power take-off, valve 8 lever (see Fig. 109) is moved to its upper position. Rod 7 under the action of spring 5 is moved to the extreme r.h. position, coming off valve 3 in so doing. The power take-off engagement chamber is connected with the atmosphere via the hole in rod 10 (see Fig. 107), the air is let out of the chamber, and the rod with fork 9 under the action of the spring disengages output shaft 14 gear from drive gear 3. Simultaneously with letting out the air to the atmosphere, valve 3 (see Fig. 109) under the action of spring 2 is pressed to seat 4 and disengages the valve inlet and outlet holes.

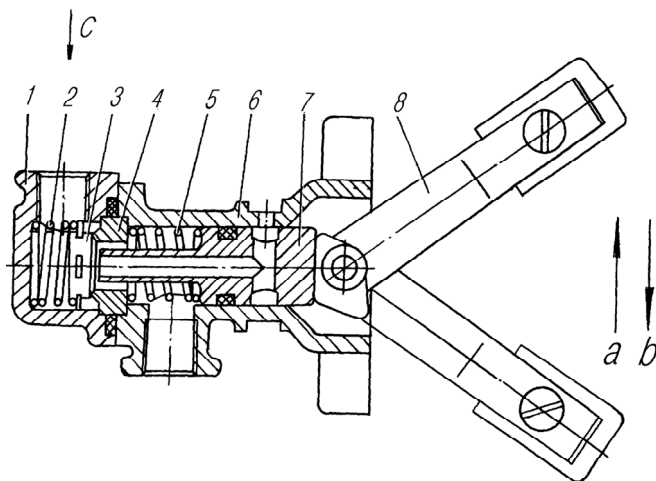


Fig. 109. Air Valve:
1 – cover; 2 – valve spring; 3 – valve;
4 – valve seat; 5 – rod spring; 6 –
body; 7 – valve rod; 8 – lever; a –
disengaged; b – engaged; c – air
supply

Auxiliary Power Take-Off

The power is taken off the primary shaft of the transfer box via sliding clutch 2 (Fig. 110) and is designed for driving winch and other auxiliary units. The design of the reinforced auxiliary PTO is similar.

Operation of the auxiliary power take-off is possible at any gear engaged in the transfer box, including the neutral one. A plunger pump is mounted to lubricate bearings of gears and shafts in the auxiliary power take-off.

The pump consists of piston 17 with delivery valve 18, safety valve 20 and body 22. The piston with connecting rod is mounted on the eccentric of shaft 3 and moves forward, when it rotates. To prevent the excessive pressure, which arises as the rotation

speed grows, the suction valve of a differential type with a cylindrical spring is provided. The oil is taken through the pipe connected with the oil sump of the transfer box, and is supplied from the pump to the gear bearings via channels in shaft 3 and in primary shaft of the transfer box. A part of the oil penetrates through gaps and lubricates the bearings of the shafts.

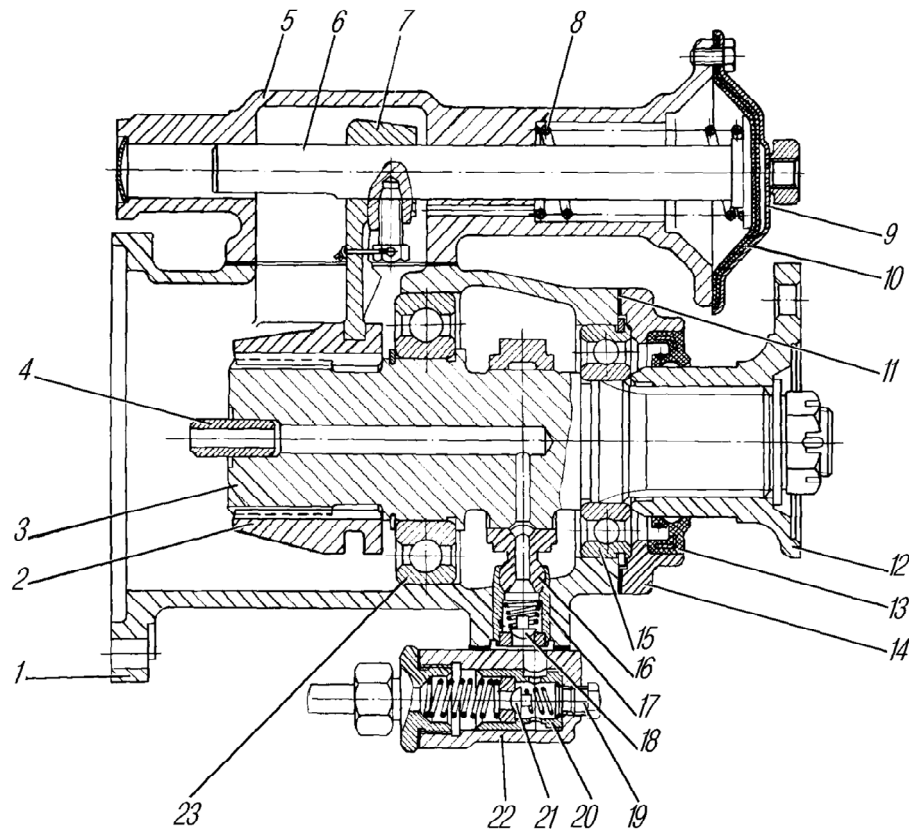


Fig. 110. Auxiliary Power Take - Off:

1 – body; 2 – clutch; 3 – shaft; 4 – shaft bushing; 5 – engagement chamber body; 6 – engagement rod; 7 – fork; 8 – spring; 9 – cover; 10 – diaphragm; 11 – gasket; 12 – flange; 13 – collar; 14 – cover; 15, 23 – ball bearings; 16 – pump connecting rod; 17 – piston; 18, 21 – pump valves; 19 – plug; 20 – safety valve; 22 – valve body

For remote control of the auxiliary power take-off the control valve 6 (see Fig. 11) is mounted on the bracket fixed to the lower edge of the dashboard in the driver's cab on the right of the driver.

The control valve lever is fixed in the disengaged position with the screw mounted on the valve bracket.

When the auxiliary power take-off operates for a long time, the bearings of the transfer box primary shaft and those of the power take-off shaft should not warm up excessively. The excessive warming-up indicates some fault in the oil pump.

The pump working order should be checked by two persons.

For verifying the pump operation:

- pull the parking brake lever as far as it will go;

- set the gearshift lever of the transfer box in the neutral position;
- disconnect the winch, for this purpose lower down the lever on the r.h. side member;
- screw out plug 19 (see Fig. 110) in the pump body;
- start the engine, engage the auxiliary power take - off and one of the gears in the gearbox;
- check if the pump is in good working order by closing the hole for plug 19 by your finger.

If the pump is in good working order, you will feel oil pulsation in the hole for the plug.

The operation of the power take - off with the faulty oil pump is prohibited.

Winch

The winch is designed for the truck self - recovery as well as for recovering vehicles stuck in difficult terrain.

The winch (Fig. 111) is designed for self - recovery as well as for recovering trucks and trailers in difficult terrain. It comprises a worm - type reduction gear unit, a drum with a wound - on wire rope and a rope winding guide.

The reduction gear unit mechanism comprises a globoid pair with 31:1 ratio. Worm wheel 20 is riveted to the hub that is able to mesh with drum shaft 10 via sliding clutch 22. Automatic band brake 1 (Fig. 112) that prevents incidental rotation of the drum and rope unwinding, when the truck clutch is disengaged, or if the safety pin has been sheared off, is mounted on the reduction gear worm.

The brake should be adjusted, when the reverse gear is engaged and the drum sliding clutch is disengaged. If the brake heats to the temperature, your hand can not bear (about +60 °C), within 1 - 3 min, screw out nut 3 and lock nut 4 fastening the band by two or three revolutions.

Winch reduction gear unit adjusting. Adjust the reduction gear unit bearings, if axial clearances have appeared in them, as well as when a new worm pair is installed.

Adjust the bearings, if only re - tightening of the bearing cap bolts has not resulted in elimination of the axial clearances.

The bearings should be re - adjusted with preload.

The torque required for turning over the reduction gear unit worm in bearings 29, 31 and 32 (see Fig. 111) should be about 1.0 - 2.5 N·m (0.1 - 0.25 kgf·m). If the shaft rotation is too easy, or if it has an axial clearance, remove some of shims 28 and 33 of the same thickness from under the front and rear caps of the bearings. If the shaft is cranked at more than 2.5 N·m (0.25 kgf·m), add shims of the same thickness under the caps. When checking the worm shaft torque, the bolts fastening caps should be tightened well home.

Quantity of the shims placed under the rear and front caps should be approximately the same; that makes further adjustment of the worm pair meshing easier. Adjust the worm wheel shaft taper bearings by changing the number of shims 16 and 24 under bearing caps.

The preload of the worm wheel shaft bearings should be checked, when the shaft is meshed with the worm. The torque required for turning over the worm wheel shaft in the bearings should be 3 - 6 N·m (0.3 - 0.6 kgf·m).

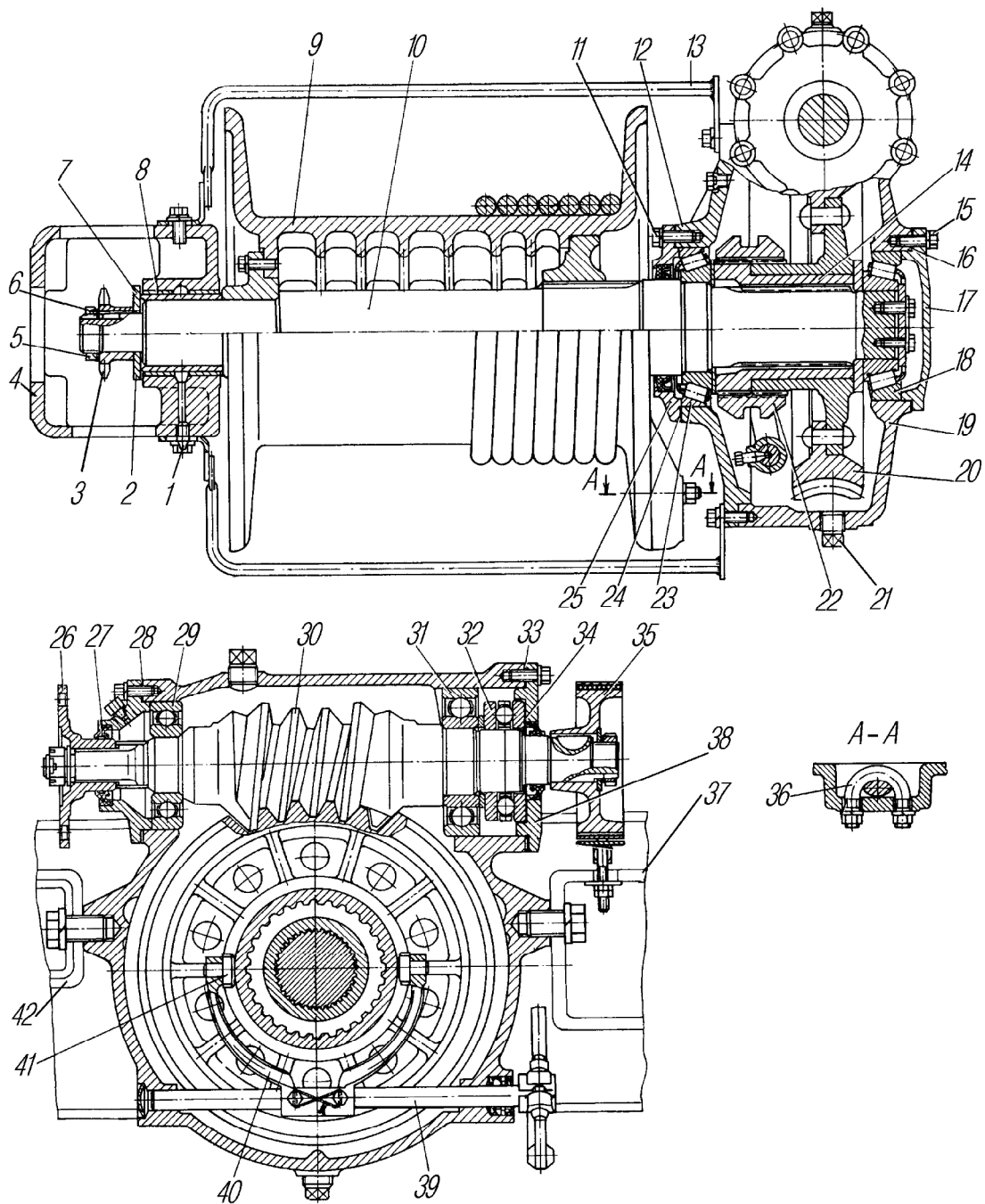


Fig. 111. Winch Reduction Gear Unit:

1 – lubricator; 2 – thrust washer; 3 – sprocket; 4 – drum shaft bracket; 5 – lock washer; 6 – nut; 7 – sliding bearing; 8 – distance bush; 9 – drum; 10 – drum shaft; 11, 15 – bolts; 12 – reduction gear cover; 13 – rope railing; 14 – fixed coupling; 16, 24, 28, 33 – shims; 17, 25, 27, 37 – bearing caps; 18, 23, 29, 31, 32 – bearings; 19 – reduction gear unit case; 20 – worm wheel; 21 – plug; 22 – sliding clutch; 26 – flange; 30 – reduction gear worm; 34 – gasket; 35 – band brake; 36 – rope fastening clamp; 38 – lead screw right-hand bracket; 39 – coupling rod; 40 – fork; 41 – slide block; 42 – winch suspension cross-member

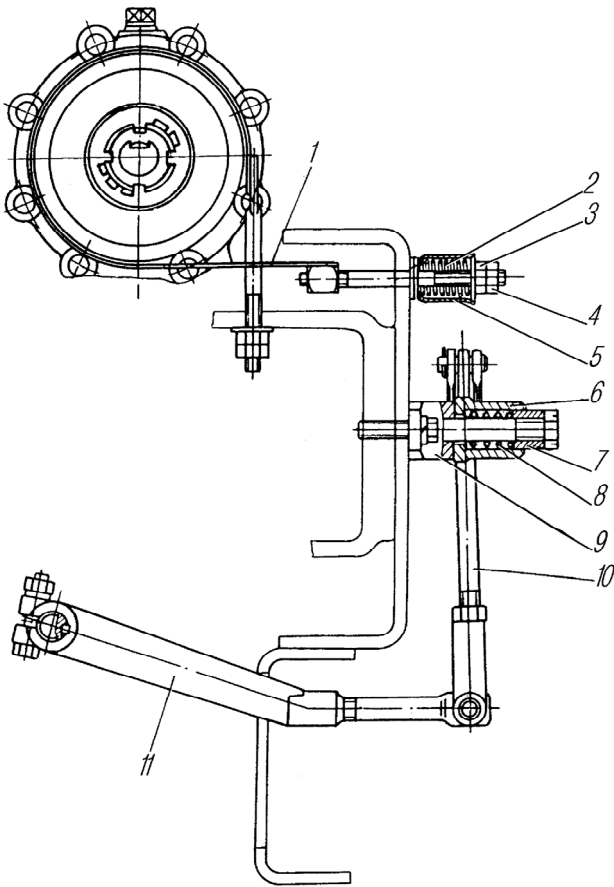


Fig. 112. Winch Control:

1 – band brake; 2, 8 – springs; 3 – nut; 4 – lock nut; 5 – binding coupling; 6 – winch control lever; 7 – bush; 9 – bracket; 10 – tie rod; 11 – winch engagement lever

Upon readjusting the bearings, check with the help of paint, whether the worm pair is meshed properly, by the teeth contact pattern. If the pair has been adjusted correctly, the contact pattern of the worm wheel tooth working surface without loading should be located in the middle of it and equal 5 mm in width and $\frac{2}{3}$ in height of the tooth, minimum.

To change the contact pattern through the height of the tooth, move worm 30 axially, using shims.

To displace the contact pattern towards the tooth root, remove a number of shims 28 from under cap 27 on the side of the flange, to displace it towards the tooth end, add shims. Correspondingly, change the number of shims 33 under cap 37 on the side of the brake, so that the total thickness of shims on both sides remains the same. The contact pattern is displaced across the tooth width by the axial displacement of the worm gear in the same direction, where the pattern is displaced.

The globoid worm pair can operate properly, if only the meshing has been adjusted correctly.

Improper adjustment can cause excessive heating of the pair and rapid wear of worm wheel teeth.

Winch drive. Power taken off the transfer box is transferred via auxiliary power take-off to the winch reduction gear unit by three cardan shafts. To protect the winch parts against overload, safety pin 2 (Fig. 113), which is sheared off if the load exceeds a permissible one, is mounted on the front cardan shaft.

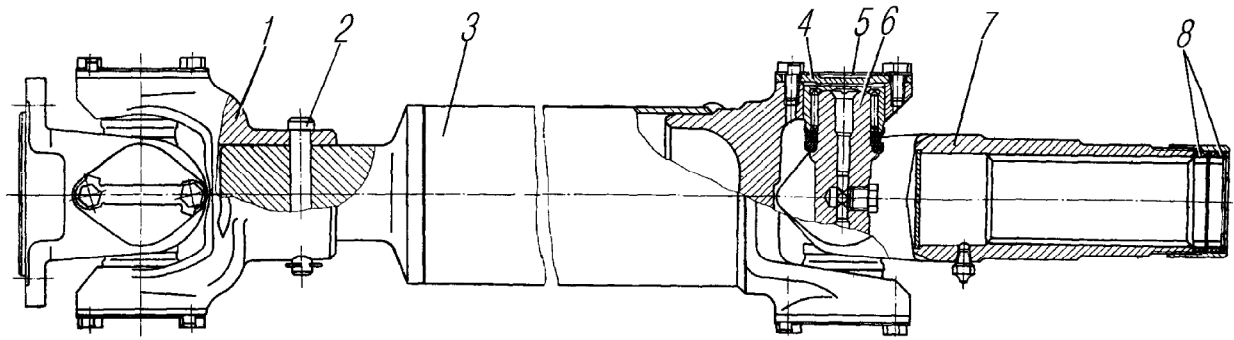


Fig. 113. Winch Drive Front Cardan Shaft:

1 – cardan joint fork; 2 – safety pin; 3 – cardan shaft; 4 – needle bearing cap; 5 – locking strip; 6 – spider; 7 – slide fork; 8 – packing rings

All cardan joints are of the same design and unified with those of GAZ - 53A truck. Bearings of the cardan joints can be fixed by lock rings instead of supporting and stopping plates.

The intermediate cardan shaft is mounted on two supports. To compensate inaccurate installation slide forks 7 of the front and rear shafts are mounted onto the splined ends of the intermediate cardan shaft. Lubricant in the splined joints is held by packing rings 8.

To reduce uneven rotation of the winch reduction gear worm, the drive cardan shafts are mounted so that the axes of holes for the bearings in slide forks of front 4 (see Fig. 34) and rear 6 shafts lie in the same plane.

Rope winding guide. The winch is equipped with a rope winding guide (Fig.114), which provides proper winding of the wire rope on the drum, if the drum deflects relative to the truck axis through 15 degrees, maximum. The rope is fastened on the drum by a clamp and is moved out backwards only.

The guide roller holder case 22 puts the rope, reciprocating along lead screw 6 and on two guide rolls 7. The l.h. and r.h. threaded screw, mounted on two bearings, is driven via a chain gear from the drum shaft through driving and driven sprockets 16 and 10. Tensioning of the chain is adjusted by shims 2 and 14; the chain sagging is 3 - 10 mm.

Axial force from lead screw 6 is transferred to the guide roller holder case via lead screw slide block 20. The latter is installed in the guide roller holder case and fixed with cover 21. Guide rollers 19 are mounted on polyamide bushes 18 and turn on pins 17 which are fixed by locking strip 5.

Rules of using the winch. Prior to using the winch, make sure that the drive for engaging and disengaging the winch drum operates correctly; also check that the rope is wound correctly and is fastened securely. If the drive is adjusted properly, the length of tie rod 10 (see Fig. 112) between the axes of the holes in the adjusting forks should be 228 - 232 mm.

If it is difficult to engage the winch drum during a cold season, it is required to warm up the winch reduction gear unit in idle running during 3 - 5 min.

Do not use the winch rope for towing a truck or a trailer or if the rope angle of deflection relative to the truck center line is exceeds 15 degrees.

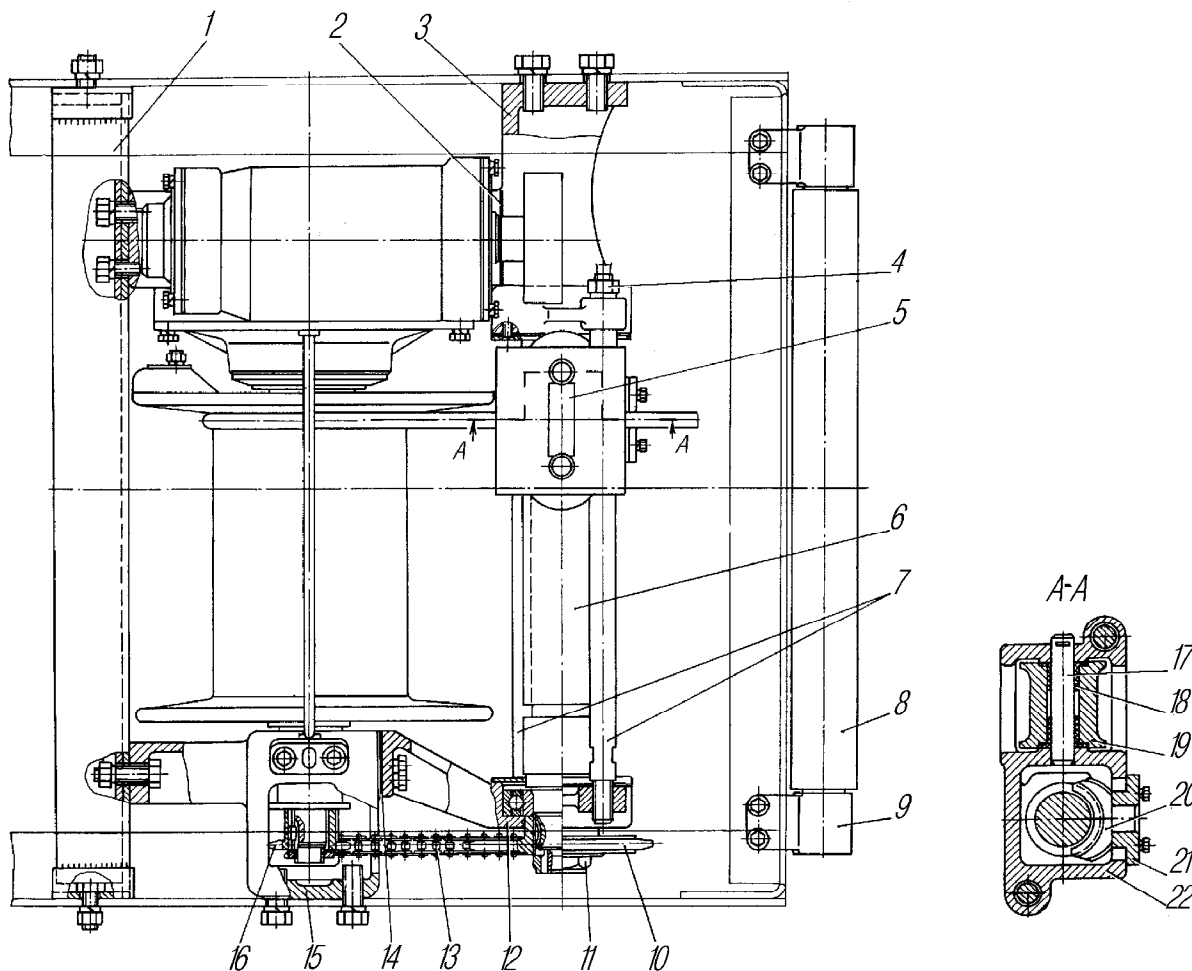


Fig.114. Winch Rope Winding Guide:

1 – winch cross member; 2, 14 – chain tension r.h. and l.h. shims; 3, 12 – lead screw r.h. and l.h. brackets; 4, 11 – nuts; 5 – locking strip; 6 – lead screw; 7 – guide rolls; 8 – horizontal roller; 9 – horizontal roller bracket; 10, 16 – driven and driving sprockets; 13 – chain; 15 – drum shaft bracket; 17 – guide roller pin; 18 – bush; 19 – guide roller; 20 – lead screw slide block; 21 – slide block support cover; 22 – guide roller holder case

To engage the winch:

- set the transfer box and gearbox levers in the neutral position;
- using a 30 mm wrench, set the sliding clutch lever in the upper position ("ON"), when forcing out the rope. For moving out the rope manually, the sliding clutch lever should be in its lower position ("OFF");
- engage the auxiliary power take - off by control valve 6 (see Fig. 11);
- engage the first or second gear and move out the rope of the desired length; choose the rope sagging manually. Before you start pulling, there should be, at least, three or four rope loops on the drum;
- to pull a cargo, engage the reverse gear;
- for the truck self-recovering, engage the reduction gear unit in the transfer box and the reverse gear in the gearbox.

Increase the engine speed smoothly. Abrupt acceleration of the engine does not result in increasing the pulling force applied on the rope, but can cause a shearing off the safety pin. If the safety pin is sheared off, immediately disengage the clutch and set the gear shift lever in the neutral position; otherwise, the shaft can be seized in the flange. Replace the sheared - off safety pin.

Do not use bolts or other parts instead of the pin.

In service it is difficult to determine the force applied to the rope; therefore, before using the winch, estimate advisability to use the pulley proceeding from particular conditions.

Use of the winch with the pulley is shown in Fig. 115. When the pulley is used without a hook, use the towing rope supplied with the truck.

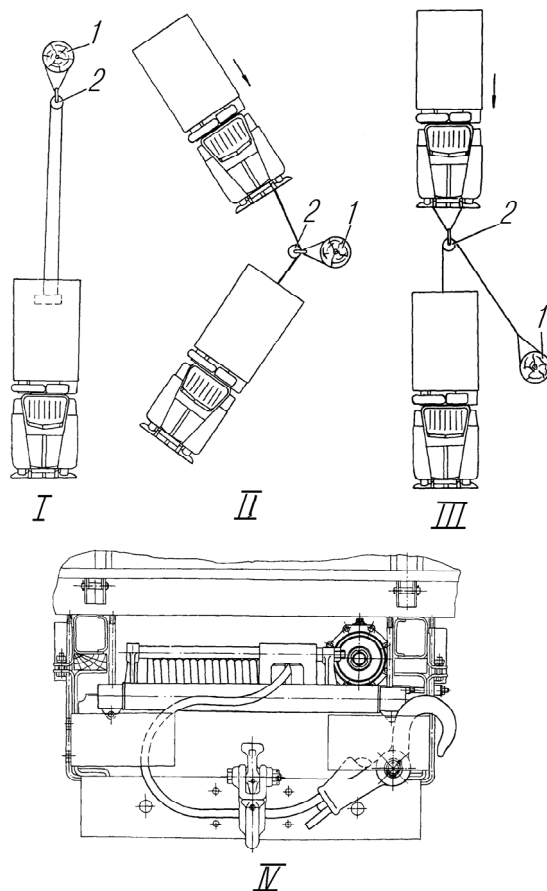


Fig. 115. Winch Pulley Application:
1 – fixed object; 2 – pulley; I – pulling force increase when self - recovering; II – change of pulling force direction when recovering truck; III – pulling force increase for recovering truck; IV – folding of rope in transportation position

If the pulley has to be applied for increasing the pulling effort for self - recovering (position I), it should be fastened with the towing rope to an object selected as a support and the winch rope hook – to the hook of draw gear. If the pulley is applied to change a towing direction, when recovering other truck (position II), it should be fastened with the help of towing rope to the object that serves as a support, and the winch rope hook – to the towing hook of the truck to be pulled out. If the pulley is applied to increase the pulling effort for recovering other truck (position III), the pulley should be fastened to the towing hook or rope thrown on the towing hooks of the truck

to be pulled out, and the winch rope hook – to a fixed object by means of the second towing rope. It is admissible to fasten the winch rope directly to the fixed object, in so doing the hook is fastened to preliminarily tightened rope.

To avoid overheating of the winch reduction gear unit do not pull the cargo, using the whole length of the rope more than three times in succession at the maximum load or the load close to it.

Put the winch hook in the transport position as shown in Fig. 115, IV.

Tire pressure control system

The tire pressure control system (Fig.116) allows to control and maintain the tire pressure within the required norm as well as to increase cross - country ability of the truck for the account of the tire pressure reducing. It provides an opportunity to continue travelling with a punctured wheel inner tube without changing the wheel (the wheel valves of intact wheels should be closed), if the supplied air quantity is enough for maintaining the required tire pressure.

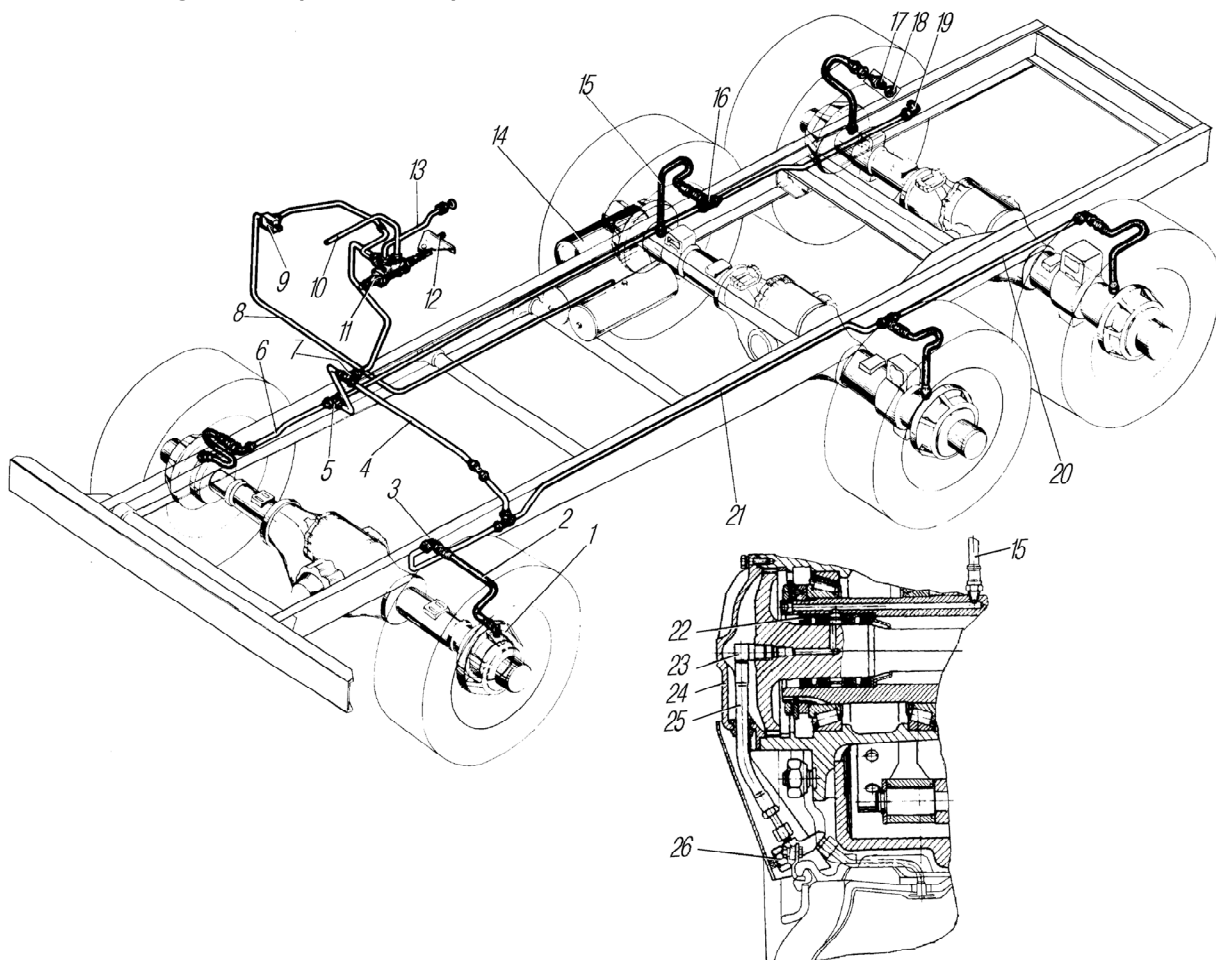


Fig.116. Tire Pressure Control System:

1 – air - supply union; 2, 15, 25 – hoses; 3, 5, 16 – T - joints; 4, 6, 8, 20, 21 – air lines; 7 – central T - joint; 9 – spider; 10 – outlet pipe; 11 – pressure control valve; 12 – valve control lever; 13 – pipe to pressure gauge union; 14 – air bottle; 17 – union; 18 – nut; 19, 23 – elbows; 22 – air - supply collars assembly; 24 – hub cap; 26 – wheel valve

Air is supplied to the tires via a single - line circuit. The tires of all the wheels are connected to each other, their pressure is the same and controlled simultaneously.

