Operation Manual

Agrison Electric Forklift AG Series



Agrison

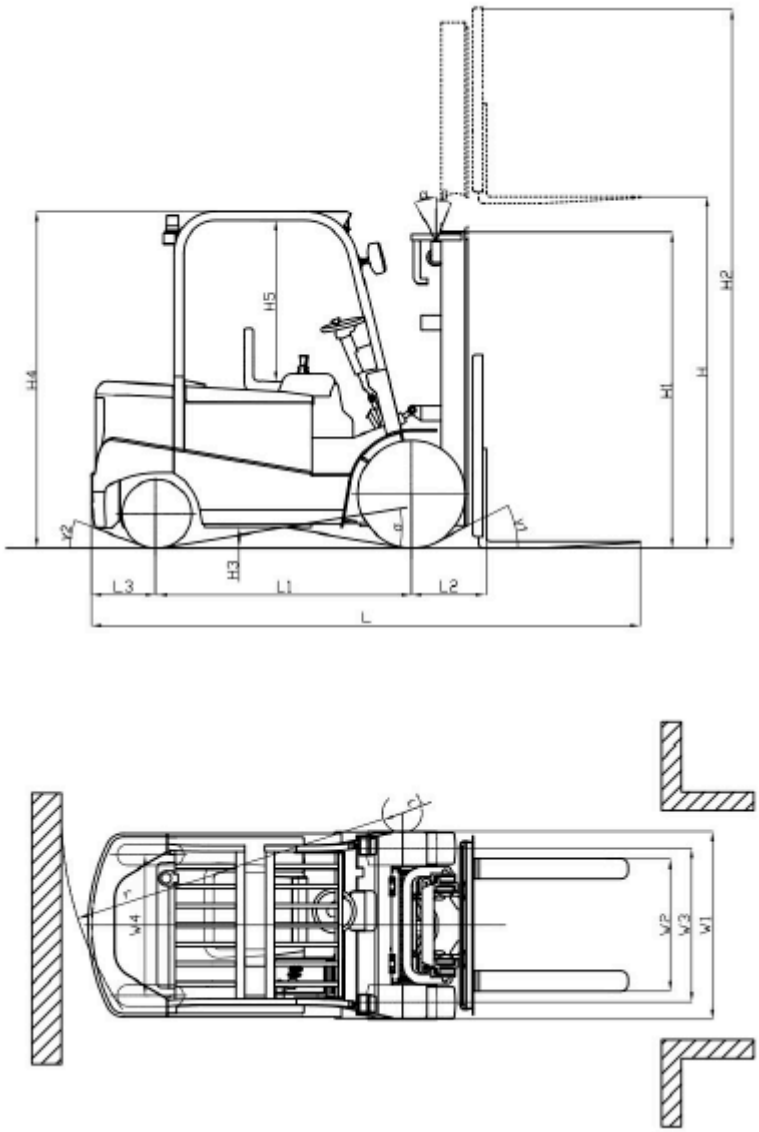
2098 Hume Highway

Campbellfield VIC 3061

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I. Main Technical Parameters of Forklift Truck



Outline drawing of forklift truck

Technical parameters of battery forklift truck

Main information										
	Model			CPD75	CPD10	CPD15	CPD18	CPD20	CPD25	CPD30	CPD35
	Power type			Battery	Battery	Battery	Battery	Battery	Battery	Battery	Battery
	Rated load		KG	750	1000	1500	1800	2000	2500	3000	3500
	Load center distance		mm	300	500	500	500	500	500	500	500
	Driving type			Seat	Seat	Seat	Seat	Seat	Seat	Seat	Seat
Measurement											
1	Length	With fork L1	mm	2040	3170	3170	3200	3380	3380	3630	3630
		Without fork L2		1400	2100	2100	2130	2310	2310	2560	2560
2	Whole Width B			800	960	960	1050	1150	1150	1220	1220
	Height	Height no lifting frame H1		1680	1950	1950	2000	2000	2000	2080	2080
3		Top frame height H2		1820	1890	1890	2145	2145	2145	2215	2215
		Max Height working H3		3070	3655	3655	3995	3995	3995	4185	4185
4	Distance from seat to top light L3			970	970	970	1020	1020	1020	1060	1060
5	Wheel base L4			860	1180	1180	1335	1515	1515	1680	1680
6	Front overhang Y			300	340	340	483	483	483	490	490
7	Back overhang L5			290	490	490	400	400	400	425	425
8	Front wheel tread R			700	955	955	900	970	970	1000	1000
9	Back wheel tread P			668	890	890	920	950	950	980	980
10	Min Floor clearance F			90	90	90	110	135	135	145	145
11	Max lifting height H			2500	3000	3000	3000	3000	3000	3000	3000
12	Free lifting height H4			80	80	80	80	170	170	160	160
13	Fork changing S			703/190	765/180	765/180	925/200	1024/200	1024/200	1060/250	1060/250
14	Min Turning radius WA			1200	1500	1500	1950	2050	2050	2200	2200
15	Min driiving width RA			1600	2000	2000	3400	3760	3760	4100	4100
Performance											
16	Frame angle α/β		(°)	6°/12°	6°/12°	6°/12°	6°/12°	6°/12°	6°/12°	6°/12°	6°/12°
17	Max lifting speed without goods		mm/s	400	300	300	350	400	380	450	425
18	Max lifting speed with full goods			350	260	260	300	300	280	280	260
19	Max speed without goods		Km/h	13	15	15	15	15	15	14	14
20	Max speed with full goods			12	14	14	14	14	14	12.5	12.5
21	Max climbing angle		%	≤10	≤10	≤10	≤10	≤15	≤15	≤15	≤15
Weight											
23	Whole weight		Kg	1100	1850	2000	3500	4050	4200	4950	5600
Wheels and tire											
26	Driving Wheel			2x/2	2x/2	2x/2	2x/2	2x/2	2x/2	2x/2	2x/2
27	Type model			Solid Tyre	Solid Tyre	Solid Tyre	Solid Tyre	Solid Tyre	Solid Tyre	Solid Tyre	Solid Tyre
28	Front Tyre			16x4 1/2-8	16x6-8	18x7-8	6.50-10	7.00-12	7.00-12	28X9-15	28X9-15
29	Rear Tyre			3.50-5	15x4 1/2-8	16x6-8	5.00-10	18x7-8	18x7-8	18x7-8	18x7-8
30	Hand Brake			Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal	Hydraulic Pedal
31	Brake type			M-Hand	M-Hand	M-Hand	M-Hand	M-Hand	M-Hand	M-Hand	M-Hand
Battery and motor											
32	Battery Volt/ capacity		V/Ah	48/140	48V/300	48V/300	48V/400	48/500	48/500	80/500	80/500
33	Driving motor power		Kw	AC3	AC4	AC4	DC5	AC11	AC11	AC16.6	AC16.6
34	Pump power			DC3	DC5.5	DC5.5	AC8.6	AC12	AC12	AC12	AC12

II. Driving, Operation and Daily Maintenance of Forklift Truck

The drivers and managers of forklift trucks must keep in mind "Safety first" and perform safe and standardized operations in accordance with *Operation and Maintenance Manual* and *Driver Handbook*.

1. Transportation of forklift truck

When containers or trucks are used to load and transport forklift trucks, attention must be paid to the following precautions:

(1) Brake the parking brake;

(2) Fix the mast and the counterweight with steel wires at the front and back, and well pad and firmly wedge the corresponding positions of the front and rear tyres with wedges;

(3) Perform lifting according to the position indicated in the "Lifting label" of the forklift truck.

2. Storage of forklift truck

(1) Lower the mast to the lowest position;

(2) Close the electric lock, place all joysticks at the neutral positions, and pull off the power plug;

(3) Tighten the hand brake lever;

(4) Well pad the front and rear tyres with wedges;

(5) In case of parking for a long time, keep the wheels overhead. Complementarily charge the battery once a month.

3. Preparation before operation

(1) Check whether each instrument is normal;

(2) Check the air pressures of the tyres;

(3) Check the conditions of each handle and the pedal;

(4) Check whether the voltage of the battery pack is within the working range and whether the specific gravity and the level of the electrolyte are suitable;

(5) Check whether the contact of each connector or plug of the electrical system is reliable;

(6) Check the hydraulic oil, the electrolyte and the braking fluid for leakage;

(7) Check each main fastener for tightness;

(8) Check whether the lighting and signals, etc. are normal;

(9) Release the parking brake;

(10) Perform test run of mast lifting, front and rear tilting, steering and braking;

(11) Ensure that the pollution degree of the hydraulic oil is not higher than

Grade 12.

4. Precautions for safe operation

(1) Since forklift trucks belong to special equipment, only the drivers passing the training and examination and holding driving licenses can drive them; maintenance shall also be performed by the personnel passing the training and examination, so as to guarantee normal usage of forklift trucks;

(2) The operators shall wear shoes, helmets, clothes and gloves used for safety protection during operation;

(3) When the center of gravity of the goods is 500mm from the fork arm, the maximum load is the rated lifting capacity and the load shall not exceed the specified value during handling. When the center of gravity of the goods is greater than 500mm from the fork arm, the lifting capacity shall be reduced according to the value specified in the load curve and overload is prohibited strictly;

(4) Forklift trucks are only suitable for operation on flat and hard pavements. Any oil or grease on the pavement must be wiped off;

(5) Before and after usage of forklift trucks, routine inspection must be performed and operation with any fault is prohibited; in the working process of the forklift truck, if any abnormity is found, the forklift truck must be stopped for inspection and can't be operated until troubleshooting;

(6) When a handle is operated, attention shall be paid to preventing the other handle from moving and the handle shall not be operated at any position other than the driver's seat;

(7) It is prohibited to load unfixed or loosely stacked goods and the goods with large dimensions shall be handled with care;

(8) The forklift trucks equipped with fittings specially ordered by the users make the scope of application wider. However, the forklift trucks with fittings will reduce the effective load and the stability. The equipped fittings and special devices shall not be used for other purposes. Please read the additional information and use the forklift trucks in strict accordance with the requirements. No user shall modify the forklift trucks without permit.

(9) The fork shall not be used to pull up the embedded part (when necessary, the pull force shall be calculated firstly);

(10) When the goods are being loaded, the distance of the fork shall be adjusted according to the size of the goods, and the weight of the goods shall be equally borne by two forks, so as to prevent unbalanced loading or sliding of the goods to a side during driving. It is prohibited to bear the goods with single fork;

(11) When goods with a large volume are handled, the goods will block the line of sight of the driver and the forklift truck shall reverse;

(12) When the goods are being loaded, the fork shall be placed to the bottom. After the fork is inserted into the stockpile, the fork arm shall contact the goods and then the mast shall be tilted backward to the limit position, and the forklift truck shall be driven when the fork is lifted 200mm-300mm from the ground;

(13) When the goods are being lifted up or down, nobody shall stay below the gantry; and it is prohibited to utilize the fork to carry and lift anybody;

(14) During the handling operation, the mast shall be placed at the vertical position and the forklift truck shall be braked;

(15) In use, attention shall be paid to the mechanical, hydraulic, electrical and speed regulator performances and working conditions;

(16) The power supply shall be connected. Firstly, the key switch shall be turned on, the position of the direction switch shall be selected, the steering wheel shall be rotated to see whether the vehicle is rotated normally, and the speed regulating pedal shall be treaded slowly to keep a suitable starting acceleration;

(17) Attention shall be paid to observation of the voltage of the voltmeter. When the forklift truck is working, if the voltage of the voltmeter is lower than 41V, it shall be stopped immediately and the battery shall be charged or replaced with a fully charged battery;

(18) During handling, the load shall not exceed the specified value, the distance and position of the fork shall be suitable, and the fork must be fully inserted into the goods, so as to evenly distribute the goods on the fork and prevent unbalanced loading;

(19) The movement of the control handle of the multiple directional control valve can control the ascending or descending speed of the goods, and the ascending or descending or initial speed of the goods should not be too high;

(20) Before forward or backward tilting of the mast, the fork shall be braked. In case of forward tilting, the throttle shall be decreased and the mast shall be tilted slowly, so as to prevent the goods from sliding out;

(21) When the high lift forklift truck is working, the mast shall be tilted backward to the maximum extent, the handling operation shall be subject to forward and backward tilting within the minimum scope; the forklift truck shall not be driven or steered when the fork is being lifted up;

(22) For the high lift forklift trucks with a lift height greater than 3m, attention shall be paid to preventing the top goods from falling down, and protective measures must be taken when necessary;

(23) The overhead guard is a main component used to prevent the top goods from falling down and protect the safety of the operator. Loose installation, reuse after dismantling and use after modification will be very dangerous and may result in serious accidents;

(24) The backrest is a main component used to prevent the goods loaded on the fork from sliding down towards the operator. Loose installation, reuse after dismantling and reuse after modification will be very dangerous and may result in serious accidents;

(25) The height of the goods to be loaded and unloaded shall be limited within the height of the backrest. If the height of the goods exceeds that of the backrest, the goods tend to slide down towards the operator and may result in serious accidents;

(26) In case of outdoor operation, the impact of wind on the stability of the forklift truck is very high and special attention must be paid to that:

(27) The forklift truck shall be driven slowly with double care at the wharf or on the waist board;

(28) When the forklift truck carries goods and runs, the mast shall not be tilted forward, handling operation shall not be performed, and the forklift truck shall not be braked, so as to prevent the goods from sliding out;

(29) The forklift truck shall be driven into the stockpile at a low speed and meanwhile attention shall be paid to observation nearby the goods for any projecting hard objects, so as to prevent the tyres from being punctured;

(30) During driving, attention shall be paid to any pedestrian, obstacle or pavement pothole as well as the clearance above the forklift truck;

(31) When the forklift truck is running, it is prohibited to extend hands, feet or other parts of the body out of the cab or carry anybody on the truck;

(32) On the slope, the forklift truck shall be driven with care and shall not be steered or driven in the transverse or inclined direction, otherwise it is under the risk of rollover; on a steep slope, the forklift truck shall be driven forward in case of climbing up and shall be driven backward in case of climbing down; in case of climbing down, it shall be braked with the foot and driven with care; in case of running on a slope, the forklift truck must not be stalled;

(33) The forklift truck shall be started, steered, driven, braked and stopped smoothly, in particular, it must be decelerated in case of steering on a wet or smooth pavement;

(34) The forklift truck shall not be suddenly started, accelerated, stopped and sharply turned, and any improper operation may result in rollover. In such case, the driver shall stay calm, hold the steering wheel with both hands and lean towards the direction opposite to rollover and shall not jump out of the truck.

(35) In case of no-load running, the forklift truck with fittings shall be operated as a loaded forklift truck;

(36) In use, the chain shall be inspected regularly to guarantee good lubricating conditions between chains and the tightness of the left and right chains shall be kept consistent; if the chain is worn in use, when the chain pitch variation exceeds 2% of the standard value, the chain must be replaced to guarantee safe load bearing;

(37) The chain shall not be replaced until the forklift truck is decelerated and parked safely, so as to guarantee safe load bearing;

(38) When the forklift truck is driven under a load, it shall not be braked suddenly;

(39) When leaving the forklift truck, the fork shall be descended and landed, the gear lever shall be placed at the neutral position and the power supply shall be cut off. In case of parking on a slope, the parking brake shall be pulled. In case of parking for a long time, the wheels must be padded with wedges;

(40) When the mast is tilted forward or backward to the limit position or the fork is lifted up to the maximum height, the handle must be returned to the middle position quickly;

(41) The pressures of the multitandem valve and the safety valve shall have been regulated before delivery of the forklift trucks, and the users shall not regulate them at will in use, so as to prevent too high pressures from causing damages to the whole hydraulic system and the hydraulic elements;

(42) The inflation pressure of the tyres shall be in accordance with the air pressure value specified in the "Tyre pressure" label;

(43) On a flat and solid pavement, according to the acoustic power (7m from the vehicle body) test method, the maximum noise value outside the forklift truck body shall be 80dB; however, as the pavement conditions change, the noises will fluctuate;

(44) On a flat and solid pavement, the driver will feel the vibration of the forklift truck during operation and driving, and the vibration strength of the forklift truck will fluctuate as the working environment changes;

(45) In order to handle ultra-wide goods, the users select "extended forks", but it shall be noted that the bearing capacity of the extended forks shall work in strict accordance with the requirements of the load curve, the bearing capacity is the same as that of standard forks within the specified load center, and the forks must work under reduced loads when the load center moves forward; but it is strictly prohibited to pick or collide with the goods with the fork tip and attention shall be paid to the safety during driving or turning;

(46) The functions in various labels on the forklift trucks shall be learnt and noted;

(47) The service environment of the forklift trucks is generally below the altitude of 1000m within the temperature range of -15℃ - 35℃. They shall be used with care under other poor environments.

5. Routine maintenance of forklift truck

(1) Maintenance profile

a. The forklift trucks shall be subject to regular inspection and maintenance to keep good conditions; some key safety parts shall be replaced regularly as required.

b. Genuine parts and components of the Company shall not be replaced or charged with oils with different models.

c. If any damage or failure is found, it shall be reported to the manager and it is prohibited to use the forklift truck before repair.

d. Any person failing to pass the training shall not repair the forklift truck.

(2) Key points of starting

a. Quantity of hydraulic oil: The oil level shall be at the middle position of the scale of the oil level gauge.

b. The tubes, joints, pumps and valves shall be checked for leakage and

damages.

c. Check the service brake: The idle travel of the brake pedal shall be 40mm, and the clearance between the front floor and the pedal shall be greater than 20mm.

d. Check the function of the hand brake: When the hand brake lever is pulled to the bottom, the forklift truck shall be braked on the specified slope (no load).

e. Instruments and lighting fixtures, etc.: It shall be checked whether the instruments, lights, connectors, switches and each part of the electrical line work normally.