The tire pressure of the front wheel and rear bogie in the URAL - 4320 - 0911 - 30 trucks and the URAL - 44202 - 0612 - 30 bolster trucks is different (see the Section "Specifications").

Prior to starting movement, open the wheel valves of the rear bogie, set the pressure control valve lever to the neutral position and check the tire pressure and if necessary, bring the pressure to the required value and close the wheel valves.

Open the wheel valves of the front axle and check the tire pressure and if necessary, bring the pressure to the required value.

When the truck moves with the rated tire pressure, the wheel valves of the front axle should be open and those of the rear bogie should be closed.

The tire pressure of the front wheel and rear bogie in the URAL - 4320 - 31, the URAL - 4320 - 0611 - 31 trucks and the URAL - 4420 - 31 bolster truck is different. So, check the tire pressure, following the procedure described above. When moving with the rated tire pressure the wheel valves of the front axle should be closed and those of the rear bogie should be open.

In the areas with difficult terrain, such as swampy terrain, snowed - up virgin and loose sand it is permitted to reduce pressure to 0.1 MPa (1.0 kgf/cm²). For this purpose open the wheel valves of the rear bogie and reduce the pressure in all the tires simultaneously.

After surmounting a difficult section of terrain, bring the tire pressure to a required value (see Table 12 of the Chapter "Driving the Truck").

The pressure control valve is of slide type and consists of body 6 (Fig. 117), where collars 9 and slide valve 10 are installed in.

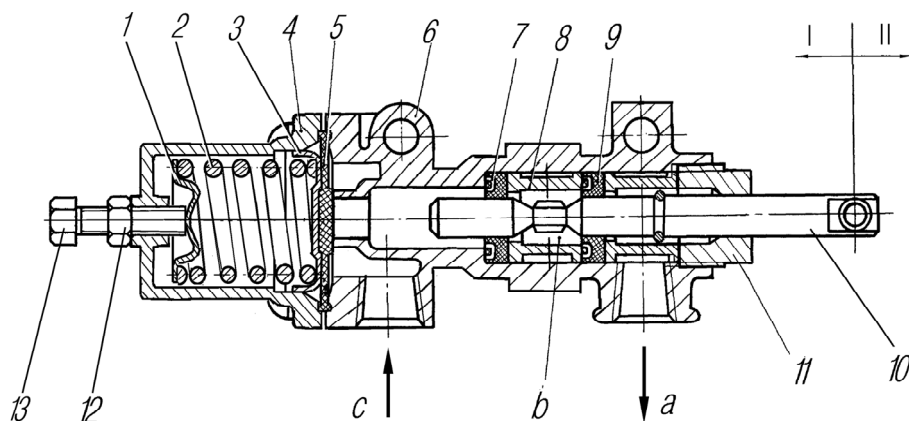


Fig.117. Pressure control valve:

1 – thrust washer; 2 – limit valve spring; 3 – guiding cup; 4 – valve cover; 5 – valve diaphragm; 6 – valve body; 7 – collar distance ring; 8 – spacer; 9 – collar; 10 – slide valve; 11 – slide - valve guide; 12 – nut; 13 – bolt; a – to atmosphere; b – to tires; c – from air bottle; I – inflation; II – exhaust

As the slide valve moves along the pin, the circular bore turned thereon communicates the valve hollow with the atmosphere or with the delivery main. The limit

valve is used for cutting off the tire inflation system, if the pressure in the truck pneumatic system drops lower than 600 kPa (6 kgf/cm²), is adjusted by bolt 13.

The air-supply collars assembly 22 (see Fig. 116) comprises four collars fitted in the axle journal (casing). The collars seal the joints of ducts in the fixed journal (casing) and those in the rotating half-axle.

Use and maintenance of the system. Having opened the rear axle wheel valves, blow them through with the air from the tires. For this purpose, set the valve control handle to the «ВЫПУСК» (exhaust) position and decrease the tire pressure by 0.03 - 0.05 MPa (0.3 - 0.5 kgf/cm²); after that bring the pressure to the value corresponding to a certain road surface.

Also blow through the system before parking the truck and every time after the truck leaves a warm garage.

Read the tire pressure on the pressure gauge, when the pressure control valve lever is set in the neutral position and the wheel valves are open.

If tire pressure is different in the front and rear axles, in order to check the tire pressure in any axle close the wheel valves of the other axles.

In order not to damage the tire pressure gauge by air pressure jumping, smoothly shift the control valve lever to «НАКАЧКА» (inflation) position, especially if the tire pressure is low, and in so doing the wheel valves must be open.

If the pressure falls down, close the wheel valves and then opening them one by one, detect which tire the air leakage occurs in.

If it is necessary to reduce the tire pressure, open the rear axle wheel valves and set the pressure as per Table 12 depending on the travelling conditions (see Chapter "Driving the Truck").

Maintenance of the system lies in checking its tightness. Check the system for tightness after the tires have cooled down to the ambient temperature. The points of heavy air leakage should be determined by ear and those of small air leakage – by applying soap emulsion.

The air leakage through connections should be eliminated by tightening up or replacing faulty parts of the connection.

If the pressure control valve, wheel valves and pipe connections are found tight in the course of checking, it follows that the air leaks through air-supply collars. If the heavy air leakage occurs, replace the collars.

First of all the reliability of air-supply collars assembly operation depends on availability of grease on the collar friction surfaces and its condition. When installing the collars, lubricate these surfaces and apply the grease into the hollows between the first and second and also between the third and fourth collars. When mounting a half-axle, also lubricate the working surface of the journal thoroughly, in so doing the grease should not get into the air-supply hole.

When installing the collars, use a special mandrel (position III in Fig. 118) so as to exclude a possibility of their injuring, when pressing them in. Use a special puller (positions I and II) available in the set of tools, when removing the collars.

Install the half-axles with the hub caps as per the instructions given in Chapter "Driving Axles. Adjustment of Wheel Hub Bearings".

If there are heavy damages in the tire pressure control system, inflate the tires with the help of hose available in the set of driver's tools, connecting it to the air take-off valve and to the wheel valves in turn.

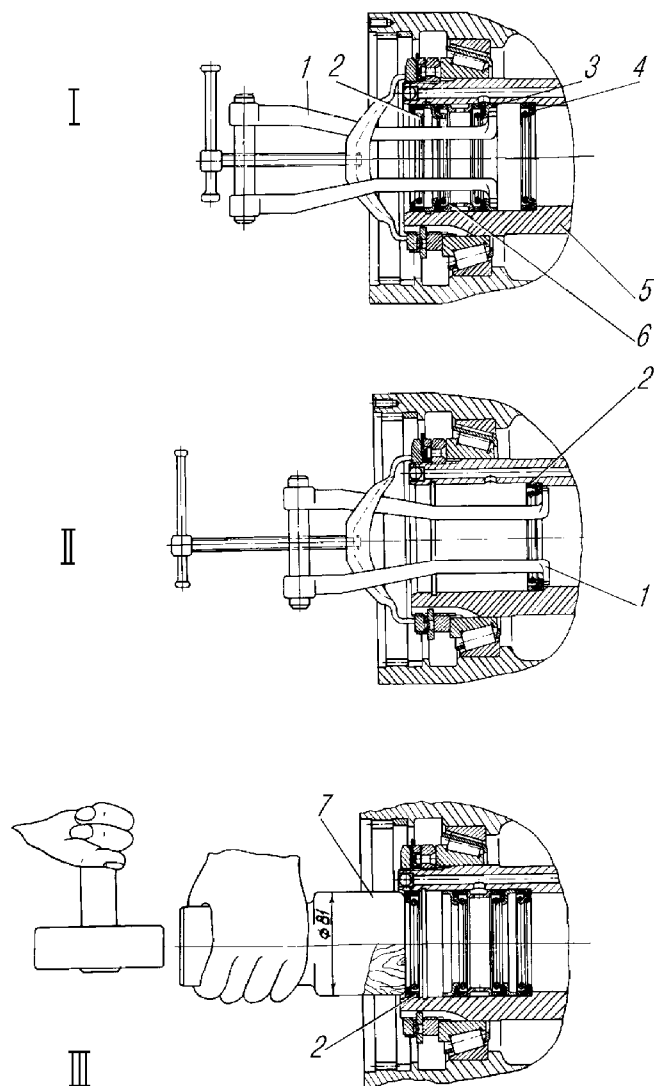


Fig. 118. Dismantling (I, II) and Installation (III) of Air - Supply Collars Assembly Parts:
1 – puller; 2 – collar; 3, 4 – hold - ers; 5 – slewing journal; 6 – dis - tance ring; 7 – mandrel

Sealing system

For reliable operation of the truck units and systems, which are exposed to water, when fording, and maintaining constant pressure in the inner hollows of the units, as well as in fuel tanks the sealing system is foreseen.

POSSIBLE TROUBLES AND METHODS OF TROUBLE - SHOOTING

Trouble	Possible Reason	Trouble - Shooting
Starting Preheater		
Overheating of heat exchanger, water ejection through heat exchanger filler	Ice plugs in the intake branch pipes because of non-observance of instructions regarding complete water draining, or misuse of heat exchanger. No circulation.	Warm the pipes by engaging the heater repeatedly, with intervals 2 - 3 min, pouring over the pipes on the outside by hot water
The heater can not be engaged	The pump unit motor does not rotate: - fan impeller freezing-on due to incomplete water removing from it after washing the truck or fording; - liquid pump unit impeller freezing-on due of non-observance of instructions regarding water draining from the cooling system.	Warm the fan and liquid pump casings by available means
	High-voltage source feed chain break	Ditto
	High-voltage source does not operate	Check and tighten up terminal connections of conductors
	The spark plug does not operate	Disconnect the high-voltage wire and fix its end at a distance of 3 - 5 mm from the truck "ground". If no spark appears when switching on the plug, change the high-voltage source
	The solenoid valve can not be actuated (no click when switching on the solenoid valve)	Clean or replace the spark plug
	The fuel filter in the solenoid valve or nozzle is clogged	Check, if the solenoid valve feed chain is in good working order, check the wire terminal tightening
	Nozzle clogging	Rinse the filter and blow it through with compressed air, or replace it
		Disassemble the nozzle. Wash its parts in kerosene or acetone. Assemble the nozzle and check for proper fuel spraying without screwing the nozzle in the burner
The heater smokes or ejects flame	Disturbed adjustment of the fuel pump	Reduce the fuel consumption adjusting the fuel pump reducing valve

Trouble	Possible Reason	Trouble - Shooting
The heater smokes or ejects flame Too long engine heating - up, combustion of the heater is unstable, smoking	Low motor shaft speed Low fuel feed because of the nozzle filter clogging, nontight fuel lines, disturbed adjustment of the fuel pump	Charge the storage battery, check, if the motor is in good working order Rinse the filters, the nozzle, eliminate the non-tightness of the fuel lines. Adjust the fuel pump reducing valve
High noise Gear self - disengagement Difficult engagement of the gears and differential lock	T r a n s f e r B o x Insufficient oil in the transfer box Enhanced axial movement of the primary and lay shafts Gear shift fork and clutch wear. Wear of splines of gear shift clutch and primary shaft Enhanced axial movement of the primary shaft Burrs on splines of gears, front holder, engagement clutches Lock seizing	Pour the oil up to the level of the inspection plug Adjust the bearings, or replace them Replace worn - out parts Adjust the bearings, or replace them Scrape spline surface Clean the hole for the ball
Increased noise of axles	D r i v i n g A x l e s Bevel gears' contact pattern is displaced onto the edge of the tooth narrow end Clearance in the reduction gear bearings Wear and injury of gear teeth working surface	Adjust gearing in accordance with contact pattern Restore preload of the bearings Replace the gears
Intensive, uneven wear of the tread pattern	W h e e l s a n d T i r e s Incorrect toe - in of steerable wheels Disturbed adjustment of the wheel hub bearings and steering stub bearings Wear of parts of steering rod joints High radial or lateral runout of the wheels Abrupt braking or starting, travelling with the tire pressure reduced or increased too much, tire overloading by cargo weight	Adjust the toe - in Adjust the bearings Replace the worn - out parts Replace the wheels with enhanced radial or lateral runout Observe rules and apply rational driving technique. Observe strictly the specified tire inner pressure, do not overload tires

Trouble	Possible Reason	Trouble - Shooting
Unstable truck movement, free travel of the steering wheel exceeds 25 degrees	S t e e r i n g Wear of "worm - segment" pair Wear of "rack - segment" pair Wear of steering rod joints and splined bushes of the steering cardan drive Slakened fixing of the steering gear	Adjust backlash between the worm and segment teeth and those of the rack and segment Repalce the worn - out parts by new ones, lu - bricate splined connections Tighten up the bolts fastening the steering gear case
"Heavy" steering	Insufficient oil level in the steering hydraulic system tank Air or water in the system (foam in the tank, cloudy oil)	Add oil up to the required level Remove air. If air can not be removed, check tighteing of all joints, remove and rinse the mesh filter, check if the gasket under the manifold is in - tact. Check tightening of the bolts fixing the mani - fold. And if the faults have not been remedied by means of the above measures, replace the oil
	Insufficient thightening of the pump drive belt The pump does not provide the required deliv - ery and pressure Increased oil leakage in the distributor, scores on bearing surfaces of the slide valve Slacked tightening of the slide valve nut	Tighten up the belt Check the pump Replace the distributor
Increased noise as the pump is running	The splined joint of the steering cardan shaft lost its mobility Screwing - out of the seat of the pump safety valve Insufficient oil level in the steering hydraulic system tank	Unlock the nut, tighten it up and relock by press - ing its belt into the shaft slot Disassemble, clean and lubricate Disassemble the pump, screw in the seat Add the oil up to the required level
Oil ejection through the oil tank breather	Filter clogging The gasket under the manifold is damaged Mesh filter clogging Oil level is too high	Rinse the filter Replace the gasket Check the filter as - sembly and rinse the filter Bring the oil level to its norm

Trouble	Possible Reason	Trouble - Shooting
B r a k e S y s t e m		
When pressing the brake pedal the truck fails to be braked - the brake failure pilot lamp lights on	Friction lining wear, large clearances between the service brake shoes and drums	Replace the friction linings. Adjust clearances between the service brake shoes and drums
The minimum air pressure pilot lamp is "ON" continuously (with the engine running)	The braking fluid is not available in the master cylinder tanks Air is not available in the bottles due to failure of the compressor and pressure governor, the pneumatic system is not tight	Replace the braking fluid, bleed the brakes, if required Eliminate the compressor fault. Replace the pressure governor. Locate the air leakage and eliminate the injury
Braking is not efficient enough - the brake failure signalling lamp turns on	Braking fluid leakage or air in the master cylinder or in the hydraulic line of one of the brake circuits	Detect the spot, where the fluid leaks, and eliminate the injury. Pour the braking fluid, bleed the brakes
Braking is not efficient enough - the minimum air pressure pilot lamp lights on	The inner collar is worn-out, or fluid is not available in one of the master cylinders The piston collars, or those of the air booster spacer are worn-out, and the air escapes from the booster pipe when the pedal is pressed	Replace the collar. Add the fluid, bleed the brakes Replace the collars
The brake is blocked up (it can not be released)	Free travel of the brake pedal is not available Mineral oil in the hydraulic drive causing swelling of rubber collars The compensating hole in the master cylinder is clogged	Adjust the free travel of the brake pedal Wash the hydraulic drive with spirit, replace the collars Dismantle the tank and scour the compensating hole using soft wire, dia. 0.6 mm.
The pressure governor is actuated frequently.	Compressed air leakage in the line from the regulator to safety valves assembly	Tighten up the joints, replace faulty parts in joints, the lines
S t o r a g e B a t t e r i e s		
The storage battery does not provide for sufficient engine speed	The battery discharge is under permissible limits Rapid voltage dropping in starter feed chain	Charge the battery and check, if the alternator and voltage regulator are in good working order Clean the battery terminals and wire leads, apply process petroleum. If need be, tighten up the fixture of starter wire leads

Trouble	Possible Reason	Trouble - Shooting
The storage battery does not provide for sufficient engine speed Rapid battery self-discharge	Failure of all or several battery cells The storage batteries terminals are closed by mud and electrolyte spilt over the battery surface The electrolyte is contaminated by impurities	Bring the battery to a repair shop Wipe the battery with a dry piece of cloth, and then by another one moistened in 10 % solution of ammonium hydroxide or of calcined soda Discharge the battery by the current equal to 1/10 of its capacity down to voltage 1.1 - 1.2 V per each cell. Pour out the electrolyte, wash the battery, fill in fresh electrolyte and charge it
Rapid lowering of electrolyte level in the batteries The electrolyte pours out of the vent of one or some cells When charging the storage battery completely discharged, electrolyte's voltage and temperature grow rapidly, intensive gassing starts, while the density grows insignificantly	The electrolyte boils out Battery monoblock damage Excessive level of electrolyte Excessive charging current Short circuit of the plates in one of the cells Plate sulfatizing that can occur in case the battery has been out of operation for a long time, or the battery was used with a low electrolyte level for a long time, or it was short-charged regularly	Check the voltage regulator Bring the battery to a repair shop Suck off the excessive electrolyte by a rubber bulb Check the voltage regulator Bring the battery to a repair shop Sulfatized plate should be restored by charge-discharge cycle, current not exceeding 1/20 of the battery capacity, the original density of the electrolyte 1.12 g/cm³, maximum. Heavy sulfatized plates are not subject to restoration
The power take-off (PTO) fails engage	P o w e r T a k e - O f f The pneumatic chamber diaphragm of the PTO engagement mechanism is damaged The driving gear teeth of the PTO is worn or injured Severe air leaks because of insufficient tightening of air line fixtures, or their failure	Replace the diaphragm Disassemble the PTO, sharpen gear teeth, or replace worn-out parts Locate leakage by applying soap solution onto the hose and fixtures. Tighten up the fixtures where applicable Replace the faulty parts

Trouble	Possible Reason	Trouble - Shooting
The PTO fails to disengage	The return spring of the PTO engagement pneumatic chamber is broken The return springs of control valve are broken Seizing of the control valve rod Lack of gap between the valve and rod, the PTO being disengaged, due to deformation of the valve of control valve	Replace the spring Replace the springs Disassemble the valve, eliminate the cause of seizure and lubricate the valve body surface contacting the rod with a thin layer of ЦИАТИМ-201 grease Replace the valve of control valve
Auxiliary Power Take - Off		
Uneasy disengagement of the auxiliary power take - off (APTO) High vibration, noise and oil leakage The APTO fails to engage The APTO fails to disengage	Burrs on the shaft splines of the transfer box, APTO and engagement coupling Slacked flange nut Worn rear bearing of the APTO The pneumatic chamber diaphragm of the APTO engagement mechanism is damaged Severe air leaks because of insufficient tightening of air line fixtures, or their failure The return spring of the APTO engagement pneumatic chamber is broken The return springs of control valve are broken Seizing of the control valve rod Lack of gap between the valve and rod, the APTO being disengaged, due to deformation of the valve of control valve	Scrape the surface of splines Tighten up the flange nut Replace the rear bearing Replace the diaphragm See Section "Power Take - Off"

PECULIAR FEATURES OF OPERATION

PREPARATION OF NEW TRUCK FOR OPERATION

Before putting a new truck into operation, study this Operation Manual, carry out the daily maintenance, and additionally proceed as follows:

1. Install accessories available in the box with driver's tool kit in the truck according to the Operation Manual.
2. Check and adjust tension of the drive belts, if required.
3. Check an oil level in the engine oil sump, the gearbox, the transfer box, the axle housings, the hubs of the rear walking - beam suspension, the pump tank of the steering booster, the steering gear housing and in the advanced fuel injection coupling. Top up the oil, if required.
4. Check a coolant level and top it up.
5. After filling the fuel tank, prime the engine fuel feed system, using the manual fuel feed pump.
6. Check a level and density of electrolyte in the storage batteries; add distilled water and re - charge the batteries if required.
7. Open the wheel valves and bring the tire pressure up to rated value.
8. Check the door locks.
9. Check operation of window raisers in the cab doors.
10. Perform a test run.

ENGINE START AND STOP

Sequence of operations, when starting the engine, depends on its warm condition and on ambient temperature. Electric engine starting system ensures its start without preheating at an ambient temperature to -10°C . At the temperature lower than -10°C make use of the starting preheater. If the storage batteries are under - charged, and for the purpose of increasing the engine service life, it is recommended by the Manufacturer to use the starting preheater also at the ambient temperature above -10°C .

Engine start without preheating

The cold engine should be started at an ambient temperature from 0°C down to -10°C as follows:

1. Pump through the engine fuel system, using the manual fuel feed pump.
2. Set the gearshift lever of the gearbox in the neutral position.
3. Shut the radiator blind.
4. Switch on the storage batteries.
5. Set the engine stop lever in the working position (shift it up to the stop at the panel).
6. Press the clutch pedal as far as it will go.
7. Press the fuel feed control pedal as far as it reaches the position that corresponds to a medium engine speed.
8. Holding the pedal pressed, switch on the starter by turning the key in the extreme right - hand position.
9. As the engine starts, switch off the starter by releasing the key of the starter switch; hold the fuel feed control pedal in the position that corresponds to medium engine speed until the engine runs steadily, then, smoothly release the clutch pedal

(the gearshift lever should be in the neutral position). Using the speed control knob, set minimum engine speed. The constant engine speed is set by pulling out knob 7 (see Fig. 23). The knob is connected with the control lever of the fuel - injection pump regulator via tie - rods and is located on the front panel in the cab. If the engine fails to start, repeat the procedure described above. If the engine still fails after making three attempts, detect and eliminate the fault. The starter may be switched for 15 s only; each interval between the start attempts should be not less than 1 min.

Before starting the warmed engine, shift the fuel feed control pedal to the position that corresponds to medium engine speed. Switch on the starter, and after the engine starts, release the key of the lock switch.

Cold engine start with use of starting preheater

For preheating and starting the cold engine using low - freezing coolant in the cooling system proceed in the following sequence of operations:

1. Raise the hood and make sure that the valve of the preheater fuel tank is open.

2. Switch on the pump unit for 10 - 15 s, using the switch on the starting pre - heater control console.

3. Switch on fuel electric heater, using the switch on the starting preheater control console (spring - loaded switch) and hold the switch knob in this position depending on the ambient air temperature for the following time: 30 s at a temperature above -30°C ; 60 s at a temperature from -30°C to -50°C .

4. Energize the spark plug, using the switch on the starting preheater control board (spring - loaded switch) and at the same time, keeping the spark plug energized, switch on the pump unit and solenoid valve. Hold the spark plug switch knob (for not more than 20 s) until specific roaring is heard in the heat exchanger indicating ignition of fuel in the burner. The preheater in good working order should be started within 10 to 15 s.

5. Release the spark plug switch knob (in so doing the spark is de - energized). Continuous uniform roaring in the heat exchanger indicates a steady operation mode of the preheater. If the preheater fails to start, switch off the pump unit and solenoid valve and repeat the start in a minute, following the above sequence. If the preheater fails to start after two successive attempts have been made, detect and eliminate the cause of trouble.

6. Lower the hood.

7. After liquid in the engine cooling system is warmed up to $80 - 100^{\circ}\text{C}$, as indicated by the coolant temperature indicator on the dashboard, de - energize the solenoid valve, blow through the gas ducts of the heat exchanger for 20 - 30 s and switch off the pump unit.

8. Start the engine as described in subsection "Engine Start Without Preheating".

When using water in the engine cooling system*¹, warm up and start the engine as follows:

1. Prepare 32.5 l of clean water (for the YAMZ - 236M2 engines) and 38 l (for YAMZ - 238M2).

2. Make sure that two drain cocks of the preheating system and the preheater cock were closed after complete draining of water, when the truck is parked. After starting the preheater, see that no water leaks through the drain cocks. If otherwise, close the cocks.

*¹ For trucks to be delivered to Russian Armed Forces.

3. Open the fillers of the radiator and preheater heat exchanger.
4. Start the preheater in the sequence as described above and immediately fill 12 l of water in the heat exchanger through the filler, screw on the filler plug. The radiator filler should be left open. If the preheater stops spontaneously, repeat its starting; if it still fails to start, drain water out of the system immediately. Detect and eliminate the troubles in the preheater operation, then start the preheater and proceed with warming - up in the sequence described above.
5. Warm the engine until steam begins to come vigorously out of the radiator filler.
6. Top up the system with the water via the radiator filler and plug up the filler opening.
7. Continue heating the engine until the water temperature reaches 80 °C - 100 °C as per readings of the coolant temperature indicator on the dashboard.
8. De - energize the solenoid valve, blow through the gas ducts of the heat ex - changer for 20 - 30 s and switch off the pump unit.
9. Open the cock of the cab heater.
10. Start the engine as described in subsection "Engine Start Without Preheat - ing".

Engine stop

The running engine is shut down with the help of the engine stop knob which is connected with lever 7 via tie rod 5 (see Fig. 24). The stop knob is located on the front panel in the cab.

Before shutting down the engine, let it run during 1 - 3 min unloaded at medium speed; then reduce the engine speed down to minimum and pull out the knob as far as it will go.

RUNNING - IN A NEW TRUCK

A service life, reliability, and economical operation of the truck depend on the initial running - in of the parts in the pre - service period. The running - in of the truck may be performed prior to putting it in operation as well as in the course of operation. The new truck should be carefully serviced within this period; and the operation rules listed below are to be strictly observed.

In the course of the truck operation, a care of heat mode of truck units should be taken. During an initial run of 1000 km (50 hours of engine running) proceed as follows:

- warm the engine at a speed of 1300 - 1600 min⁻¹;
- do not exceed the travelling speed of 5 km/h with the first gear engaged; 10 km/h, with the second one engaged; 20 km/h, with the third one engaged; 40 km/h, with the fourth one engaged and 50 km/h, with the fifth gear engaged;
- do not use the truck under heavy road conditions and with a trailer;
- tighten up the wheel fastening nuts twice: after 100 - 150 km and 200 - 300 km as well as every time when removing and mounting the wheels on the truck hub;
- do not reduce the tire pressure.

Use the URAL - 4420 - 10, URAL - 4420 - 31 and the URAL - 44202 - 0311 - 31 trucks over the initial run of 1000 km on hard - surface roads and articulated with a semi - trailer having GVW 12 t maximum.

After the 1000 km (50 hours of engine running) run follow the procedure described in the section "Maintenance in Pre - service Period".

DRIVING TECHNIQUE

Proper driving of the truck is one of the most important conditions of extending its service life and ensuring trouble-free operation, besides, it allows to achieve high average travelling speeds at minimum fuel consumption.

The truck succeeds in crossing over heavy road sections, provided that all the truck mechanisms are controlled skillfully. When towing a trailer, or operating under heavy road conditions (snow, mud, soft ground, sand and the like), only start travelling with the first gear engaged. When crossing over soft ground, damp meadows, virgin snow, and sandy sections, drive the truck smoothly, without jumps, slipping, and stops. Surmount small snow-drifts and short upgrades with prior accelerating the truck.

When crossing over extreme heavy road sections (snow, mud, soft ground, sand and the like), reduce the air pressure in the tires, if need be, to a certain value that corresponds to the best passability for that particular section, and lock the transfer box differential, because slipping of drive wheels when the truck becomes immovable, or driving the truck with the slipping wheels and the differential being unlocked, cause quick wear of the transfer box differential and tires.

In all other cases of travelling, when the drive wheels do not slip, unlock the transfer box differential to avoid extra loads in the driveline. Engage the low gear in the transfer box when crossing over heavy sections of route, as well as when climbing steep upgrades.

Shift gears in the transfer box only after the truck has stopped completely. do not shift the transfer box lever in the neutral position if any gear is engaged in the gearbox, and auxiliary power take-off is disengaged.

Engage the auxiliary power take-off and the power take-off after the truck has been stopped, with the disengaged clutch and the pressure in the air system not less than 500 kPa (5 kgf/cm²). After shifting the valve lever to "ON" position, release the clutch pedal smoothly.

Brake the truck smoothly, pressing the pedal with gradual increase of the force. When descending a long downgrade, brake the truck by the engine applying the auxiliary brake. In so doing the engine speed may approach the rated one, but does not exceed 2100 min⁻¹. Should the engine speed up in excess of 2100 min⁻¹, brake the truck vigorously at regular intervals by applying the service brakes.

Caution! do not shut down the engine when driving on long downgrades.

It is not recommended to stop the truck on a downgrade. In case of emergency stop it is required to take measures in order to avoid rolling the truck down the grade: cut off the fuel feed by pulling the engine stop tie rod handle as far as it will go, apply the parking brake, engage the first gear in the gearbox and place stops under the wheels.

When driving on slippery or ice-covered roads, be careful since the truck may skid sideways.

When driving the trucks equipped with a tire pressure control system on improved-surface roads with a rated load, the tire pressure should be as rated.

When crossing over difficult sections of terrain, a short-time releasing of tire pressure is allowed. In so doing the maximum run and travelling speed should not exceed the values in Table 12.

Do not reduce the tire pressure more than it is required in accordance with the road conditions. Mind that driving with reduced tire pressure should be limited; only reduce the pressure in the case of utmost need.

When driving the truck with the reduced tire pressure, follow the readings of the tire pressure gauge.

It is prohibited to drive the truck with the reduced tire pressure for the purpose to obtain smooth running. If the truck travels for a long time, the tire pressure may rise due to their heating. Do not reduce the pressure in the heated tires so as to reduce rolling resistance and save the fuel.

Table 12

Tires 14.00 - 20, OI - 25 model

Kind of Road	Permissible Reduced Pressure, MPa (kgf/cm ²)	Max. Speed, km/h	Maximum Run within Warranty Period of Tires, km
Heavy section of swampy terrain, snowed - up virgin land and loose sands	0.07 (0.7)	15	600
	0.10 (1.0)	25	800
	0.15 (1.5)	30	1400
All types of roads, while inflating tires, after heavy sections of roads	0.15...rated (1.5...rated)	40	1400

Tires 390R20, O - 65 model

Kind of Road	Permissible Reduced Pressure, MPa (kgf/cm ²)	Max. Speed, km/h	Maximum Run within Warranty Period of Tires, km
Heavy section of swampy terrain, snowed - up virgin land and loose sands	0.10 (1.0)	15	600
	0.15 (1.5)	20	800
	0.20 (2.0)	30	1400
All types of roads, while inflating tires, after heavy sections of roads	0.20...rated (2.0...rated)	40	1400

Tires 390/95R20, KAMA - URAL model

Kind of Road	Permissible Reduced Pressure, MPa (kgf/cm ²)	Max. Speed, km/h	Maximum Run within Warranty Period of Tires, km
Heavy section of swampy terrain, snowed - up virgin land and loose sands	0.10 (1.0)	20	600
	0.15 (1.5)	25	800
	0.20 (2.0)	35	1400
All types of roads, while inflating tires, after heavy sections of roads	0.20...rated (2.0...rated)	45	1400

Tires 1200x500 - 508, 500/70 - 508 (1200x500 - 508),
500/70 - 20 (1200x500 - 508), ID - P284 Model

Kind of Road	Permissible Reduced Pressure, MPa (kgf/cm ²)	Max. Speed, km/h	Maximum Run within Warranty Period of Tires, km
Heavy sections of swampy terrain, snowed - up virgin land and loose sands	0.10 (1.0) 0.15 (1.5)	20 20	400 1000
All types of roads, while inflating tires, after heavy sections of roads	0.15...rated (1.5...rated)	30	1000

When moving with the rated tire pressure:

- on the URAL - 4320 - 31, the URAL - 4320 - 0611 - 31 trucks, the URAL - 4420 - 31 bolster trucks the wheel valves of the front axle should be closed and those of the rear bogie should be open;
- on the URAL - 4320 - 0911 - 30 trucks, the URAL - 44202 - 0612 - 30 the wheel valves of the front axle should be open and those of the rear bogie should be closed.