(3) Charging of battery pack

a. First charging and supplementary charging of the battery pack shall be in strict accordance with the requirements in the battery instructions;

b. When the forklift truck is working, if the voltage of the battery pack is reduced to 40V or the voltage of any single battery is reduced to below 1.7V or the instrument alarms, the forklift truck shall stop work immediately and shall not be resumed until the battery pack is charged or replaced.

c. During charging, the specific gravity, level and temperature, etc. of the electrolyte shall be checked from time to time.

d. After use of the forklift truck, the battery shall be charged as soon as possible and the standing time shall not exceed 24h. During charging, undercharge and overcharge shall be prevented, so as to prevent the battery from damages.

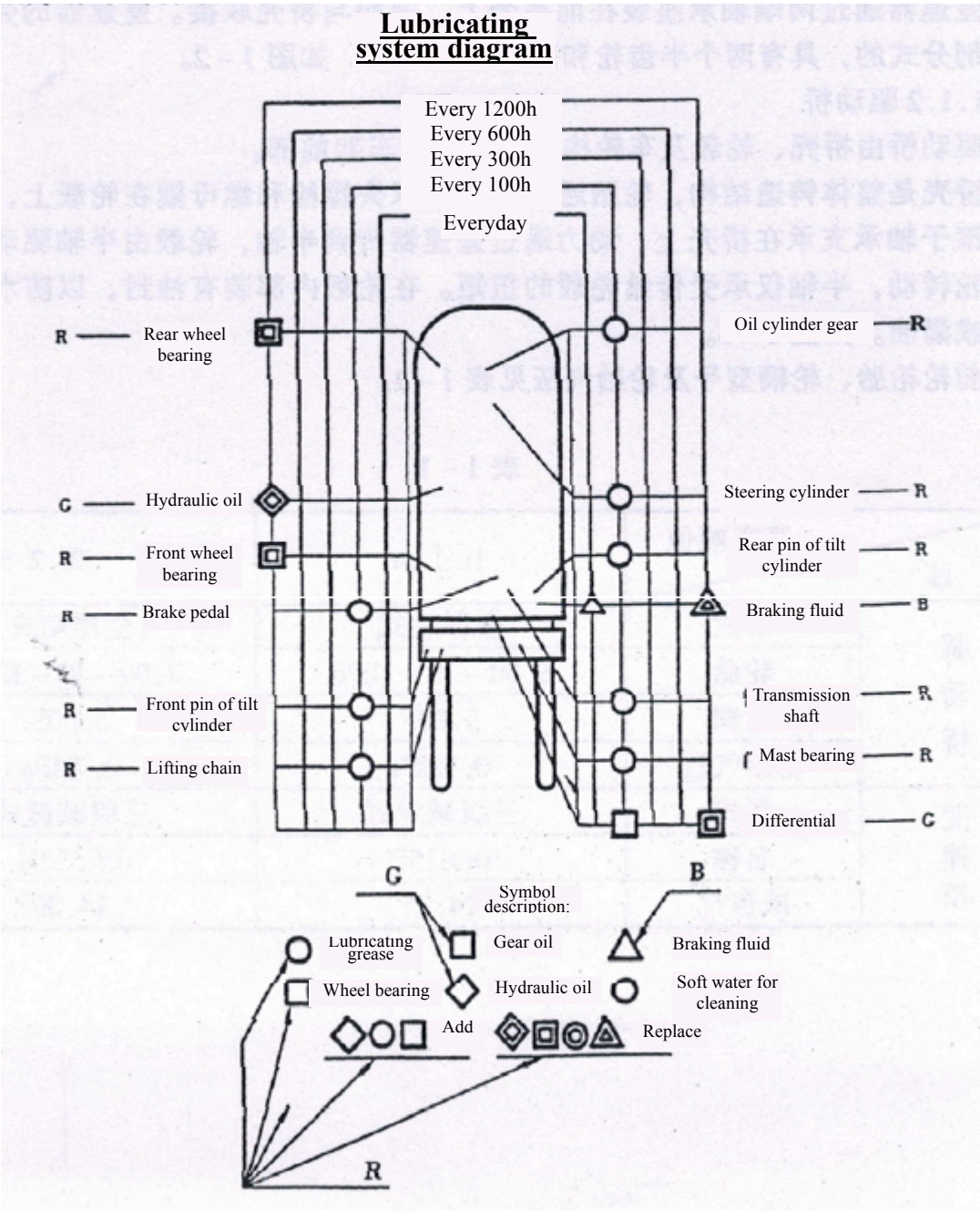
For the charging method and operation and maintenance, please refer to the operation manual of the battery.

(4) Oil and grease for forklift truck

Description	Brand and code		Qty.
	Domestic	Foreign	
Hydraulic oil	N32# or N46#	ISOVG30	25L
Gear oil	85W/90	SAE85W/90	4.4L
Braking fluid	DOT3 synthetic braking fluid		1.5L
Lubricating grease	3# lithium base grease dropping point 170	JISK2220/2#	

Oil and grease shall be injected according to the automotive standard. Aforementioned hazardous substances shall be treated according to relevant laws and regulations.

6. Lubrication system diagram



III. Structure, Principle, Adjustment and Maintenance of Forklift Truck

1. Drive system

1.1 Overview

The drive system of the forklift truck comprises the reduction gearbox assembly, the differential assembly and the drive axle. The driving gear of the reducer is directly connected with the travel motor, the traveling speed of the forklift truck increases as the motor speed increases, and the driving direction is changed by changing the rotating direction of the motor.

1.1.1 Reduction gearbox and differential

The reduction gearbox is located between the drive axle and the travel motor, two pairs of cylindrical helical teeth reduce the speed of the output shaft of the travel

motor and increase the torque transmitted from the output shaft and then this torque is transmitted to the differential, as shown in Fig. 1-1.

The differential is installed on the front half housing through the bearing blocks at both ends, and the front end is linked with the axle housing. The housing of the differential is in the left and right split form, with two half-gears and four planetary gears, as shown in Fig. 1-2.

1.1.2 Drive axle

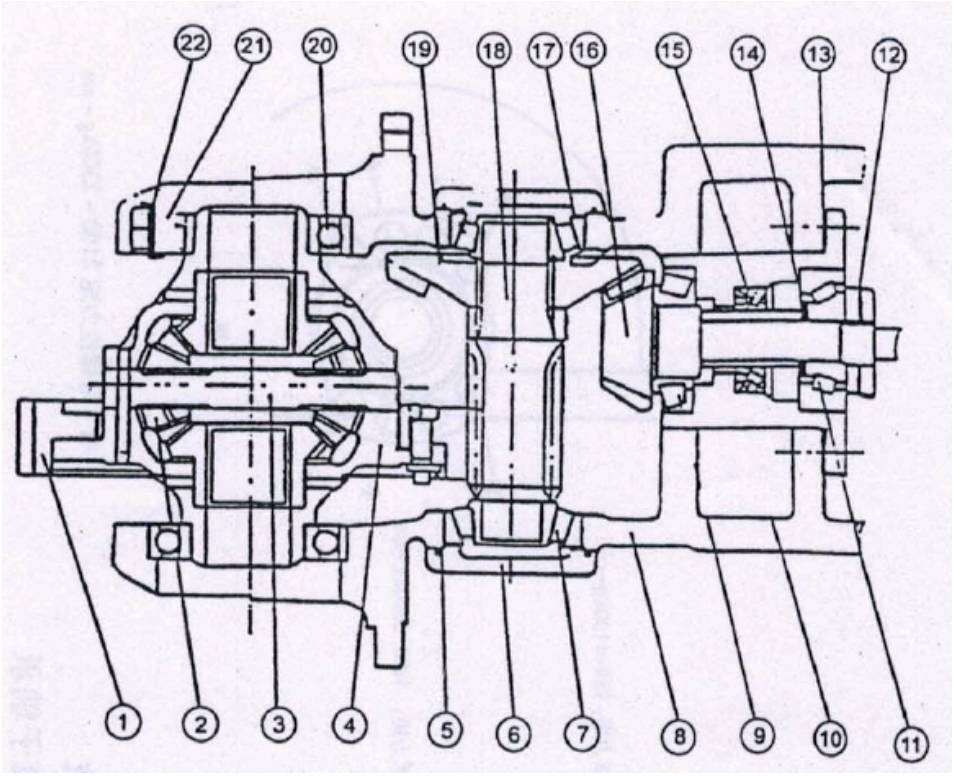
The drive axle comprises the axle housing, the hubs and the wheels, installed at the front of the frame.

The axle housing is an integrally cast structure, the tyres are skid-mounted on the hubs through rims using studs and nuts, the hubs are supported on the axle housing through the tapered roller bearings, the power is transmitted to the half axle through the differential, the hubs are driven by the half axle and drive the front wheels, and the half axle only bears the torque transmitted to the hubs. The interior of the hub is installed with oil seal to prevent water and dust from entering or oil leakage, as shown in Fig. 1-3.

See Table 1-1 for the models of the tyres and rims of the front wheels and the tyre pressures.

Table 1-1

Item \ Tonnage of forklift truck		1t & 1.5t	2t & 2.5t
Drive axle	Form	Full floating type	Full floating type
	Tyre	6.50-10-10PR	7.00-12-12PR
	Rim	5.00F	5.00S
	Tyre pressure	0.7MPa	0.7MPa
Gearbox	Form	Three-stage speed reduction type	Three-stage speed reduction type
	Description	DCS15H	DCS25H
	Reduction ratio	14.25	14.05



① Gear ring	② Planetary gear	③ Gear shaft	④ Differential housing
⑤ O ring	⑥ Cover	⑦ Bearing	⑧ Reducer housing
⑨ Bearing	⑩ Bearing block	⑪ Bearing	⑫ Nut
⑬ Tab	⑭ Tab	⑮ Oil seal	⑯ Active cone gear shaft
⑰ Tab	⑱ Gear shaft	⑲ Spiral bevel gear	⑳ Bearing
㉑ Bearing block	㉒ Lock washer		

Fig. 1-1 Reducer and differential

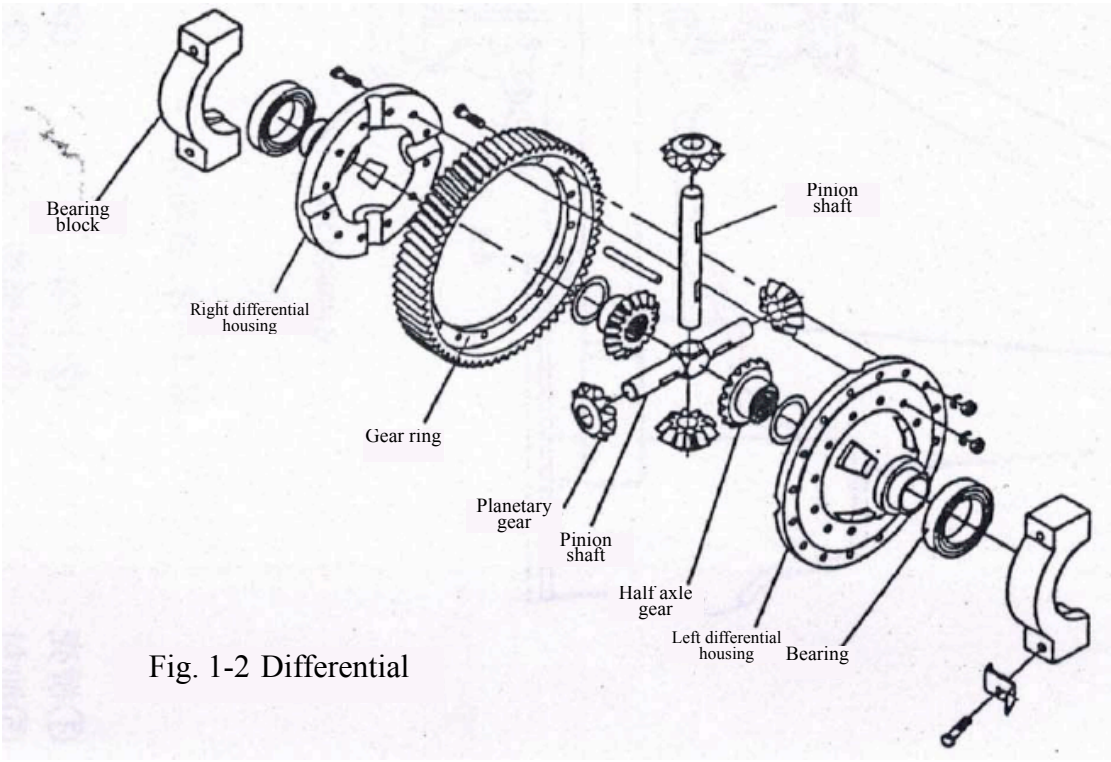


Fig. 1-2 Differential

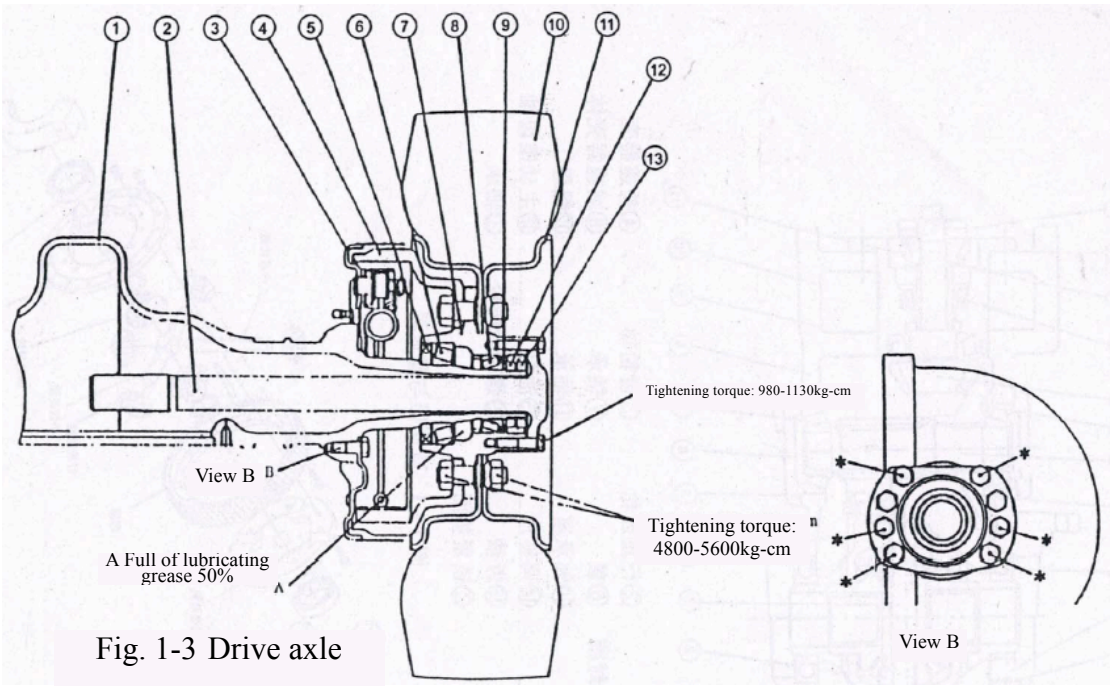


Fig. 1-3 Drive axle

Bolt torque with *: 2100-2300kg-cm

① Axle housing	② Half axle	③ Wheel side brake	④ Brake drum
⑤ Oil seal	⑥ Tapered roller bearing	⑦ Hub	⑧ Tapered roller bearing
⑨ Oil seal	⑩ Tyre	⑪ Rim	⑫ Adjusting nut
⑬ Lock nut			

1.2 Installation of hub

(1) Add 100cc lubricating grease into the hub and then install it on the shaft.

(2) Use a torque of about 1kg.m to tighten the adjusting nut and then return 1/2 revolution.

(3) Hang the spring scale on the bolt to measure the starting torque of the hub. When the specified value is reached, slowly lock the nut.

Starting torque: 5-15kg.m.

(4) Install the locking plate and the lock nut and pull up and lock the locking plate to stop the movement.

(5) Tyre assembly

Install the air connection rod and the cap on the tyre and assemble the rim. Pay attention to the following conditions:

Note: (a) The air valve stem is located at the rim gap and outward;

(b) The rim bolt head shall be installed outwards.