Fording. The truck can cross fords, 0.7 m deep. After special preparations the truck equipped with a sealing system is capable to cross the fords from 1.2 m to 1.7 m deep (these figures include a wave height). Crossing a deep - water ford requires a great care. Prior to fording it is necessary to measure the ford depth very carefully, to check the condition of the ford bottom, to make sure there are no pits, large stones, swampy places, to choose and check the places where the truck is to enter the water and get out of it, as well as mark deep places with surveying rods.

To cross over a ford down to 1 m deep:

- close the radiator with its shutter;
- set the rated tire pressure.

To cross over a deeper ford:

- on the truck equipped with a fan coupling, set the fan friction drive switch to the forced switching - off position, having set the handle of fan coupling control valve to the position designated as "O";
- make the storage batteries watertight by inserting rubber pads into the battery plugs and screwing the plugs tight;
- remove the mud from the resting surface of the exhaust pipe flange, install the fording valve with the flap joint upward;
- check the fastening of the gas exhaust system connections.

Cross over the ford with the first or second gears engaged in the gearbox, the reduction gear engaged in the transfer box and the locked inter - axle differential. Enter the water at a low speed, not generating waves. Avoid manoeuvring and do not stop. The time of truck staying in the water should not exceed 15 min.

To avoid penetration of mud and water into the tool box press its cover tight with the help of the central screw. Upon fording, open the tool box, remove the water and dry the tools.

After fording, check the oil level in the truck engine and units. The increased oil level, availability of water drops on the oil dipstick and change of the oil colour

are signs of water penetration into the oil sump of the engine. If so, change the oil immediately. If the water has got into the oil sump, change the oil.

Check availability of the water in the fuel - feed system by screwing out draining plug of the fuel tank and that of the fuel filter until the fuel starts pouring. If the water has got into the tank, drain the sediment out of the tank and replace the filtering elements of the fine fuel filter.

Remove the water out of the pump unit air line and the heat exchanger of the starting preheater by switching on the pump unit for 2 - 3 min.

Check the hollows of the engine flywheel housing and clutch housing for water by removing the hatch cover, cranking the flywheel and screwing the conical plug out of the lower hatch of the clutch housing. Upon checking put the removed parts in their places. Perform the checking right after crossing over the ford, not leaving the parked truck without the said check for a long truck.

Apply some lubricant into the plain bearings and joints with the help of oil gun.

When moving after crossing over the ford, a special care should be taken due to reduction of the brakes efficiency because of wetting the brake linings. Dry the brake mechanisms 3 - 5 times by breaking the truck in the course of its moving.

If the engine has stopped, while fording, try to start up the engine two or three times with the starter, having one - minute breaks between the starts. If the engine can not be started, the truck must be drawn out of the water immediately.

After the stuck truck has stayed in the water for more than 20 min, tow it to any nearest service station where they perform its service. If the truck moves by its own power check all basic assembly units of the truck, as well as the hollows of the wheel hubs and those of the front axle steering knuckles for water penetration into them. If the oil level in the truck units is higher than the norm, reduce it to the required one and replace the oil at the first opportunity.

After fording, prepare all assembly units of the truck for operation under normal road conditions and eliminate the reasons of water penetration into them. To keep the truck ready for fording perform regularly checks of the condition of its hoses, pipes, their connections, units seals and remedy faults in due time.

Crossing trenches, ditches and pits. Drive at a low speed, lock the transfer box differential under extremely heavy conditions. Approach the trenches at square angles; otherwise, the load could be re-distributed and unloaded wheels could slip when the truck is inclined.

Driving with trailer or semitrailer. To ensure serviceability of towing device use a towing loop of 90 mm in inner diameter and a sectional area of 42 mm, a towing hook with throat diameter of 48 mm and width in the throat zone of 69 mm. Maximum permissible dimensions: loop cross - section – 38 mm; hook throat – 52 mm; hook width – 66 mm.

The towing hooks and loops with dimensions different from the above should be replaced with new ones.

When maneuvering, avoid folding of the trailer until its tow - bar thrusts against the end of the chassis frame side member or other truck components.

Non - observation of these requirements may cause the trailer loop seizure in the towing hook throat, and breakage of the towing hook.

When crossing extremely difficult sections of terrain, uncouple the trailer, and after crossing the terrain section pull it to the truck with the help of winch. In doing so, mind that three or four coils should be left on the winch drum. Pull the trailer at the medium engine speed. Do not tow the trailer by the winch rope.

The bolster truck centre of gravity is located higher than the centre of gravity of platform trucks with sides. Therefore, a special care should be taken in the course of movement. Break the articulated vehicle smoothly.

Mind that the articulated vehicle moves properly under difficult road conditions when the tractor truck and the semi-trailer do not have a folding angle in a horizontal plane or such an angle is quite small. If the folding angle increases, a lateral force, which tends to overturn the tractor truck or generate its sidewise skidding, begins acting.

Caution! when driving with the engaged auxiliary brake on a slippery road, which has a low adhesion ratio, and with no solenoid valve of the braking system available on trailers, folding and skidding of the trailer are possible.

MAINTENANCE

Maintenance is intended to keep the truck in good working order and in proper external appearance; to reduce the intensity of parts wear; to prevent failures and damages, also to detect them and eliminate in due time. Maintenance is a preventive measure that is carried out compulsorily by scheduled order after definitive runs or operation periods of the truck.

Keeping the schedule of the maintenance, also its proper execution to a specified extent, will ensure a permanent inherent availability of the truck and reduce repair demand. For proper execution of the maintenance it is recommended to do it at special spots, which are outfitted with necessary tools and fixtures.

Adjustment and maintenance of the engine fuel system instruments, of electric equipment, hydraulic systems should be performed by qualified specialists.

Types of Maintenance

Depending on schedule and applied labour, the maintenance is subdivided into the following types:

- Daily Maintenance (DM);
- Pre-Service Maintenance;
- First Maintenance (M - 1);
- Second Maintenance (M - 2);
- Seasonal Maintenance (SM).

Schedule of Maintenance

Daily Maintenance is to be carried out before the truck leaves and after it returns.

Pre-Service Maintenance is to be carried out after first 1000 km of run (50 hours of engine operation).

Seasonal Maintenance is to be carried out twice yearly, in spring and in autumn, together with the next scheduled maintenance.

The schedule of maintenances M - 1 and M - 2 may be corrected depending on the truck operation conditions and climatic regions as per GOST Standard 21624 - 81 and the "Rules for Maintenance and Repair of Automotive Vehicles" (Publishing House "Transport", Moscow, 1986). For the first category of operation conditions First Maintenance (M - 1) is to be carried out every 4000 km of run (125 hours of engine operation), Second Maintenance (M - 2), every 16 000 km of run (500 hours of engine operation).

LIST OF MAINTENANCE JOBS

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Daily Maintenance (DM) <i>Servicing Before Leaving</i>		
Inspect the truck and check for leaks of fuel, oil, brake fluid and coolant, also of air. Eliminate troubles, if need be. Inspect the engine, clean it from dust and mud, when needed. Check level of brake fluid; top up, if required. Before starting the engine: - check oil level in the crankcase and add to the normal, if need be; - check coolant level in the radiator, top up, if required Fill up the tank of windshield washer pump Check functioning of lighting devices, light and sound alarms, instrumentation and windshield wipers Check operation of the generator by the current indicator (see Section "Electric Equipment. Generator") Check serviceability of the following units: - clutch; - steering;	Oil level should lie within "B" and "H" marks available on the dipstick Coolant level should lie beyond the end faces of cooling pipes in the upper radiator tank (see the Lubrication Chart) Drain water from the tank at subzero ambient temperature Faulty units are not allowable The current indicator should read charging current The clutch should ensure full and smooth engagement (without slipping), full disengagement (without dragging) The pin nuts of steering rods and booster should be cottered; play in joints is not tolerated; fixing of cardan shaft forks should not be loose	Tank with oil, oil dispenser column, wiping material Tank with low-freezing coolant, rule Vessel Current indicator By visual inspection By visual inspection

Description	Technical requirements	Instruments, tools, fixtures and materials needed
- service brake system - parking brake system Check the towing unit for good condition (when operating the truck with trailer) Check the tires for good condition and the wheels for proper fastening Inspect fixing of the fifth wheel and sub - frame of the bolster trucks	Check serviceability of pilot lamps 3 and 4 (see Fig. 13) by pressing button 6. The pilot lamps should light up. Replace the bulbs in pilot lamps, if need be. The hydraulic and air systems should be tight. Depress and hold the brake pedal for 1 - 2 min. Should after this period pilot lamp 12 light up, it signifies the failure of the inner collar in the brake master cylinder. In this case replace the collar. There must be no visible pointer movement of the two - pointer pressure gauge. If otherwise, or if pilot lamp 4 lights up on the dashboard in case of bad air leakage, eliminate fault in the air part of the drive. The brake shoes being fully pressed to the drum, the brake pawl should position on 4 - 12th teeth of the segment The towing hook nut should be locked, and the hook catch cottered Tires should be free from injuries and should not bear any foreign objects in the thread. Wheel nuts should be tight Fasteners of the fifth wheel and sub - frame should be tight	Truck pressure gauge, brakes failure pilot lamp on the dashboard By visual inspection By visual inspection. Tight up the wheel nuts, if need be
Wash the truck and clean the driver's cab and platform bed In winter fill the fuel tank completely to avoid moisture condensation in it	Servicing After Trip	
		Manual washing using a hose, brushes, wiping material Fuel filling column

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Drain the condensate out of air bottles. In winter drain the condensate after each departure from a heated garage	When draining the condensate pressure must be available in air bottles	
Maintenance in pre - service period after first 1000 km of run (50 hours of engine operation)		
Engine		
Maintain the power unit in accordance with the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines		
Inspect and, if need be, tighten up the fasteners of power unit at all points, all connections of air intake and exhaust systems	Fastenings should be tight	Wrenches 14x17, 17x19
Drain the sediment from the fuel tank	Fuel leaks through the drain hole plug are not allowed	Wrench 14x17, 17x19, vessel, wiping material
Drain the sediment from the coarse - mesh and fine - mesh fuel filters	Fuel leaks through drain hole plug are not allowed	Ditto
Transmission		
Check and adjust, if required, the clutch pedal free stroke (see section "Clutch Release Control")	Clutch pedal free stroke must lie within 50 - 60 mm, with no pressure available in truck air system.	Wrenches 17x19, 14x17, pliers, rule
Inspect and, if need be, tighten up the fasteners of cardan shafts	Fastening should be tight	Wrenches 14x17, 17x19, box wrench 17x19
Inspect and, if need be, tighten up the nuts fixing:		
- arm, upper cap and the lower ones of steering knuckles, and ball support flanges;	Fastening should be tight	Box wrench 24x27
- final drive to the axle case	Ditto	Wrenches 17x19, 24x27, box wrenches 17x19, 22x24, combination wrench 14x14, pliers, screwdriver
Running Gear		
Inspect and, if need be, tighten up the nuts fixing:		
- locking wedges of front spring pins;	Fastening should be tight	Wrench 17x19

Description	Technical requirements	Instruments, tools, fixtures and materials needed
- front spring eyes;	Fastening should be tight	Socket wrench 30x32, tire iron with tommy bar, pliers, driftpin, screwdriver, hammer
- front spring U - bolts;	Fastening should be tight. When tightening up, the truck must be fully loaded	Wrench for spring U - bolt nuts, tire iron with hydraulic jack tommy bar
- rear spring U - bolts;	Ditto	Socket wrench 27x38, tire iron with hydraulic jack tommy bar
- torque rod pins;	Fastening should be tight	Insert to wrench 50 insert, tire iron with hydraulic jack tommy bar, pliers, screwdriver, driftpin, hammer
- wheels	Ditto	Socket wrench 27x38 for wheel nuts, tire iron
Inspect and, if need be, tighten up the bolts fixing:		
- brackets of upper torque rods;	Fastening should be tight	Socket wrench 24, tommy bar
- walking - beam axle assy to walking - beam brackets;	Ditto	Socket wrench 30x32, tire iron with hydraulic jack tommy bar
- front brackets of front springs to lower flange of frame side - member;	Ditto	Wrench 22x24
- rear brackets of front springs to reinforcement parts of frame side - member;	Ditto	Wrench 22x24 (24x27), socket wrench 24, tommy bar
- fifth wheel (for bolster trucks)	Ditto	Wrenches 17x19, 22x24, box wrench 24x27
Inspect and, if need be, tighten up the fastening of towing unit cross - member (when operating with trailer)	Ditto	Wrenches 17x19, 22x24
Steering		
Dismantle and wash the steering pump filter. Check oil level, top up, if required	Oil leaks through filter gasket are not allowable. The oil level should lie between the upper and lower marks available on the dipstick, the plug being unscrewed	Wrench for bleeding hydraulic brakes, screw - driver, vessel for oil, vessel for washing the units, wiping material
Tighten up the pin fasteners of:		

Description	Technical requirements	Instruments, tools, fixtures and materials needed
- steering rods; - steering booster Tighten up the nuts fastening the steering gear case Check and, if need be, tighten up the nuts fastening the steering car - dan forks Check tension of pump belts and adjust, if need be	Fastening should be tight Ditto Ditto Ditto See Section "Steering. Steering Booster Pump"	Wrench 24x27, box wrench 24x27, pliers Box wrench 24x27, socket wrench 36, pliers, screwdriver, hammer, tire iron with hydraulic jack tommy bar Wrenches 17x19, 22x24, box wrench 24x27 Wrenches 14x17, 17x19 Wrench 10x12, rule
Adjust clearance be - tween wheel brake shoes and drums (see Section "Service Brake System")	Service Brake System Do not disturb original adjustment of shoe support pins. Upon readjusting the brake drums should not heat when the truck drives	Wrench 19x24, box wrench 22x24
Check electrolyte level and density in stor - age batteries; add distilled water, if need be; charge the battery Check and, if need be, adjust the headlamps (see Sub - Section "Light - ening and Signalling Sys - tem") Check bunch of wires for reliable fastening Check brackets of the storage battery box for reliable fixing to the truck frame Check and, if need be, tighten up the fastening of the starting preheater high - voltage source Inspect condition of rubber jackets on rear lamps, turn indicator re - peaters, storage battery switch, braking signal switch, fuel level sender, auxiliary brake switch	Electric Equipment See Section "Storage Batteries" Adjust the headlamps on unloaded truck placed on an even horizontal ground Fastening should be tight Ditto Ditto Fastenings should be tight	Wrenches 11x13, 17x19, vessel with distilled water, glass tube dia. 3 - 5 mm, densimeter Screwdriver, screen with special marks Pliers, screwdriver, knife, insulating tape Wrenches 17x19, 22x24 Screwdriver Visually

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Check fastening of the power take - off body to the gearbox housing	Special Equipment Fastening should be tight	Wrench 14x17
Change oil in the following units: - transfer box housing (see the Lubrication Chart) - steering gear case (see the Lubrication Chart) - final drives of driving axles (see Lubrication Chart) Lubricate the power unit in conformity with the Lubrication Chart in Operation Manual for YAMZ-236M2, YAMZ-238M2 engines	Lubrication Fill oil up to the edge of the inspection hole available in the housing rear wall. No oil leakage through plugs is permissible Fill oil up to the edge of the inspection hole. No oil leakage through plugs is permissible Ditto	Wrench 17x19, vessel for used oil, model 133M oil dispenser tank, wiping material Wrench 22x24, vessel for used oil, model 133M oil dispenser tank, wiping material Wrench 27x30, vessel for used oil, model 133M oil dispenser tank, wiping material
When performing M - 1 on a new truck, wash the booster filter, tighten up the nut of telescopic shock absorber body (further on tighten up when leakage is seen), lubricate the bearing of clutch release coupling and that of the clutch release fork shaft bushing	Maintenance No. 1 (M - 1)	
Maintain the power unit in accordance with the Operation Manual for the YAMZ-236M2, YAMZ-238M2 engines Inspect and, if need be, tighten up the fasteners of power unit at all points	Engine Fastenings should be tight	Wrenches 17x19, 19x22

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Inspect and, if need be, tighten up all fastenings of air intake and exhaust systems Check and, if need be, adjust the tension of the steering pump drive belt	Ditto Permissible sagging should lie within 7 - 13 mm when applying an effort of 40N (4kgf) in the middle of the run	Wrenches 14x17, 17x19 Wrench 10x12
Running Gear		
Inspect and, if need be, tighten up the nuts fixing: - locking wedges of front spring pins; - front spring eyes ^{*1} - front spring U-bolts ^{*1} ; - rear spring U-bolts ^{*1} ;	Fastening should be tight Ditto Fastening should be tight. When tightening up, the truck must be fully loaded Ditto	Wrench 17x19 Socket wrench 30x32, tire iron with tommy bar pliers, screwdriver, driftpin, hammer Socket wrench 30x32 for spring U-bolt nuts, tire iron with hydraulic jack tommy bar Socket wrench 30x32 for wheel nuts, tire iron with hydraulic jack tommy bar
Steering		
Check oil level in the tank of booster pump; add oil, if need be	Oil level should lie between the upper and lower marks on the dipstick the plug being unscrewed	Oil dipstick, wiping material
Braking Systems		
Adjust clearance between wheel brake shoes and drums (see Section "Service Brake System")	Upon readjusting, the brake drums should not heat when the truck drives	Wrench 19x22, box wrench 22x24
Electric Equipment		
Clean battery surface from dust and dirt, clean through vent holes in storage battery plugs Check electrolyte level in storage batteries; add distilled water, if need be	Battery surface should be clean, holes in plugs unclogged Electrolyte level should be 10 - 15 mm above the protective shield	Wiping material, dia. 2 mm wire 17x19, vessel with distilled water, glass tube dia. 3 - 5 mm, densimeter

*1 When making the first M - 1, later on when making M - 2.

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Check wire shoes and battery leads connections for tightness and security	Wire shoes should be connected reliably	Wrenches 14x17, 17x19
Lubrication		
Lubricate in accordance with the Lubrication Chart: - front spring pins; - bushings of the towing unit (when operating the truck with trailer) Check and, if need be, top up oil to normal in steering knuckle housings of front driving axle	Pack until fresh grease appears out of joints between the spring pin and eye Pack until fresh grease appears Fill oil up to the inspection hole edge. No oil leakage through plugs is permissible	Grease lever - plunger gun or solid oil pump, wiping material Grease lever - plunger gun, wiping material Wrench 27x30, model 133M oil dispenser tank, wiping material
Every Second M - 1		
Maintain the power unit in accordance with the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines		
Maintenance No.2 (M - 2)		
Carry out the works specified for M - 1 and the works as follows:		
Engine		
Maintain the power unit in accordance with the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines Check fastening of the radiator Check fastening of the air filter and hose connections of air intake system Inspect and, if need be, tighten up the fasteners of the inlet pipe muffler Drain sediment from the fuel tank	Fastenings should be tight Ditto Fastenings should be tight Fuel leakage through drain hole plug is not permissible	Wrench 17x19, pliers Screwdriver, wrench 10x12 Wrenches 14x17, 17x19 Wrenches 14x17, 17x19, vessel, wiping material
Transmission		
Check and adjust, if required, the clutch pedal free stroke (see Section "Clutch Release Control")	Clutch pedal full stroke must be within 50 - 60mm with no pressure available in the truck air system	Wrenches 14x17, 17x19, pliers, rule

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Inspect and, if need be, tighten up the fasteners of cardan shaft flanges and fixing of the centre support to the beam Check clearances in the cardan shaft spiders Inspect and, if need be, tighten up the nuts fixing: - arm, upper and lower caps of the steering knuckles and ball support flanges Inspect and, if need be, tighten up the fastening of driving axle final drives	Fastenings should be tight When rocking the cardan shaft tube in radial plane and about axis no plays should be sensed. Fastenings should be tight Ditto	Wrenches 14x17, 17x19, 19x22, box wrench 17x19 Box wrench 24x27 Wrench 22x24, box wrench 22x24, pliers, screwdriver
Running Gear		
Inspect and, if need be, tighten up the nuts fixing: - front spring eyes; - front spring U-bolts; - rear spring U-bolts; - torque rod pins Inspect and, if need be, tighten up the bolts fastening: - walking - beam axle assy to walking - beam brackets; - walking - beam brackets to the truck frame cross - member;	Fastening should be tight Fastening should be tight. When tightening up, the truck must be fully loaded Ditto Fastenings should be tight Fastening should be tight Ditto	Socket wrench 30x32, tire iron with tommy bar, pliers, screwdriver, driftpin, hammer Socket wrench 30x32 for spring U-bolt nuts, tire iron with hydraulic jack tommy bar Socket wrench 27x38 for spring U-bolt nuts, tire iron with hydraulic jack tommy bar Wrench 50 insert, tire iron with hydraulic jack tommy bar, pliers, screwdriver, driftpin, hammer Socket wrench 30x32 for spring U-bolt nuts, tire iron with hydraulic jack tommy bar Wrench 17x19

Description	Technical requirements	Instruments, tools, fixtures and materials needed
- brackets of upper torque rods; - clamp of front spring rear brackets; - front brackets of front springs to lower flange of frame side - member; - rear brackets of front springs to boosters of frame side - member; - fifth wheel to sub - frame and frame (for bolster trucks) Inspect condition of tires, wheels, also their fastening	Fastening should be tight Ditto Ditto Ditto Ditto See Section "Wheels and Tires". Fastening should be tight	Socket wrench 24, tommy bar Wrenches 17x19, 22x24, hammer chisel Wrench 22x24 Wrench 22x24 (24x27), socket wrench 24, tommy bar Box wrenches 24x27, wrenches 17x19, 22x24, box wrench Wrenches 11x13, 17x19, socket wrench 27x38 for wheel nuts, hydraulic jack, tire iron with hydraulic jack tommy bar, ГАПО dolly for dismantling wheels
Steering		
Check and, if need be, tighten up the nuts fixing: - steering gear case; - cardan forks of steering gear shaft - pins of link rods; - booster Check and, if need be, adjust: - free wheeling; - front wheel toe - in Check and, if need be, adjust the tightening of steering booster pump belt Dismantle and wash the filter of steering pump	Fastening should be tight Ditto Ditto Ditto See Section "Steering. Testing for Free Wheeling" See Section "Steering. Adjusting the Front Wheel Toe - In" See Section "Steering. Steering Booster Pump." Oil leaks through filter gasket are not allowable	Wrenches 19x22, 22x24, box wrench 24x27 Wrenches 14x17, 17x19 Box wrench 24x27, pliers Box wrench 24x27, socket wrench 36, pliers, screwdriver, hammer, tire iron with hydraulic jack tommy bar Play meter Wrench 17x19, gas wrench, rule L = 2,000mm Wrench 10x12, ruler Wrench for bleeding hydraulic brakes, screw - driver, vessel for oil, vessel for washing the units, wiping material

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Check fastening of the storage battery box brackets to the truck frame Check charging degree of storage batteries. Proceed as specified in Section "Electric Equipment" (at least once in three months) Check and, if need be, adjust the headlamps (see Section "Lighting and Signalling System") Check fixing of the starter to the engine Check wires for fixing and insulation Check fixing and cleanness of wire shoes on starter terminals	Electric Equipment Fastenings should be tight If the storage battery is discharged by 50% in summer, or by 25% in winter, recharge it fully at the charging station Adjust the headlamps on unloaded truck placed on even horizontal ground Fastenings should be tight Loose fixing and damaged insulation are not allowed Loose fixing and soiling of connections are not allowed	Wrenches 17x19, 22x24 Wrenches 11x13, 14x17, 17x19, densimeter, vessel with distilled water, dia. 3 - 5 mm glass tube, wiping material Screwdriver, screen with special marks Wrench 22x24 Pliers, screwdriver, knife, insulating tape Wrenches 10x12, 17x19
Inspect and, if need be, tighten up the fasteners of cab, bed, hood and fenders	Cab, Platform Bed Fastenings should be tight	Wrenches 10x12, 11x13, 17x19, 22x24
Check fastening of the power take-off	Special Equipment Fastenings should be tight	Wrench 14x17, wiping material
Check and, if need be, replenish oil to the normal level in: - transfer box housing - intermediate support of cardan shaft; - final drives of driving axles; - hubs of rear walking - beam suspension; - steering gear case Lubricate the power unit in conformity with the Lubrication Chart in the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines	Lubrication The oil level should be as high as the inspection hole edge. No oil leakage through plugs is permissible Ditto Ditto Ditto Ditto	Wrenches 17x19, 22x24, 27x30, model 133M oil dispenser tank, wiping material Ditto Wrench 27x30, model 133M oil dispenser tank, wiping material Wrench 17x19, model 133M oil dispenser tank, wiping material Wrench 17x19

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Lubricate in accordance with the Lubrication Chart: - upper bearings of steering knuckle pins; - splined joint of steering cardan shaft - water pump bearings - splined joints of intermediate cardan shaft and intermediate axle drive one; - torque rod hinges	Pack lubricant via lubricator in volume specified in the Lubrication Chart Disassemble and lubricate the splined joint Pack through lubricator until fresh grease is squeezed out Ditto Pack grease until fresh grease is squeezed out. Should the packing ring be deformed considerable, It is not necessarily that fresh grease squeezes out	Lever-plunger gun, wiping material Wiping material Lever-plunger gun, wiping material Ditto
Every second M-2 carry out additionally the following works Engine Maintain the power unit in accordance with the Operation Manual for the YAMZ-236M2, YAMZ-238M2 engines		
Check and adjust, if need be, the rear support of power unit (see section «Power Unit Mounting»)	Fastenings should be tight	Wrenches 17x19, 22x24
Check and adjust, if need be, tapered bearings of transfer box primary and intermediate shafts (see section "Transfer Box")	Transmission Primary and intermediate shafts axial displacement — 0,03-0,08 mm	Wrenches 8x10, 12x13, 14x17, 17x19, 22x24, box wrenches 27x38 и 41x46, combination pliers, screw-driver, tire iron, beam crane, pointer indicator, indicator fixture, driftpin, flange puller 375Э-3918050, cleaning cloth
Inspect the frame condition When operating the truck with trailer, check and eliminate, if need be, axial play of the towing hook (see Section "Running Gear. Truck Frame")	Running Gear Loosening of riveted connections, cracks in frame side-members and cross-members are not allowed Axial play of the towing hook should not exceed 0.5 mm	Visually, portable lamp Socket wrench 55, wrench for bleeding hydraulic brakes, tire iron with hydraulic jack tommy bar

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Check and tighten up, if need be, fasteners of the towing unit to the cross-member Check the walking beam for axial displacement and adjust, if need be (see Sub - section "Running Gear. Truck Suspension")	Fastenings should be tight Axial displacement is not allowable	Wrenches 17x19, 22x24 Wrenches 10x12, 14x17, 17x19, driftpin, hammer
Check operation of the braking system fault alarm (see Section "Air-Over Hydraulic Control of Service Brake System") Check outlet pressure on both sections of the brake valve and functioning of the triple protection valve (see Section "Air-Over Hydraulic Control of Service Brake System") Check functioning of the single protection valve (see Section "Air-Over Hydraulic Control of Service Brake System") Check pressure on the coupling head of single-line control (black) (see Section "Air-Over Hydraulic Control of Service Brake System") Check pressure on the coupling feeding head of single-line control (blue) (see section "Air-Over Hydraulic Control of Service Brake System") Check brake pedal for free stroke, adjust, if need be (see Section "Air-Over Hydraulic Control of Service Brake System") Check operation of the braking force regulator (see Section "Air-Over Hydraulic Control of Service Brake System")	Braking System Alarm should be in good working order Air pressure indicated by test gauges must be equal to that in the system (as indicated by two-pointer pressure gauge) Air should flow to air bottle of trailer brakes as the pressure in the other bottles rises to 550 kPa (5.5 kgf/cm²) The test pressure gauge should indicate 480 - 530 kPa (4.8 - 5.3 kgf/cm²). When applying service or parking brake, the test gauge should indicate 0 The test pressure gauge should indicate 0. When applying service or parking brake, the test gauge should indicate pressure available in system Pedal free stroke should be within 20 - 30mm Pressure indication on test pressure gauges should correspond to amounts indicated in the table of the braking force regulator	Box wrench 17x19, pliers, screwdriver, pilot lamp on the dashboard Wrench 11x13, test pressure gauges Wrench 17x19, test pressure gauges Test pressure gauge Ditto Wrenches 17x19, 22x24, screwdriver, pliers Wrench 17x19, test pressure gauge

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Lubricate the power unit in conformity with Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines Lubricate the adjusting lever shaft of parking brake (see the Lubrication Chart) Remove service brake shoes, clean and lubricate axles and bushings of brake shoes (see the Lubrication Chart) Dismantle wheel hubs, remove aged lubricant and pack the fresh one. Wash, lubricate and adjust hub bearings when reassembling (see Section "Driving Axles" and the Lubrication Chart) Disassemble and lubricate splined joints of front and rear axle drive cardan shafts (see the Lubrication Chart) Lubricate the hinges of steering rods and the booster (see the Lubrication Chart) Change lubricant in: - steering knuckle housings of front driving axle (see the Lubrication Chart); - wheel cylinders of service brake (remove and disassemble them)	Lubrication When turning the parking brake adjusting lever, the shoes should go apart without seizure, and return back under the action of springs The service brake shoes should rotate freely about their axle Apply grease onto the bearing rollers and cage evenly over the entire outer surface. Bearings being adjusted correctly, after a short run the hub should be cold, or slightly heated Apply lubricant in thin layer over the entire surface of the splines. When reassembling, see that the arrows stamped on the tube shaft and sliding fork lie one opposite the other Gun grease until rod end protective coupling starts to expand. The hinges should be tight Fill lubricant up to the inspection hole edge Wash the parts in alcohol, or braking fluid	Drop oiler Screwdriver, hammer, pliers, tire iron, wiping material Socket wrench 140, iron with hydraulic jack tommy bar, screwdriver, jack, ГАПО dolly for dismantling wheels, vessel for lubricant, wiping material, wrenches 10x12, 17x19, half-axle puller Wrenches 17x19, 22x24, vessel for lubricant, wiping material Lever-plunger gun, wiping material Wrenches 10x12, 17x19, 24x27, socket wrench 140, iron with hydraulic jack tommy bar, screwdriver, hammer, ГАПО dolly for dismantling wheels assembled with hub and drum, vessel for used oil, wiping material Washing bath

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Wash and lubricate the parts; replace damaged and worn parts; - hubs of rear walking - beam suspension (see the Lubrication Chart); - in tire inflation collars (see Section "Tire Pressure Control System" and the Lubrication Chart)	Fill oil up to the edge of filler - and - inspection hole available in the cap. No oil leakage through the cap seal and plug is permissible Air inlet hole should be free of lubricant	Wrench for bleeding hydraulic brakes, wrench 17x19, vessel for used oil, model 133M oil dispenser tank, wiping material Wrenches 17x19, 22x24, wrench for bleeding hydraulic brakes, half - axle puller, wiping material
Every third M - 2 additionally carry out the following works Running Gear		
When operating the trailer, inspect the thread on the hook and nut of the towing unit. Should the thread be deformed, replace the hook and nut by the new ones	Deformed thread is not allowed	Wrench 22x24, box wrench 24x27, socket wrench 55, wrench for bleeding hydraulic brakes, tire iron
Lubrication		
Change lubricant:* - in transfer box case (see Section "Transmission. Transfer Box" and the Lubrication Chart); - in final drives of driving axles (see the Lubrication Chart); Lubricate the shaft of centre bracket shaft driving the clutch and brake valve	Fill oil up to the edge of inspection hole available in the housing rear wall. Oil leakage through plugs is not permissible Ditto Pack until fresh grease appears	Wrench 27x30, vessel for used oil, model 133M oil dispenser tank, wiping material Wrench 27x30, vessel for used oil, model 133M oil dispenser tank Grease lever - plunger gun, wiping material
Every fourth M - 2 additionally carry out the following works Brake System		
Remove and disassemble air boosters with master cylinders; wash the parts and lubricate them before reassembling. Replace collars, which have marks and flay marks (see the Lubrication Chart) Change braking fluid	Wash booster parts in kerosene while master cylinder parts in alcohol or brake fluid After bleeding add fluid into master cylinder tanks up to 15 - 20mm below the filler upper edge	Wrenches 10x12, 11x13, 14x17, 17x19, 27x30, hammer, pliers, screwdriver, bath, cloth, wrench for bleeding hydraulic brakes Wrench for bleeding hydraulic brakes, portable lamp, vessel, hose, wiping material

* When using substitute of TCII - 10TаII - 15B oil, change oil at every second M - 2.

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Lubricate the thread of the parking brake adjusting device (the see Lubrication Chart)	Remove the rubber stopper in brake shield, then lubricate	
Every sixth M - 2 additionally carry out the following works		
Adjust bearings of steering knuckle pins (see Section "Driving Axles") Adjust final drives of driving axles	Transmission Thickness of shims removed from under the lever and cover should be equal by 0.15 mm (0.05 + 0.1) mm For technical requirements and adjustment sequence refer to Section "Driving Axles"	Box wrench 24x27, stops for lower covers of steering knuckles, jack, tire iron Fixtures for removal and mounting of reduction gears, dynamometer, indicator, wrenches 12x13, 17x19, 22x24, 24x27, pliers, screwdriver, hammer, tire iron, puller for half-axle, wiping material
Lubrication		
Lubricate the power unit in conformity with Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines		
Seasonal Maintenance (SM) Engine		
Lubricate the power unit in conformity with the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines		
Check adjustable voltage on the truck Maintain the starter in accordance with the Operation Manual for the YAMZ - 236M2, YAMZ - 238M2 engines	Electric Equipment See Section " Voltage Regulator"	Voltmeter of accuracy class not lower than 1.0 with scale 0 - 30V, screw - driver
Lubrication		
In spring and autumn replace fuel and oil by the ones corresponding to the season Check oil level in the winch reduction gear and top it up, if need be (see the Lubrication Chart);	Oil and fuel leakage is not permissible Oil level should come to the inspection hole edge. No oil leakage through plugs is permissible	Wrench 24x27, model 133M oil dispenser tank, wiping material

Description	Technical requirements	Instruments, tools, fixtures and materials needed
Lubricate chain transmission of the winch rope winding guide	Lubricate the chain along its full length	Wiping material
Additionally once a year, in autumn		
Prepare the starting preheater for winter operation (see Section "Engine Starting Preheating System") Disassemble and lubricate the hinges of fuel feed control (see the Lubrication Chart) Lubricate terminal connections in accordance with the Lubrication Chart	Engine Coolant and fuel leakage is not allowed. Preheater operation with open flame at the outlet is not permissible Pack grease in the hinge body. The hinges being assembled, the ball pins should move freely, without seizure	Wrenches 10x12, 11x13, 14x17, 17x19, screwdriver, bath for washing the units, wiping material Wrenches 8x10, 11x13, pliers, screwdriver
Remove and disassemble the auxiliary power take-off, wash and lubricate the parts Disconnect and blow with pressed air pipes and hoses of the sealing system	Special Equipment Wash the parts in kerosene or diesel fuel. Lubricate them with transmission oil Clogging of pipes and hoses is not allowed.	Wrenches 12x13, 17x19, combination wrench 14x14, box wrench 17x19, socket wrench 27x38 for nuts Wrenches 12x13, 17x19, 22x24, combination wrench 14x14, socket wrench 10, compressor hose
Inspect painted surfaces and, if need be, touch them up. Weld detected cracks and touch them with paint	Frame, Cab, Hood and Fenders, Bed Rust, paint spalling, cracks are not allowed	Portable lamp
Disassemble air cylinders of auxiliary brake and clutch booster; lubricate pistons and inner surface of cylinders (see the Lubrication Chart) Lubricate the bearing of winch shaft (see the Lubrication Chart) Lubricate splined connections Of winch drive cardan shafts (see the Lubrication Chart)	Lubrication Apply a thin layer of lubricant over entire surface of cylinders and pistons Pack until fresh grease appears Lubricate through the grease cup until fresh grease appears	Wrench 17x19, combination wrench 14x14, screwdriver, driftpin, pliers Grease lever-plunger gun, wiping material Wrench 17x19, box wrench 22x24, wiping material

TRUCK LUBRICATION

General Provisions

The truck Lubrication Chart gives instructions about using of fuels and oils manufactured in Russia and of their foreign substitutes when operating the trucks under conditions of temperate climate. Detailed recommendations and methods for lubrication of particular units and parts are described in corresponding Sections of this Operation Manual, which is supplied with each truck.

Lubrication operations should be carried out when maintaining the truck in accordance with the schedule, also when repairing the respective unit

Range of basic fuels and oils as well as their substitutes for the power unit, also schedule of their change should be in conformity with recommendations of the Operation Manual for the YAMZ engines, which is supplied with each truck.

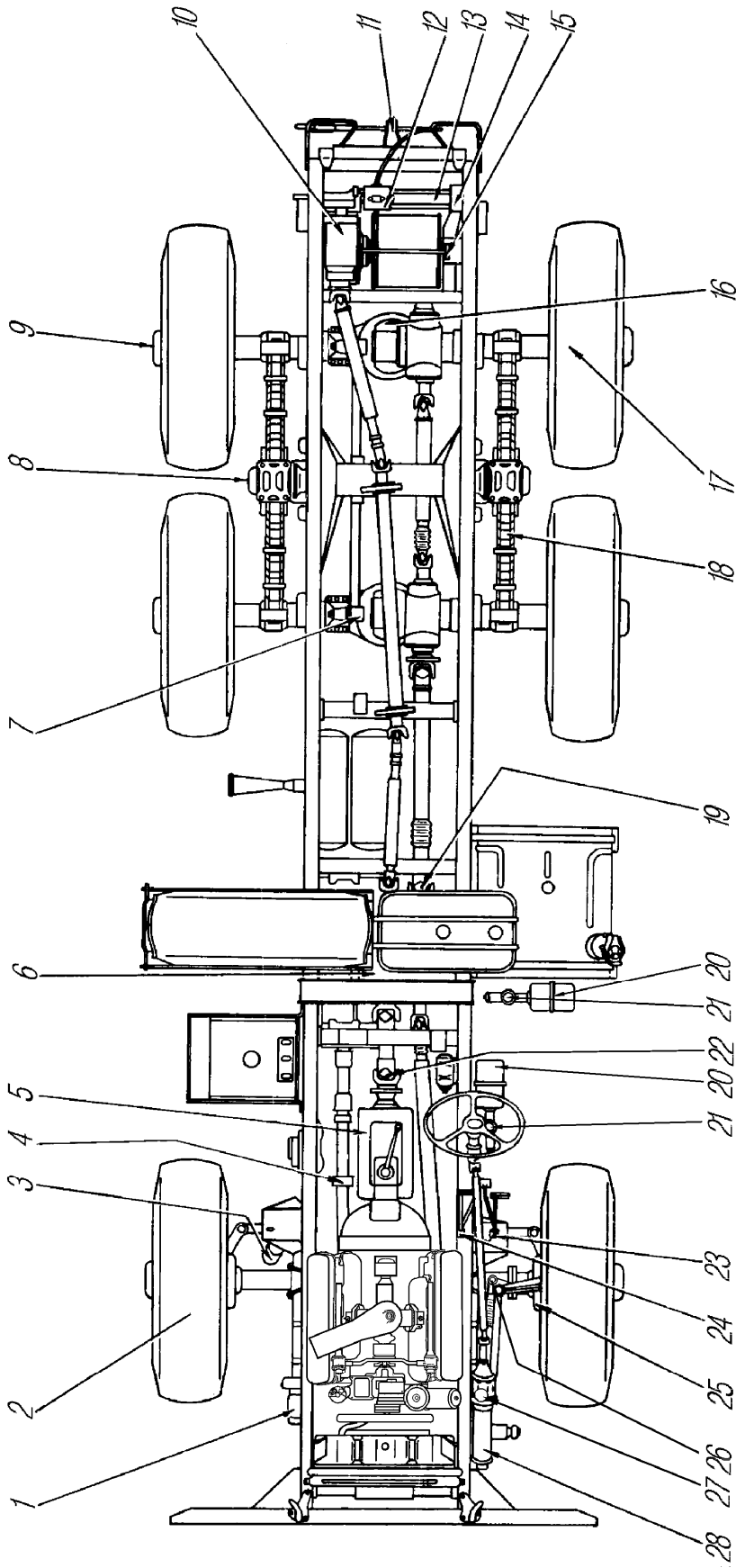
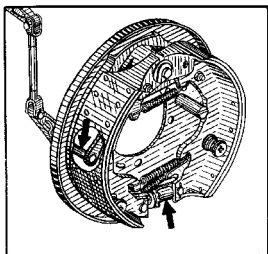
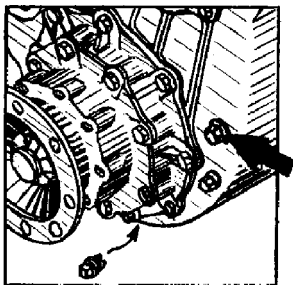


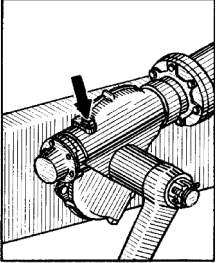
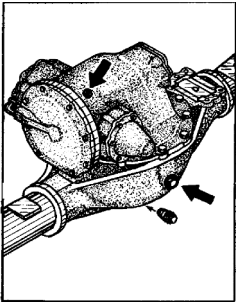
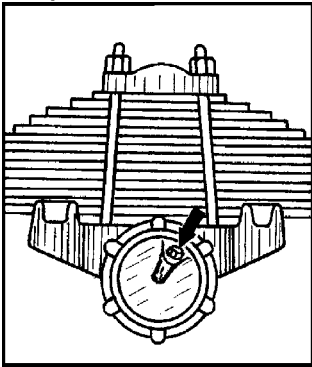
Fig. 119. Truck Lubrication Diagram

CHART OF LUBRICANTS AND

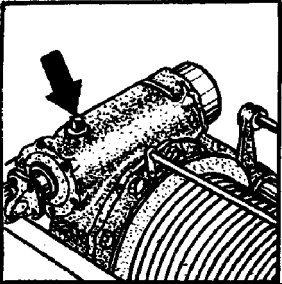
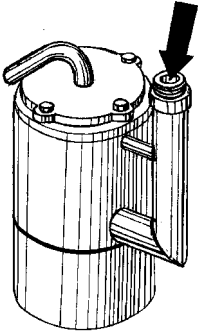
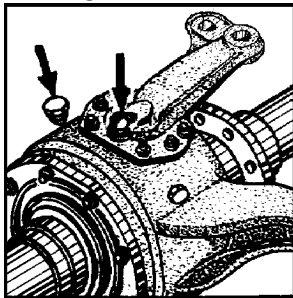
Item In Fig. 119	Designation of lubrication point	Quantity of points	Main grades, season application	Substitutes, season application
1	2	3	4	5
-	Engine fuel system	1	See Operation Manual for the YAMZ engine	
-	Engine crankcase: YAMZ - 236M2 YAMZ - 238M2	1		
-	Fuel injection advance coupling	1		
-	Parking brake adjusting lever shaft 	1	Oil used for engine	Oil used for engine
-	Parking brake adjusting mechanism thread	1		
-	Starter bearings	3	See Operation Manual for the YAMZ engine	
-	Starter drive	1		
5	Gearbox *2	1		
6	Transfer box *2 	1	Oil TCII - 15K (at temperature not below minus 30 °C)	Oil TCII - 10 (at temperature not below minus 45 °C) At a temperature below minus 30 °C it is allowed to dissolve oil TCII - 15K with 10 - 15 % of diesel arctic or winter grade fuel

WORKING FLUIDS

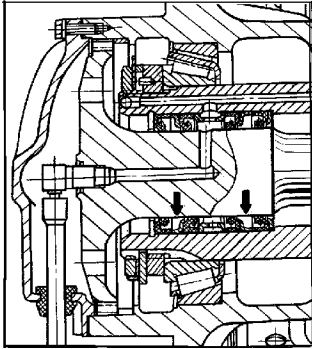
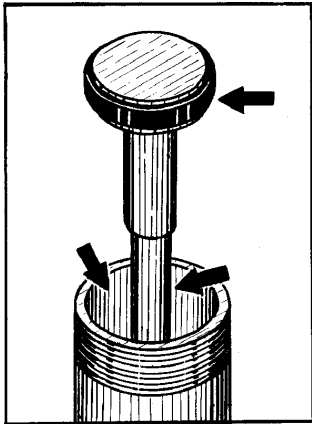
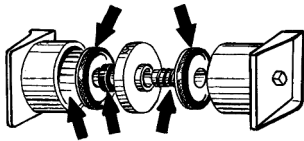
Foreign grades	POL qty		POL change interval (replenishment)		Hints for lubrication (filling or charge)
	Filling (l, kg)*1	Total per truck (l, kg)*1	Main grade	Substitute	
6	7	8	9	10	11
	See Section "Specifications"		See Operation Manual for the YAMZ engine		
	24.0	24.0			
	28.0	28.0			
	0.16	0.16			
Shell Rotella TX 30, Mobil Delvak 1230, BP Vanellus M30, Shell Rotella TX20W, Mobil Delvak 1220, BP Vanellus M20W	7 - 10 drops	7 - 10 drops	Every second M - 2		Clean the shaft between adjusting lever and mud guard, lubricate
	4 - 5 drops	4 - 5 drops	Every fourth M - 2		Remove rubber plug on brake shield, lubricate
Shell Spirax 90 EP, Mobilube GX 90, BP Gear oil EP SAE 90, Esso Gear oil GP 90	0.02	0.06	See Operation Manual for the YAMZ engine		
	0.04	0.04			
	5.50	5.50			
	3.50	3.50	After initial 1000 km		Change oil. Fill oil up to the filler hole edge
			M - 2		Check oil level and, if need be, add up to the filler hole edge
			Every third M - 2	Every second M - 2	Change oil

1	2	3	4	5
-	Cardan shaft intermediate support	1	Oil TC _{II} - 15K (at temperature not below minus 30 °C)	Oil TC _{II} - 10 (at temperature not below minus 45 °C) At a temperature below minus 30 °C it is allowed to dissolve oil TC _{II} - 15K with 10 - 15 % of diesel arctic or winter grade fuel
28	Steering gear case *2 	1		
-	Auxiliary power take - off	1		
16	Drive axle final drives: *2 - front	1		Oil TA _{II} - 15B (at temperature not below minus 25 °C) Oil TC _{II} - 10 (at temperature not below minus 45 °C) At a temperature below minus 25 °C it is allowed to dissolve oil TC _{II} - 15K, or TA _{II} - 15B with 10 - 15 % of diesel arctic, or winter grade fuel
	- intermediate, rear 	2		
8	Rear walking - beam suspension hubs *2 	2		

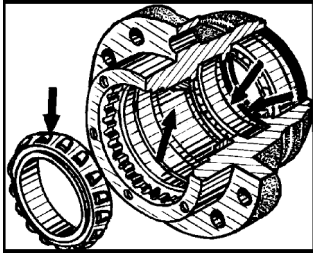
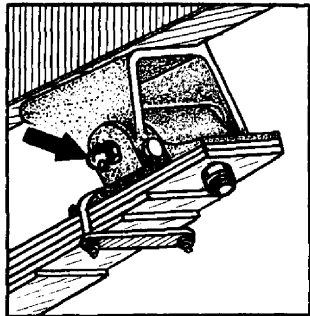
6	7	8	9	10	11
Shell Spirax 90 EP, Mobilube GX 90, BP Gear oil EP SAE 90, Esso Gear oil GP 90	0.15	0.15	M - 2		Check oil level and, if need be, add up to the filler hole edge
			Every third M - 2		Change oil
	1.48	1.48	After initial 1000 km		Change oil. Fill oil up to the filler hole edge
			M - 2		Check oil level and, if need be, add up to the filler hole edge
			In the course of disassembly		Change oil
	0.01	0.01	SM (once a year)		When overhauling lubricate working surfaces of parts
BP Gear oil EP SAE 90, Deusol Gear EP 90, Esso Gear oil GP 90 Mobilube GX 90 Shell Spirax 90 EP	5.0	5.0	After initial 1000 km		Change oil. Fill oil up to filler hole edge available in the axle case. If the final drive was demounted, first pour 1 l of oil through the breather hole on final drive casing, the remaining oil should be poured through filler hole up to its edge
	8.5	17.0			
			M - 2		Check oil level and add, if need be
			Every third M - 2	Every second M - 2	Change oil
	0.95	1.90	M - 2		Check oil level and, if need be, add up to the edge of filler hole
			Every second M - 2		Change oil, having first removed the walking - beam cap

1	2	3	4	5
10	Winch reduction gear 	1	Oil ТСГПП	Oils used for the engine
27	Steering control hydraulic system: - with mechanism "worm - side segment" - "screw - ball nut - rack - segment" 	1	Oil "P" Oil ВМГЗ (at temperature below minus 30 °C)	Spindle oil АУ, Oil МГЕ - 46В (at temperature not below minus 18 °C)
25	Steering knuckle housing of front driving axle 	2	Mixture of lubricant ЛИТОЛ - 24 with oils for reduction gears of drive axles (50 % each)	Mixture of cardan lubricant AM with oils for reduction gears of drive axles (50 % each)
22	Spiders (needle bearings) of cardan shafts of: - drive of front, intermediate and rear axles and in - intermediate shaft	8	Lubricant ЛИТОЛ - 24	Lubricant 158 (on plant only)
	- steering control	2		
	- winch drive	4		

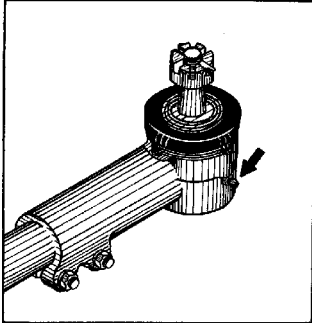
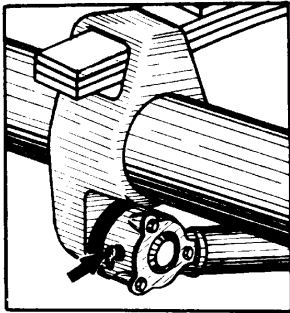
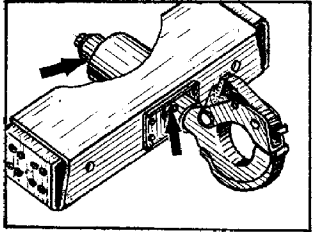
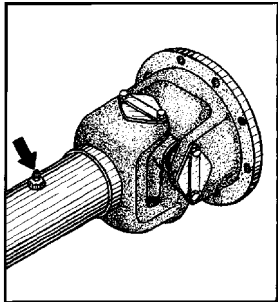
6	7	8	9	10	11
Deusol Gear EP 140, Mobilube GX 140, Gear oil GP 140, Gear oil 140 EP, Spirax EP 140	7.5	7.5	SM		Check oil level and add, if need be
			Every fourth SM, or once in two years		Change oil. Fill oil up to inspection hole edge available on reduction gear case cover
Shell Tellus 22, Mobil DTE - 13, BP Energol HLP 22	5.5	5.5	After initial 1000 km M - 1	After initial 1000 km M - 1	Check oil level and add, if need be. The oil level should be between upper and lower marks available on the dipstick, with the plug being un - screwed. Oil "P" should be changed in the course of repair Change oil
	6.5	6.5		Every third M - 2, but at least once a year	
-	5.4	10.8	M - 1		Check lubricant level in unit and add lubricant, if need be. Fill lubricant up to the filler hole edge
			Every second M - 2		Change lubricant
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.036	0.290			Change lubricant in the course of dis - assembly
	0.006	0.012			
	0.024	0.096			

1	2	3	4	5
2	Tire inflation collars *3 	6	Lubricant Лита	Lubricant ЦИАТИМ - 201
4	Air cylinders of auxiliary brake system and clutch control 	4		
20	Air boosters of service brakes (rods, spacer collars, cylinders and piston collars) 	2		
-	Bearings of compressor tensioner pulley	1	See Operation Manual for the YAMZ engine	

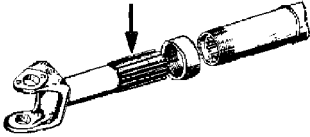
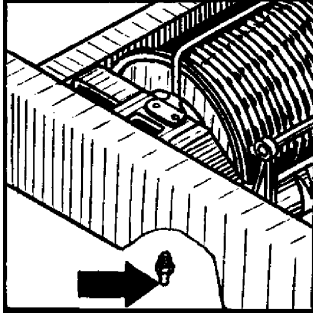
6	7	8	9	10	11
Mobilgrease BRB Zero Aeroshel Grease 6, Beacon 325	0.05	0.30	Every second M - 2		Lubricate working surfaces of collars. Pack grease in spaces between the first and second, and between the third and forth collars. Lubricate with a thin layer the working surface of half - axle
	0.007	0.028	SM (once a year)		Change lubricant. Lubricate piston collar, rod, working surface of cylinder
	0.03	0.06	Every fourth M - 2		Change lubricant. Lubricate piston collar, working surface of cylinders, rod and spacer gland
	0.02	0.02	See Operation Manual for the YAMZ engine		

1	2	3	4	5
9	Wheel hubs 	6	Lubricant Литол - 24	Lubricant Литол
-	Splines of starter drive shaft	1	See Operation Manual for the YAMZ engine	
-	Water pump bearing	1		
-	Front bearing of gearbox primary shaft	1		
-	"Ground" switch terminals and plugs	4	Lubricant Литол - 24	Solidol oil Ж, solidol oil С
-	Clutch release sleeve	1	See Operation Manual for the YAMZ engine	
-	Bearings of clutch release fork shaft	2		
1	Front spring pins 	2	Lubricant Литол - 24	Solidol oil Ж and cup grease Ж, Solidol oil С and cup grease С

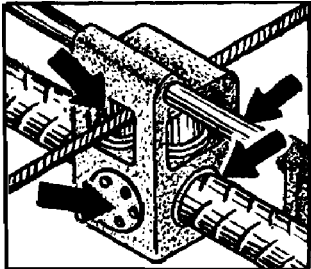
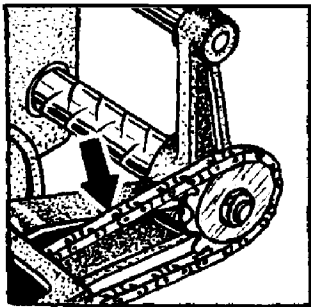
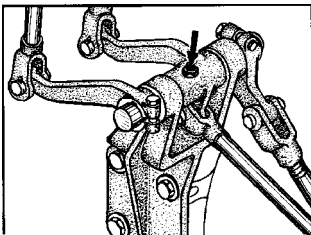
6	7	8	9	10	11
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.85	5.10	Every second M - 2		Change lubricant. Lubricate working surface of collar and pack grease into space between bearing and collar having first removed aged lubricant. Wash outer bearing. Lubricate bearing until complete filling of the space between rollers, pack grease into the hub between bearings
	0.016	0.016	See Operation Manual for the YAMZ engine		
	0.045	0.045			
	0.025	0.025			
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.0005	0.002	SM (once a year, in autumn)		Lubricate with a thin layer the plugs before connection, while the terminals after connection, having first cleaned them
	0.04	0.04	See Operation Manual for the YAMZ engine		
	0.005	0.01			
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.075	0.15	M - 1		Lubricate through grease cup until fresh grease oozes from gap between pin and eye of the spring

1	2	3	4	5
26	Joints of booster and steering rods 	6	Lubricant Литол - 24	Solidol oil Ж and cup grease Ж, Solidol oil C and cup grease C
7	Torque rod joints 	12		
-	Joints of fuel feed control	6		
11	Towing unit bushes 	2		
-	Knuckle pin upper bearings	2		
19	Splined connections of cardan shafts: - intermediate axle and intermediate shaft drive 	2		

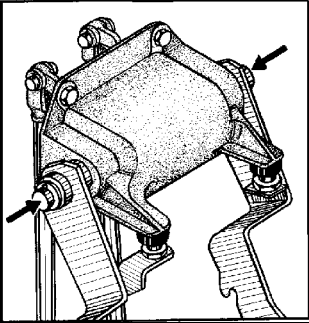
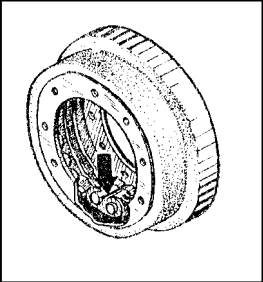
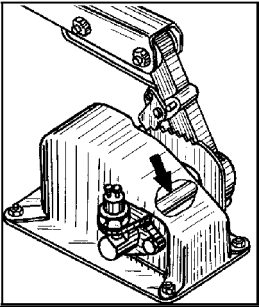
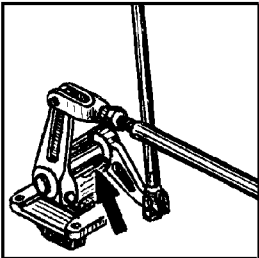
6	7	8	9	10	11
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.037	0.22	Every second M - 2		Lubricate through grease cup. Pump lubricant before beginning of deformation of protective coupling of end pieces
	0.06	0.72	M - 2		Lubricate trough grease cups until fresh lubricant appears from gap between head and packing ring, or before beginning of deformation of packing ring
	0.0033	0.020	SM (once a year)		Lubricate working surfaces when disassembling
	0.025	0.05	M - 1		Lubricate trough grease cups until fresh lubricant appears (when operating with trailer)
	0.100	0.20	M - 2		Lubricate trough grease cup
	0.020	0.04	M - 2		Lubricate trough grease cups until fresh grease oozes

1	2	3	4	5
19	- rear and front axles drive 	2	Lubricant Литол - 24	Solidol oil Ж and cup grease Ж, Solidol oil C and cup grease C
	- steering control	1		
	- winch drive	2		
-	Spare wheel lift re - duction gear	1		
15	Plain bearing of winch drum shaft 	1		
14	Rope winding guide bearings 	2		
-	Friction surfaces between "fifth wheel" bracket and cushion *4	1		Solidol oil Ж, solidol oil C or lubricant Литол
-	Knuckle and slot of the "fifth wheel" *4	1		
-	Front and rear clamps, pivot pin of rear clamp	3		

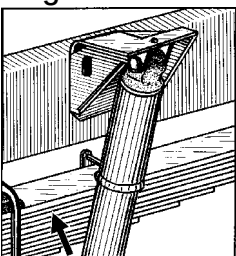
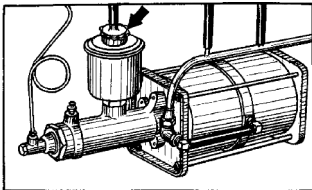
6	7	8	9	10	11
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2	0.180	0.36	Every second M - 2		Change lubricant
	0.010	0.010	M - 2		Disassemble and lubricate
	0.02	0.04	SM (once a year)		Lubricate through grease cups until fresh grease oozes
	0.05	0.05	-		Lubricate in the course of disas - ssembly
	0.1	0.1	SM (once a year)		Lubricate trough grease cups until fresh grease oozes
	0.035	0.07	-	-	Lubricate in the course of disas - ssembly
	0.1	0.1			Lubricate in the course of disas - ssembly
	0.03	0.03			
	0.015	0.045			

1	2	3	4	5
13	Working surfaces of winch winding guide lead screw 	1	Graphite grease УССА	Solidol oil Ж, solidol oil С or lubricant ЛИТОЛ - 24
12	Roller bushes and holder body cavities of winch rope - guide rollers	3		
14	Chain transmission of winch rope winding guide 	1		
23	Center bracket shaft of brake valve control and clutch control 	1		

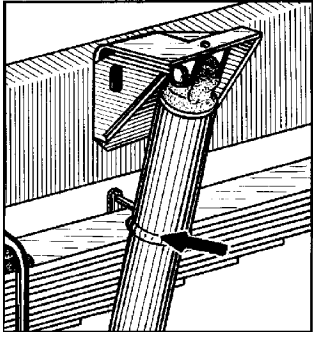
6	7	8	9	10	11
Shell Barbatia 2, Mobilgrease Graphited No. 3, Castrol Spheerol LG2	0.30	0.30	-	-	Lubricate after each winch operation. If winch was not used, lubricate once a year in the course of SM
	0.033	0.1	-	-	Lubricate when disassembling
	0.1	0.1	-	-	Lubricate when disassembling
	0.03	0.03	Every third M - 2		Lubricate trough grease cups until fresh grease oozes

1	2	3	4	5
24	Clutch and brake pedal shaft 	1	Graphite grease УСсА	Solidol oil Ж, solidol oil С or lubricant Литол - 24
17	Service brake shoe pins 	12		
-	Parking brake control two - arm lever pin on transfer box	1		
-	Rod pins, brake shoes supports and lever joints of parking brake	4		
-	Pin of parking brake control lever in cab 	2		
-	Pins of parking brake control intermediate levers on cross - piece 	2		

6	7	8	9	10	11
Shell Barbatia 2, Mobilgrease Graphited No.3, Castrol Spheerol LG2	0.015	0.015	-	-	Lubricate when disassembling bushes and shafts
	0.005	0.060	Every second M - 2		Lubricate shoe bushes and pins
	0.005	0.005	-	-	Lubricate when disassembling, having first cleaned them
	0.005	0.020			
	0.0075	0.015	-	-	Lubricate when disassembling bushes and pins
	0.0075	0.015	-	-	

1	2	3	4	5
18	Spring leaves 	4	Graphite grease УСсА	Solidol oil Ж, solidol oil С or lubricant Литол - 24
-	U - bolts thread of front and rear springs	16		
-	Terminals of: - service brake failure sender	2	Lubricant ВНИИ НП - 510 (at manufacturing factory only)	Lubricant Литол - 24
	- indicator pickup of minimum operating pressure in pneumatic system	3		
-	- brake signal switch	2		
-	Terminals and fastening studs: - rear lamps	6		
	- number plate lamp	3		
21	Hydraulic system of brakes 	2	Brake fluid «ТОМЬ» At a temperature below minus 40 °C dissolve brake fluid with 18 - 20 % of ethyl alcohol (by weight) *5	Brake fluid «Нева», ГТЖ - 22М, or «Роса» At a temperature below minus 40 °C dissolve brake fluid with 18 - 20 % of ethyl alcohol (by weight) *5
-	Service brakes master cylinders	2	Brake fluid «ТОМЬ»	Brake fluid «Нева», ГТЖ - 22М, or «Роса»

6	7	8	9	10	11
Shell Barbatia 2, Mobilgrease Graphited No.3, Castrol Spheerol LG2	0.325	1.300	-	-	Lubricate after dis - assembly concave surface of spring leaves, having first removed the rust
	0.004	0.064			Lubricate during disassembly having first removed rust and mud
Retinax A, Alvania R3, Alvania RA, Mobilux 3, Beacon 3, Energrease L2		0.008		SM (once a year)	Lubricate with a thin layer after connection of ter - minals, having first cleaned them
					Lubricate with a thin layer prior to connection of plugs, having first cleaned them
					Lubricate with thin layer prior to connection of ter - minals, having first cleaned them
					Lubricate with a thin layer the plugs of rear lamp, number plate lamp prior to connec - tion, fastening studs together with nuts after their fixing, having first cleaned them
Shell Donax B, Mobil Hydraulic Brake Fluid, Gastrol Girling Pentosin Super Fluid I 1703 - R	0.850	1.700	DM		Check fluid level and, if need be, add in tanks 15 - 20 mm below upper edge of filler neck
			Every fourth M - 2, but at least once every two years		Change fluid
	0.150	0.30	Every fourth M - 2		Wash working surfaces of parts of wheel and master cylinders with brake fluid

1	2	3	4	5
-	Service brakes wheel cylinders	6	Brake fluid «ТОМЬ»	Brake fluid «Нева», ГТЖ - 22М, or «Роса»
			Grease ΔТ - 1 (at manufacturing factory only)	Brake fluid «Нева», ГТЖ - 22М, «ТОМЬ» or «Роса»
3	Telescopic shock absorbers 	2	Shock - absorber fluid АЖ - 12Т	Spindle oil АУ
-	Cooling system with preheater: YAMZ - 236М2	1	See Operation Manual for the YAMZ engine	
	YAMZ - 238М2			

*1 In columns 7, 8 the oils and working fluids are given in liters, plastic greases in kilograms.

*2 Column 7 gives rated values of oils and working fluids to be filled in, therefore, after priming it is a good practice to check the level of oil/fluid and, if need be, to bring the level to the norm, as required in Section "Maintenance".