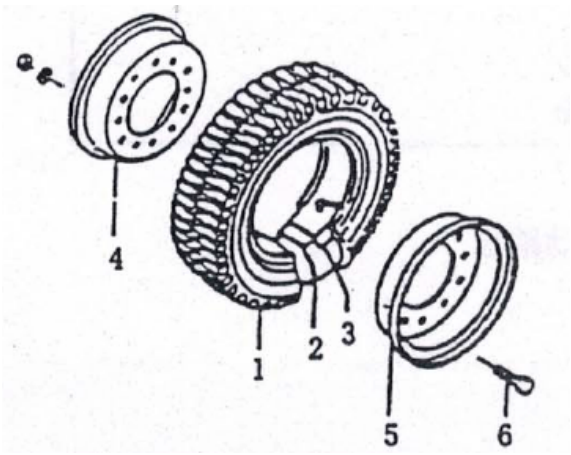


Fig. 1-6 Wheel assembly

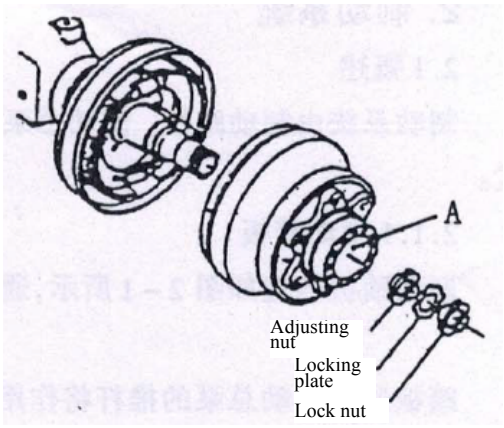


Fig. 1-4 Adding lubricating grease

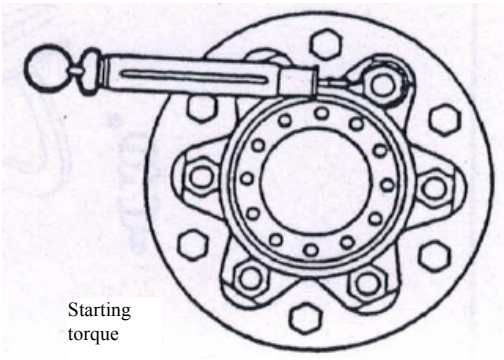
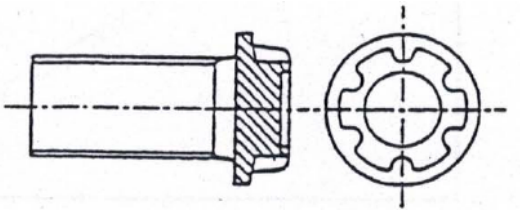


Fig. 1-5 Measuring the starting torque



Rim bolt structure

1. Tyre 2. Valve rod

3. Cap 4. Internal wheel

5. External wheel 6. Rim bolt

2. Braking system

2.1 Overview

The braking system comprises the brake pedal, the brake master cylinder and the wheel brake, belonging to front 2 wheels braking internal expansion hydraulic type.

2.1.1 Brake pedal

The structure of the brake pedal is shown in Fig. 2-1 and it is installed on the frame through the support.

The pedal converts the foot power on the pedal to the brake oil pressure through the push rod of the brake master cylinder.

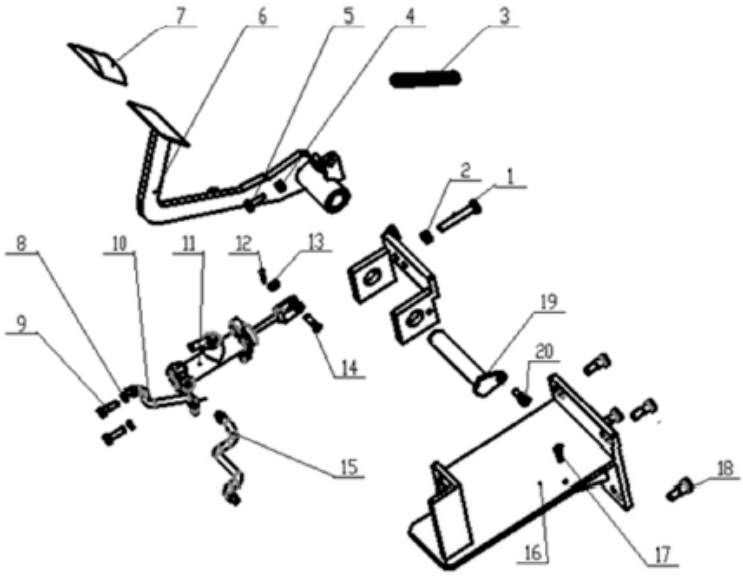
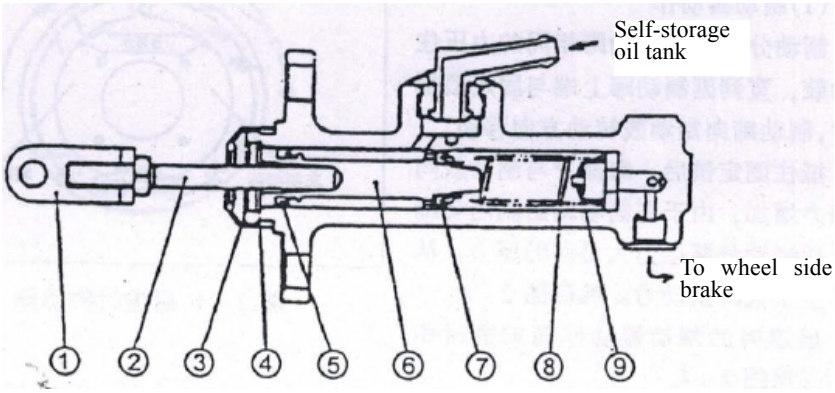


Fig. 2-1 Brake pedal

2.1.2 Brake master cylinder

The master cylinder comprises a valve seat, a check valve, a return spring, a cup, a piston and an auxiliary cup. The end is fixed with a lock washer and a locking wire, the exterior is protected by the rubber dust cover, and the piston of the master cylinder is operated through the push rod by operating the brake pedal. When the brake pedal is treaded down, the push rod pushes forward the piston and the braking fluid in the body returns to the oil tank through the return opening until the main cup blocks the return opening. After the main cup is pushed through the return opening, the braking fluid in the front cavity of the master cylinder will be compressed to open the check valve, so as to flow towards the wheel cylinder through the brake line, thus, the piston of each wheel cylinder extends out, so as to enable the brake shoe lining to contact the brake drum and realize the deceleration or braking effect. At this time, the rear cavity of the piston is made up by the braking fluid from the return opening and the oil inlet. When the brake pedal is released, the piston is compressed backward by the return spring and meanwhile the braking fluid in each brake wheel cylinder is also compressed by the return spring of the brake shoe, so as to enable the braking fluid to return to the master cylinder (the front cavity of the piston) through the check valve, the piston returns to the original position, the braking fluid in the master cylinder flows back to the oil tank through the return opening, and the pressure of the check valve is adjusted in certain proportion to the residual pressure in the braking line and the brake wheel cylinder, so as to enable proper installation of the wheel cylinder cup to prevent oil leakage and eliminate possible air blockage in case of emergency brake.



①Connecting rod ②Push rod ③Dust cover ④Snap ring
⑤Auxiliary apron ⑥Piston ⑦Main cup ⑧Spring
⑨Check valve

Fig. 2-2 Brake master cylinder

2.1.3 Brake

The brake is a double-shoe brake installed at both sides of the drive axle.

The brake comprises 2 groups of brake shoes, a brake wheel cylinder and a regulator.

An end of the brake shoe contacts the dowel pin, while the other end contacts the regulator. The return spring and the compression spring rod press the parking brake.

In addition, the brake is also assembled with a parking braking mechanism and an automatic regulating device, as shown in Fig. 2-3, 2-4 and 2-5.

(1) Action of brake

The brake wheel cylinder applies an equal force to the primary brake shoe to press the brake drum, until when the upper end of the auxiliary brake shoe is supported against the dowel pin, the brake shoe moves towards the rotating direction of the brake drum.

Then the friction between the lining and the brake drum is increased. Since the primary brake shoe applies a pressure much higher than the pressure of the brake wheel cylinder to the auxiliary brake shoe, a high braking force will be

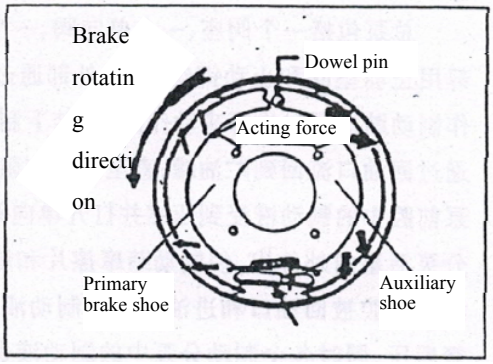


Fig. 2-3 Forward movement

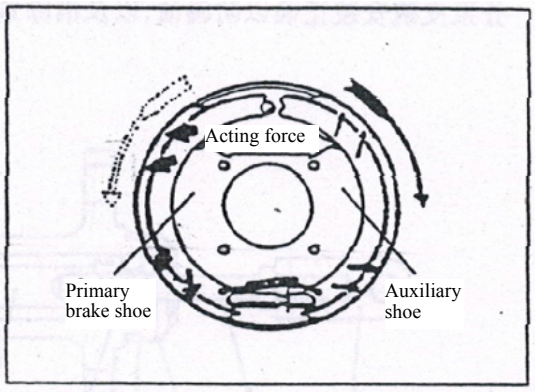


Fig. 2-4 Backward movement

generated. Refer to Fig. 2-3.

The backward movement of the brake is opposite to the forward movement. Refer to Fig. 2-4.

(2) Parking braking

The parking brake is assembled in the brake and comprises a connecting rod and a push rod.

The connecting rod is pinned at the side of the primary brake shoe, and the action of the connecting rod is transmitted to the side of the auxiliary brake shoe through the push rod, as shown in Fig. 2-5.

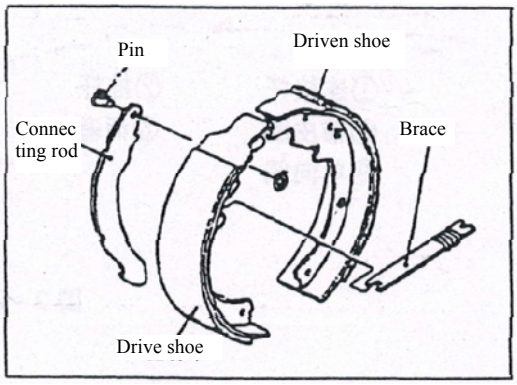


Fig. 2-5 Parking brake

(3) Clearance auto-regulating mechanism

The clearance auto-regulating mechanism can keep a proper clearance between the lining and the brake drum. Refer to Fig. 2-6 for the structure.

The clearance auto-regulating mechanism only acts in case of reversing.

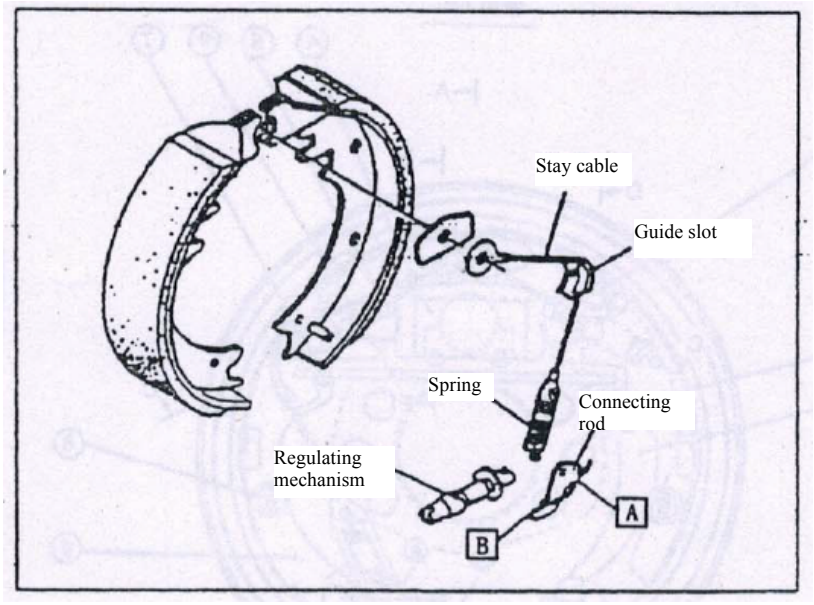


Fig. 2-6

▲ Action of clearance auto-regulating mechanism

When the forklift truck is reversed, it shall be braked, the auxiliary brake shoe contacts the primary brake shoe and they rotate together to enable the connecting rod to turn right around Point A, as shown in Fig. 2-6, and Point B is elevated. After the brake is released, the connecting rod turns left under the action of the spring force and Point B is lowered. When the clearance between the lining and the brake hub is increased, the vertical distance of rotation of Point B is increased, the regulator is turned by a tooth, the regulating stem is elongated (as shown in Fig. 2-7) and the clearance is shortened accordingly. The regulating range of the clearance is shown in the following table:

Unit: mm

Model	1.0-1.5t	2.0-2.5t
Clearance	0.35-0.55	0.40-0.45

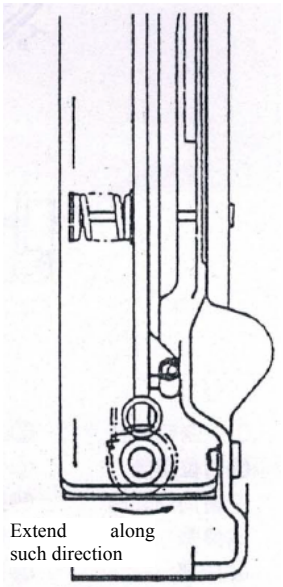
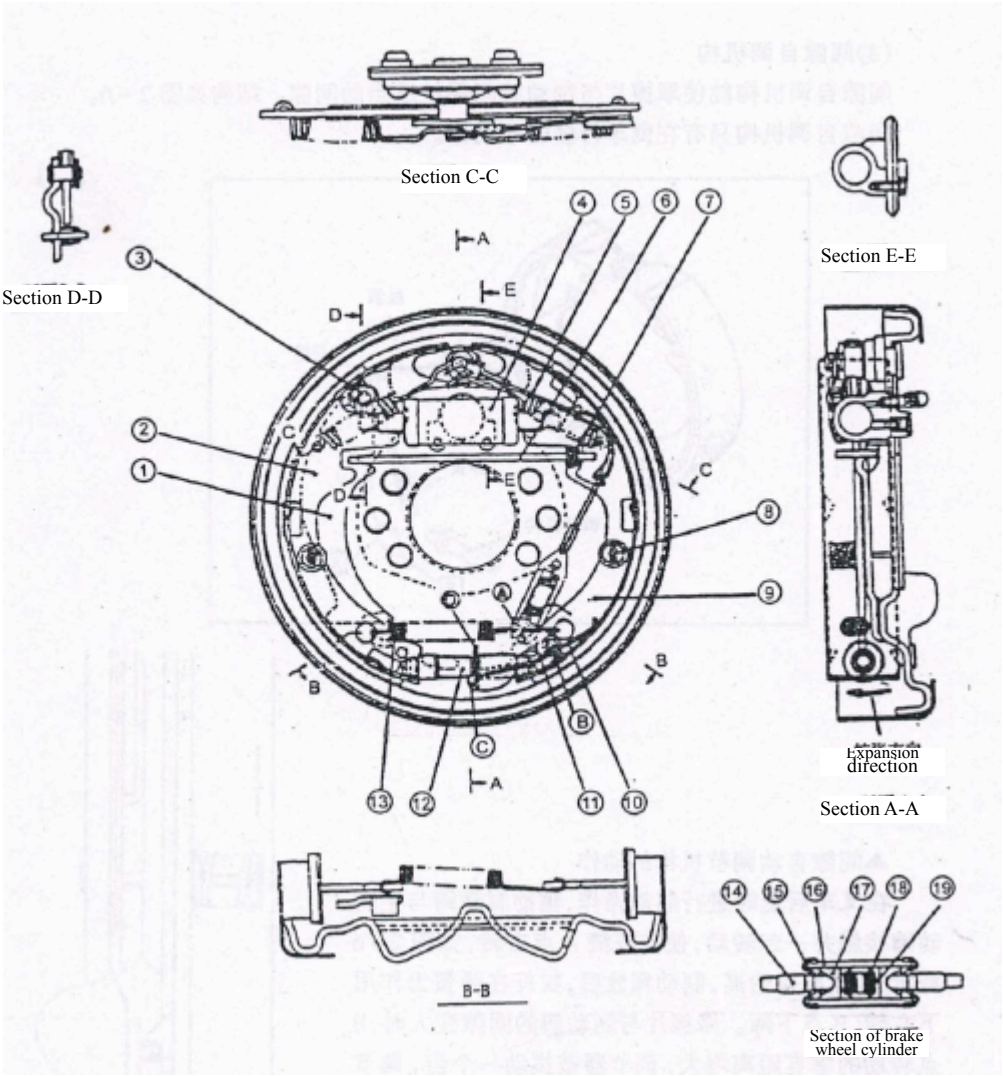
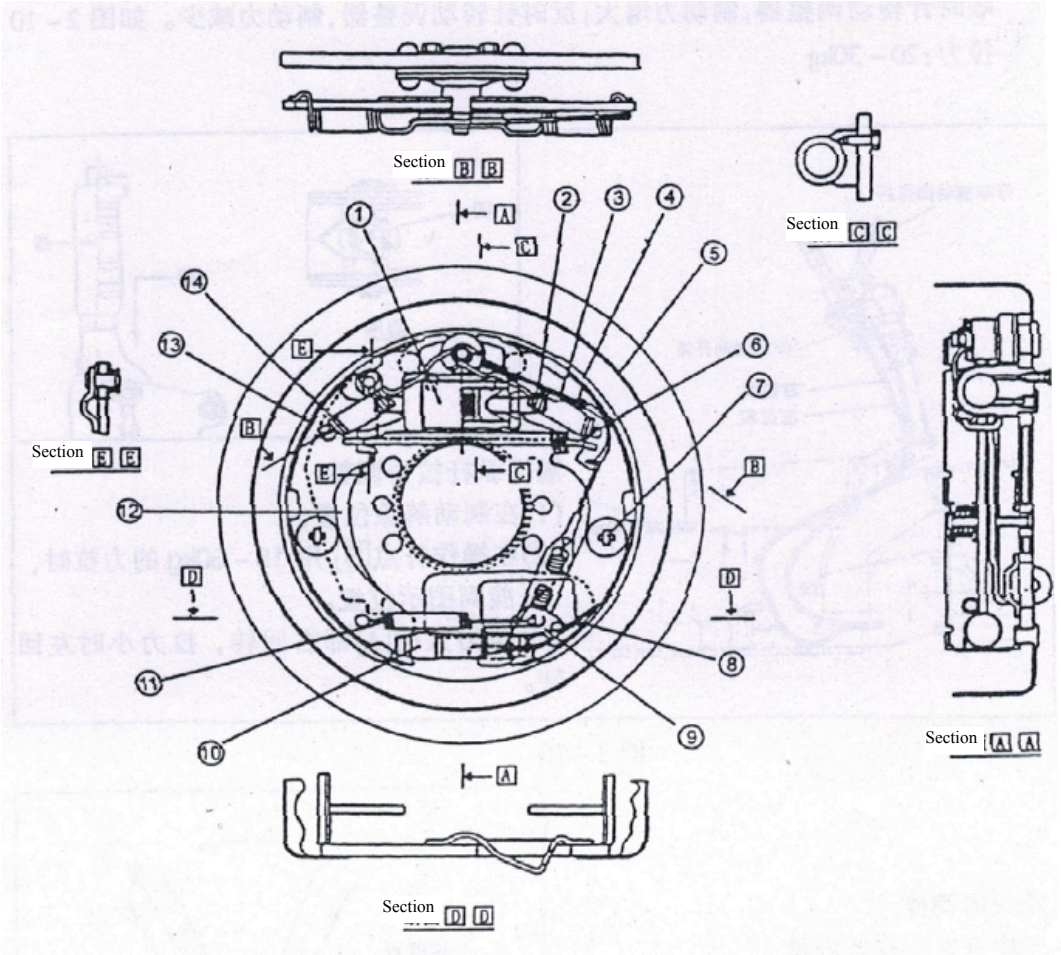


Fig. 2-7 Clearance auto-regulating mechanism



① Hand brake lever	② Primary brake shoe	③ E-shaped collar	④ Brake wheel cylinder
⑤ Return spring	⑥ Hand brake push rod	⑦ Spring	⑧ Compression spring
⑨ Auxiliary brake shoe	⑩ Spring	⑪ Ratchet	⑫ Clearance regulator
⑬ Spring	⑭ Push rod	⑮ Dust ring	⑯ Body
⑰ Piston	⑱ Spring	⑲ Cup	

Fig. 2-8 Brake (1-1.5t vehicle)



① Brake wheel cylinder ② Spring ③ Ejector rod ④ Auxiliary brake shoe
⑤ Bottom plate ⑥ Hand brake push rod ⑦ Compression spring ⑧ Spring
⑨ Ratchet ⑩ Clearance regulator ⑪ Spring ⑫ Hand brake lever
⑬ Primary brake shoe ⑭ Return spring

Fig. 2-9 Brake (2-2.5t vehicle)

2.1.4 Parking brake control device

The parking brake handle is cam type used for the regulator located at the end of the brake handle to regulate the braking force.