*3 Applicable to the Ural - 4320 - 10, Ural - 4320 - 31, Ural - 4420 - 10, Ural - 4420 - 31 trucks.

*4 Applicable to the Ural - 4420 - 10, Ural - 4420 - 31, Ural - 44202 - 0311 - 31, Ural - 44202 - 0612 - 30 trucks.

*5 Replace diluted brake fluid by fresh (undiluted) fluid when performing spring SM.

6	7	8	9	10	11
	0,05	0,30	Every second M - 2		Wash working surfaces of wheel and master cylinders parts with brake fluid
	0,02	0,12			Lubricate working surfaces of parts when reassembling
	0,850	1,700	-	-	Change fluid after disassembly, washed shock absorber parts in kerosene and dried them up
	31,0	31,0	See Operation Manual for YAMZ engine		Check coolant level and, if required, bring it up to normal: 15 - 25 mm above the end faces of radiator cooling pipes at temperatures above zero up to 40 °C
	36,5	36,5			

STORAGE

General instructions

A new truck, if it is not to be put into operation, can be stored without preservation, within three months from the date of its dispatch from the Manufacturer. In this case, upon the truck has been put into storage, apply a thin layer of ЛитоЛ - 24 lubricant or solid oil onto unpainted surfaces of the front axle ball supports, provide maintenance of the storage batteries and tires as per instructions given by their Operation Manuals.

If it is required to store the truck for the period, exceeding the said above, it should be preserved and protected in conformity with the requirements of this Chapter.

Store the truck in a clean, dry, ventilated and dim-out room or under a shed. When storing it in the open air, protect its tires, steering wheel, rubber and plastic parts from exposure to the direct sun rays, and cover the engine and its systems by water-proof packing paper or painted film, tarpaulin, etc. Keep the tires inflated.

Preparation for storage

Perform the daily maintenance and scheduled M - 1, M - 2 or SM (season) maintenance depending on a truck run and a season.

Fill in the housings of the transfer box, axle reduction gear units, steering with working - and - preservative oils or working oils up to the norm; fill in the winch housing with the working oil.

Make sure that the winch lever is in its disengaged position, then engage the auxiliary power take-off drive for 3 - 5 min with the engine running.

To preserve YAMZ - 236 (238) power unit it is required to follow the procedure described below:

- when using «ТОСОЛ» fluid, antifreeze or water instead of coolant, feed one of the anticorrosive agents into the cooling system as per Table 13 of this Operation Manual;
- pour the oil out of the engine and gearbox;
- fill in the engine oil sump and gearbox housing with the working - and - preservative oil;
- start the engine and let it run within 3 - 5 min at medium engine speed;
- seal the air intake and outlet pipes, the housing ventilation branch pipe, the water pump draining hole, the slit on the flywheel housing (where the pointer is available), the gearbox breather;
- pour the fuel out of the coarse-mesh and fine-mesh filters;
- disconnect the drain pipe from the fine-mesh filter and the feed pipe from the coarse-mesh filter;
- connect a special fuel intake and immerse it into the vessel with filtered preservative fuel mixture;
- pump through the fuel feed system with the hand fuel primer pump until the clean, preservative mixture free from air bubble goes out of the drain pipe on the fine-mesh filter;
- crank the engine crankshaft by two or three revolutions, in so doing the regulator lever should be set in the position that corresponds to the fuel feed;
- fill in each engine cylinder with 60 - 70 ml working - and - preservative oil that have a temperature of 70 - 100 °C. Pour the oil through the holes in the inlet manifolds, when the connecting manifold is removed;

- crank the engine crankshaft without feeding the fuel by two or three short-time engagements of the starter;
- remove the cylinder head covers and screw out by two revolutions the bolts fastening the pipes to nozzles of the third and fourth cylinders of YAMZ - 236M2 engine and to those of the fourth and fifth cylinders of YAMZ - 238M2 engines;
- pump in the preservative fuel mixture through the drain pipe (M10 tip) until it goes from under the screwed-out bolts without the air bubbles and after that screw in the bolts;
- remove the clutch housing hatch cover, insert the plug and put the hatch cover into its place;
- slack off tightening of the water pump, alternator, compressor belts and those of the steering hydraulic booster pump.

Close the wheel valves.

Drain water out of the windshield washer tank.

Switch off the storage batteries.

Clean, wash, dry and powder with talc the cab floor rubber carpets, roll them up and put onto the seats.

When storing the truck in the open air, remove the platform body canopy, windshield wiper brushes and rear-view, wide-angle and side-view mirrors, pack and store them in a closed room.

Dry the canopy prior to packing.

Cover the rubber parts by the protection compound as per Table 13 or wrap them up with a packing material.

Close the cab ventilation hatch tight, close the adjustable glasses, slewing door air vents and lift up the radiator blade.

Apply a thin layer of lubricant onto:

- the plug and socket units of the rear lights, the number plate light, connections of the bottle air pressure senders;
- terminal connections of the brake system failure senders and the STOP signal switches;
- the battery output terminals with the wire leads.

Lubricate the exterior unpainted surfaces of the front axle ball bearings, open surfaces of the transfer box rods and those of the auxiliary power take-off with a thin layer of ЛИТОЛ - 24 grease.

Apply the preservative grease onto open areas of threaded joints, the cab door exterior handles, the frames of the slewing air vents, the windshield washer nozzle heads, the head lamp mouldings, the chain drive, the lead screw, the guiding shafts, the winch rope winding guide rollers and rope, the "hook-nut" threaded pair of the towing unit, and lubricate the open areas of the rods with ЛИТОЛ - 24 grease or solid oil.

Lubricate the tire irons attached to the truck, interior surfaces of the socket wrench heads, holes for the tap wrench, the dipstick, the pullers with the preservative grease and pack the said items with the paraffined or other paper.

Lubricate the joints of the auxiliary brake, those of the tool box, the storage battery box, the platform body sides, the cab doors, the hood, the door and hood locks with the working- and - preservative (engine or transmission) oil.

Shut the holes, which connect the inner hollows with the atmosphere and are located on the brake valve, the pressure regulator, the trailer brakes control valve, the condensate draining cocks, the sealing pipes behind the cab, with the help of an adhesive tape.

If water has been used in the cooling system, drain it upon the truck has been put into storage.

Table 13

Preservative and Protective Materials

Designation of Material	Denomination and Composition
Engine preservation	M - 4 ₃ /8ГР _к working - and - preservation oil or M - 6 ₃ /10B oil mixture or M - 8Г2 _к or M - 10Г2 _к oil mixture as per GOST 8581 - 78 Standard with 10 % AKOP - 1 additive (by volume) as per GOST 15171 - 78 Standard
Fuel preservative mixture	Mixture of diesel fuel as per GOST 305 - 82 Standard with 2 % of AKOP - 1 additive (by volume)
Anti - corrosion additive for coolant	Mixture of the following components (162 g of each component): sodium nitrite as per GOST 19906 - 74 Standard, potassium bichromate as per GOST 4220 - 75 Standard and trisodium phosphate as per GOST 201 - 76 Standard, or 770 g of sodium tetraborate as per GOST 8429 - 77 Standard, 77 g of benzotrizole and 31 g of sodium nitrite
For preservation of driveline units and suspension walking beams	TM5 - 12РК working - and - preservative oil or mixture of ТСП - 15K transmission oil as per GOST 23652 - 79 Standard and 10 % of AKOP - 1 additive (by volume)
For preservation of exterior unpainted and painted surfaces and threaded areas	Canon grease as per GOST 19537 - 83 Standard
For preservation of plug - and - socket units and terminal connections of the electric equipment	BT13 - 1 processing petrolatum, ЛИТОЛ - 24 grease or solid oil
For touch - up painting of damaged metal surfaces	МЛ - 12 enamels as per GOST 9754 - 76 Standard: orange, sand, khaki; МЛ - 152 enamels as per GOST 18099 - 78 Standard: orange, sand, goldish yellow; МЧ - 145 enamel as per GOST 23760 - 79 Standard: orange; МЧ - 123 enamel, black; МС - 17 enamel black
To protect tires, hoses, drive belts and other rubber items from adverse effect of sunlight	Mixture of aluminum powder with light oil varnish or aluminum paste with white spirit in the ratio of 1:4 or 1:5 (by weight). Fine casein composition - mixture of chalk 75 % (by weight), casein glue 20 %, slaked lime 4.5 %, calcinated soda 0.25 %, phenol 0.25 %
Packing material for sealing and partial packing	Paraffined paper as per GOST 9569 - 79 Standard, capacitor paper as per GOST 1908 - 82 Standard, double - layer paraffined packing paper as per GOST 8828 - 75 Standard, packing bituminized and tar paper as per GOST 10354 - 82 Standard, rubberized fabric, etc.

Unload the wheels, by lifting them up to 80 - 100 mm above the ground, and the truck suspension, following the procedure described below:

- to unload the front axle wheels put the unloading supports, 620 mm high, under the ball support 18 flanges of the axle stubs (see Fig. 41);
- to unload the intermediate and rear axle wheels put the unloading supports, 560 mm high, under the supporting brackets of leaf springs 8 (see Fig. 47) and in so doing unload the intermediate axle wheels first;

- to unload the rear suspension put the unloading supports, 770 mm high, under the cylinder part of rear suspension axle 21 bracket;
- to unload the front suspension put the unloading supports, 220 mm high, between the leaf springs and the chassis frame side members.

In-storage maintenance of trucks

Check the tire pressure, condition of the protective coatings, check the truck for fuel and oil leaks and those of the special fluids every month. Eliminate the detected faults.

Regularly remove rust from painted and unpainted surfaces, restore paint - and - varnish coatings; upon removing the rust from the unpainted surfaces, coat them with preservative grease. Scrape the damaged paint - and - varnish coatings with fine-grained or water-proof sand paper; after that wipe the surface with a piece of cloth moistened in clear gasoline or solvent, dry and in summer coat it by two layers of enamel of the same colour with intervals of 5 - 10 min, in winter lubricate it with the preservative grease.

If units of the truck stored out - of - doors are filled with working oils, check the working order of all the units, components and systems once a month, by starting the truck engine at the storage site, running all the units (with the hung-out wheels) or by the truck running (see Subsection "Preparation for Storage"), with obligatory pressing the brake pedal 5 - 7 times, engaging the auxiliary power take-off for 3 - 5 min (without engaging the winch drum lever).

Upon finishing the work connected with the engine starting, slack off the drive belts again, seal the fuel feed and gas exhaust systems; let the air out of the bottles through the condensate drain cocks. Restore the grease on the surface of the ball supports.

When storing the trucks in unheated rooms or under a shed, perform the above - said check of the working order of the units, components and systems every quarter.

When storing the truck, the units of which are filled with the working - and - preservative oils, in the open air or under a shed, check the working order of its service brake and clutch, the gearbox, transfer box and parking brake drives once every six months by means of setting the corresponding levers in different positions. When seizing (blocking up) the drive tie rods, find out the reason and eliminate it.

Upon finishing the check, set all the levers in their neutral position. Check the working order of the fuel feed control and the radiator shutter drive. If necessary, check the truck serviceability by starting its engine and running its units as described above.

Prepare the working - and - preservative oils by mixing the working oils with AKOP - 1 compound thoroughly at a temperature of + 60 °C maximum. It is strictly prohibited to pour AKOP - 1 compound directly into housings of the truck units.

To include the anti-corrosion compounds to the engine cooling system, drain off 4 - 5 l of the coolant, solve one of variants of the above-said of the compound compositions in this volume and pour the concentrated solution in the cooling system, using a hopper with a mesh. Then start the engine and warm it up to a temperature of 80 - 90 °C.

To keep the engines and reserve the guarantee for them it is required to start the engines and warm them up to a temperature of 80 °C as often as once every three months; and this fact should be recorded in the Certificates of Engine Technical and Operational Data.

Taking trucks out of storage

Before resuming the truck operation after its storage:

- check the tire pressure and bring it to the norm;
- remove the truck from its supports and release its springs;
- unseal the fuel feed, gas exhaust and engine ventilation systems and the oil tank;
- remove the protecting grease from the truck exterior surfaces with the help of a piece of soft cloth moistened in kerosene or clear gasoline;
- tighten up and adjust tightening of the compressor, alternator and water pump drive belts according to the Operation manuals for YAMZ - 236M2, YAMZ - 238M2 engines;
- check oil level in the truck driveline units, the steering booster pump tank, hubs of rear suspension walking beams and that in the oil tank and bring it to the norm, if required;
- perform examination and maintenance of the truck as per requirements to its daily maintenance;
- if some of the working - and - preservation or working oils or fluids, which are filled in the truck units and systems, do not suit the season of their operation, or their expiration date has been reached, refill them with new ones;
- prior to starting the engine pump through the fuel feed system with the help of the fuel primer pump;
- remove the bottom cover of the clutch housing hatch, remove the plug and put the hatch cover into its place.

TRANSPORTATION

The trucks can be transported by rail, sea and air. In so doing the preparatory work should be done as follows:

1. Prior to shipment check the tire pressure and, if necessary, bring it to the norm and close the wheel valves. The tire pressure of the trucks without the tire pressure control system should be of the rated value.
2. Upon placing the truck on a transport means:
 - brake the truck with its parking brake;
 - engage the first gear in the gearbox and lower gear in the transfer box;
 - cut off the fuel feed (pulling the engine stop handle as far as it will go);
 - switch off the storage batteries.
3. The truck handling should be performed with the help of a special mooring device (Fig. 120) or by its own power.

If the cooling system is filled with water, the decision whether to drain it or not is taken reasoning from particular conditions of the truck transportation.

When transporting the trucks by rail, the truck should be mounted and fixed on an open rolling stock as per regulations established by the "Technical Specifications of Cargoes Loading and Fixing", the RF Ministry of Communications, ("Transport" Publishers, Moscow, 1990).

The truck mounted on the railway flat car should be fixed for its rear towing device with the help of two bracing cables and for the front towing hooks – with two bracing cables; and thrust bars, 100x160x760 mm, are to be put under the front wheels at the front and under the rear wheels at the rear.

The truck placed above the coupling of the flat cars (Fig. 121) should be fixed for its rear towing device with the help of two bracing cables and for the support

brackets of the front axle leaf springs with the help of two bracing cables. Thrust bars should be fastened under the intermediate axle wheels at the front and under the rear axle wheels at the rear. The front wheels of the truck should be fixed by lateral thrust bars on the outer side of the wheels.

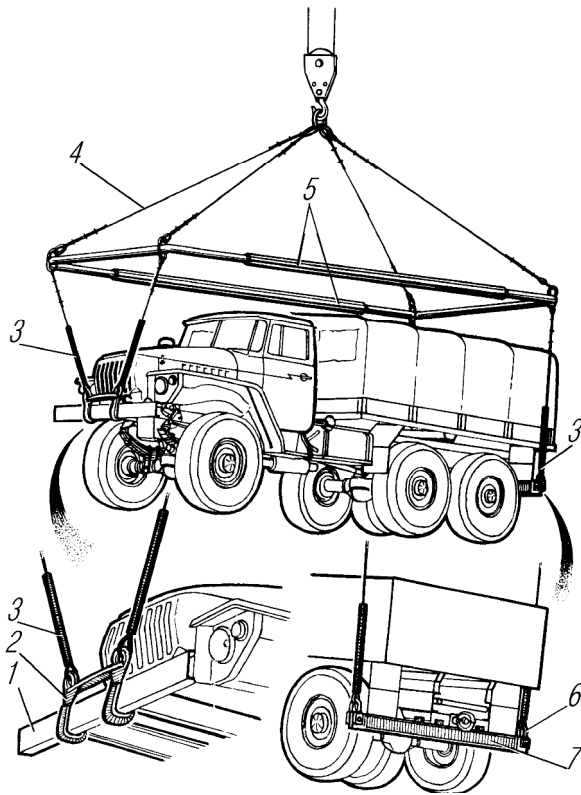


Fig. 120. Truck Slings

Diagram:

1 – truck front bumper; 2 – bumper catch; 3 – rubber protective hoses; 4 – rope; 5 – frame; 6 – clamp; 7 – rear beam

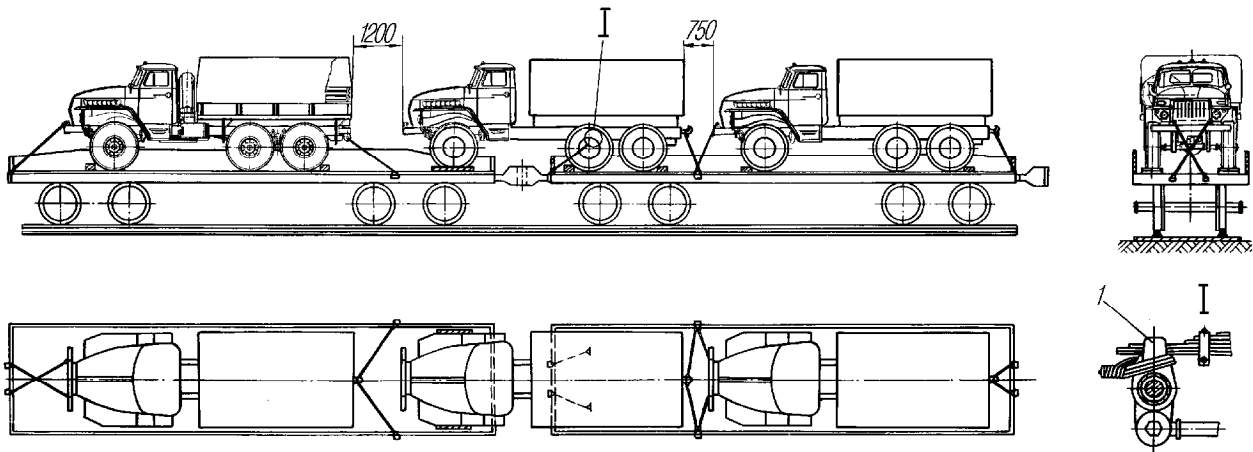


Fig. 121. Diagram of Loading and Fastening of Three Trucks on Two Four - Axle Railway Flat Cars:
1 - spring support bracket

The number of the wires in the bracing cable, their diameter as well as the number of the nails required to fasten the thrust bars should be chosen in conformity with the "Technical Specifications of Cargoes Loading and Fixing", the RF Ministry of Communications, taking into account the weight of the truck to be transported (loaded or unloaded).

In each particular case the transportation conditions should be agreed upon with the railway station of departure. To make the truck suit to the railway overall sizes 02 - BM, GOST 9238 - 83 Standard, remove the canopy and arches from the truck platform body.

When transporting the trucks by air, preparatory work should be done and truck cushioning should be additionally disengaged by special devices manufactured and supplied by a consignor. The design of the devices, which disengage the cushioning, should prevent their falling out, when vibrations occur, and the selected material should prevent creasing as it can result in slackening of the truck fixing.

The truck fuel tanks should be half-filled. Place and fasten the truck as per special diagrams.

When transporting the trucks by water transport, load the truck without any cargo in its body.

Method of loading, placing and fastening of the truck with special equipment mounted on its chassis are described in operation manuals for the equipment.

The trucks are transported in marine vessels in all the rooms intended for cargo (holds, twin decks), the trucks are transported on the top deck upon consent of the owner of the cargo (sender).

Place the trucks in the hold and on the deck, so that the distance between them is not less than 250 mm on the radiator side and not less than 130 mm on the other sides.

Upon placing the truck on the vessel, perform the preparatory work, fasten the truck to prevent its longitudinal and lateral motion with special mooring devices available with the vessel or with bracing cables. Tighten the bracing cables by twisting their wires by crow bars until the secure fixing of the truck has been provided. Slackening of the bracing cables or their separate wires is not permissible.

Fasten the bracing cables to the front towing hooks, and to rear towing unit. The fastening variants are shown in Fig. 122, 123.

On the bolster truck fasten the bracing cables for its rear towing hooks. The mooring devices or bracing cables should not be in contact with the truck tires. If the trucks are placed crosswise in the vessel, put brake shoes under the truck wheels.

Place and fix the trucks as per vessel diagram.

Responsibility for placing and fastening the truck, when transporting it, is borne by forwarders.

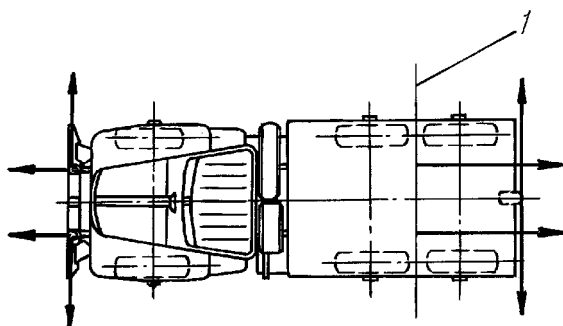


Fig. 122. Truck Fastening on Top Deck:
1 – walking - beam suspension axis

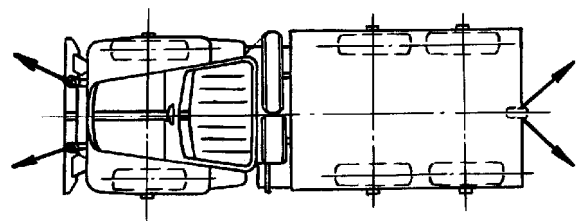


Fig. 123. Truck Fastening in Hold

SALVAGING

Upon expiry of its service life, the truck is subject to salvaging. For this purpose follow this procedure:

- wash and dry the truck;
- remove the storage batteries and check whether they are further serviceable. If not, pour off the electrolyte into special glassware and bring the storage batteries to a collecting station;
- pour off the coolant from the engine cooling system into a special vessel;
- pour off the oils from the truck units and remove the rest of oil from the filling hollows of the units with the help of gas - vapour installation;
- dismantle the electric wiring from the truck and bring it to a collecting station;
- remove the wheels, plastic and rubber parts from the truck and bring them to a collecting station;
- dismantle the truck units, disassemble them, detect defective parts and bring the parts, which are not suited for application as spares, to a collecting station.

The brake apparatus which are subject to salvaging should be disassembled. The parts are to be assorted according to types of materials. Depending on how much the parts are worn, particular parts can be utilized for repairing similar apparatus, the rest of the metal parts are to be collected as scrap.

When salvaging, observe safety precautions described in the section "Safety Requirements".

When working with poisonous and dangerous materials, fulfill general technical requirements for handling them.

APPENDICES

APPENDIX 1

TORQUES APPLIED FOR TIGHTENING OF MAIN THREADED CONNECTIONS, N.m (kgf.m)

Engine	
Nuts fastening:	
exhaust silencer	24 - 36 (2.4 - 3.6)
silencer inlet pipes to exhaust manifolds	28 - 36 (2.8 - 3.6)
Lock nuts fastening silencer inlet pipes to exhaust manifolds	33 - 41 (3.3 - 4.1)
Transfer Box	
Nuts fastening bearings of primary, intermediate shafts and differential rear holder	200 (20), minimum
Nuts of transfer box flanges	200 (20), minimum
Bolts fastening:	
differential washer	22 - 32 (2.2 - 3.2), minimum
differential rear holder	55 - 65 (5.5 - 6.5)
bearing caps of primary and intermediate shafts	30 - 35 (3.0 - 3.5)
case of differential rear bearing	40 - 56 (4.0 - 5.6)
bearing cap of rear axle drive shaft	44 - 56 (4.4 - 5.6)
bearing cap of front axle drive shaft	30 - 35 (3.0 - 3.5)
Oil level inspection plugs:	
MK24x1.5	100 - 140 (10 - 14)
K 3/8"	80 - 120 (8 - 12)* ¹
Drain plug	100 - 140 (10 - 14)
Cardan Drive	
Supporting plate bolts of spider bearings	14 - 17 (1.4 - 1.7)
Nuts of bolts fastening:	
flanges of intermediate and rear cardan shafts	60 - 70 (6.0 - 7.0)
flanges of front and rear cardan shafts	90 - 100 (9.0 - 10.0)
Nuts of bolts fastening centre support and longitudinal beam	200 - 240 (20 - 24)
Drain plug of centre support	100 - 140 (10 - 14)
Drive Axles	
Bolts fastening:	
final drive to axle case:	
M16	160 - 200 (16 - 20)* ²
M18	190 - 230 (19 - 23)
caps of reduction gear through shaft and bearing bodies of driving bevel and spur gears	60 - 80 (6.0 - 8.0)
bearing body caps of driving bevel gear and steering knuckle seal	12 - 18 (1.2 - 1.8)
final drive side cover	44 - 56 (4.4 - 5.6)
differential bearing caps	250 - 320 (25 - 32)
Nuts fastening:	
final drive to axle case	120 - 150 (12 - 15)
ball support to half - axle casing	280 - 320 (28 - 32)
steering knuckle levers and kingpin bearing caps:	160 - 280 (16 - 28)
front axle slewing journals	190 - 230 (19 - 23)

*¹ Applicable to trucks without auxiliary power take - off.

*² With availability of M14 bolts maintain a torque of 120 - 150 N m (12 - 15 kgf m).

final drive flanges	250 (25)
differential pinion cages	120 - 140 (12 - 14)
intermediate and rear axles brake support	160 - 200 (16 - 20)
Nuts and lock nuts of driving bevel gear bearings	450 - 500 (45 - 50)
Nuts of wheel hub bearings	200 - 250 (20 - 25)
	back off nuts
	1/8 - 1/6 a turn,
	maximum
Lock nuts of wheel hub bearings	400 - 500 (40 - 50)
Oil level inspection plugs in steering knuckles, in axle case	100 - 140 (10 - 14)
Drain plug in axle case	100 - 140 (10 - 14)
Suspension	
Nuts of torque rod pins	600 (60), minimum
Nuts of front spring eye U - bolts::	
spring being removed from the truck	20 - 28 (2.0 - 2.8)
spring being mounted onto the truck	screw nuts home,
	back off 1.5 - 2
	a turn
Nuts fastening:	
front springs U - bolts (fully loaded truck)	400 - 500 (40 - 50)
shock absorbers	40 - 50 (4.0 - 5.0)
shock absorber bodies	120 - 150 (12 - 15)
Nuts of front spring eye bolts	280 (28), minimum
Brace bolts of front spring rear brackets:	
upper	120 - 160 (12 - 16)
lower	180 - 220 (18 - 22)
Centre bolt of front spring	30 - 70 (3.0 - 7.0)
Nuts of rear spring U - bolts (fully loaded truck)	580 - 660 (58 - 66)
Nuts of bolts fixing:	
walking - beam brackets to cross - member	110 - 160 (11 - 16)
bracket of upper torque rod	250 - 320 (25 - 32)
front spring front brackets to lower flange of frame side	
member	120 - 160 (12 - 16)
front spring rear brackets to reinforcers of frame side member	180 - 220 (18 - 22)
walking - beam axis assembled with walking - beam brackets	700 - 800 (70 - 80)
Coupling bolts of walking - beam nuts	44 - 56 (4.4 - 5.6)
Wheels	
Wheel nuts	400 - 500 (40 - 50)
Tube valve nut	22 - 32 (2.2 - 3.2)
Steering	
Nuts fixing:	
ball pins of steering tie rods and booster	240 (24), minimum
	with tightening up
	to matching of the
	nearest nut slot and
	cotter pin hole
steering pitman arm	400 - 450 (40 - 45)
steering gear worm	40 - 56 (4.0 - 5.6)
slide valve	20 - 23 (2.0 - 2.3)
Bolts fixing steering gear to truck frame:	
M14	80 - 100 (8.0 - 10)
M16	110 - 140 (11 - 14)
Bolts fixing steering cardan forks M10	44 - 56 (4.4 - 5.6)
Bolts fixing side cover of steering gear case, cover and body of	
slide valve	44 - 56 (4.4 - 5.6)

Steering wheel nut	80 - 100 (8.0 - 10)
Brake System	
Nuts of compressor head studs	12 - 16 (1.2 - 1.6)
Bolts of parking brake support	80 - 100 (8.0 - 10)
Electrical equipment	
Generator pulley nut	60 - 80 (6.0 - 8.0)
Brake signal switch BK - 12Б	24.5 (2.45) maximum
Secondary brake release 2802.3829	30.0 (3.0) maximum
Vessel air pressure drop sensor 2702.3829	30.0 (3.0) maximum
Coolant temperature sensor TM100A	24.5 (2.45) maximum
Coolant overheat sensor TM111 - 01	24.5 (2.45) maximum
Oil pressure drop sensor 2602.3729	45 (4.5) maximum
Oil pressure sender MM370	150 (15) maximum
Cab	
Nuts of cab fixing bolt	40 - 60 (4.0 - 6.0)
Lock nut of cab fixing bolt	120 - 140 (12 - 14)
Fifth wheel	
Fifth wheel bolts:	
M14	80 - 90 (8.0 - 9.0)
M16	120 - 140 (12 - 14)
Nuts of sub - frame U - bolts	80 - 100 (8.0 - 10)
Power take - off	
Bolts and nuts fixing power take - off case to gearbox case	22 - 32 (2.2 - 3.2)
Auxiliary power take - off	
Nut of auxiliary power take - off flange	140 (14), minimum
Winch	
Bolts of winch cardan shaft flanges	60 - 65 (6.0 - 6.5)

APPENDIX 2

DATA FOR CHECKING AND ADJUSTMENT

Coolant temperature in cooling system, °C	75 - 100
Axial displacement of primary and intermediate transfer box shafts, mm	0.03 - 0.08
Free travel of clutch pedal, mm	50 - 60
Full travel of clutch pedal, mm	195 - 220
Free turning angle of steering wheel with operating booster pump	≤ 25°
Brake pedal travel, mm	1 - 3
Free travel of brake pedal, mm	20 - 30
Full travel of brake pedal, mm	150 - 180
Clearance between brake drums and shoe linings, mm	0.20 - 0.35
Air pressure in air system, kPa (kgf/cm ²)	650 - 800 (6.5 - 8.0)

APPENDIX 3

DATA ON WEIGHT OF MAIN COMPONENTS (less fuel, lubricant and fluid), kg

Transfer box	178
Drive front axle with hubs, brakes and steering rod	692
Rear / intermediate axle with hubs and brakes	612
Truck frame	654
Towing unit	60
Front spring of truck powered with:	
YAMZ - 236M2 engine	77.30
YAMZ - 238M2 engine	81.18
Rear spring of truck powered with:	
payload to 7 tonf	116.5
payload over 7 tonf	131.15
Walking - beam axle assembly	149
Wheel 515 - 254 (254Г - 508)	53.2
Wheel 514 - 400 (400Г - 508)	68.7
Wheel 8.5 - 20	45.5
Tire 14.00 - 20 model ОИ - 25	120
Tire 390/95R20 КАМА - УРАЛ	120, maximum
Tire 390R20, model О - 65	120, maximum
Tire 1200x500 - 508, model ИД - П284	120
Tire 500/70 - 508, model ИД - П284	120
Tire 500/70 - 20, model ИД - П284	120
Tire 12.00R20, У - 4, ИД - 304	90
Steering gear (worm - side segment)	39
Steering gear (screw - ball nut - rack - segment)	27.1
Parking brake	22
6СТ - 190 Storage battery	57.2
Power take - off with pump	24.2
Power take - off with flange	15.9
Auxiliary power take - off	15.3
Winch with reduction gear	287
Winch rope with hook	100
Platform body	790 ^{*1}
Platform body canopy	33.5
Cab	428
Hood and fenders	120.38

^{*1}1020 kg for the Ural - 4320 - 10, Ural - 4320 - 31, Ural - 43202 - 0351 - 31 trucks; 1170 kg for the Ural - 4320 - 0911 - 30 trucks

APPENDIX 4

WIRE COLOURING

Wire colour	Wire designation in Fig. 86
White	46,46a
Blue	30 _Δ , 30 _Ж , 30 _Л , 42 _Б , 45, 45a, 45 _Б , 49, 49a, 51, 55e, 55 _Ж , 55 _К , 55 _М , 55 _Н , 55 _Ч , 57a, 57 _Б , 57 _Δ , 83, 122
Yellow	15 _Г , 15 _Δ , 30a, 39, 39a, 39 _Б , 40, 41 _В , 53, 53a, 53 _Г , 53 _Δ , 61 _А , 61 _В , 61 _К , 62 _Б , 70, 84a, 85, 85a, 85 _Б
Green	5 _Т , 12a, 12 _В , 12 _Г , 30 _Б , 30 _И , 30 _Х , 30 _Э , 34, 41, 41a, 41 _Б , 43, 51, 51a, 51 _Б , 51 _Г , 51 _Ж , 51 _К , 51 _Н , 51 _П , 51 _Т , 51 _Ф , 51 _Ц , 51 _Я , 61 _Г , 61 _Δ , 69, 78, 84, 91, 99
Red	16, 30 _В , 30 _Г , 30 _У , 31a, 31 _Б , 31e, 32, 44, 44a, 51 _Ю , 51 - 1, 51 - 2, 52e, 54e, 54 _Ж , 55, 55a, 58e, 61, 62a, 77 _Б , 77 _В
Brown	20, 30e, 30 _К , 30 _П , 30 _Т , 31 _В , 42, 47, 47a, 51 _В , 51 _Δ , 51e, 51 _И , 51 _Л , 51 _М , 51 _Х , 51 _Ч , 61a, 68, 71, 80, 90, 90a
Orange	14, 15, 15 _Б , 19, 31 _К , 48, 48a, 58a, 58 _Б , 58 _В , 58 _Δ , 81, 87, 123, 135a
Grey	35, 41 _Г , 53 _Б , 53 _З , 54, 54a, 54 _Г , 54 _Δ , 54 _З , 57, 67, 77, 77a, 86, 86a, 86 _Б , 88, 100, 100a
Violet	15 _В , 52, 52a, 52 _Б , 52 _В , 52 _Г , 52 _Δ , 52 _И , 52 _К , 52 _Л , 56, 79, 82, 82a, 90 _Б , 90 _В , 90 _Г , 90e, 101, 135 _Б
Black	8, 17, 33, 52 _Ж , 53e, 53 _Ж , 58, 73, 73a, 73 _Б , 76, 76a, 80a, 90 _Δ , 90 _Ж

APPENDIX 5

ROLLING BEARINGS

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity
1180304K2C23	Single - row radial ball bearing	20x52x18	Steering booster pump	1
307A	Ditto	35x80x21	Power take - off driven shaft	2
64805	Single - row radial roller bearing without races	25x38x24,7	Power take - off driving gear	2
211A	Single - row radial ball bearing	55x100x21	Power take - off shaft (front support)	1
50208A	Ditto	40x80x18	Ditto (rear support)	1
804807K3C10, alternatively 804707AC10	Roller needle bearing	33,65x50x35	Spiders of intermediate cardan shaft, of intermediate axle drive cardan shaft	16
50311A	Single - row radial ball bearing	55x120x29	Front axle drive shaft of transfer box, shaft of reinforced auxiliary power take - off (rear support)	2
7312A	Single - row tapered roller bearing	60x130x34	Transfer box primary shaft, winch drum shaft	3
6 - 7610A	Ditto	50x110x42,5	Transfer box intermediate shaft	2

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity per truck
7310A	Ditto	50x110x29,5	Final drive driving spur gear	6
12311K1M	Radial roller bearing with short cylindrical rollers	55x120x29	Final drive driving gear shaft (rear support)	3
6 - 7515A	Single - row tapered roller bearing	75x130x33,5	Differential, final drive driving gear shaft (front support)	9
2007124A	Ditto	120x180x38	Wheel hubs	12
12318KM	Radial roller bearing with short cylindrical rollers	90x190x43	Final drive driven bevel gear	3
7516A	Single - row tapered roller bearing	80x140x35,25	Final drive driving gear shaft (front support)	3
804805K1	Roller needle bearing	25x39x30,5	Spiders of cardan shafts of front and rear axle drive	16
311A	Single - row radial ball bearing	55x120x29	Rear axle drive shaft of transfer box, transmission cardan shaft intermediate bearing, lead screw of winch rope winding guide	5
704902K6YC10	Roller needle bearing	15,2x28x20	Spiders of steering cardan shaft	16
220A	Single - row radial ball bearing	100x180x34	Transfer box differential	1
6 - 218	Ditto	90x160x30	Ditto	1
180206	Ditto	30x62x16	Intermediate bearing of steering cardan shaft, steering wheel shaft	4
8207	Single - thrust ball bearing	35x62x18	Steering worm shaft	2
943/45, alternatively CΛ455538M	Roller needle bearing	45x55x38	Steering segment shaft	2
2306KM	Radial roller bearing with short cylindrical rollers	30x72x19	Steering worm shaft	1
108710KC17	Single - thrust ball bearing	50x80,5x23	Front axle steering knuckle	2
12309KM	Radial roller bearing with short cylindrical rollers	45x100x25	Ditto	4
154901E	Roller needle bearing	12x22x16	Steering booster pump	1
6 - 180603K2C9	Single - row radial ball bearing	17x47x19	Generator (rear support)	1

Designation	Bearing type	Overall dimensions*, mm	Location	Quantity per truck
6 - 1180304K2C9	Ditto	20x52x18	Generator (front support)	1
804704K3C10	Roller needle bearing	22x35x26,5	Spiders of cardan shafts of winch drive	16
180508K2C17	Single - row radial ball bearing	40x80x23	Intermediate cardan shaft of winch drive (supporting bearings)	2
46310AK	Single - row radial - thrust ball bearing	50x110x27	Winch reduction gear worm (front support)	1
312A	Single - row radial ball bearing	60x130x31	Winch reduction gear worm (rear support)	1
8311	Single - thrust ball bearing	55x105x35	Ditto	1
7216A	Single - row tapered bearing	80x140x28,5	Winch drum shaft	1
8103 or 8903	Single - thrust ball bearing	17x30x9	Spare wheel lift reduction gear bearing	1
* Inside diameter x outside diameter x mounting width				

APPENDIX 6

SPECIFICATIONS OF TRUCK BULBS

Where installed	Rating, W (at designed voltage)	Type	Q - ty per truck
Headlamp 401.3711	55 + 50	A24 - 55 + 50	2
671.3711	75 + 70	AKГ24 - 75 + 70 - 1	2
Front lamp ПФ133АБ	28	A24 - 21 - 3	2
	7	A24 - 5	2
Rear lamp ФП133АБ	28	A24 - 21 - 3	4
	7	A24 - 5	2
7462.3716	28	A24 - 21 - 3	6
7472.3716	14	A24 - 10	4
Turn indicator repeater	7	A24 - 5	2
Cab roof lamp	28	A24 - 21 - 3	1
Portable lamp	28	A24 - 21 - 3	1
Hood lamp	7	A24 - 5	1
Signal, pilot and instrument illumination lamps	3	A24 - 2	19
Front marker lamp 264.3712	7	A24 - 5 - 1	2
Number plate lamp	7	A24 - 5	2
Road train sign lamp	7	A24 - 5	3
Flood head lamp	70	AKГ24 - 70	1 (2*)
Emergency light signalling switch	3.5	AMH24 - 3	1
*1 Applicable to the Ural - 4420 - 10, Ural - 4420 - 31, Ural - 44202 - 0311 - 31, Ural - 44202 - 0612 - 30 trucks.			

APPENDIX 7

WASTE OIL COLLECTION RATE, L

Engine	18.0
Gearbox	7.3
Transfer box	2.7
Steering gear case	1.2
Drive axle reduction gears	19.0
Steering hydraulic system	3.0
Winch reduction gear	6.3
Walking - beam hub	1.9

APPENDIX 8

SPARE PARTS, TOOLS AND ACCESSORIES

The Manufacturer supplies each truck with a single set of spare parts, tools and accessories, that contains the spare parts intended for elimination of troubles during the guarantee period of operation, as well as tools and accessories.

On special order the Manufacturer supplies a group set of spare parts (SPT&A - G) - one for 10 trucks.

In replacing faulty parts by corresponding spare parts from the SPT&A Sets abide by the following technical documents:

- Operation Manual "Ural - 4320 - 10, Ural - 4320 - 31 Trucks and their Modifications";
- Repair Manual "Ural - 4320 Truck Tractor and its Modifications";
- Repair Manual "Ural - 4320, Ural - 4420, Ural - 44201 Trucks (less engines)" Parts 1,2,3.

The guarantee period of preservation treatment of SPT&A sets is three years, provided the sets are stored in closed rooms.

Owing to continuous modification process of truck design, the range of spare parts of SPT&A sets can differ. The more precise range of spare parts is given in the shipping documents supplied with each truck.

When shipping the trucks the SPT&A - 0 is put in the transportation box of SPT&A. Recommendations for the in - service location of the tools and accessories on the truck are given in the present Section.

The location of tools and accessories relating to the equipment mounted on the truck chassis is determined by the Manufacturer.

When running the truck the location of the tools and accessories, namely towing rope 8 (Fig. 126), can be determined by the driver himself.

Location of tools and accessories in the Ural - 4320 - 10, the Ural - 4320 - 31 trucks

Position in Fig.	Description	Quantity
	In tool bag 11 (Fig. 124)	
1	Bench hammer 1000 g	1
2	Chisel	1
3	Socket wrench 55	1
4	Socket wrench 41x46	1
5	Insert wrench 50	1

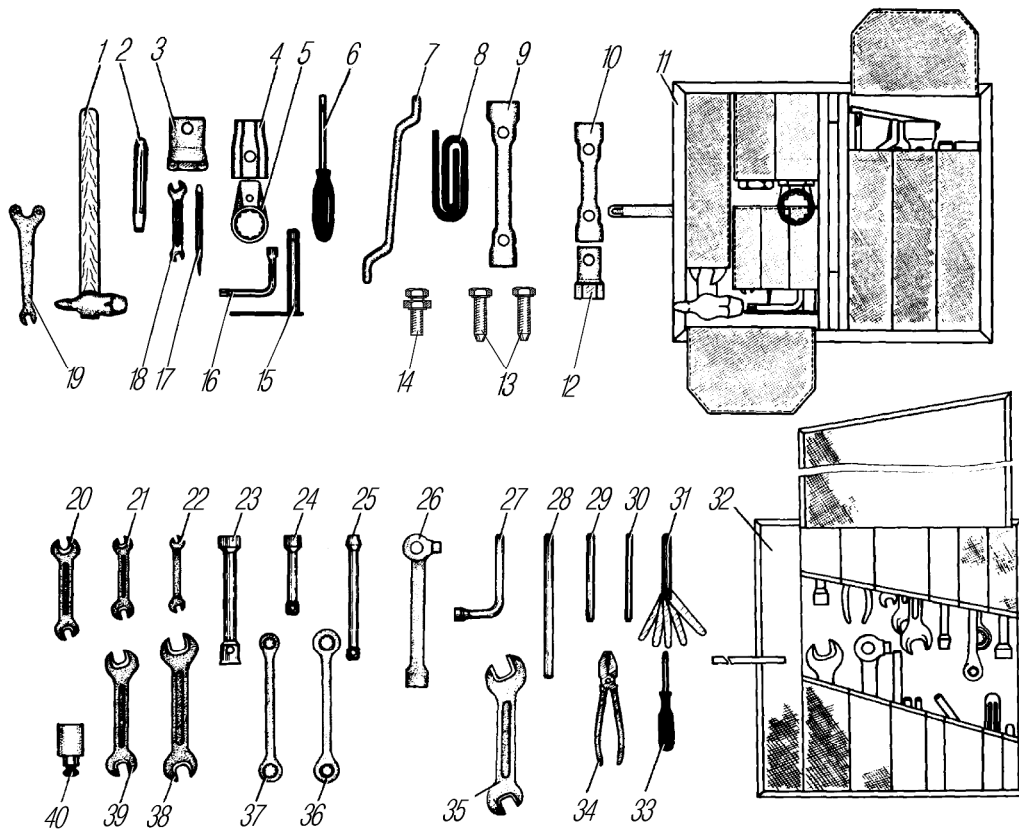


Fig.124. Tools of the Ural - 4320 - 10, Ural - 4320 - 31 trucks

Position in Fig.	Description	Quantity
6	Screwdriver A - 250x1.4	1
7	Ring wrench 24x27	1
8	Union pipe	1
9	Socket wrench 27x38 for wheels	1
10	Socket wrench 30x32 for spring U - bolt nuts	1
12	Socket wrench 36	1
13	Puller - bolt for ball support	2
14	Engine ring bolt	1
15	Wrench for hydraulic brake bleeding	1
16	Socket wrench 6x8	1
17	Driftpin	1
18	Wrench 11x13	1
19	Wrench for shock absorber nut	1
In tool bag 32 (Fig. 124)		
20	Wrench 14x17	1
21	Wrench 10x12	1
22	Wrench 8x10	1
23	Socket wrench 19	1
24	Socket wrench 14	1
25	Socket wrench 12	1
26	Socket wrench 24	1
27	Socket wrench 10	1
28	Bar	1
29	Bar	1

Position in Fig.	Description	Quantity
30	Ditto	1
31	Feeler gauge	1
33	Combination screwdriver	1
34	Pliers	1
35	Wrench 32x36* ¹	1
36	Ring wrench 22x24* ²	1
37	Ring wrench 17x19	1
38	Wrench 19x22	1
39	Wrench 27x30	1
40	Injector remover	1
In tool box under platform bed (Fig. 125)		
3	Axe	1
4	Half - axle puller	1
5	Socket wrench 140	1
6	Hydraulic jack	1
7	Lever - plunger pressure gun	1
8	10 ltr jerry can	1

*¹ Wrench 7813 - 00351H12.X1 GOST 7275 - 75 is allowed.
 *² Wrench 7811 - 0025 GOST 2839 - 80 is allowed.

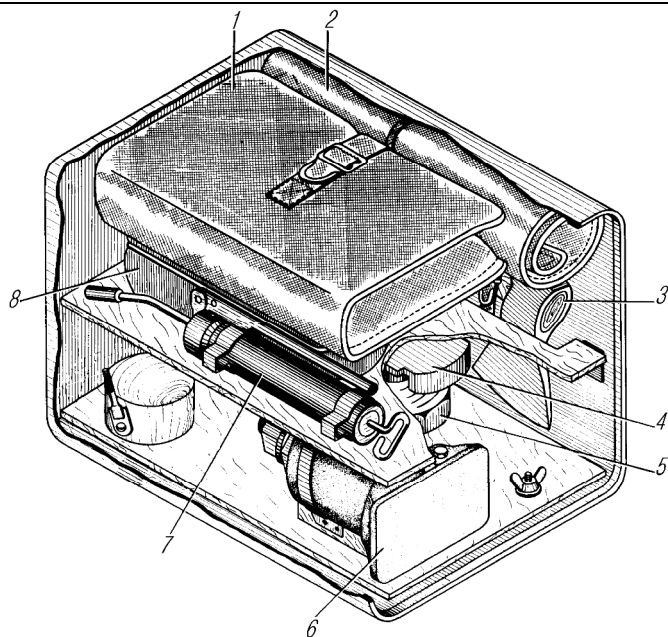


Fig. 125. Tool Box:
 1,2 - tool bags; 3 - axe; 4 - axle - shaft puller; 5 - socket wrench 140; 6 - jack; 7 - lever - plunger gun; 8 - 10 l jerry can

Position in Fig.	Description	Quantity
Put without fixing in tool box		
-	«Б» - type coupling head with union	1
-	Rubber pail	1
-	Air hose	1
-	Fuel transfer pump	1
-	Tire inflation collar puller	1* ³
-	Winch pulley	1* ⁴

*³ Per 10 trucks (on special order).
 *⁴ Optional.

Position in Fig.	Description	Quantity
Fixed under platform (Fig. 126)		
6	Tire iron	2
7	Entrenching spade	1
9	20 l jerry can (in special container)	1
10	Cross - cut saw	1 ^{*5}
^{*5} One per 10 trucks.		

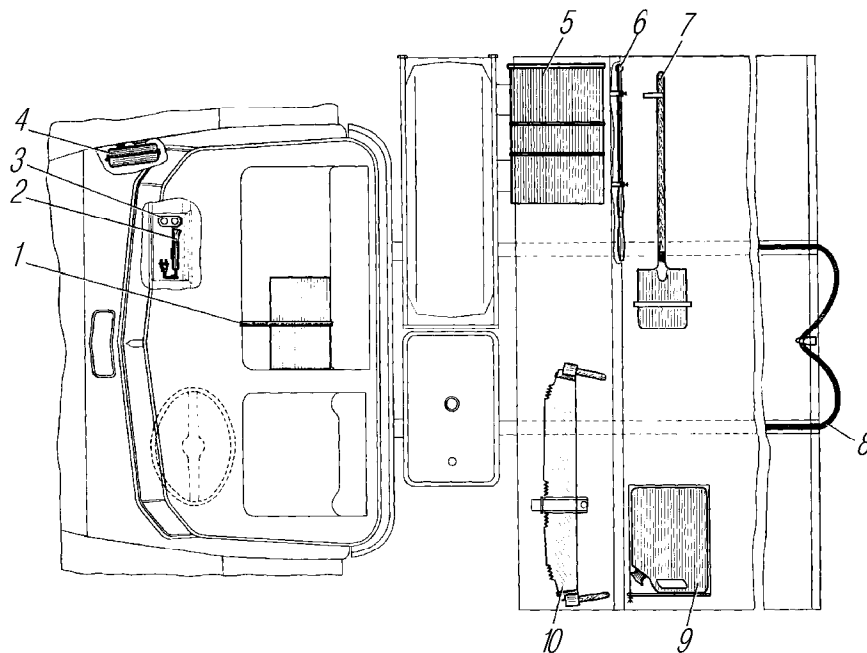


Fig.126. Location of Tools and Accessories
on the Ural - 4320 - 10, Ural - 4320 - 31 Trucks:

1 - ПНВ case fastening belt; 2 - portable lamp; 3 - plug; 4 - first - aid kit case; 5 - tool box; 6 - tire irons; 7 - entrenching spade; 8 - towing rope; 9 - 20 l jerry can; 10 - cross - cut saw

Position in Fig.	Description	Quantity
In luggage compartment (Fig. 126)		
3	Connector plug	1
2	Portable lamp	1
-	Operating Manual	1
-	Gaskets for storage battery plugs	12
On cab side panel (Fig. 126)		
4	First - aid kit case	1
On platform (Fig. 126) (placed in jacket and fixed on front side)		
-	Platform canopy, assembly	1
-	Spacer pipes	1
-	Canopy jacket	1
8	Towing rope (in longitudinal bars of platform base)	1
In special seats of platform front part		
-	Canopy bows (set)	1
In spare parts box		
-	Warm - keeping jacket for radiator and side panels	1

Special notes on location of tools and accessories

On the bolster trucks Ural - 4420 - 10, Ural - 4420 - 31, Ural - 44202 - 0311 - 31, Ural - 44202 - 0612 - 30 the tools are kept in a tool box behind the cab, the jerry cans are in a special container, the towing rope is fixed on the rear desk; and the spade on the rear left - hand fender (applicable to the Ural - 4420 - 10, Ural - 4420 - 31 tractors).

On the Ural - 4320 - 10, Ural - 4320 - 31 trucks the handle of spare wheel lift reductor is kept in the tool box.

On the Ural - 43202 - 0351 - 31 truck the reductor handle and spare wheel lift reductor itself are kept in the tool box.

TELESCOPE - TYPE HYDRAULIC JACK

Specifications

Type	telescopic, hydraulic, with two working plungers
Lifting capacity, kN (tf)	80 (8)
Jack height the plungers lowered and screw turned in, mm	270
Height of load lift, mm	285
Oil volume, l	0.6

For lifting a load with the jack:

- set the jack in the required position, turn out screw 1 (Fig. 127) as desired. If the ground is soft, place a strong wooden board or some other flat object under the jack base beforehand;

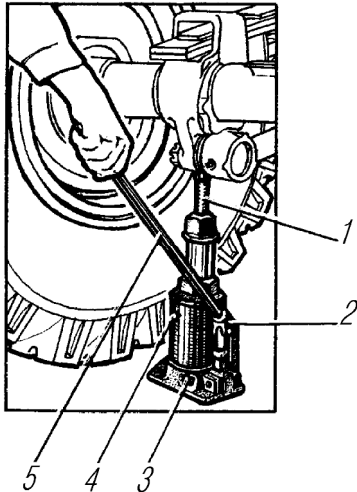


Fig. 127. Using jack:
1 - screw of inner working plunger; 2 - pump lever; 3 - shut - off needle; 4 - plug; 5 - tire iron

- make some quick pumping strokes of lever 2, shut - off needle 3 being screwed out;
- using a tire iron, screw home the shut - off needle turning it clockwise;
- raise the working plungers as required rocking the tire iron fitted into lever 2.

Should the jack fail to operate due to seized valves, slightly knock at the delivery plunger lever with the tire iron.

For lowering the load:

- slowly screw out the shut - off needle turning it counter - clockwise;
- screw out plug 4 and let out the air; on lowering, screw the plug home.

When using the jack place pads under the truck wheels. Be sure to apply the parking brake and to engage the lower gear in the gearbox.

For lifting the front axle, set the jack screw head in the recess on the clip fastening the spring; for lifting the rear or intermediate axle set it under the spring support bracket.

When the jack is out of operation the head screw should be turned in, the working and delivery plungers lowered and the shut-off needle screwed out.

If oil seeps through plungers or shut-off needle, tighten collar nuts, and eliminate oil leaks through joints of casing parts by tightening the casing head.

Do not raise the working plungers by hand when the shut-off needle is screwed home; otherwise air can enter the jack working chamber.

If the jack fails to ensure the plunger's full working stroke, check the oil level. Add oil up to the filler closed with plug 4 after lowering the jack plungers completely and the jack standing upright. See the jack mechanism on Fig. 128.

If the jack fails to operate due to dirt accumulated on parts of the working chamber, drain soiled oil through the filler, fill kerosene and pump the jack through after screwing out the shut-off needle. Then, on draining the kerosene, fill filtered oil, BMГ3 grade. The jack may be filled with MKE - 10A oil.

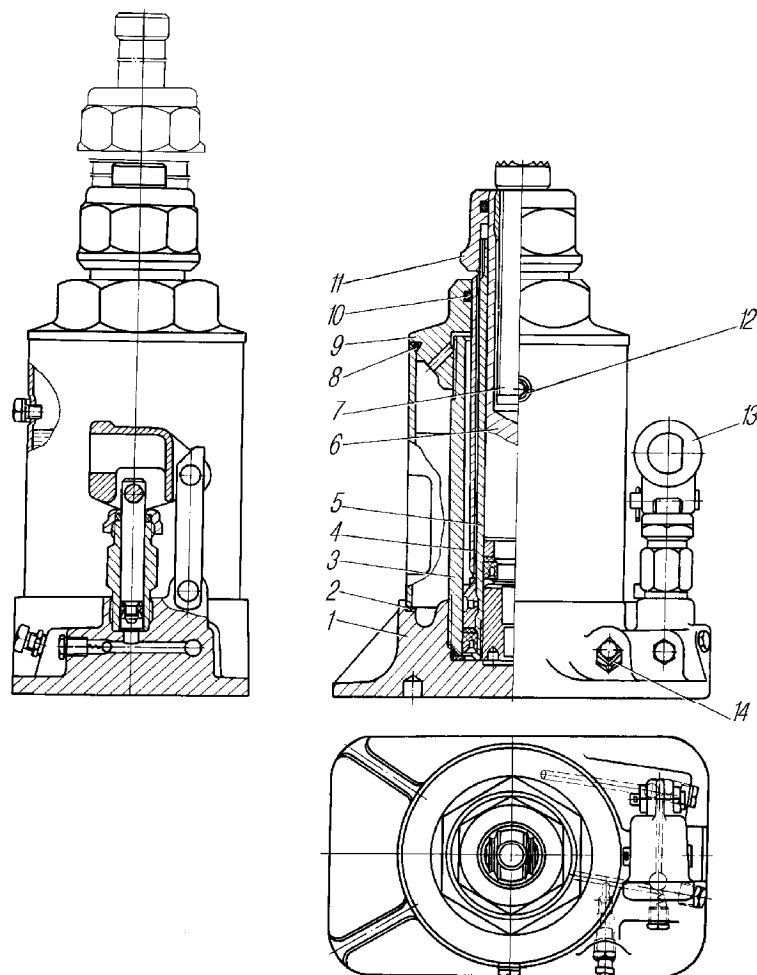


Fig. 128. Jack:

1 - base; 2 - gasket; 3 - cylinder of outer working plunger; 4 - cylinder pipe; 5,6 - outer and inner working plungers; 7 - screw; 8 - seal; 9 - case head; 10 - packing ring; 11 - plunger head; 12 - plug; 13 - pump level; 14 - shut-off needle

SUPPLEMENTARY INFORMATION ON TRUCK DESIGN

The assembly units and systems different from those described in this Manual can be installed in the truck. Peculiarities of their design and maintenance are given below.

CLUTCH RELEASE CONTROL

When mounting the power unit with a diaphragm clutch, the clutch control design will be modified and will be of two types: mechanical clutch release control with an air booster (Fig. 129) and hydraulic clutch release control with an air - hydraulic booster (Fig. 130).

Mechanical clutch release control with air booster

Booster air cylinder 21 (Fig. 129) is mounted on the gearbox housing and acts on clutch release fork shaft lever 23. The cylinder is controlled by air valve 8, which is mounted on tie rod 9.

Hose 10 connects valve 8 with pneumatic system of the truck.

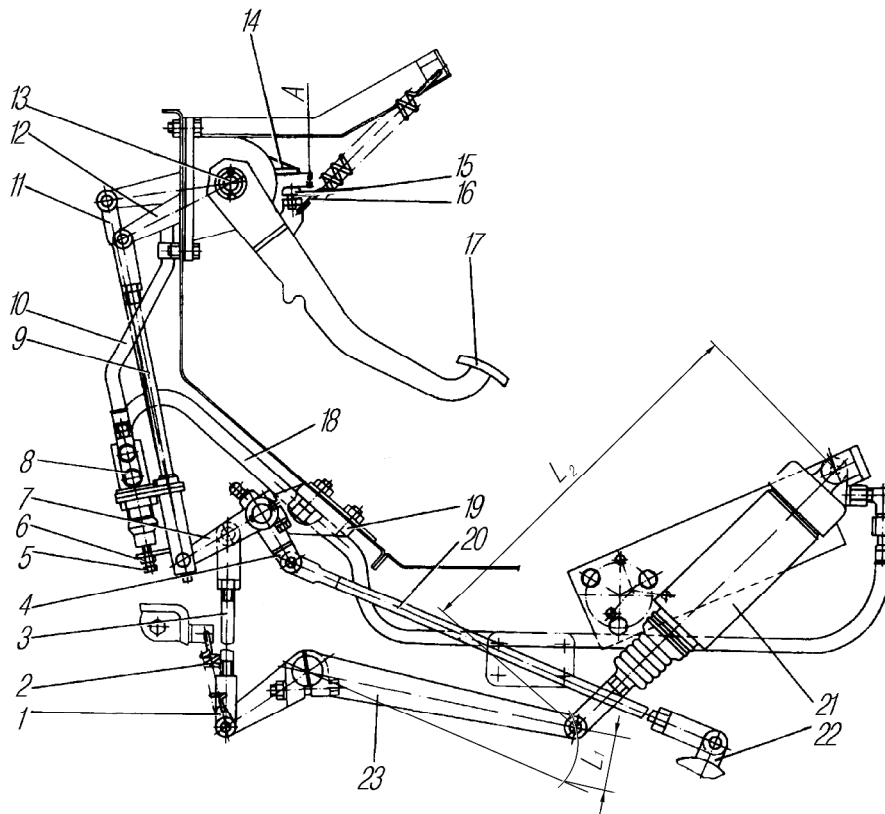


Fig. 129. Diaphragm Clutch with Air Booster and Brake Valve Control:

1 - plate; 2 - return spring; 3, 9 - clutch control tie rods; 4 - brake valve control lever; 5 - adjusting bolt; 6 - lock nut; 7 - clutch control lever; 8 - air valve; 10, 18 - hoses; 11, 20 - brake valve control tie rods; 12 - clutch pedal shaft lever; 13 - clutch pedal shaft; 14 - clutch pedal adjusting bolt rest; 15 - brake pedal return spring; 16 - clutch pedal adjusting bolt; 17 - brake and clutch pedals; 19 - bracket; 21 - air cylinder; 22 - brake valve lever; 23 - clutch release fork shaft lever; $A = 7 - 10 \text{ mm}$; $L_1 = 50 - 55 \text{ mm}$; $L_2 = 320 \text{ mm}$

When acting onto clutch pedal 17, the effort is transferred to air valve 8 rod via lever 12 and the parts of tie rod 9 opening its valve.

The air pressure from the truck pneumatic system is transferred to cylinder 22 through hose 18; the cylinder has a further effect on lever 23.

The moment of air valve engagement, when air is available in the truck pneumatic system, is adjusted as follows:

- disconnect hose 18 from valve 8;
- screw out adjusting bolt 5 providing a clearance between the bolt and valve rod;
- press down clutch pedal 17 as far as it will go;
- screw in bolt 5 until the valve of the air valve opens (air going out of air valve 8 control line);
- further screw in adjusting bolt 5 by 0.5 - 1.0 turns and lock it with nut 6.

Adjustment of Clutch Pedal Full Travel. A full travel of the clutch pedal of 120 - 150 mm is to be adjusted either when clearance $A = 7 - 10$ mm is lacking between the adjusting bolt and its rest (the clearance decreases as friction pads wear), or when travel of lever 23 of clutch release fork shaft falls below 50 mm.

Perform adjustment when air pressure in the truck pneumatic system is not less than 0.6 MPa (6 kgf/cm²) in the following sequence of operations:

- screw adjusting bolt 16 until it thrusts against the pedal bracket, and then screw it out by 7 - 10 mm (6 to 8 turns);
- disconnect tie rod 3 from lever 23, or tie rod 9 from lever 12 not taking off return spring 2;
- measure size L_2 ; should it be less than 320 mm reset lever 23 one spline clockwise. Turning in opposite direction is impermissible because the coupling can eventually engage with thrust ring;
- the pedal being lifted as high as it will go, match the hole in the fork with that in the lever by increasing the length of tie rod 9 or decreasing the length of tie rod 3. When changing the length of tie rods the length of the tie rod body threaded into the fork shall be 12 mm minimum;
- insert the pins easily (without tensioning) and cotter them;
- screw home bolt 16 and lock it.

The truck operation with lacking "A" clearance is prohibited to avoid premature wear of the clutch.

The design does not allow for free travel of the clutch pedal.

Hydraulic clutch release control with air - hydraulic booster

Master cylinder 7 (Fig. 130) is fitted in the engine compartment and secured on a bracket to the front cab panel. Pusher 13 (Fig. 131) acts on the piston, which is connected with pedal mechanism 8 through a lever (see Fig. 130).

When acting on the clutch pedal, the fluid pressure from the master cylinder is transmitted via pipe 31, hose 24 to the air - hydraulic booster. In the booster the fluid applies pressure on the rod at the same time opening the valve of air system.

The air part consists of air bottle 22, 8 l capacity, mounted onto the rear bracket of storage batteries, single protection valve 21 and pipes. The feed is performed from a separate circuit of air system.

The single protection valve is fitted on the bottle and serves to split the air duct going from the separate circuit of air system to the bottle so that the pressure available in it retains independent of pressure drop in main circuits. Condensate drain valve and control outlet valve 18 are fitted on the bottle.

Air is supplied to the air - hydraulic booster via pipe 17 and hose 16.