Regulation of braking force:

If the regulator is rotated clockwise, the braking force will be increased; if the regulator is rotated anticlockwise, the braking force will be reduced, as shown in Fig. 2-10.

Pull: 20 - 30kg

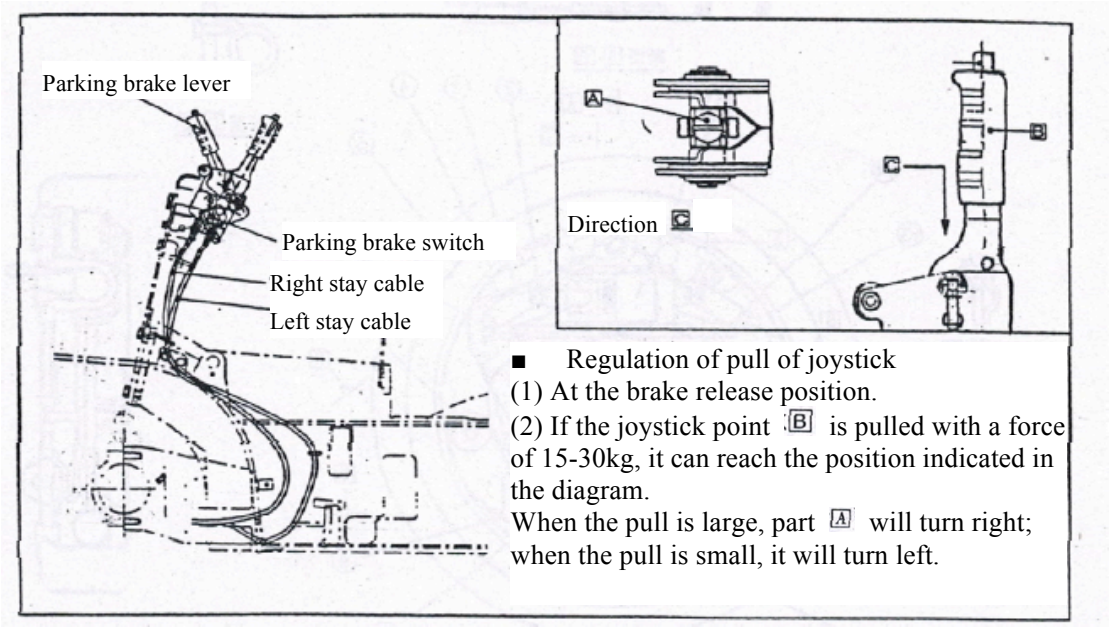


Fig. 2-10

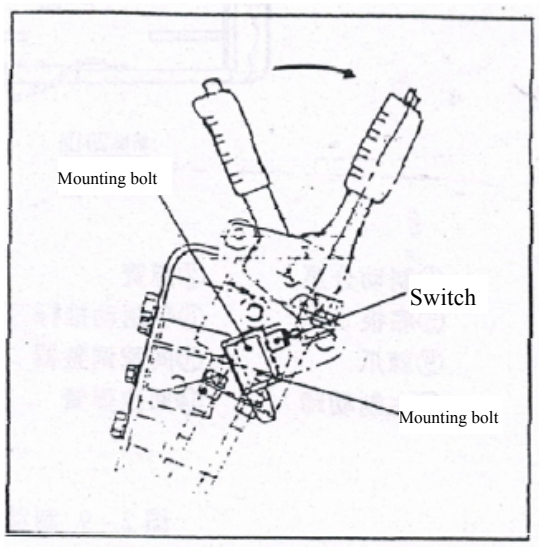
Regulation of switch

①Loosen 2 mounting bolts.

②Pull up the parking brake lever.

③Press the switch roller on the support of the joystick to listen to the action sound, then press it down by 1mm and then fix it.

④Release the parking brake, then pull the joystick again and confirm that the switch is ON.



Parking brake lever Fig. 2-11

2.2 Key points of dismantling, installation and adjustment of brake

This section describes disassembly, assembly and adjustment of the brake as well as the adjustment method of the brake pedal when the wheels and hubs are dismantled.

This section is applicable to 3t brakes. For other models, although the regulator structures are different, the maintenance method is basically the same.

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2.2.1 Disassembly of brake

(1) Dismantle the support pin on the auxiliary brake shoe, the regulating stem, the regulating device and the spring.

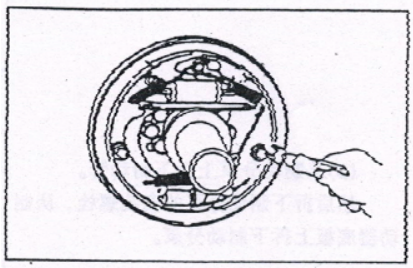


Fig. 2-12

(2) Dismantle the shoe return spring.

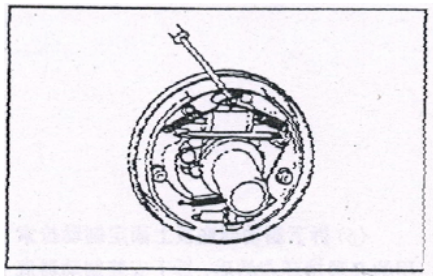


Fig. 2-13

(3) Dismantle the setting spring on the primary brake shoe.

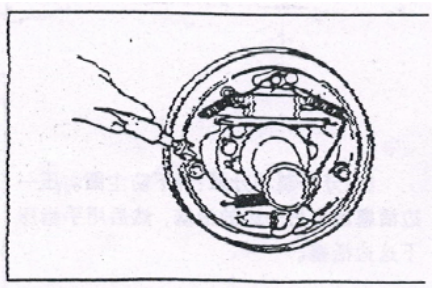


Fig. 2-14

(4) Dismantle the primary brake shoe and the auxiliary brake shoe. Meanwhile, dismantle the regulator and the regulator spring.

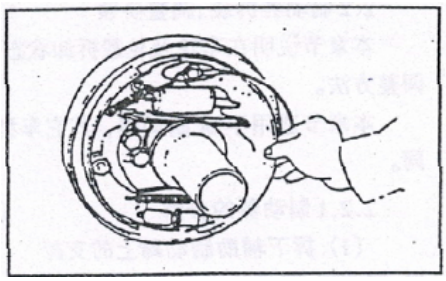


Fig. 2-15

(5) Dismantle the brake pipe from the brake wheel cylinder.

Then dismantle the mounting bolt of the brake wheel cylinder and dismantle the brake wheel cylinder from the brake

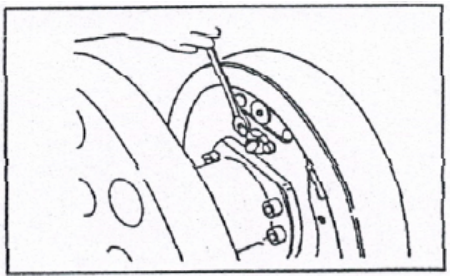


Fig. 2-16

bottom plate.

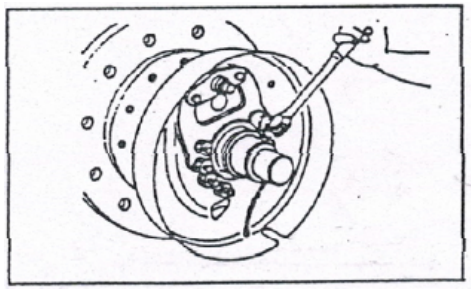


Fig. 2-17

(5) Dismantle the E-shaped collar used to fix the brake stay cable on the brake bottom plate. Then dismantle the bolt used to install the brake bottom plate and dismantle the brake bottom plate from the drive axle.

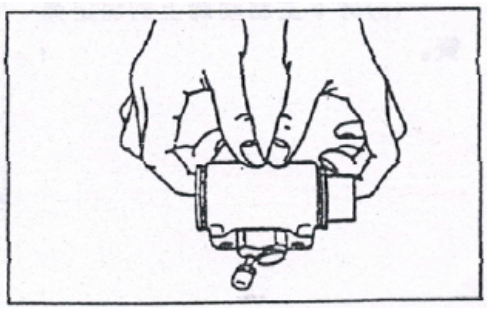


Fig. 2-18

(7) Disassembly of the brake wheel cylinder: Dismantle the dust ring. Press the piston at a side to eject the piston at the other side and then press such piston with fingers.

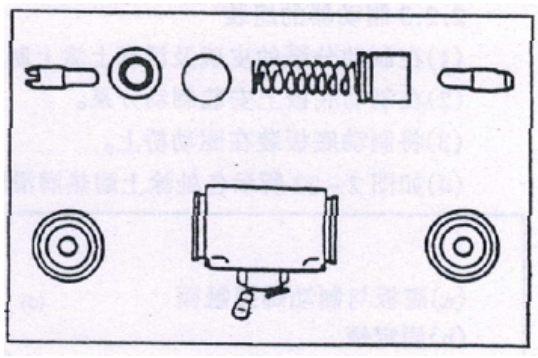


Fig. 2-19

2.2.2 Inspection of brake

Inspection of each part and component and repair or replacement of damaged parts and components.

(1) Check the surface in the wheel cylinder body and the surrounding of the piston for rust.

Then determine the clearance between the piston and the body.

Standard size: 0.03-0.10mm

Limit size: 0.15mm

(2) Visually check the piston cup for damages and deformations and replace it in case of any abnormity.

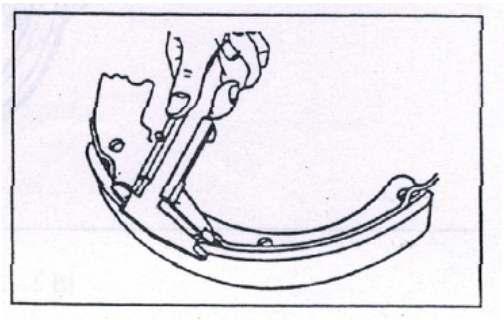


Fig. 2-20

(3) Determine the free length of the

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spring of the brake wheel cylinder and replace the spring when the free length exceeds the standard.

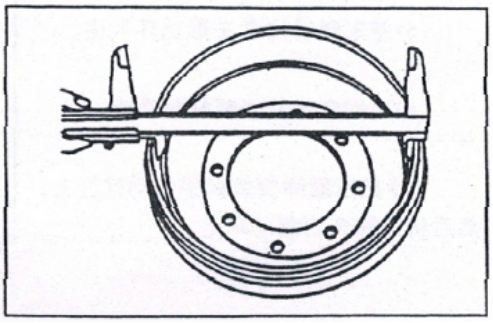


Fig. 2-21

(4) Determine the thickness of the lining and replace the lining when the wear exceeds the wear limit.

Unit: mm

	1.0-1.5t	2.0-2.5t	3t
Standard value	4.8	7.2	8
Limit value	2.5	5.0	6

(5) Visually check the internal surface of the brake drum, grind to correct it in case of damages or biasing wear and replace it when the correction exceeds the correction limit.

Unit: mm

	1.0-1.5t	2.0-2.5t	3t
Standard value	254	310	314
Limit value	256	312	316

2.2.3 Assembly of brake

(1) Apply the braking fluid to the cup and the piston of the brake wheel cylinder and assemble the spring, the piston and the dust ring in order.

(2) Install the brake wheel cylinder on the brake bottom plate.

(3) Install the brake bottom plate on the drive axle.

(4) As shown in Fig. 2-22, apply the heat-resistant grease to each place and pay attention not to applying the grease to the lining.

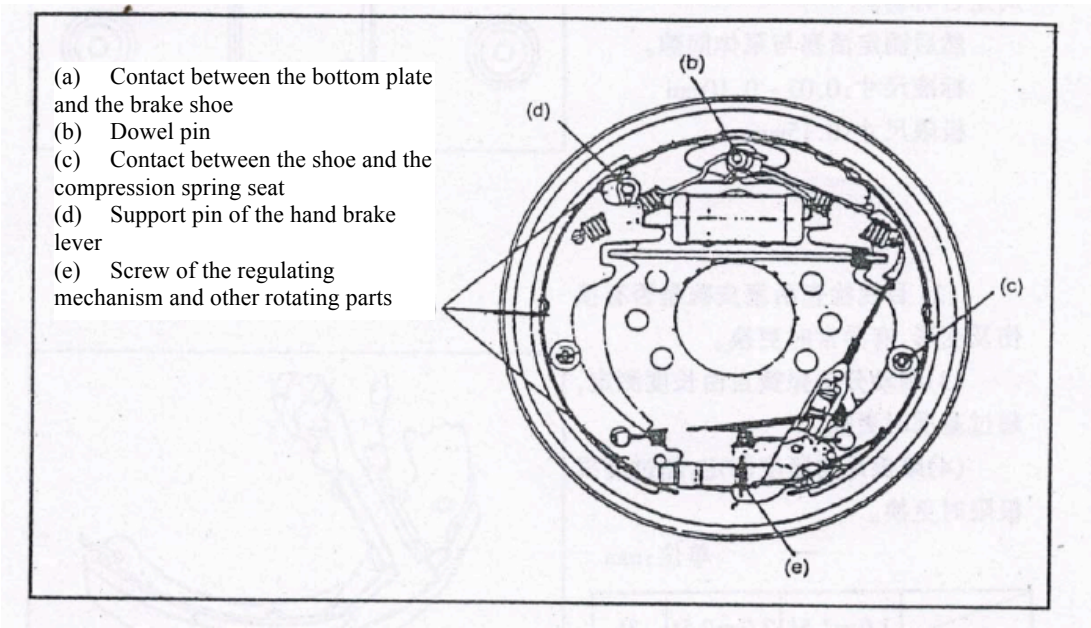


Fig. 2-22

(5) Lock the E-shaped collar of the parking brake stay cable.

(6) Install the brake shoe using the fixed spring.

(7) Install the compression spring on the hand brake push rod and then install the push rod on the brake shoe.

(8) Install the brake shoe link on the support pin and then install the brake shoe return spring. Firstly install the primary shoe and then install the auxiliary shoe.

(9) Install the regulator, the regulator spring, the ejector rod and the ejector rod return spring.

Pay attention to the following points:

(a) The regulator thread direction and the installation direction;

(b) Regulator spring direction (contact between the regulator tooth and the spring is prohibited);

(c) Direction of the ejector rod return spring (fix the spring hook at the support pin end to the side opposite to the

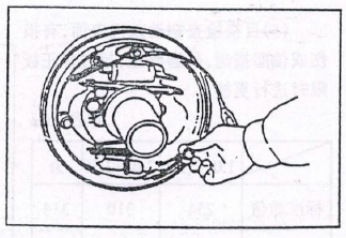


Fig. 2-23

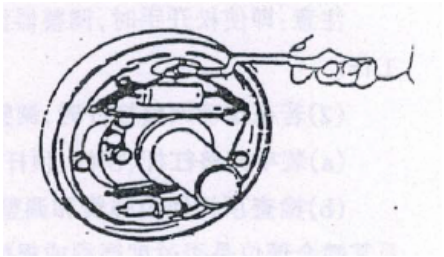


Fig. 2-24

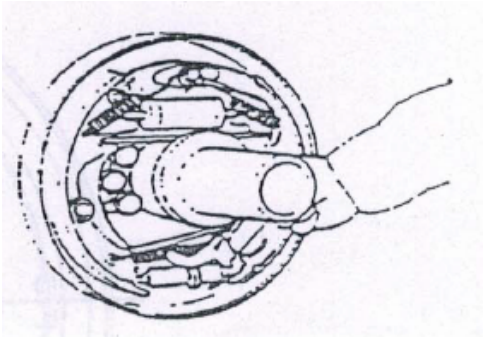


Fig. 2-25

ejector rod);

(d) Ensure that the lower end of the regulating lever contacts the regulator tooth.