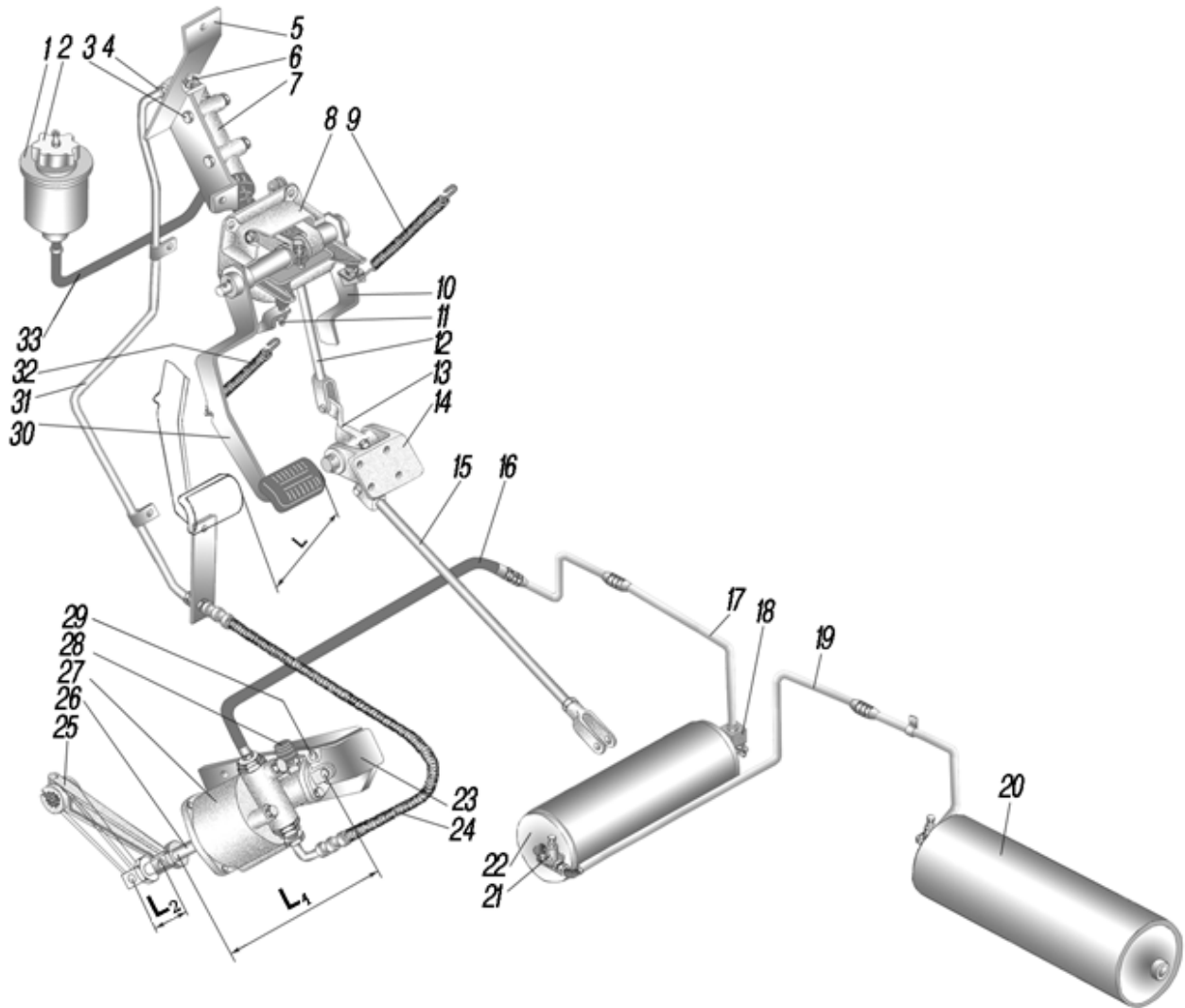


Fig. 130. Clutch Release Control:

1 - expansion tank; 2 - tank cover; 3 - bolt; 4 - nut; 5,14,23 - brackets; 6 - cylinder thrust; 7 - master cylinder; 8 - pedal mechanism; 9,32 - springs; 10 - brake pedal; 11 - clutch pedal thrust; 12,15 - brake pedal rods; 13 - brake valve control lever; 16,24,33 - hoses; 17,19,31 - clutch control pipes; 18 - control outlet valve; 20,22 - air bottles; 21 - single protection valve; 25 - clutch release fork shaft lever; 26 - rod; 27 - air - hydraulic booster; 28 - air - hydraulic booster bleeding valve; 29 - bracket thrust bolt; 30 - clutch pedal; $L = 185 - 200$ mm; $L_1 = 254$ mm; $L_2 = 30 - 40$ mm

Clutch Master Cylinder. The design of the master cylinder is shown in Fig. 131. If repair is necessary, when assembling fit ring 14 as shown in Fig. 131. When assembling do not fail to lubricate inner surface of cylinder, rubber rings and collar with braking fluid.

Air - Hydraulic Booster comprises body 1 (Fig. 132) containing inside piston 5 and rod 4. The piston with the rod are dynamically sealed in the body and can move axially. The piston is sealed in the body by rubber collar 9 while the rod by two rubber rings 3.

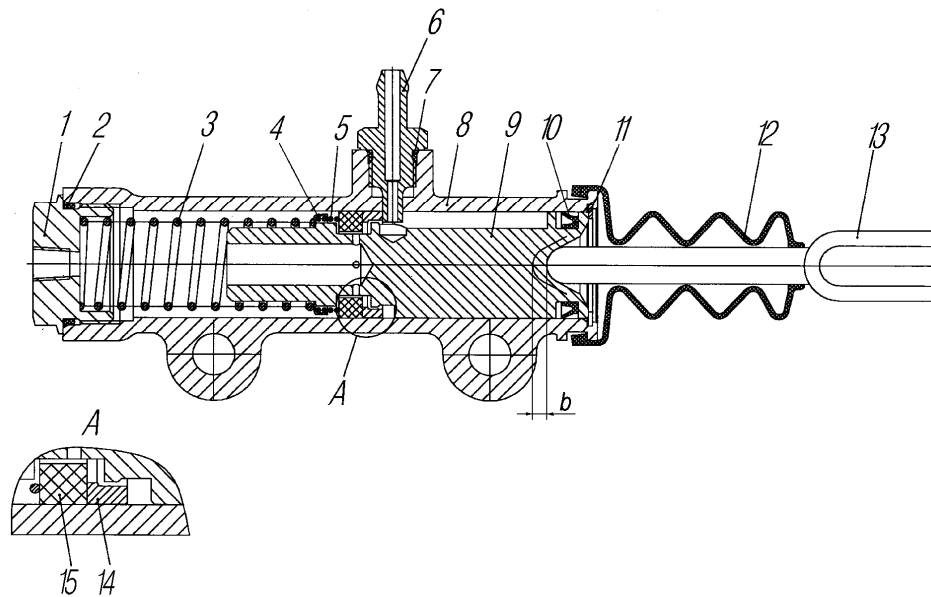


Fig. 131. Master Cylinder:

1 - plug; 2,7 - rubber rings; 3 - return spring; 4 - loading spring cup; 5 - loading spring; 6 - inlet union; 8 - cylinder body; 9 - piston; 10 - collar; 11 - retaining ring; 12 - protective jacket; 13 - pusher; 14 - ring; 15 - packing ring; $b = 0.2 - 0.6 \text{ mm}$

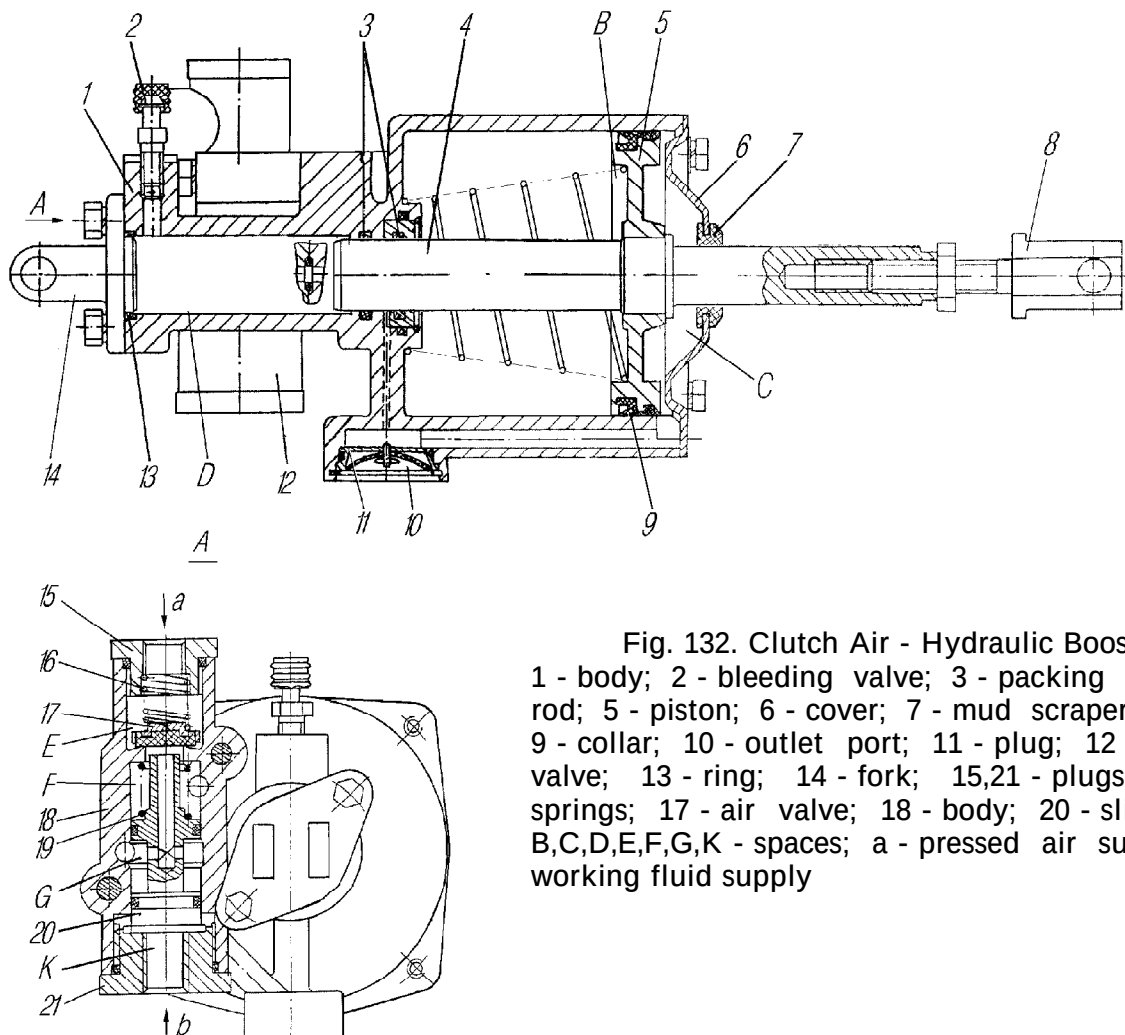


Fig. 132. Clutch Air - Hydraulic Booster:

1 - body; 2 - bleeding valve; 3 - packing rings; 4 - rod; 5 - piston; 6 - cover; 7 - mud scraper; 8 - fork; 9 - collar; 10 - outlet port; 11 - plug; 12 - control valve; 13 - ring; 14 - fork; 15,21 - plugs; 16,19 - springs; 17 - air valve; 18 - body; 20 - slide valve; B,C,D,E,F,G,K - spaces; a - pressed air supply; b - working fluid supply

On the piston side the body is closed with cover 6, which the rod goes through. Fork 8 secured to the rod end is fixing the clutch air - hydraulic booster to the clutch release fork lever. In the centre of cover 6 is fitted rubber scraper 7, which clears the rod from dirt and prevents entering of dirt into the body.

On the other side of body 1 is fitted fork 14 by means of which the clutch air - hydraulic booster is fastened to the gearbox via a bracket. Fork 14 has a flange sealed in the body by rubber ring 13. Outlet port 10 featuring a rubber valve is available in the lower body portion. The valve serves to prevent entering of dirt into the body.

Union 2 is fitted in the upper body portion to remove air from space D. The clutch air - hydraulic booster control valve is secured to body 1 by two bolts and comprises body 18 closed on either side with plugs 15 and 21. Inside of body 18 are fitted slide valve 20 and air valve 17. The slide valve is dynamically sealed in the body by two rubber rings and is spring - loaded relative to the body by coiled cylindrical spring 19. Spring 19 moves slide valve 20 off the air valve until it thrusts against plug 21. The slide valve has a radial and an axial holes interconnecting spaces F and G.

Air valve 17 is pressed by spring 16 against the seat made inside the body and disconnects spaces E and F.

Space B is connected with space F by a system of holes; spaces C and G are connected with the outlet port. Spaces K and D are interconnected by holes. Space K is connected with the clutch release master cylinder through a connection hole available in plug 21 by pipes. Space E is connected with the air bottle through a connection hole available in plug 15 by pipes.

Space E has an outlet for pressed air to actuate the booster control.

Adjustment of Clutch Pedal Travel. Perform adjustment with the system being fully bled and no pressed air available in air bottle 22 in the following sequence of operations:

- slacken the lock nut of thrust 11 (see Fig. 130) and screw the latter until it thrusts against the pedal;
 - move clutch master cylinder 7 in oval holes of bracket 5 to its upper position;
 - fix the master cylinder using thrust 6 and bolts 3;
 - depress the clutch pedal until it thrusts against the floor;
 - check the clutch for proper release (the clutch shall not drag);
 - should the clutch drag, obtain its release in moving the master cylinder downward in a step equal to a half turn of thrust 6;
 - torque bolts 3 of master cylinder 7 to 44 - 56 N.m (4.4 - 5.6 kgf.m);
 - using thrust 11 adjust the pedal free travel, the clearance between pusher 13 (see Fig. 131) and piston 9 should be $b = 0.2 - 0.6$ mm corresponding to a pedal travel of 1 - 3 mm;
 - due to wear of friction pads of the clutch driven disc lever 25 (see Fig. 130) is turning anti - clockwise. Minimum permissible size $L_1 = 254$ mm. The pads being in proper condition and when minimum size L_1 is reached, reposition lever 25 clockwise by one slot;
 - measure rod's 26 stroke at an air pressure of 800 kPa (8.1 kgf/cm²), which corresponds to pressure governor's cut off. The stroke should be within $L_2 = 30 - 40$ mm.
- Bleeding. When changing the braking fluid or repairing the hydraulic control bleed the system in the following sequence of operations:
- fill expansion tank 1 with braking fluid;

- take off the protective cup of valve 28, fit the bleeding hose onto the valve, slacken the valve by $1/2 - 3/4$ a turn and immerse the hose end into a clean transparent vessel filled with braking fluid;

- slacken nut 4 and retighten it as first fluid drops appear;

- depress abruptly clutch pedal 30, the valve being open, and release the pedal smoothly, the valve being closed, until no air bubbles come out of the hose. Tighten the bleeding valve when no more air bubbles and fluid come out.

To avoid air suction by the master cylinder when bleeding, see that the fluid level in the expansion tank always exceeds the half and the hose end is kept immersed in the fluid.

Criterion of the full bleeding is an abrupt increase of force to be applied on the pedal when moving it by $L_2 = 35 - 40$ mm after the free stroke is taken up.

The clutch hydraulic control can be bled by shortcut method using an external source of pressed air. In this case proceed as follows:

- fill the expansion tank with braking fluid;

- take off the protective cup of valve 28, fit the bleeding hose onto the valve, slacken the valve by $1/2 - 3/4$ a turn and immerse the hose end into a clean transparent vessel filled with braking fluid;

- fit the hose from an source external of pressed air onto the head of cover 2 of expansion tank 1;

- in supplying air under a pressure not more than 200 - 250 kPa (2.0 - 2.5 kgf/cm²) obtain the state when no air bubbles come out of the pipe.

Clutch Control Maintenance consists in regular inspection of the control system components, cleaning them from dirt and checking as follows:

- tightness of hydraulic and air parts of the system;

- fluid level in the expansion tank and tightening of thread connections.

- close contact of the stop bolt 29 with the gearbox housing.

When driving the truck, the following operations are to be carried out:

- Check daily serviceability of clutch and fluid level in the expansion tank of master cylinder, top up, if required. The fluid level in the expansion tank should be 15 - 20 mm below the upper edge of topping - up point;

- When maintaining in pre - service period check the clutch pedal free stroke, clutch pedal free stroke must be 1 - 3 mm;

- When seasonal maintaining (once every two years) replace brake fluid in the clutch hydraulic drive. The fluid level in the expansion tank should be 15 - 20 mm below the upper edge of topping - up point. The used brake fluid "Tom" or "Neva", "Rosa". At a temperature below minus 40°C dissolve brake fluids with 18 - 20% of ethyl alcohol (by weight). The used fluid quantity 0,5 l.

COMBINED (PNEUMOHYDRAULIC) DRIVE OF SERVICE BRAKES

An oil - water separator* is installed in the truck brake system. The schematic diagram of service brake drive and the combined drive of the trailer brakes with the oil - water separator is shown in Fig. 133.

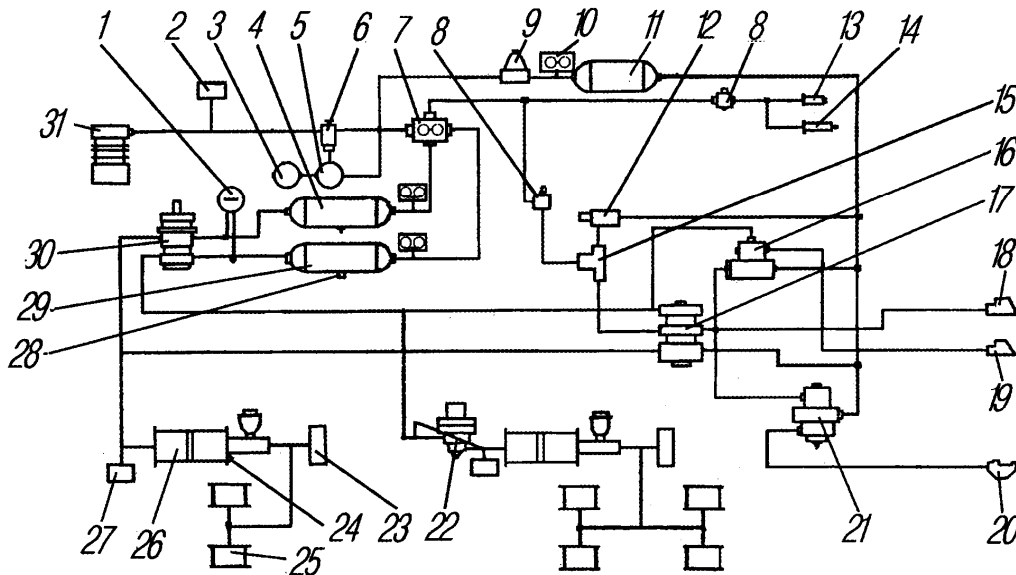


Fig. 133. Schematic Diagram of Service Brake Drive & Combined Drive of Trailer Brakes with Oil - Water Separator:

1 – two - pointer pressure gauge; 2 – towing valve; 3 – regenerating bottle*; 4, 11, 29 – air bottles; 5 – oil - water separator; 6 – pressure regulator; 7 – triple safety valve; 8 – trailer brakes cut - off air valve; 9 – single safety valve; 10 – pressure drop senders; 12 – trailer parking brake control valve; 13 – fuel cut - off air cylinder; 14 – air cylinder for exhaust branch pipe throttle closing; 15 – two - line valve; 16 – safety valve; 17 – control valve of trailer brakes with two - line drive; 18, 19 – automatic coupling heads; 20 – coupling head, A type; 21 – control valve of trailer brakes with single - line drive; 22 – braking forces regulator; 23 – braking signal engagement senders; 24 – brake failure alarm senders; 25 – wheel cylinders; 26 – brake air booster; 27 – check outlet valves; 28 – condensate draining cocks; 30 – brake valve; 31 – compressor

The oil - water separator* is designed for clearing the compressed air of water and oil to prevent the drive freezing and failure as well as to reduce the opportunity of corrosion of brake drive apparatus components.

The oil - water separator is designed for operation as completed with the pressure regulator, type 100 - 3512010 - 20, and a 5 - liter regenerating air bottle.

The compressed air is supplied from the pressure regulator to outlet I of the oil - water separator (Fig. 134) and further to the ring hollow A. When flowing through filter 4 to the top of the oil - water separator, the air is cleared of oil, solid particles and moisture. Flowing further through molecular sieve adsorber 6 with zeolite, the compressed air is subject to final drying. The dry compressed air flows into hollow B of the oil - water separator and overcoming resistance of the return valve 7, it is supplied into the truck brake system via outlet II. Simultaneously, the compressed air is delivered via outlet III to the regenerating air bottle through the throttle with a diameter of 1.5 mm.

* Except bolster trucks.

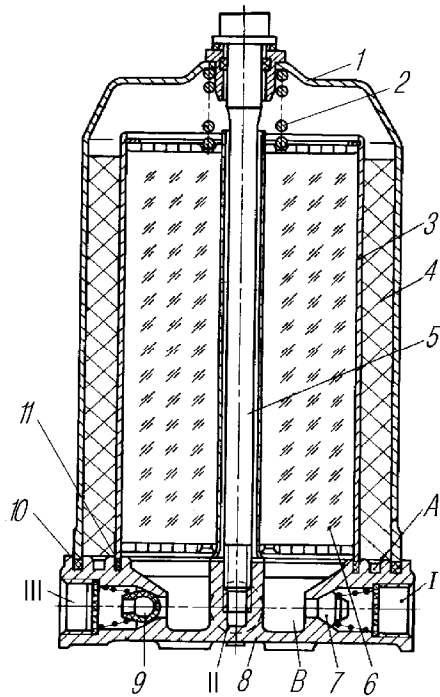


Fig. 134. Oil - Water Separator:

1 – cap; 2 – spring; 3 – sleeve; 4 – filter; 5 – screw; 6 – adsorber; 7 – return valve; 8 – body; 9 – throttle; 10, 11 – packing rings; I – outlet to brake system; II – inlet from compressor; III – outlet to regenerating bottle; A, B – hollows

After the truck brake system has been filled with the compressed air, the pressure regulator comes into action. The pressure in hollow B drops and return valve 7 closes. The dry air from the regenerating air bottle flows out to the atmosphere through throttle 9 and adsorber 6, regenerating the adsorber properties. The proper operation of the oil - water separator and pressure regulator is detected by the value of the controlled pressure and the regulator actuation – automatic release of condensate.

The efficiency of the oil - water separator should be regularly checked by availability of the condensate in the expansion tanks of the air system. A significant quantity of the condensate in the expansion tanks evidences unsatisfactory operation of the oil - water separator. In this case remove the cap, take out the filter and adsorber. Remove oiled granules of the adsorbent. If the adsorbent contains much dust and broken granules, replace it.

The aA - 2KT or aA - 2MIII synthetic zeolite, volume – 1 dm³, the service life of the zeolite is 2 years. It is advisable to clean the filter at the same time with performing seasonal maintenance.

SERVICE BRAKES COMBINED PNEUMATIC - HYDRAULIC DRIVE WITH ANTI - BLOCKING SYSTEM (ABS)

The wagon truck is equipped by a pneumohydraulic drive of the brakes with the anti - blocking system*.

The anti - blocking system is intended to keep the truck stability, when slowing down the truck with increased efficiency at different wheel - to - road adhesion coefficients. Upon installation of the anti - blocking system the truck has gained a number of advantages:

- increased active safety and improved stability and controllability, especially on wet and slippery roads;

* Optional.

- an opportunity to increase its average safe travelling speed;
- an extended service life of the tires;
- improved dynamics of acceleration and movement on slippery sections of roads.

The following components are additionally installed in the drive: brake pneumohydraulic booster 5 (see Fig. 135) three solenoid adjusting valves 10 (modulators), four induction senders 6, electronic control unit 16, two pilot lamps 3 and 4, cable 18 from solenoid valve, sender cables 9 and 12.

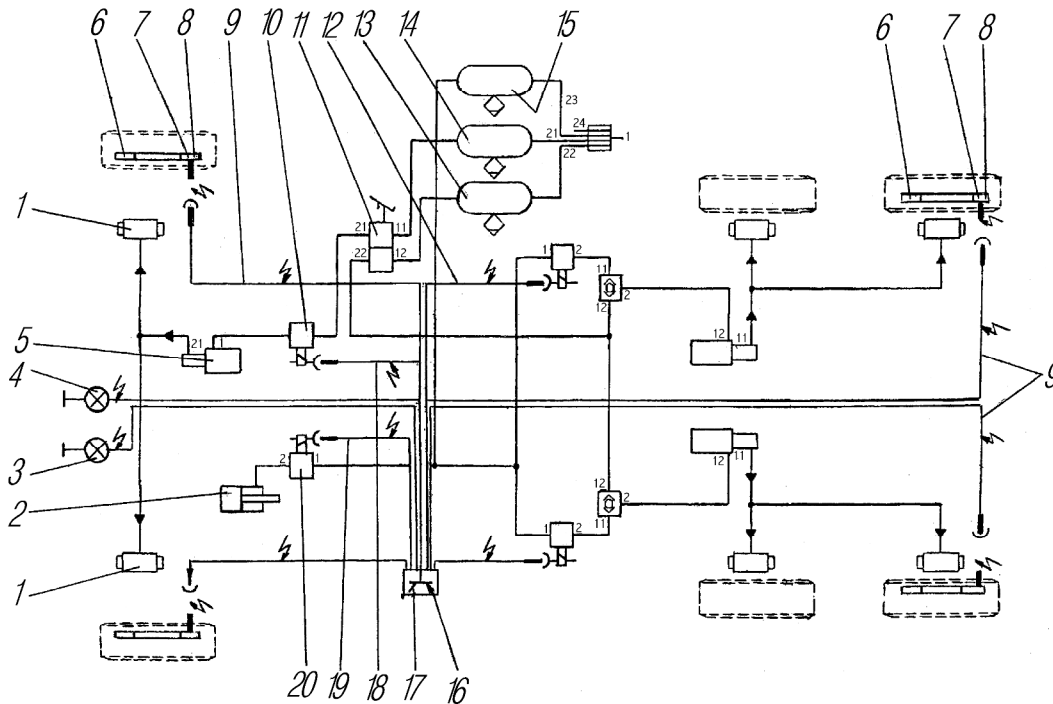


Fig. 135. Circuit Diagram of 4S/3M Anti - Blocking System Components:

1 – wheel brake cylinder; 2 – auxiliary brake cylinder; 3, 4 – pilot lamps; 5 – brake pneumohydraulic booster; 6 – senders; 7 – sender clamping bush; 8 – impulse ring; 9, 12 – sender cables; 10 – adjusting solenoid valve; 11 – brake valve; 13 – air bottle of rear brake circuit; 14 – air bottle of front brake circuit; 15 – air bottle of trailer brake circuit; 16 – electronic control unit; 17 – relay; 18 – cable from solenoid valve; 19 – extension cable; 20 – electropneumatic valve

The first main circuit comprises bottle 4 (see Fig. 136), upper section of brake valve 33, modulator 30, air booster 28, front axle wheel cylinders 31.

The second circuit consists of bottles 32, lower section of brake valve 33, braking forces regulator 26, modulators 25, air boosters 23 and 24, wheel cylinders 21 of the rear and intermediate axles.

Air boosters 23 and 28 are mounted on the chassis frame under the cab and air booster 24 is on the fuel tank.

The modulators are fastened near the air boosters.

Adjusting solenoid valve (modulator). The modulator provides quick increase, reduction or maintaining the pressure in the air cylinders of the air booster in the course of slowing down the truck, depending on the control signals of the electronic unit, and via the hydraulic part of the drive it generates the corresponding pressure in the hydraulic cylinders of the service brakes, which govern the required braking torque on the wheel.

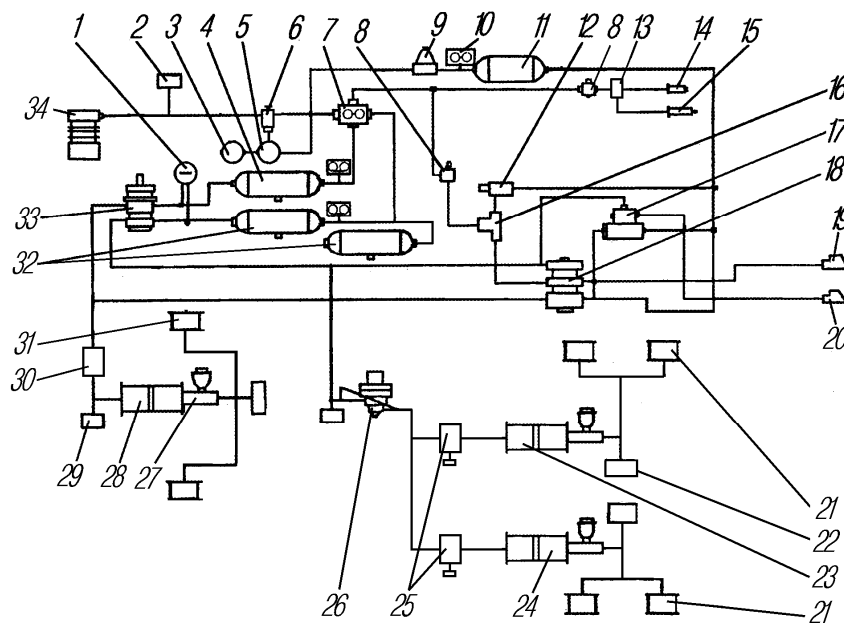


Fig. 136. Diagram of Service Brake Drive and Trailer Brakes Double - Line Drive with Anti - Blocking System:

1 – two - pointer pressure gauge; 2 – tow valve; 3 – regenerating bottle*; 4 – air bottle of front brake circuit; 5 – oil - water separator*; 6 – pressure regulator; 7 – triple safety valve; 8 – trailer brake cut - off air valve; 9 – single safety valve; 10 – pressure drop senders; 11 – air bottle of trailer brake circuit; 12 – trailer parking brake control valve; 13 – electropneumatic valve; 14 – fuel feed cut - off air cylinder; 15 – air cylinder for exhaust branch pipe flap closing; 16 – two - line valve; 17 – protection valve; 18 – control valve for trailer brakes with double - line drive; 19, 20 – automatic coupling heads; 21 – wheel brake cylinders of intermediate and rear axles; 22 – braking signal engagement senders; 23, 24, 28 – brake pneumohydraulic boosters; 25, 30 – modulators; 26 – braking forces regulator; 27 – brake failure sender; 29 – check outlet valves; 31 – front axle wheel brake cylinder; 32 – air bottle of rear brake circuit; 33 – brake valve; 34 – compressor

The electronic control unit is the basic part of the anti - blocking system. The control unit is located in the driver's cab. The connecting diagram for plug - and - socket joints of the control unit is shown in Fig. 137.

Auxiliary brake control. The anti - blocking system is designed for supplementary control of the auxiliary brake.

The control is performed by sending a signal from the electronic unit to the electropneumatic valve, which breaks the air supply to the auxiliary brake cylinders, letting the air out of them until the blocking stops.

After the blocking has stopped, the electropneumatic valve connects up the auxiliary brake again until the driver disconnects it.

Wheel brake mechanism. The front and rear brake mechanisms have coil pickups 1 (Fig. 138). The wheel rotation is controlled with the help of pulse gear 3 moving in combination with the hub. The ring is pressed onto hub 4.

Coil pickup 1 comprises a permanent magnet with a round core and a coil. Rotation of the pulse gear induces voltage impulses, the frequency of which is proportional to the wheel speed. The sender is fastened to a special bushing. When installing the sender, the adjustment of the air clearance is not required.

* Except bolster trucks.