(10) Connect the brake line to the wheel cylinder.

(11) Measure the inside diameter of the brake drum and the outside diameter of the brake shoe and regulate the regulator so that the difference between the inside diameter of the brake drum and the outside diameter of the brake shoe lining is 1mm.

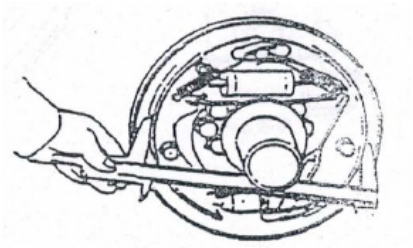


Fig. 2-26

2.2.5 Regulation of brake pedal

(1) Shorten the push rod;

(2) Regulate the lock bolt and regulate the pedal height as shown in Fig. 2-28;

(3) Tread down the brake pedal and elongate the push rod until the front end of the push rod contacts the piston of the master cylinder;

(4) Tighten the lock nut of the push rod.

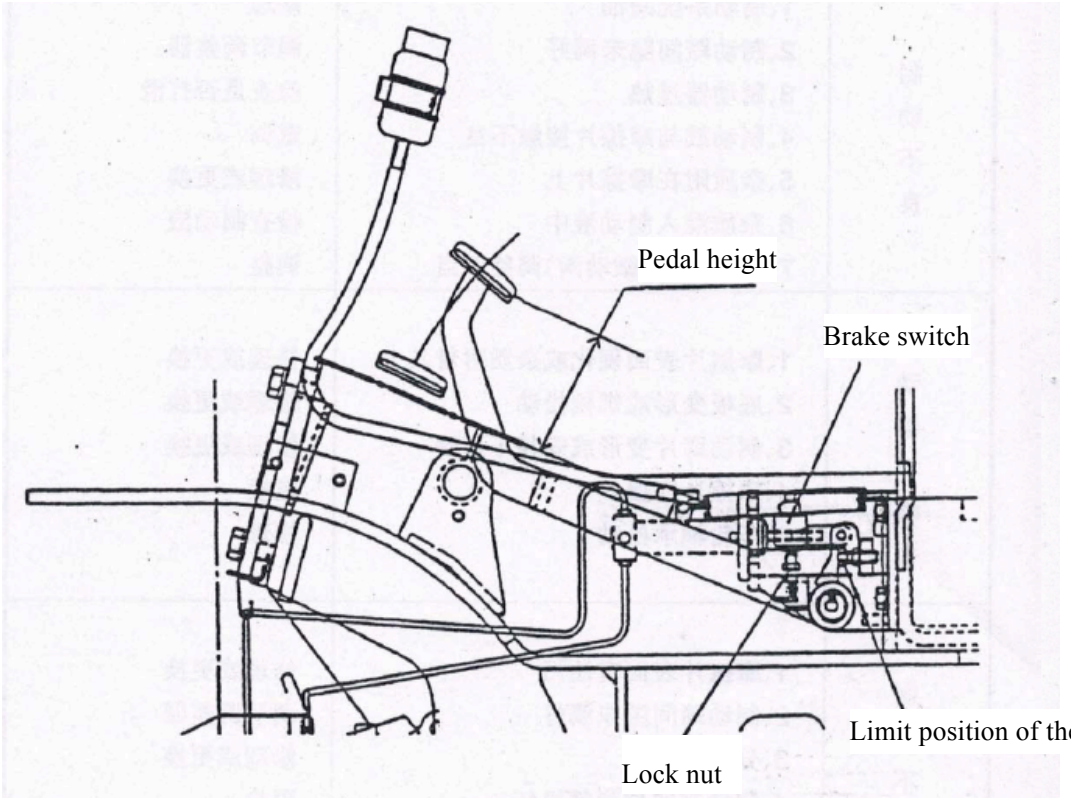


Fig. 2-28

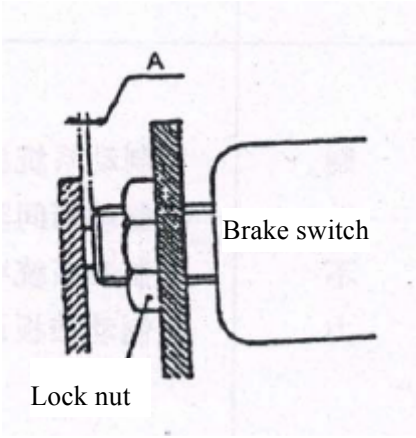
▲ Regulation of brake switch

(a) After regulation of the height of the brake pedal, release the lock nut of the brake switch;

(b) Unplug the plug to disconnect the conductor;

(c) Rotate the switch to obtain the clearance A=1mm;

(d) Confirm that the brake light is lit when the brake pedal is treaded down.



2.2.6 Fault diagnosis

Fault	Cause analysis	Troubleshooting method
Poor braking	1. The oil of the braking system leaks.	Repair
	2. The clearance of the brake shoe is not well regulated.	Regulate the regulator.
	3. The brake is too hot.	Check for sliding.
	4. The contact between the brake drum and the lining is poor.	Re-adjustment
	5. Impurities are adhered to the lining.	Repair or replacement
	6. Impurities are mixed into the braking fluid.	Check the braking fluid.
	7. Adjustment of the brake pedal (inching valve) is improper.	Adjustment
Noises of the brake	1. The surface of the lining is hardened or impurities are adhered to the surface.	Repair or replacement
	2. The bottom plate is deformed or the bolt is loosened.	Repair or replacement
	3. The brake shoe is deformed or installed improperly.	Repair or replacement
	4. The lining is worn.	Replacement
	5. The wheel bearing is loosened.	Repair
Uneven braking	1. There is oil on the surface of the lining.	Repair or replacement
	2. The clearance of the brake shoe is not well regulated.	Regulate the regulator.
	3. The wheel cylinder fails.	Repair or replacement
	4. The return spring of the brake shoe is damaged.	Replacement
	5. The brake drum is inclined.	Repair or replacement
Inadequate braking	1. The oil of the braking system leaks.	Repair or replacement
	2. The clearance of the brake shoe is not well regulated.	Regulate the regulator.
	3. The braking system is mixed with air.	Venting
	4. The brake pedal is regulated improperly.	Re-adjustment

3. Steering system

3.1 Overview

The steering system mainly comprises a steering wheel, a steering shaft, an axial pump and a steering axle. The steering shaft is connected with the steering gear through the universal joint, the connecting shaft is connected with the steering wheel through the universal joint, and the steering column can be tilted forward or backward to a proper position. (As shown in Fig. 3-1) The steering axle is installed on the tail frame at the back of the frame, there is a steering knuckle at the left and right respectively, and the steering cylinder piston drives the steering knuckle through the connecting rod and deflects the steering wheel, so as to realize steering.

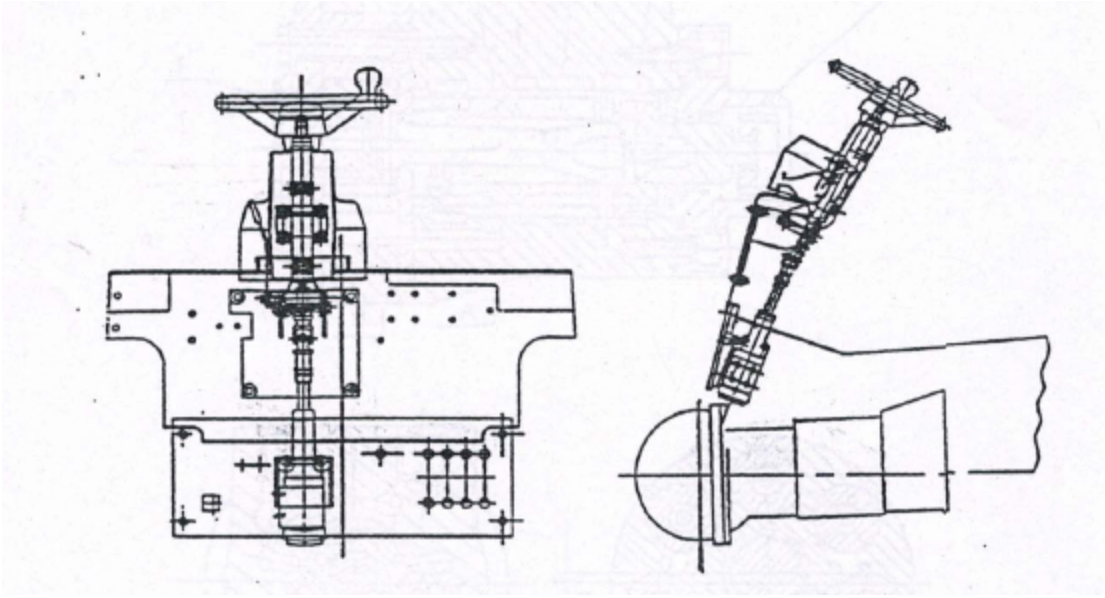


Fig. 3-1 Steering gear

3.1.1 Cycloidal hydraulic steering gear

The hydraulic steering gear (Fig. 3-2) can metrically convey the pressure oil from the steering pump to the steering cylinder through the pipe according to the rotating angle of the steering wheel. When the oil pump fails to supply oil, manual steering can be performed.

The steering gear comprises a general steering gear and a combination valve, the hole in the cover of the combination valve is installed with the system safety valve, and the valve body is also installed with a two-way overload valve used for protection when the wheel is suffered from sudden external impact during running of the forklift truck and high pressure is generated in the hydraulic system, so as to prevent the parts from damages. The safety valve and the two-way overload valve have been regulated by the manufacturer and the user shall not regulate them at will.

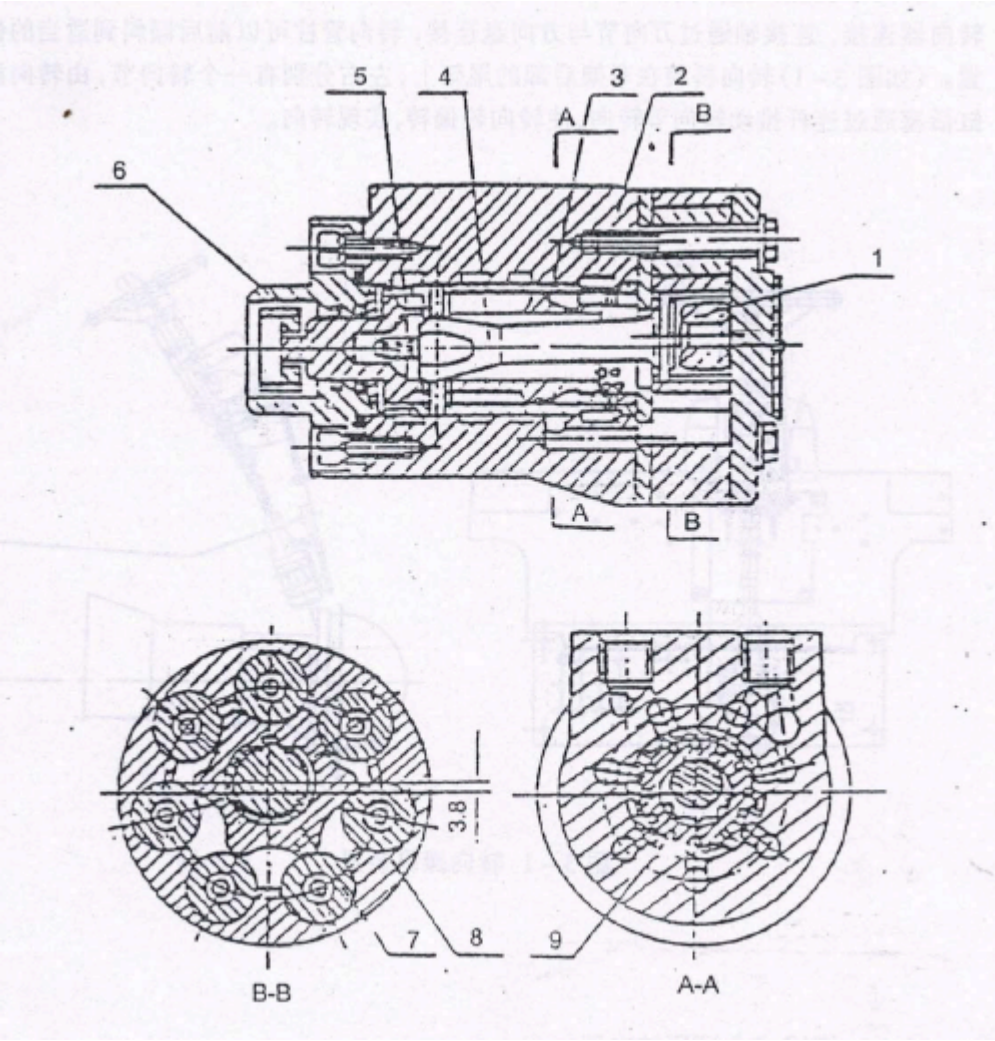


Fig. 3-2 Hydraulic steering gear

① Limiting column ②Valve body ③Valve plug ④ Universal driving shaft
⑤ Spring ⑥Link block ⑦Rotor ⑧Stator lamination
⑨Valve bush

3.1.2 Steering axle

The steering axle is a welded structure with a box cross section (as shown in Fig. 3-3) and it comprises a steering axle body, a steering cylinder, a connecting rod, a steering knuckle and a steering wheel, etc. The steering trapezium is a crank slider mechanism, and the cylinder piston rod drives the steering knuckle through the connecting rod and deflects the steering wheel, so as to realize steering. The steering axle is skid-mounted on the tail frame at the back of the frame through the bearing block with bolts using front and rear pins, so as to enable the axle body to swing around the pin, there is a steering knuckle at the left and the right of the steering axle respectively, the rear hub is installed on the steering knuckle spindle using two tapered roller bearings, the wheels are skid-mounted on the hubs through rims, and the inside of the bearing is installed with oil seal to keep the lubricating grease in the cavities of the hub and the steering knuckle.

See the following table for the models of the tyres and rims of the steering axle as well as the tyre pressures:

Tonnage of forklift truck	1-1.5t	2-3t
Tyre	5.00-8-8PR	18x7-8-14PR
Rim	3.50D	4.33R
Tyre pressure	0.7MPa	0.9MPa
Steering pressure	5.5MPa	6.3MPa

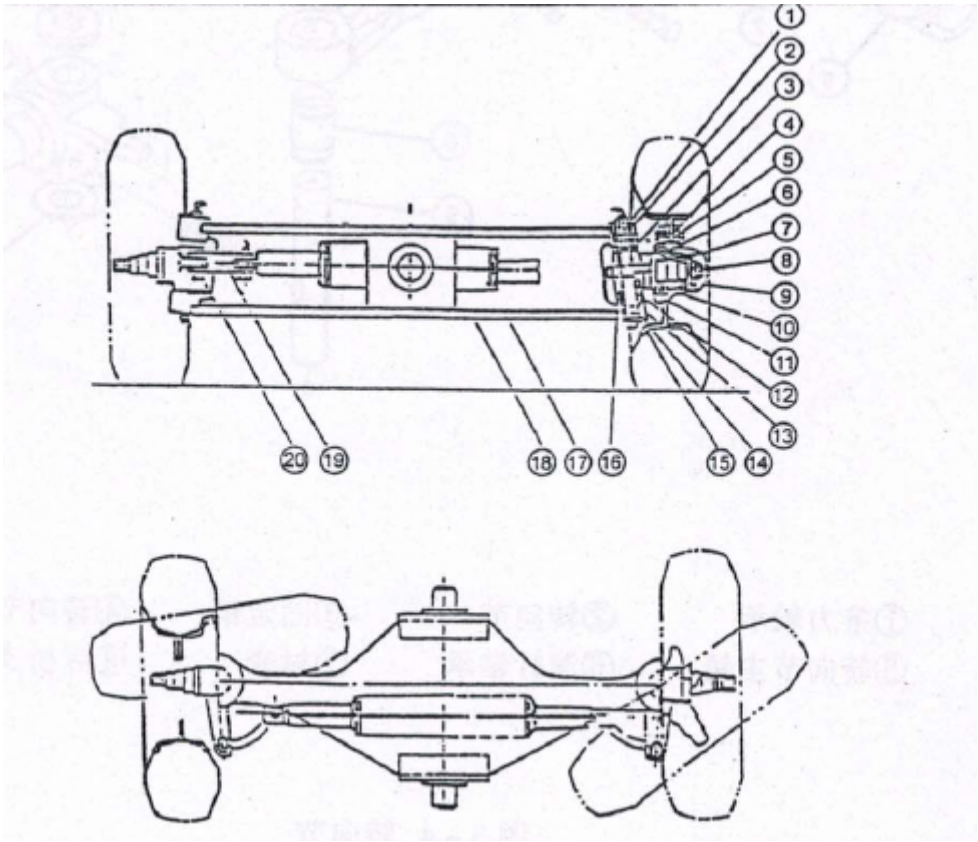
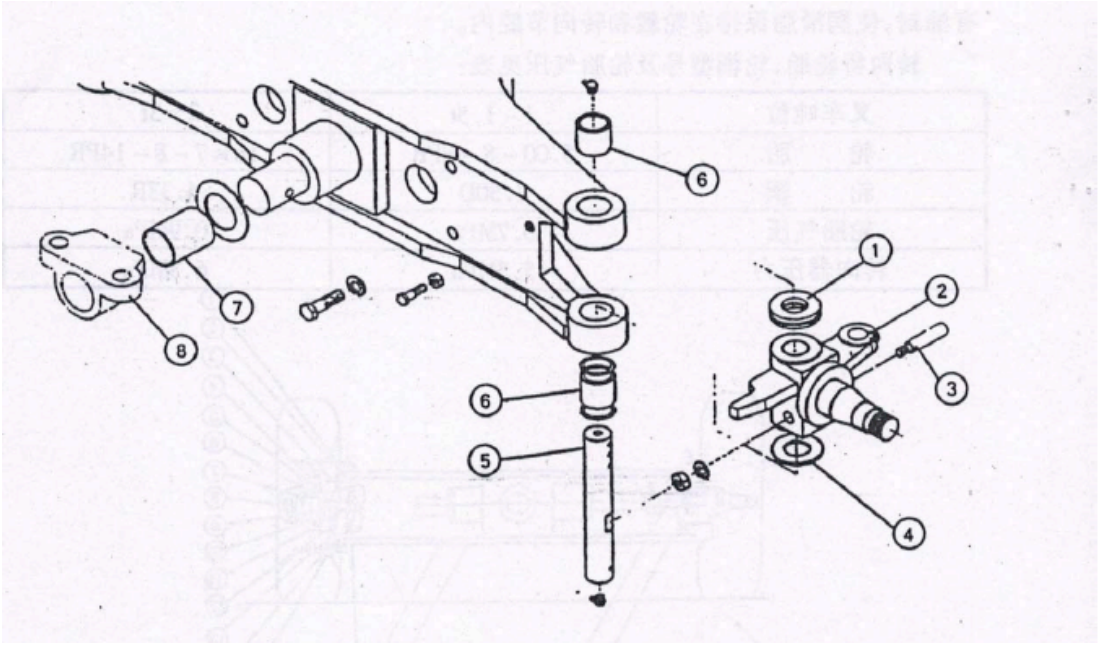


Fig. 3-3 Steering axle

①Oil seal ②Needle bearing ③Thrust bearing ④Oil seal
⑤Hub nut ⑥ Tapered roller bearing ⑦ Tapered roller bearing ⑧Lock nut
⑨Hub cover ⑩Steering hub ⑪ Lock pin ⑫ Adjusting washer
⑬ Needle bearing ⑭ Oil seal ⑮ Kingpin ⑯ Steering knuckle
⑰ Steering cylinder ⑱ Steering axle body ⑲ Pin ⑳ Pin

(1) Steering knuckle

The steering knuckle is installed between both ends of the steering axle body using the kingpin, the conical bearing, the dust cover and the O ring, the upper end of the kingpin is fixed on the axle body using the stop pin, the lower end of the kingpin is fixed on the axle body using the cotter pin; and the conical bearing pressed on the axle body is used for supporting. (Fig. 3-4)

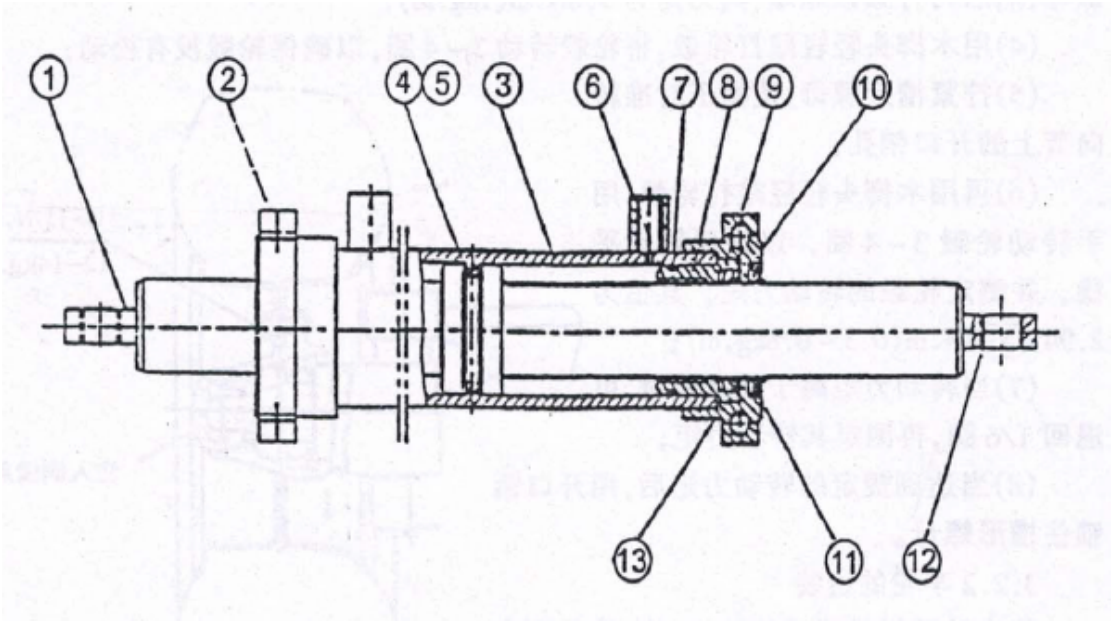


①Thrust bearing	②Steering knuckle	③Dowel pin	④ Adjusting pad for steering knuckle
⑤Kingpin	⑥Needle bearing	⑦Bushing	⑧Rear axle bearing

Fig. 3-4 Steering knuckle

(2) Steering cylinder

The steering cylinder is a double-acting piston cylinder, both ends of the piston rod are connected with the steering knuckle through the connecting rods, and the pressure oil from the hydraulic steering gear moves left and right through the piston rod of the steering cylinder, so as to realize left and right steering. The piston seal is the combined seal comprising the support ring and the O ring, Yx ring axial seal is used between the cylinder head and the piston rod, and the cylinder is fixed on the steering axle through the cylinder heads at both sides. (Fig. 3-5)



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Fig. 3-5 Steering cylinder

①Thrust bearing	②Cylinder head	③Cylinder block	④O ring
⑤Support ring	⑥Bushing	⑦O ring	⑧Bushing
⑨Yx seal ring	⑩Gasket	⑪ Dust ring	⑫ Lining

⑬ Stopper

(3) Hub

The hub is installed on the steering knuckle using two tapered roller bearings, the wheels are skid-mounted on the hubs through rims, the inside of the bearing is installed with oil seal to keep the lubricating grease in the cavities of the hub and the steering knuckle and the nut is used to adjust the tightness of the bearing.

3.2 Key points of adjustment and repair

3.2.1 Adjustment of pre-tightening load of steering wheel bearing

(1) As shown in Fig. 3-6, apply lubricating grease to the inner cavities of the hub, the internal and external bearings and the hub cover and meanwhile apply certain lubricating grease to the oil seal lip;

(2) Fix the outer ring of the bearing on the hub and install the hub on the steering shaft;

(3) Install a flat washer, tighten the slotted nut with a torque of 206-235N.m (21-24kg.m), release the slotted nut and then re-tighten the nut with a torque of 9.8N.m (1kg.m);

(4) Slightly hit the hub with a wood hammer and rotate the hub by 3-4 revolutions to ensure that the hub is not loosened;

(5) Tighten the slotted nut to enable the slot to align with the cotter pin hole on the steering knuckle;

(6) Then slightly hit the hub with a wood hammer, manually rotate the hub by 3-4 revolutions to guarantee stable rotation and determine the rotating torque of the hub, the value of which is 2.94-7.8N.m (0.3-0.8kg.m);

(7) When the rotating torque is higher than the specified value, return it by 1/6 revolution and determine the rotating torque again;

(8) When the rotating torque meets the specified value, lock the slotted nut with the cotter pin.

3.2.2 Assembly of wheel

The inner tube and the liner shall be placed inside the cover tyre, the inner and outer rims shall be installed together, and attention shall be paid to the following issues:

1. The inflating valve shall be outward and in the middle of the cut.

2. The mounting bolt of the rim shall be installed with the head towards the outside.

3. During inflation, nobody shall stand nearby.

4. When the tyre pressure is inflated to about 98kPa (lkgf/cm^2), the tyre shall be slightly hit to enable the inner tube and the liner to enter the rim.

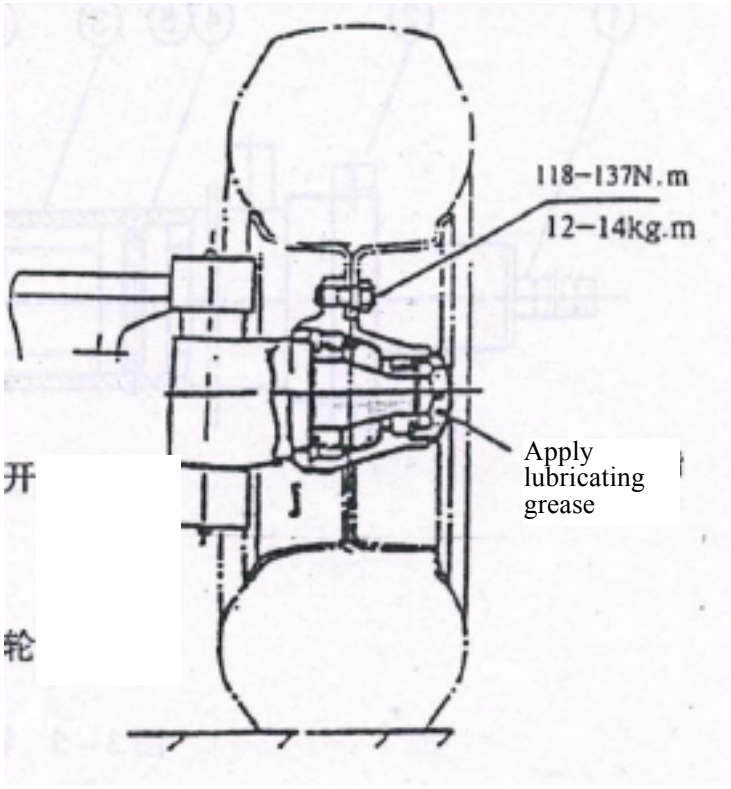
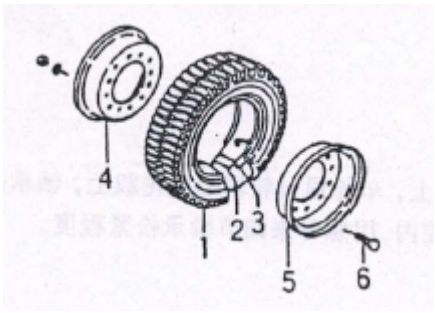


Fig. 3-6 Adjustment of pre-tightening load



1. Tyre 4. Rim (inner)
2. Inner tube 5. Rim (outer)
3. Liner 6. Safety bolt

Fig. 3-7 Wheel assembly

3.2.3 Inspection after re-installation of steering system

(1) Rotate the steering wheel left and right and rotate the steering wheel to the limit position to see whether the left and right forces are even and whether the rotation is stable;

(2) Check whether the layout of the oil pressure pipeline is correct and whether the left and right rotating directions are opposite;

(3) Jack the rear wheel, slowly rotate the steering wheel left and right and repeat such operation for several times to vent the air in the hydraulic line and the cylinder.

3.2.4 Fault diagnosis of steering system

Fault	Cause analysis	Troubleshooting method
Failure to rotate	The oil pump is damaged or fails.	Replacement

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the steering wheel	The hose or the joint is damaged or the pipe is blocked.	Replacement or cleaning
Heavy steering wheel	The pressure of the safety valve is too low.	Regulate the pressure.
	There is air in the oil line.	Vent the air.
	The steering reset fails or the positioning spring is broken or the elasticity is inadequate.	Replace the spring.
	Leakage in the steering cylinder is too large.	Check the seal of the piston.
Crawling or swinging of the forklift truck	The spring is broken or inelastic.	Replacement
High working noises	The oil level in the oil tank is low.	Refueling
	The suction pipe or the oil filter is blocked.	Cleaning or replacement
Oil leakage	The sealing of the steering cylinder guide sleeve is damaged or the pipeline or the joint is damaged.	Replacement

The steering motor of the forklift truck is controlled and started by the direction switch. The steering motor only works only when the direction switch is placed at the forward or backward position.

During exhausting, the steering motor shall be started, the steering wheel shall be rotated slightly (in case of abnormity, the power supply shall be cut off immediately to check the cause and eliminate the fault), the hand feeling shall be convenient and flexible, the steering wheel shall deflect accordingly, and such rotation shall be performed left and right repeatedly to vent the air in the system.

4. Electrical system

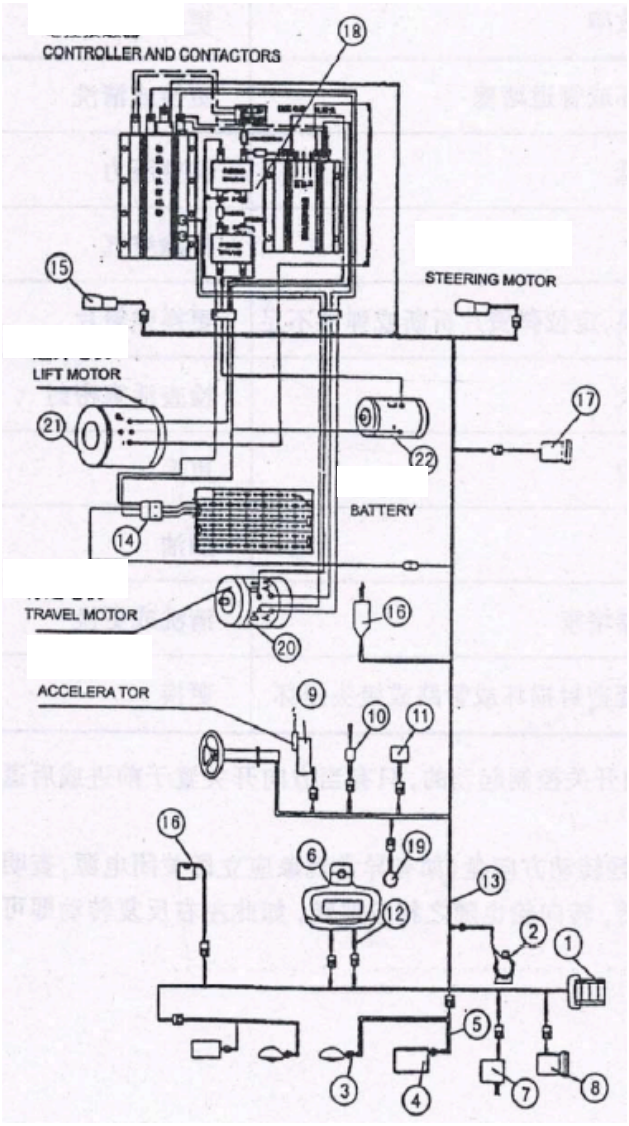
4.1 Overview

The electrical system mainly comprises a battery pack, a travel motor, a lift motor, a steering motor, a multi-functional integrated electric control assembly, a control switch, a LCD dashboard and lighting devices, etc., as shown in Fig. 4-1 and Fig. 4-2.

4.1.1 Multi-functional integrated control system

The multi-functional integrated control system comprises the separately excited motor controller assembly controlling the travel motor, the pump controller controlling the main oil pump motor and the contactor controlling the steering oil pump. The separately excited motor controller assembly comprises a controller and an accelerator, as shown in Fig. 4-3.

(1) SX transistor controller



The SX transistor controller is a controller produced by USA GE combining the latest technologies, with the capabilities of independently controlling the motor armature and the exciting circuit, combining the comprehensive advantages of half wound motors and shunt wound motors, with the characteristics of low speed and large torque, enabling the system to work at the maximum efficiency. The controller also has the advantages such as reverse braking, regenerative control, thermal protection and battery protection.

(2) The accelerator comprises the starting switch and the potentiometer, and the potentiometer converts the angle motion of the pedal to the resistance change of the potentiometer and then converts the resistance change to the voltage change to be transmitted to the controller, as shown in Fig. 4-4.