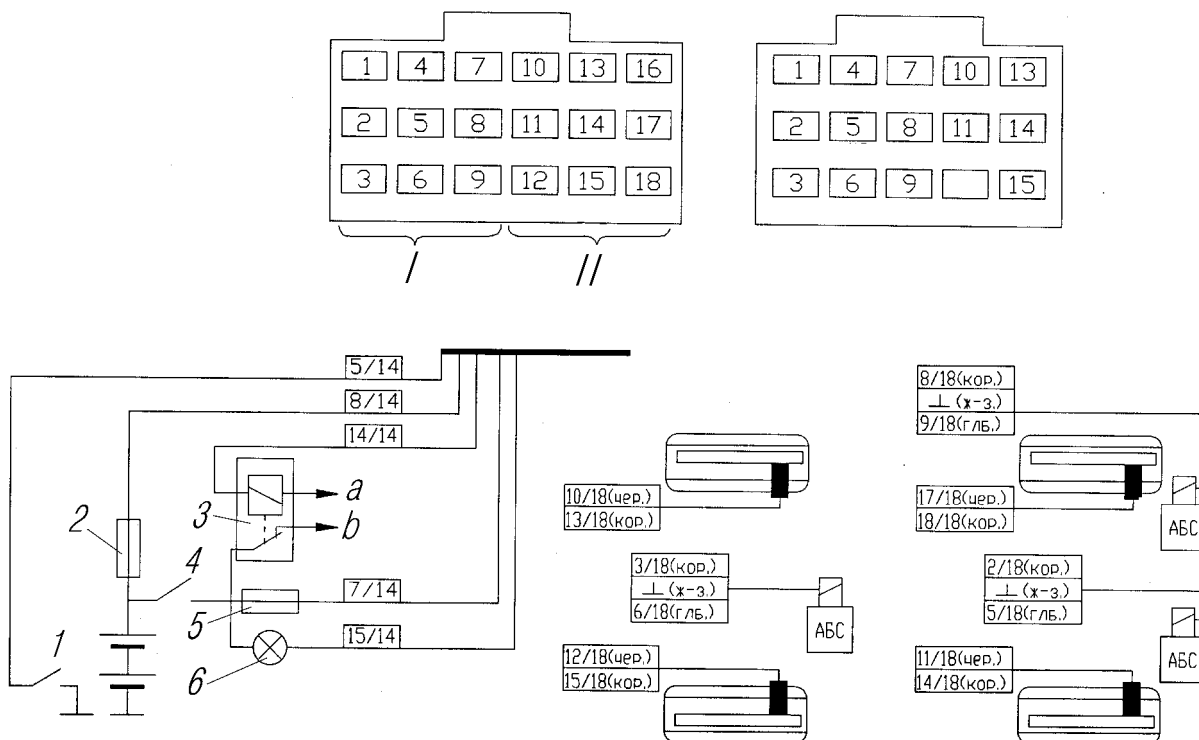


Fig. 137. Connecting Diagram of Control Unit Plug - and - Socket Joints:
1 – “OFF - ROAD” mode switch; 2 – 15A fuse; 3 – auxiliary brake release relay; 4 – ignition; 5 – 5A fuse; 6 – pilot lamp; a – to auxiliary brake switch; b – to electropneumatic valve; I – modulator valves connecting zone (1 - 9); II – rotation senders connecting zone (10 - 18)

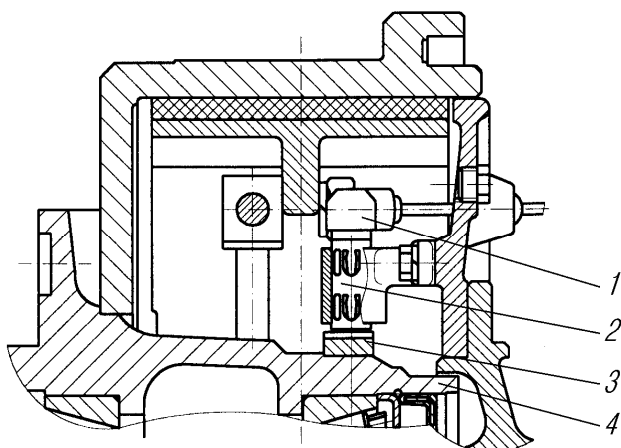


Fig. 138. Wheel Brake Mechanism:
1 – coil pickup; 2 – clamping bush;
3 – pulse gear; 4 – wheel hub

Electronic control unit wiring diagram. The description of the diagram for connecting the electric cables from different ABS components with the electronic control unit is specified in Tables 1 & 2 below. The diagram is shown in Fig. 139, 140.

Table 1

Connection of Control Unit 18 - Pin Plug & Socket Joint

Terminal №	Wire colour	ABS component to be connected
3	brown	1 st axle modulator
6	blue	
2	brown	2 nd axle modulator, left side
5	blue	
8	brown	2 nd axle modulator, right side
9	blue	
10	black	1 st axle wheel sender, right side
13	brown	
12	black	1 st axle wheel sender, left side
15	brown	
11	black	2 nd axle wheel sender, left side
14	brown	
17	black	2 nd axle wheel sender, right side
18	brown	
All yellow - and - green wires of the modulators are connected with the truck «ground».		

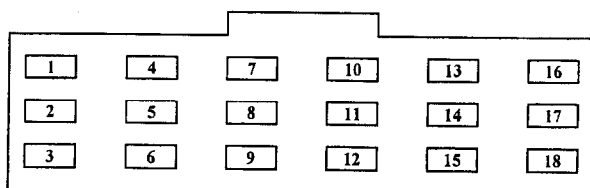


Fig. 139. View of Control Unit 18 - Pin Plug & Socket Joint

Table 2

Control Unit 14 - Pin Plug & Socket Joint Connection

Terminal №	Description of Wire to Be Connected
4	«Negative» wire of electronic control unit power supply (connected with truck «ground»)
7	«Positive» wire of electronic unit power supply (from ignition lock)
9	«Negative» wire of modulators power supply (connected with truck «ground»)
8	«Positive» wire of modulators power supply (from storage battery)
5	From «OFF - ROAD» mode button
15	From ABS pilot lamp
10	«K» diagnostic line (from «8» terminal of diagnostic socket)
11	«L» diagnostic line (from «10» terminal of diagnostic socket)

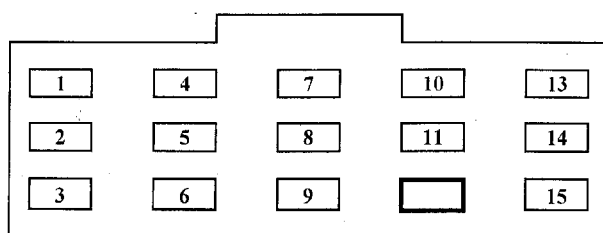


Fig. 140. View of Control Unit 14 - Pin Plug & Socket Joint

ABS operation and maintenance. Upon switching ON the starter and instruments, the ABS performs continuous diagnostics of troubles and informs the driver of its results. Pilot lamp 2 (Fig. 141) goes ON, when switching on the instruments, and goes OFF after checking ABS serviceability if no faults have been discovered.

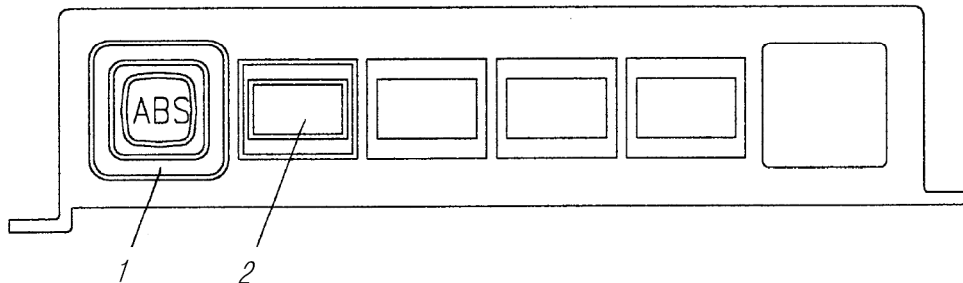


Fig. 141. ABS Control Unit:

1 – ABS actuating key when moving in “OFF - ROAD” mode; 2 – pilot lamp

ABS functioning check - up:

1. Make sure that the switching devices (cables, plug - and - socket joints) of the electronic control unit, modulators and senders are connected securely by external examination.

2. Turn on the storage battery button on the instrument board. Set the starter & instrument switch to the ПРИБОРЫ (“instruments”) position. In so doing a pilot lamp goes ON. If the electric equipment is in good working order, the pilot lamp should go OFF in 2 - 3 s.

3. Start the engine and bring the pressure in the circuits to the norm 650 - 800 kPa (6.5 - 8.0 kg/cm²). Begin movement. If the travelling speed exceeds 7 km/h the pilot lamp goes OFF. If the pilot valve does not go ON, check the installation of the senders in the wheel units, perform the control check of the system.

4. Accelerate the truck to the speed of 35 – 45 km/h and then brake it sharply. In so doing the wheels should not be blocked.

The pilot lamp should go ON and then OFF when turning on the storage battery button and starter & instruments switch again to the position “Instruments”.

If any failure occurs, the ABS is completely or partially switched OFF and the pilot lamp on the dashboard goes ON. The failure code is stored in the control unit memory for a long time and may be asked when repairing.

The system does not require special maintenance, except control over functioning and check the installation of the ABS senders when adjusting or replacing bearings in the wheel units or replacing the brake linings (if the hubs have been removed). For proper ABS operation the clearance between the stator and the rotor should not exceed 1.3 mm. To set a minimum operating clearance between the stator and the rotor, hang out the wheel and then the sender body, applying a force of 120 - 140 N (12 - 14 kgf) onto its end, move it in the clamping bush in the axial direction up to the stop at the rotor crown and turn over the wheel hub through 2 - 3 turns. If the sender movement in the bushing is hindered by penetrated mud, rust, disassemble the unit and apply a thin layer of VCcA GOST 3333 - 80 graphite grease or ВНИИ НП - 225 GOST 19782 - 74 paste onto the inner surface of the bushing.

The faults diagnostics for ABS, D version, made by WABCO is performed with the help of the Wabco 4463003200 diagnostic controller. The diagnostic controller is

a universal device working under the program recorded into program card. The 4463005010 program card is required for the truck ABS diagnostics.

The "OFF - ROAD" mode can be used to generate more sliding (temporary blocking), when applying the truck brakes during its travelling across country. The mode is entered and cancelled by a button switch located on the dashboard. When entering the "OFF - ROAD" mode, the ABS does not control the braking process at the truck travelling speed less than 15 km/h; at the travelling speed of 15 – 40 km/h the ABS performs the control, but admits a larger time period to proceed to wheel skidding, when applying the brakes. The pilot lamp is turned ON in the "OFF - ROAD" mode.

Do not actuate the "OFF-ROAD" mode of the ABS on other types of roads.

Prior to welding disconnect the contact joint from the electronic control unit.

The ABS should be repaired in accordance with manufacturer's instructions by authorized workshops.

DESIGN FEATURES OF THE URAL - 4320 - 41, URAL - 4320 - 40 TRUCKS AND THEIR VARIANTS POWERED WITH THE YAMZ - 236NE2 ENGINE

When the truck is fitted with the YAMZ - 236NE2 engine design of its units and aggregates gets changed.

Information of engine marks could be found in the Operation Manual "YAMZ - 236NE2, YAMZ - 236NE, YAMZ - 236N, YAMZ - 236BE2, YAMZ - 236BE, YAMZ - 236B Power Units".

The most suitable temperature of the coolant should be within 75 – 90 °C.

Take care to cable fixing. Exclude sagging of wires and their contact with parts of the exhaust system.

Do not operate the truck without heat shield installed between the turbo - charger and front panel of the driver's cab.

Specifications

Parameter	Ural - 4320 - 0111 - 41	Ural - 4320 - 1151 - 41	Ural - 43203 - 1151 - 41	Ural - 44202 - 0311 - 41	Ural - 44202 - 0511 - 41	Ural - 4320 - 0911 - 40	Ural - 4320 - 1951 - 40	Ural - 4320 - 1972 - 40
Payload, kg	6000	-	-	-	-	10 000	-	-
Payload on chassis, kg	-	6855	6845	-	-	-	12 000	
Semitrailer weight fall - ing on truck fifth wheel, kg	-	-	-	8100*1/5500*2/7600*3		-	-	-
Truck Kerb Weight, kg	9100	8265	8285	8670	8795	10 050	8740	8865
Gross Vehicle Weight including load, the driver and passengers, 225 kg without regard for Truck Kerb Weight allowance, kg	17 300					21 300		
Kerb Vehicle Weight distribution, kg: on front axle on rear bogie	4795 4305	4685 3580	4685 3600	4775 3895	4840 3955	5110 4940	4885 3855	4950 3915
GVW distribution, kg: on front axle on rear bogie	5300 12 000					5300 16 000		
Gross Trailer Weight, kg	11 500*1/7000*2			-		11 500*1/7000*2		
Gross Semitrailer Weight, kg	-			19 100*1/12 500*2/22 000*3				
*1 When operating on roads of grade 1 - 4. *2 Weight for operating on roads of grade 5. *3 For trucks with model 9516 semitrailer.								

Parameter	Ural - 4320 - 0111 - 41, Ural - 4320 - 1151 - 41, Ural - 43203 - 1151 - 41, Ural - 44202 - 0311 - 41, Ural - 44202 - 0511 - 41, Ural - 4320 - 0911 - 40, Ural - 4320 - 1951 - 40, Ural - 4320 - 1972 - 40	
ENGINE		
Type, model	YAMZ - 236NE2, with compression ignition, four - stroke, turbocharged, six - cylinder, V - type	
Displacement, l	11.15	
Rated power, gross, kW (hp), minimum	169 (230)	
Maximum torque, gross, N.m (kgf m), not less	882 (90)	
Speed, min ⁻¹ :		
at rated power	2100	
at maximum torque	1100 - 1300	
Engine lubrication system	Combined type, forced and constant - level lubri - cation, with oil cooling in an oil - to - water heat exchanger	
Engine air system	Containing air filter of dry type with replaceable paper element; charging air cooling and service indicator	
Exhaust system	With muffler, exhaust pipe end is directed to the right side	
Cooling system	Liquid cooling of closed type, with forced liquid circulation The cooling radiator of corrugated fin type, with radiator blade	
TRANSMISSION		
Clutch	YAMZ - 182, single - disc dry friction type, with diaphragm spring of pull - out type	
Gearbox	YAMZ - 236U, mechanical, five - speed type syn - chronized in second, third, fourth and fifth gears	
ratios	first gear - 5.22; second 2.90; third - 1.52; fourth - 1.00; fifth - 0.664; reverse - 5.22	
Transfer box		
ratios	high - 1,21 low - 2,15	
Cardan drive	Open - type, with four shafts, with joints mounted in needle bearings	
BRAKING SYSTEM		
Auxiliary brake system	Retarder of engine, compression type, installed in gas exhaust system. Air operated, interlocked with engine stop	
ELECTRICAL EQUIPMENT		
Generator	Г - 273B1, or alternatively 1322.3771, waterproof design, rated at 1000 W with integrated voltage regulator	

Controls and Instruments

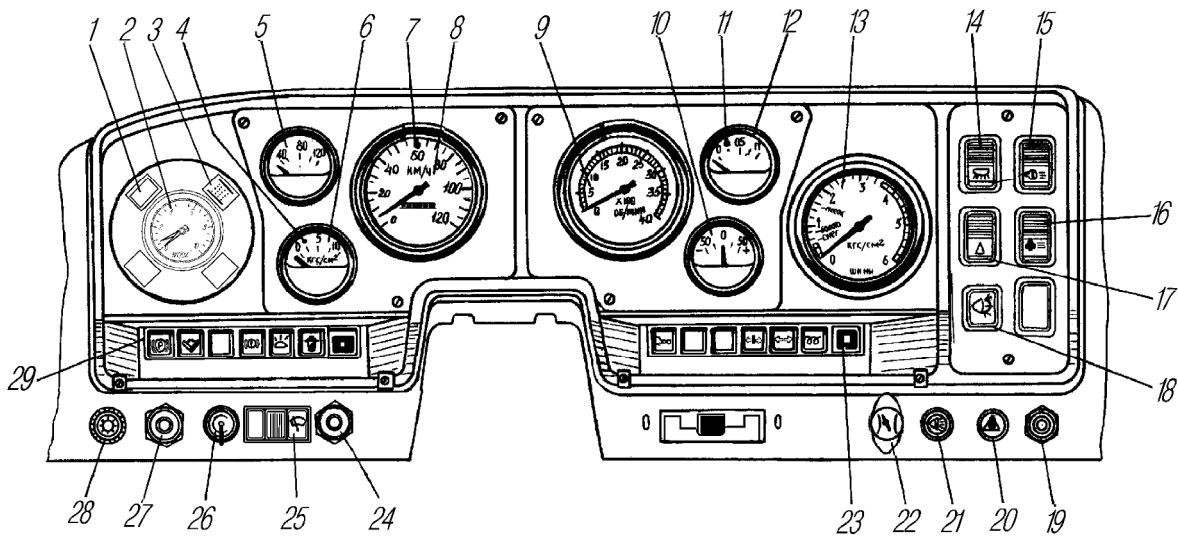


Fig.142. Dashboard:

1 – storage battery charging indicator (with 1322.3771 generator installed); 2 – two – pointer pressure gauge; 3 – air filter clogging alarm; 4 – oil pressure emergency drop lamp; 5 – coolant temperature gauge; 6 – oil pressure gauge; 7 – main beam telltale 8 – speedometer; 9 – tachometer; 10 – current indicator; 11 – fuel reserve indicator; 12 – fuel level indicator; 13 – tire pressure gauge; 14 – cab roof lamp switch; 15 – flood head lamp switch; 16 – cab heater switch, 17 – road train sign light switch; 18 – rear fog light switch (with built - in alarm); 19 – glow - plug preheater switch button; 20 – alarm signaling switch; 21 – headlamps master switch; 22 – fuel - feed manual control knob; 23, 29 – r.h. and l.h. pilot lamps assemblies; 24 – storage battery switch button; 25 – wind - shield wiper switch; 26 – starter and instruments switch (installed in case when anti - theft device is not available); 27 - windshield washer pump knob; 28 – instruments illumination rheostat - type switch

Switch 26 (Fig. 142) is installed on the dashboard when no anti - theft device is available on the steering column.

Manual fuel feed pump is mounted on the r.h. cowling panel. For delivering the fuel to the injection pump with the engine not running turn handle 1 anti - clockwise (Fig.16 in the Operation Manual) to release it from the fixed position and reciprocate it up and down. Having pumped in the fuel manually, press the handle and fix it by turning clockwise as far as it will go.

Engine

Fuel System

Engine Fuel System. Fuel is taken from main fuel tank 12 (Fig. 143) by fuel feed pump 6 and is supplied to injection pump (high - pressure fuel pump - HPFP) 17 via coarse - mesh filter 8 and fine - mesh filter 19. The injection pump delivers fuel via pipes to the injectors, which inject fuel into the engine cylinders in accordance with the firing sequence. Excessive fuel together with air, which has entered the fuel system, are returned to the fuel tank through the orificed valve of the fine - mesh filter via fuel lines 1 and 5. The fuel, which has oozed through the injector's precision parts is also returned to the fuel tank via pipes 15 and 13. The fuel

volume in the tank is measured by an electrical level gauge installed in the tank and is controlled by the indicator on the dashboard.

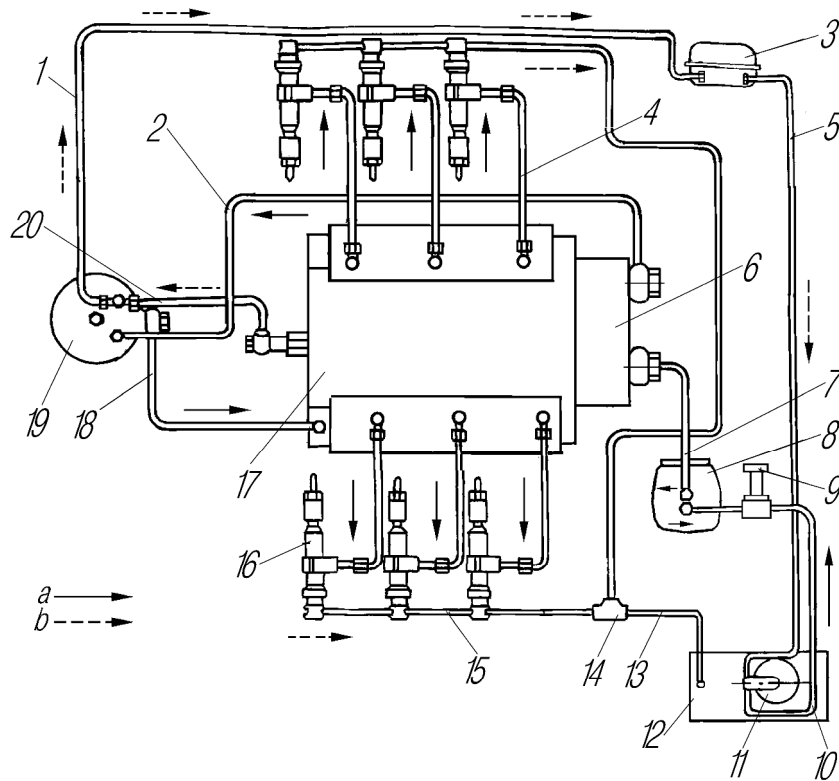


Fig. 143. Fuel System Diagram:

1,5,13,15,20 - return fuel lines; 2,4,7,10,18 - feeding fuel lines; 3 - starting preheater fuel tank; 3 - fuel drain hose; 6 - low - pressure fuel pump; 8 - coarse - mesh fuel filter; 9 - manuel fuel feed pump; 11 - fuel intake; 12 - fuel tank; 14 - T - joint; 16 - injector; 17 - injection pump; 19 - fine - mesh fuel filter; a - fuel delivery; b - fuel return

Fuel Feed and Engine Stop Control (Fig. 144) is of mechanical type, consisting of a pedal, tie rods, control levers and knobs.

Constant speed of the engine crankshaft is set by means of knob 3 of the manual control tie rod, which is connected via tie rod 1 with speed governor control lever 15. To set the required engine speed (when inflating tires, warming up cold engine etc.) first press down accelerator pedal 9 and then fix this position by pulling out the knob.

The pedal travel is limited by adjusting bolt 10. At maximum engine speed clearance "a" between pedal 9 and adjusting bolt 10 should be 2 - 3 mm.

With fuel feed control adjusted correctly pedal 9 should move easily ensuring that the speed governor control lever 15 moves from thrust against minimum idle - speed limiting bolt up to the stop at maximum idle - speed limiting one.

To stop the running engine knob 4, which is connected with the stop lever, should be pulled out.

The control knobs are located in the driver's cab on the panel under the dashboard.

Engine Air System is intended for air intake from the atmosphere, its cleaning from dust, cooling and distribution to cylinders. The system consists of a two -

stage dry - type air filter, charging air cooler, inlet pipelines, connecting hoses and fixing elements.

The air filter is fitted on the right - hand truck fender.

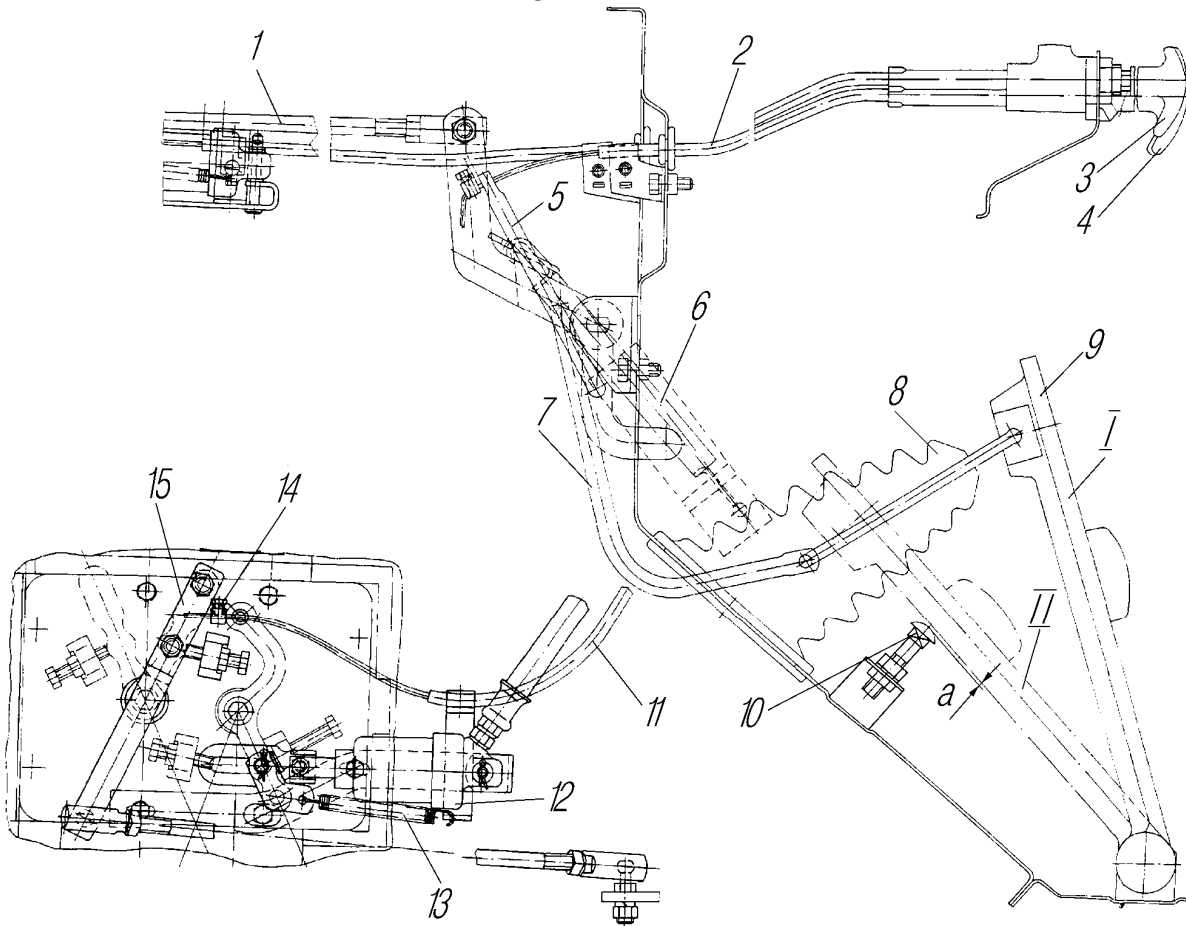


Fig.144. Fuel Feed and Engine Stop Control:

1 - rod; 2 - manual control rod; 3 - fuel manual feed rod knob; 4 - engine manual stop rod knob; 5 - linkage hand lever; 6 - spring; 7 - speed governor control shaft lever; 8 - seal; 9 - pedal; 10 - adjusting bolt; 11 - engine stop rod; 12 - air cylinder; 13 - engine stop return spring; 14 - rope wire clamp; 15 - speed governor control lever; a - clearance; I - pedal position with engine running at minimum idle-speed; II - pedal position with engine running at maximum speed and maximum power

Air is supplied to the air filter via the air suction pipe. Air received in the filter due flowing through the swirler obtains rotary motion in the annular gap between the housing and filter element. Under centrifugal force dust particles are thrown to the housing wall and collected in the dust bin through a slit in the baffle. Then, the preliminary cleaned air flows through the filter element, where it is cleaned finally. From the turbocharger the air flows via pipes to the charging air cooler, where it is cooled, and then enters the engine cylinders.

The air filter is provided with a precleaner on purpose to obtain better air cleaning and extend the filter element's service life.

The first stage of the air filter is to be maintained occasionally depending on operation conditions of the truck. The necessity of filter element maintenance should be determined by the readings of the air filter clogging indicator located on the dashboard. Every time the indicator lights up the air filter is to be maintained.

For maintaining the first cleaning stage disconnect the air pipes, remove the cover, unscrew the fixings, take out the cardboard element, take off the air filter, remove dust from the bin cover. Wash the housing and cover either in diesel fuel or hot water, blow through with dry compressed air and dry.

Inspect visually the filter element. A thin coating of dust on its inner side indicates that the element or its sealing gaskets are not tight. In this case replace the filter element.

Check sealing quality by an uninterrupted imprint on the gasket.

To maintain the filter element take off the precleaner and dislodge dust from it by shaking it or blowing through. If no ash or soot is seen on the element cardboard (element colour is grey), blow it through with dry compressed air until dust is blown off completely. To avoid tearing of the cardboard, the air pressure should not exceed 200 - 300 kPa (2 - 3 kgf/cm²). When blowing direct the air jet at an angle, adjust its force by changing the hose - to - element distance.

If soot or oil are seen on the cardboard, or if blow-over with compressed air proves ineffective, either replace the element or wash it in warm water (40 - 50 °C) with a detergent (for example, conventional powered detergent) dissolved in it, in proportion 20 - 25 g/1 l. Wash the element by immersing it in the solution for half an hour, then rotate it or dip vigorously during 10 - 15 min. After washing in the solution, rinse the element in clean warm water and dry. Do not dry it above open fire or in air heated over 70 °C.

After each servicing or fitting a new element a visual inspection of its condition should be made, illuminating it with a bulb.

Replace the element if mechanical injuries, cardboard broken corrugations or ply separations are evident.

The estimated service life of the cardboard filter element is 30 000 km. More frequent cleaning of the filtering element might reduce its service life, since total attempts of element servicing are limited (to 5 - 7 attempts including washing 3 times, maximum) because of possible cardboard disruption.

Inspect the condition of corrugated and smooth connecting rubber hoses at regular intervals. Replace them if any defects, such as cracks, cuts, ruptures and others are detected.

Engine Starting Preheating System

Fig. 25, page 42, Operation Manual: items 1, 2, 6 are excluded.

There are added:

- delivery pipe from pump unit to heat exchanger;
- delivery pipe from engine unit to pump unit.

Cooling System

Control over coolant temperature in the cooling system is performed by the indicator installed in the dashboard. The indicator sender is fitted in the water - collecting pipe. The coolant temperature in the cooling system should be within 75 - 100 °C.

When the temperature in the cooling system reaches 95 °C the coolant overheating alarm lights up. This alarm warns that it is necessary to detect the reason of engine overheating and eliminate it.

In special situations it is possible to continue travelling with the lighting alarm provided that the coolant temperature indicator is carefully observed. A short - time temperature rise, for 10 min maximum, up to 95 °C is permissible.

When using motor oils of higher viscosity, not below grade M - 5₃/14Δ(M) (SAE 10W/40) the limiting temperature will be 95 °C. At the same time a short - time temperature rise up to 105 °C is permissible.

Gas Exhaust System

Gas exhaust system is intended for removal of waste gas and reducing of ex - haust noise. The auxiliary brake (engine brake) is located between the outlet pipe branch on the turbocharger and the inlet pipe. A flexible metal hose is fitted behind the front pipe to compensate for variation of dimensions of the parts with temperature and relative displacements of the engine and silencer.

The exhaust noise silencer is fixed by two clips to the brackets on the 2 nd and 3 rd truck frame cross - members. The exhaust pipe is pointing to the right as viewed in the truck travel's direction and is connected with the silencer by a clip and U - bolt. A flange and hooks for mounting the fording valve are welded to the exhaust pipe end.

Auxiliary Brake System

In this Section the third and forth paragraphs in the Operation Manual are to be replaced by the following text: "When needed to brake the truck press the button of the auxiliary brake control air valve located on the cab floor. The compressed air is supplied to the air cylinder, the piston moves closing the flap. Simultaneously the signal is transmitted to the trailer brake actuation system and its light braking occurs.

When the foot is removed from the valve button the air leaves the cylinder passing to the atmosphere, the rod turns the lever and flap to their initial position under the action of the return spring."

Electric Equipment

Connection diagram of the air filter clogging alarm is shown in Fig.146.

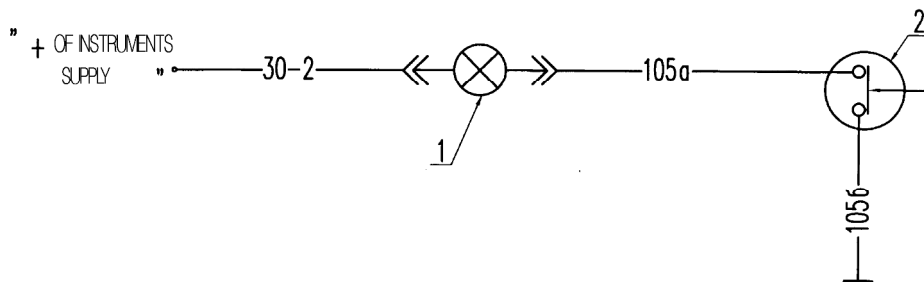


Fig. 146. Connection Diagram of Air Filter Clogging Alarm:
1 - air filter clogging alarm; 2 - sender of air filter clogging alarm

Table "Truck's Electric Units" is supplemented by the following items: air filter clogging alarm 2212.3803 - 34; air filter clogging alarm sender 13.3839.

Maintenance

Maintain the power unit in accordance with the Operation Manual for YAMZ - 236NE2, YAMZ - 236NE, YAMZ - 236N, YAMZ - 236BE2, YAMZ - 236BE, YAMZ - 236B engines.

Lubricate the power unit in conformity with Lubrication Chart in the Operation Manual for YAMZ - 236NE2, YAMZ - 236NE, YAMZ - 236N, YAMZ - 236BE2, YAMZ - 236BE, YAMZ - 236B engines.

Section "Daily Maintenance" (DM) is supplemented by the following text: "Inspect visually the compensators (metal hoses) of the engine gas exhaust system for their tightness. Should the compensator be not tight dark exhaust trails will be seen on the compensator and parts surrounding it. When detecting non - tightness replace the compensators".

Lubricants and working fluids chart

Volume of oil, grease and liquids to be filled in the units shall be as follows:

- engine crankcase: 24.0 l;
- steering hydraulic system: 5.7 l;
- cooling system including preheater: 31.0 l.

Storage

Preservation of the YAMZ - 236NE2 power unit should be carried out in the same way as preservation of the YAMZ - 236M2 one.

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