① Fuse block
② Horn
③ Headlamp
④ Front signal light
⑤ Front overhead guard harness
⑥ Dashboard assembly
⑦ Hand brake switch
⑧ Flasher
⑫ Dashboard harness
⑬ Instrument stand harness
⑭ Outlet assembly
⑮ Rear combination lam
⑯ Lifting switc
⑰ Back-up buzzer
⑱ Separately excited electric control
⑲ Foot horn switch

⑨Direction switch
⑩Turn signal lamp switch
⑪ Brake light switch
⑳ Travel motor
㉑ Lift motor
㉒ Steering motor

Fig. 4-1 Electrical system

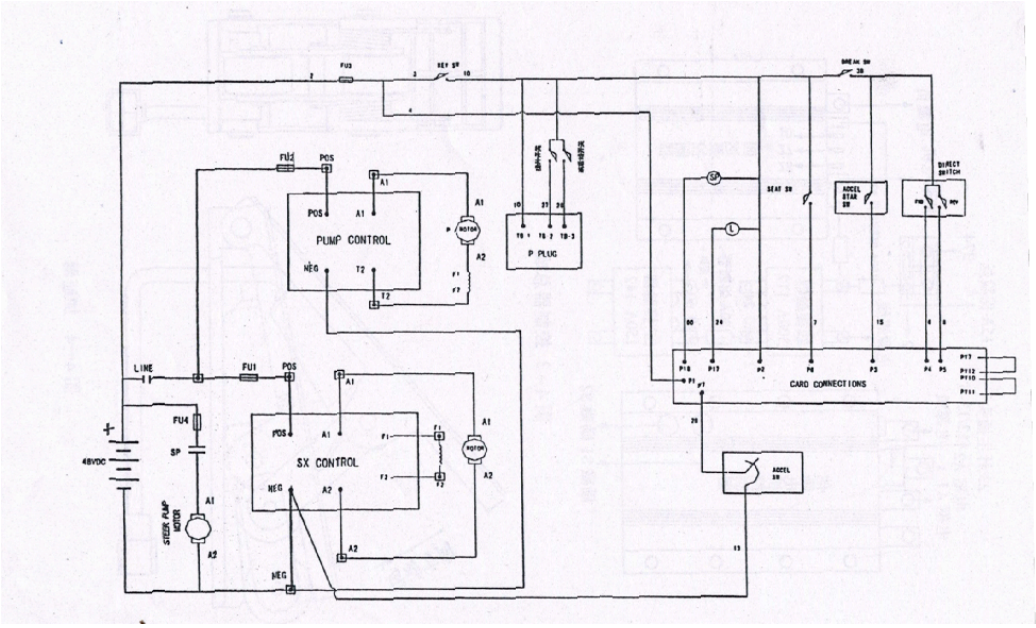


Fig. 4-2 Basic principle diagram of traction control

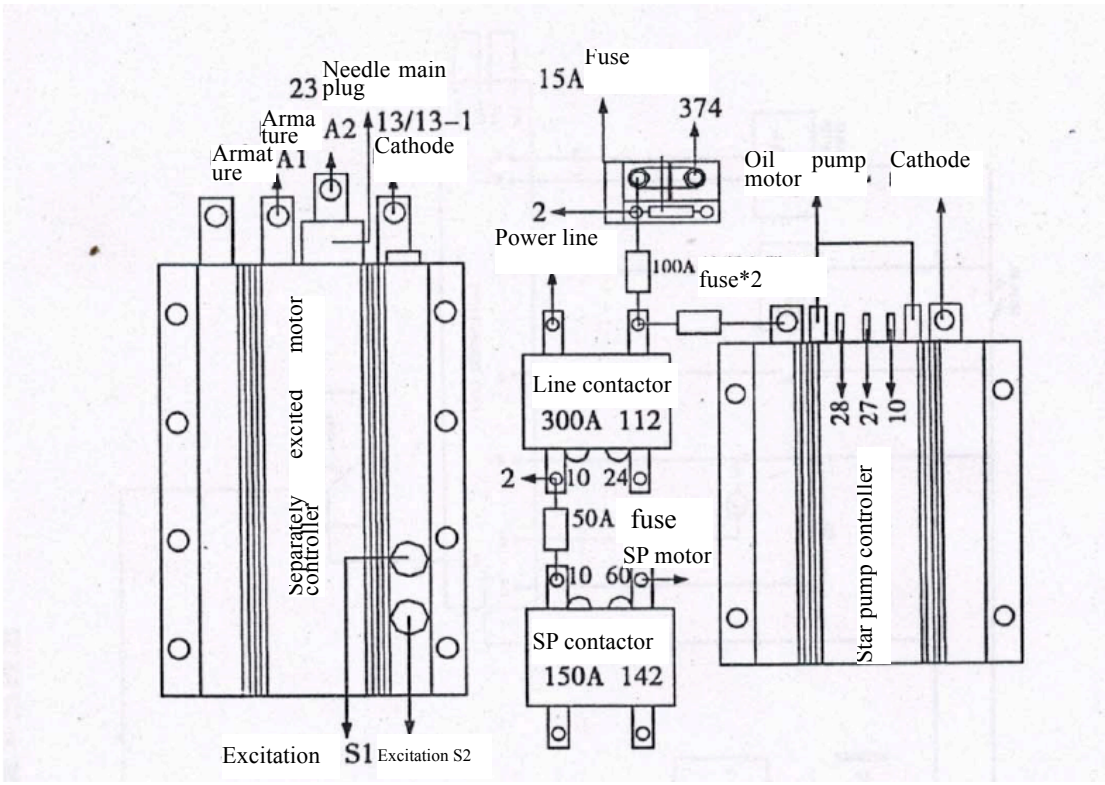


Fig. 4-3 Controller assembly

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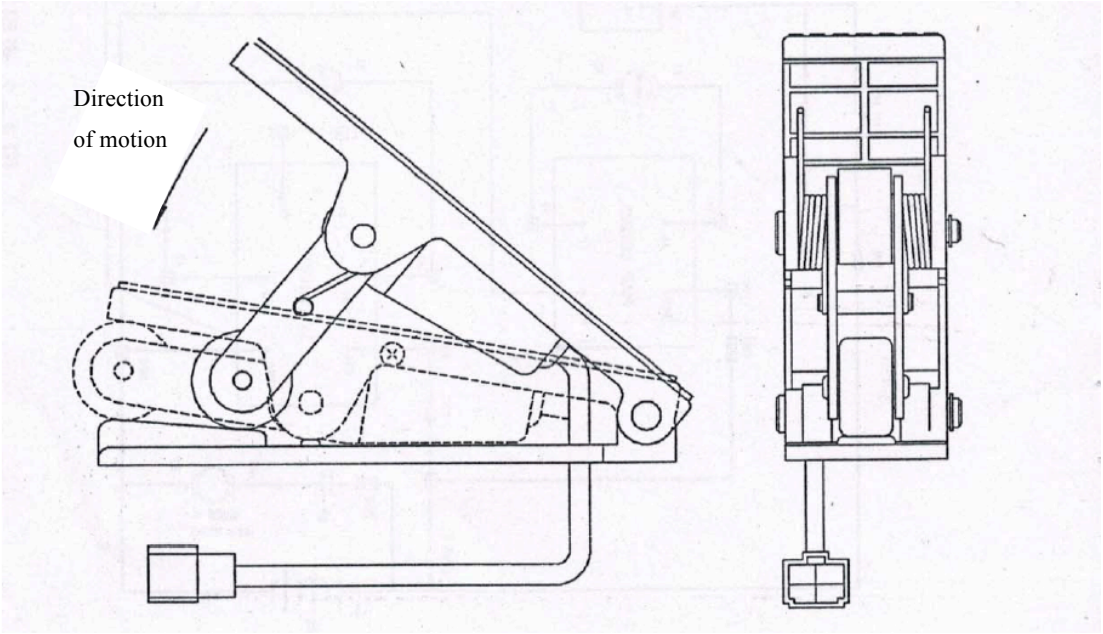
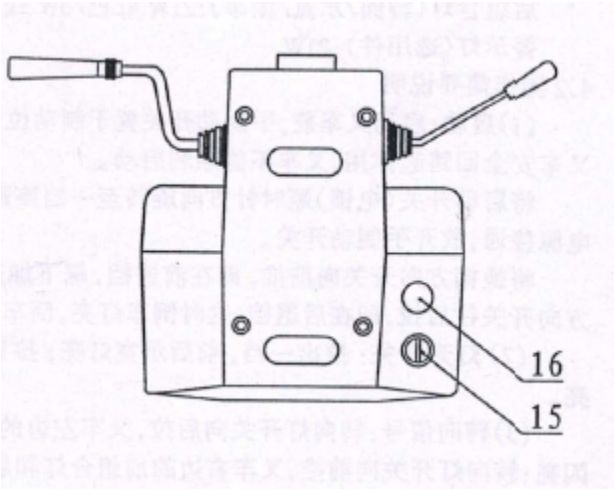


Fig. 4-4 Accelerator

4.1.2 LED dashboard

The battery forklift truck uses the display mode combining new LED and LCD, the control circuit uses the microcomputer technology, real-time sampling, real-time display and real-time control, and the strong and weak current circuits in the instruments use photoelectric isolation and control relays, with battery undervoltage warning and protection functions and high degree of automation, as shown in Fig. 4-5.



1 Instrument appearance and display and operation instructions

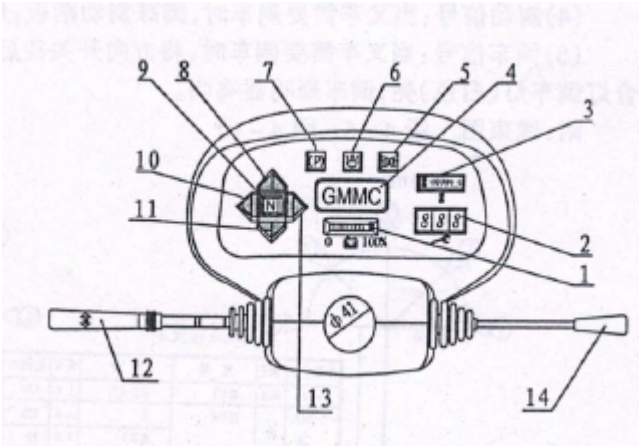
(1) The battery capacity indication displays the current battery capacity.

(2) List of electric control fault codes. When the electric control fails, this list will display a specific code to provide the maintenance personnel with the fault detection information. See the following fault index for the specific use of the list of faults.

(3) Cumulative working hours of the forklift truck under electric control.

(4) Logo of the mainframe manufacturer.

(5) Work indication of width lamps.



(6) Work indication of headlamps.

(7) Brake indication.

(8) Vehicle advancing status indication.

(9) Neutral position display.

(10) Indication of left turn signal lamp.

(11) Vehicle reversing status indication.

(12) Turn signal lamp switch.

(13) Work indication of right turn signal lamp.

(14) Direction switch.

(15) Starting switch. The electric lock starting switch shall be rotated clockwise to the first gear to connect the power supply, and the power supplies of the instrument indication and electrical control circuits shall be connected.

(16) Headlamp switch. Light switch and electric lock. When the switch is switched from the first gear, the front and rear width lamps will be lit; when the switch is switched to the second gear, the front headlamp will be lit and the width lamps are still lit.

2. Lighting signal equipment

Including various lights, signal lamps, horns and buzzers, etc.

Headlamp: 35W

Front combination lamp (steering/width indication): 21W/8W

Rear combination lamp (steering/width indication/reversing): 21W red/8W red/10W white

Warning light (optional): 21W

4.2 Brief description of operation

(1) Starting: Before the forklift truck is started, the hand brake switch shall be placed at the brake position and the shifting direction switch shall be placed at the neutral position. Otherwise the safety circuit of the forklift truck will work and the forklift truck can't be started successfully.

The starting switch (electric lock) shall be rotated clockwise to the first gear to connect the power supply, the power supplies of the instrument indication and electrical control circuits shall be connected and the hand brake switch shall be released.

If the shifting direction switch is pushed forward, i.e. at the drive gear, the accelerator pedal shall be treaded down to drive the forklift truck forward; if the direction switch is pulled back, i.e. at the reverse gear, the back-up light will be lit and the back-up buzzer will sound.

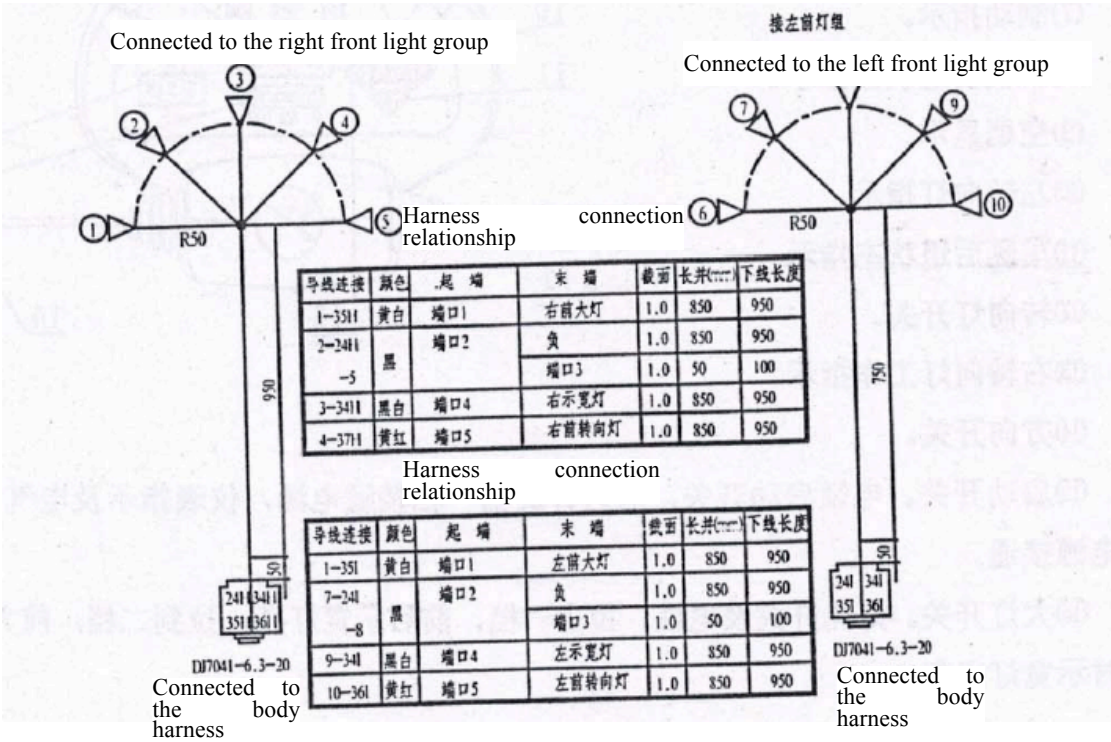
(2) Light switch: When the switch is switched from the first gear, the front and rear width lamps will be lit; when the switch is switched to the second gear, the front headlamp will be lit and the width lamps are still lit.

(3) Turn signal: If the turn signal lamp switch is pulled backward, the turn signal lamps of the front combination lamp and the rear combination lamp at the left of the forklift truck will flash; if the turn signal lamp switch is pushed forward, the turn signal lamps of the front combination lamp and the rear combination lamp at the right of the forklift truck will flash.

(4) Brake signal: When the forklift truck shall be braked, the brake pedal shall be treaded and the brake lamp (red) of the rear combination lamp will be lit.

(5) Reversing signal: When the forklift truck shall be reversed, the direction switch shall be pulled backward. At this time, the travel motor will be reversed, the back-up light (white) of the rear combination lamp will be lit and the back-up buzzer will sound.

Attached with the harness diagrams Fig. 4-6 ~ Fig. 4-10.



导线连接	颜色	起 端	末 端	截面	长共(mm)	下线长度
1-3511	黄白	端口1	右前大灯	1.0	850	950
2-2411 -5	黑	端口2	负	1.0	850	950
			端口3	1.0	50	100
3-3411	黑白	端口4	右示宽灯	1.0	850	950
4-3711	黄红	端口5	右前转向灯	1.0	850	950

Harness relationship connection

导线连接	颜色	起 端	末 端	截面	长共(mm)	下线长度
1-351	黄白	端口1	左前大灯	1.0	850	950
7-241 -8	黑	端口2	负	1.0	850	950
			端口3	1.0	50	100
9-341	黑白	端口4	左示宽灯	1.0	850	950
10-361	黄红	端口5	左前转向灯	1.0	850	950

Fig. 4-6 Headlamp harness

Conductor connection	Color	Start	End	Section	Length (mm)	Laying length
1-3511	Yellow and white	Port 1	Right front headlamp	1.0	850	950
2-2411 -5	Black	Port 2	Negative	1.0	850	950
			Port 3	1.0	50	100

3-3411	Black and white	Port 4	Right width lamp	1.0	850	950
4-3711	Yellow and red	Port 5	Right front turn signal lamp	1.0	850	950

Conductor connection	Color	Start	End	Section	Length (mm)	Laying length
1-351	Yellow and white	Port 1	Left front headlamp	1.0	850	950
7-241 -8	Black	Port 2	Negative	1.0	850	950
			Port 3	1.0	50	100
9-341	Black and white	Port 4	Left width lamp	1.0	850	950
10-361	Yellow and red	Port 5	Left front turn signal lamp	1.0	850	950

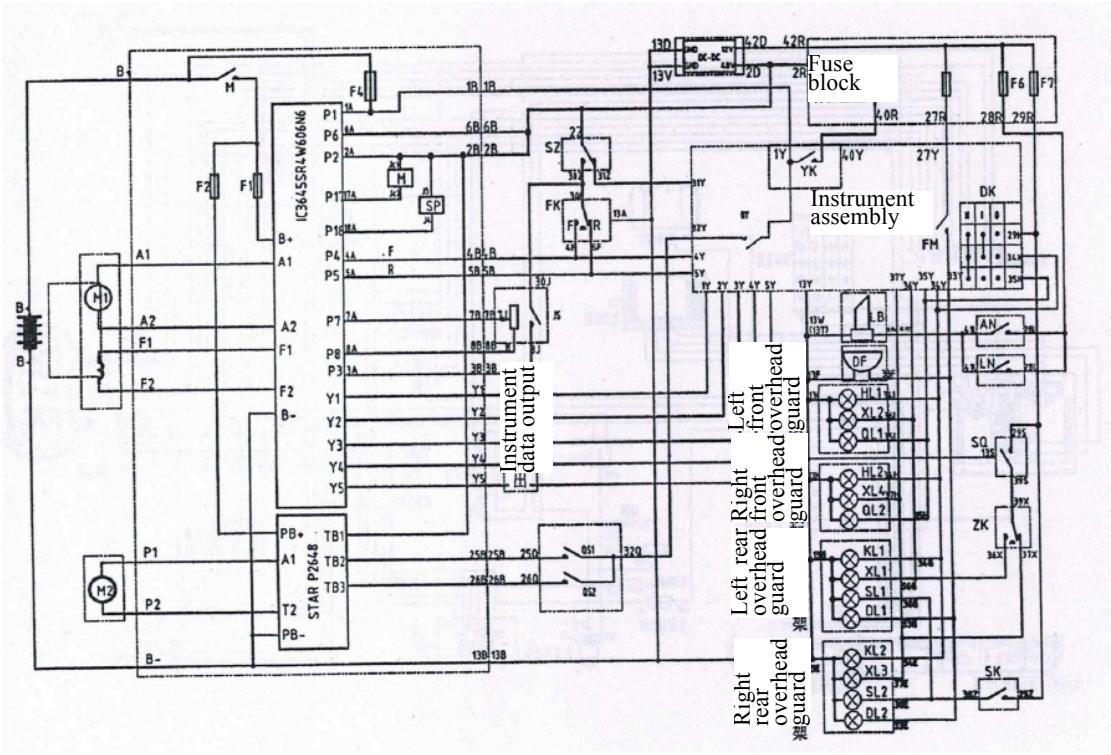


Fig. 4-7 Principle diagram

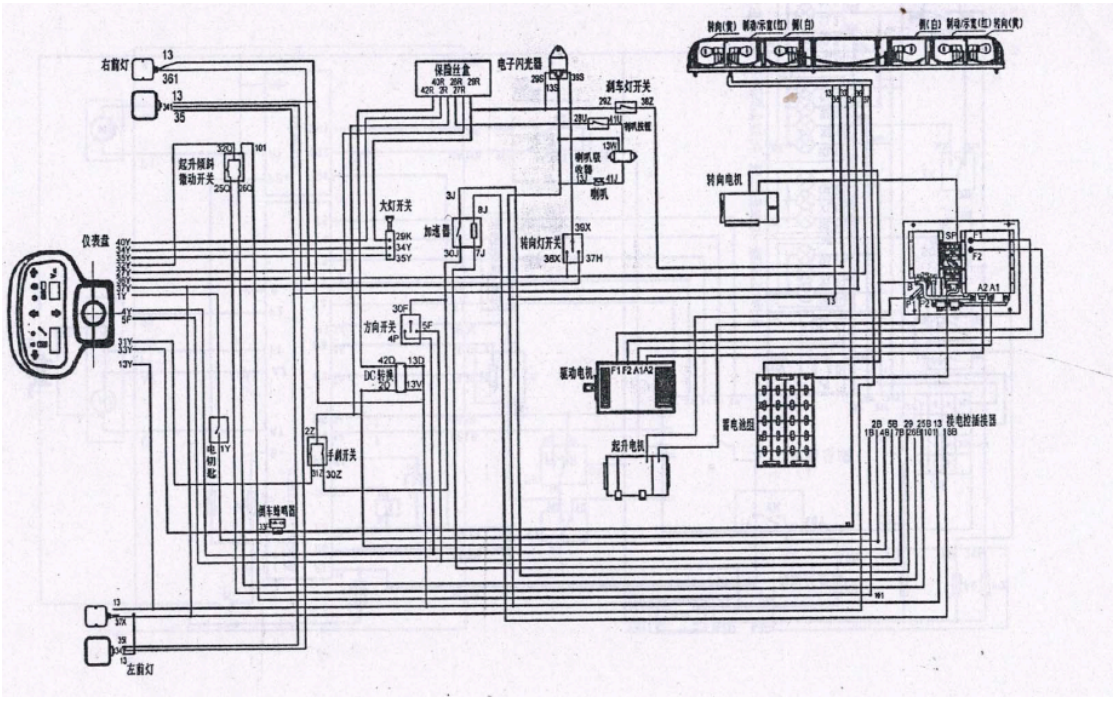


Fig. 4-8 Wiring diagram

Table (I) Description of harness terminal

1B	1V	Controller 48V	Key switch 48V input	Red	1.0mm^2	2945	3045
2B	2R	Control circuit 48V input	Fuse block F5/48 output	Orange	1.0mm^2	4065	4165
	2Z		Hand brake switch 48V		0.75mm^2	200	250
	2D		DCD+48V input		1.0mm^2	200	250
	6B		Electric control port 6B		0.75mm^2	200	250
3B	3J	Starting signal input	Accelerator starting switch output	Pink	0.75mm^2	3665	3765
4B	4F	Controller forward input	Direction switch forward output	Green	0.75mm^2	2945	3045
	4Y		Instrument forward input		0.75mm^2	200	250
5B	5F	Controller backward input	Direction switch backward output	Blue	0.75mm^2	2945	3045
	5Y		Instrument backward input		0.75mm^2	200	250
7B	7J	Acceleration signal input	Accelerator signal output	Yellow	0.75mm^2	3665	3765
8B	8J	Controller acceleration negative terminal input	Accelerator negative terminal output	Brown	0.75mm^2	3665	3765
13B	13S	Electric control 48V negative terminal DC/DC-12V negative terminal	Flasher negative terminal	Black	0.75mm^2	4065	4165
	13W		Horn and horn filter negative terminal		0.75mm^2	200	250
	13G		Left rear lamp negative terminal		0.75mm^2	200	250
	13E		Right rear lamp negative terminal		0.75mm^2	200	250
	13F		Back-up buzzer negative terminal		0.75mm^2	200	250

	13H		Right front lamp negative terminal		0.75mm^2	200	250
	13I		Left front lamp negative terminal		1.0mm^2	300	350
	13Y		Instrument negative terminal		0.75mm^2	200	250
	13D		DC/DC-48V negative terminal		1.0mm^2	200	250
	13V		DC/DC-12V negative terminal		0.75mm^2	200	250
	13A		Direction switch negative terminal		0.75mm^2	200	250
	13T		Horn and horn filter negative terminal		0.75mra^2	200	250
25B	25Q	Pump electric control lifting input	Lifting switch lifting output	White	0.75mm^2	3545	3645
26B	26Q	Pump electric control tilting input	Lifting switch tilting output	Grey	0.75mm^2	3545	3645
27R	27Y	Fuse block 12V output	Instrument back-up buzzer 12V input	Red and white	1.0mm^2	1520	1620
28R	28L	Fuse block F6/12V output	Horn button 12V input	White and yellow	0.75mm^2	4515	4615
	28U		Foot horn switch 12V input		0.75mm^2	150	200
	29Z	Fuse block F7/12V output	Brake light switch 12V input	Red and black	0.75mm^2	2965	3065
29R	29S		Flasher 12V input		0.75mm^2	200	250
	29K		Headlamp switch 12V input		0.75mm^2	200	250
Start	End	Start	End	Color	Conductor section	Nominal length	Max. length

Table (II) Description of harness terminal

30Z	30J	Hand brake switch output	Accelerator starting 48V input	Yellow and white	0.75mm^2	1420	1520
	30F		Direction switch 48V input		0,75mm^2	200	250
31Y	31Z	Instrument brake display input	Normally closed output of hand brake switch	Purple	0.75mm^2	700	800
32Y	32Q	Instrument undervoltage protection output	Lifting switch 48V input	Yellow and black	0.75mm^2	1000	1100
33Y	33G	Instrument reversing 12V output	Left back-up light 12V input	White and blue	0.75mm^2	2745	2845
	33E		Right back-up light 12V input		0.75mm^2	200	250
	33F		Back-up buzzer 12V input		0.75mm^2	200	250
34H	34Y	Right front width lamp 12V input	Headlamp switch I gear	Yellow and red	0.75mm^2	200	250
	34I		Left front width lamp 12V input		0.75mm^2	300	350
	34G		Left rear signal lamp 12V input		0.75mm^2	200	250

	34E		Right rear signal lamp 12V input		0.75mm^2	3065	3165
35H	35I	Right front headlamp 12V input	Left front headlamp 12V input	Red and yellow	0.75mm^2	1120	1220
	35Y		Headlamp switch II gear		0.75mm^2	200	250
36X	36G	Left turn signal lamp switch	Left rear turn signal lamp 12V input	Black and white	0.75mm^2	3745	2845
	36I		Left front turn signal lamp12V input		0.75mm^2	200	250
	36Y		Instrument left turning input		0.75mm^2	200	250
37H	37E	Right front turn signal lamp input	Right rear turn signal lamp input	Yellow and black	0.75mm^2	3045	3145
	37X		Right turn signal lamp switch		0.75mm^2	200	250
	37Y		Instrument right turning input		0.75mm^2	200	250
38Z	38G	Brake light switch 12V output	Left brake light 12V input	White and yellow	0.75mm^2	1700	1800
	38E		Right brake light 12V input		0.75mm^2	200	250
39S	39X	Flasher 12V output	Turn signal lamp switch 12V input	Blue and black	0.75mm^2	1520	1620
40R	40Y	Fuse block 48V input	Instrument 48V output	Green and red	1.0mm^2	1520	1620
41T	41L	Horn 12V input	Horn switch 12V output	Green and white	0.75mm^2	3715	3815
	41U		Foot horn switch 12V output		0.75mm^2	150	200
	41W		Horn 12V input		0.75mm^2	200	250
42D	42R	DCDC+12 output	Fuse block +12V input		0.75mm^2	2475	2575
1Y	11Y	Electric control port 1Y	Instrument connector 11Y	Yellow	0.5mm^2	2945	3045
2Y	12Y	Electric control port 2Y	Instrument connector 12Y	Green	0.5mm^2	2945	3045
3Y	13Y	Electric control port 3Y	Instrument connector 13Y	Blue	0.5mm^2	2945	3045
4Y	14Y	Electric control port 4Y	Instrument connector 14Y	Grey	0.5mm^2	2945	3045
5Y	15Y	Electric control port 5Y	Instrument connector 15Y	Black	0.5mm^2	2945	3045
Start	End	Start	End	Color	Conductor section	Nominal length	Max. length

4.3 Fault diagnosis

If the vehicle is mis-operated or the electric control fails, the instrument will display the status code, and the existing problem can be judged according to the status code and the description listed in the diagnosis table of status codes.

Diagnosis table of traction controller status codes

Status code	Description
-01	No seat switch input
-02	The forward direction switch is closed just after power-on.

-03	The backward direction switch is closed just after power-on.
-05	The starting switch or the brake switch is not closed.
-06	The accelerator is treaded down when the direction is not selected.
-07	The input voltage of the accelerator is too high.
- 08	The key switch is closed for the first time, the power supply is connected, and the input voltage of the accelerator is too low.
-09	The forward and backward direction switches are closed simultaneously.
-11	After the key switch is closed for the first time, when the power supply is connected, the starting switch is already closed.
-15	The battery voltage is too low or the control card is disordered.
-16	The battery voltage is too high or the control card is disordered.
-17	The type of the control card is selected improperly.
-23	In case of starting in the backward direction, the motor excitation current is too high.
-24	In case of starting in the forward direction, the motor excitation current is too high.
-27	The supplied power supply is lower than 10VDC.
-28	In the operating mode, the motor excitation current is too high.
-41	The thermal protector is open circuit or the transistor temperature is too high.
-42	The compensation voltage of the motor armature is too high.
-43	The compensation voltage of the motor armature is too low.
-44	The armature transistor can't be turned off normally.
-45	The armature transistor can't be connected normally.
-46	It is predicted that the voltage at A2 point is lower than 12% of the battery voltage.
-49	In the operating mode, the motor excitation current is too low.
-51	Before suction of the contactor, the voltages at both ends of the capacitor are too low.
-57	In the operating process, the input voltage of the motor current sensor of the controller is too low.
-64	The input voltage (P2-17) of the line contactor driver is lower than 12% of the battery voltage.
-65	In the operating mode, the current of the coil of the line contactor is too high.
-66	The excitation current exceeds the current limit of the excitation transistor.
-67	The armature current exceeds the current limit of the armature transistor.
-69	In the operating mode, the current of the power steering coil is too high.
-76	1C voltage of the capacitor is too high.
-77	In the regenerative brake process, the motor current is detected.
-82	If the armature drive current is higher than 450A for over 3.5s, the armature electric current will be closed.

4.4 Key points of maintenance

▲ Key points of spot check of controller components

Under normal conditions, it is very dangerous to touch the electrical components with hands. In such case, the battery plug must be unplugged and wait for 2 min.

When spot check must be performed in the live state, the drive axle shall be supported from the ground, so that the vehicle can't travel when the motor is rotating at a high speed.

It shall also be noted that the body shall not be contact the tyres.

1. Inspection of electrical components of controller

(1) Spot check tools and measuring appliances

S/N	Description	Specification and remarks	Purpose

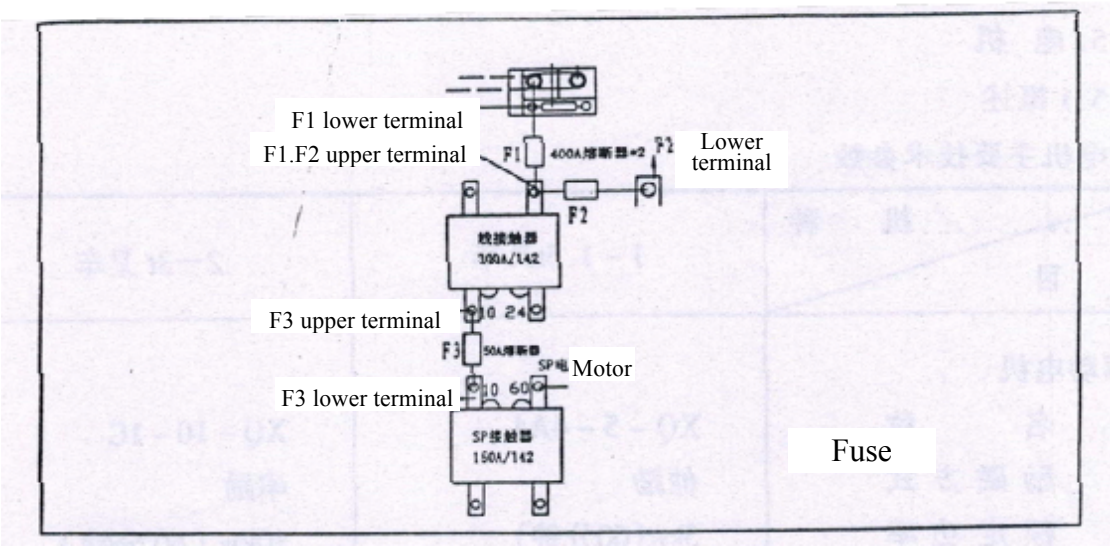
1	Screwdriver (a set)	Straight screwdrivers, cross screwdrivers (large, intermediate and small) and cross screwdrivers used for small screws	Fasten and dismantle screws of various parts and adjust the lead screw.
2	Wrench (a set)	7mm, 13mm and 17mm	Fasten and dismantle bolts and nuts of various parts.
3	Torque wrench	Power module mounting bolts M4 and M5	Used to determine the power module fastening torque.
4	Pin pliers (a set)		Install and dismantle small components.
5	Ammeter	DC500A or 1000A	Determine the current.
6	Digital gauge Analog gauge	-12V, -30V and -120V	Determine the voltage.
		Range ×1Ω, ×100Ω and ×1000Ω	Determine the resistance (digital gauge doesn't work).

Note:

When the mounting bolts and nuts of the power terminal of the controller are loosened, the generated heat will result in burning accidents. If loosening and heat radiation is found, sand paper shall be used to carefully grind, fasten and correct such position. In addition, poor contact at the plug position will result in abnormal action. For impurities and rust, etc. adhered to the plug position, the plug shall be plugged and unplugged for 2-3 times to correct the situation of poor contact. In addition, it shall also be checked whether the conductor is broken and whether the terminal is deformed, etc.

2. Inspection of fuse

When high current passes the main loop, the fuse shall be blown to prevent the controller from further damages and prevent the electric appliances from fire.



Mark	Description	Basic parameters			
F1	Traveling fuse	RNO	DC	150V	400A
F2	Loading fuse	RNO	DC	150V	400A
F3	PS fuse	RNO	DC	150V	50A

(1) Inspection of traveling fuse (F1)

① The gauge shall be switched to voltage measurement, and the (-) electrode of

the gauge shall be connected to the (-) electrode cable terminal of the controller.

② The (+) electrode of the gauge shall be connected with the upper terminal and the lower terminal of F1 fuse to measure the voltage and make a judgment.

Voltmeter (key switch ON status)

Measuring point	Voltage value	Judgment
Lower terminal	Battery voltage	Good
	0V	Poor (replace the fuse)
Upper terminal	Battery voltage	Good

(2) Inspection of loading fuse (F2)

① The gauge shall be switched to voltage measurement, and the (-) electrode of the gauge shall be connected to the (-) electrode cable terminal of the controller.

② The (+) electrode of the gauge shall be connected with the upper terminal and the lower terminal of F2 fuse to measure the voltage and make a judgment.

Voltmeter (key switch ON status)

Measuring point	Voltage value	Judgment
Lower terminal	Battery voltage	Good
	0V	Poor (replace the fuse)
Upper terminal	Battery voltage	Good

(3) Inspection of steering fuse (F3)

① The gauge shall be switched to voltage measurement, and the (-) electrode of the gauge shall be connected to the (-) electrode cable terminal of the controller.

② The (+) electrode of the gauge shall be connected with the upper terminal and the lower terminal of F3 fuse to measure the voltage and make a judgment.

Measuring point	Voltage value	Judgment
Lower terminal	Battery voltage	Good
	0V	Poor (replace the fuse)
Upper terminal	Battery voltage	Good

5. Motor

5.1 Overview

Main technical parameters of motor

Type / Item	1-1.5t forklift truck	2-3t forklift truck
Drive motor		
Name	XQ-5-4A4	XQ-10-1C
Exciting mode	Separate excitation	Series excitation
Rated power	5kw (60 min)	10kw (60 min)
Rated voltage	48V	75V
Rated current	139A	165A
Weight	95kg	135kg
Oil pump motor		
Name	XQD-6.3-3C	XQD-13-2S
Exciting mode	Compound excitation	Series excitation
Rated power	6.3kw (15 min)	13kw (15 min)

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Rated voltage	48V	80V
Rated current	172.8 A	210A
Weight	72kg	72kg
Steering motor		
Name	XQD-0.8-7	
Exciting mode	Compound excitation	
Rated power	0.75kw (30 min)	
Rated voltage	48V	
Rated current	25A	
Weight	12kg	

5.1.1 Drive motor

The drive motor is installed on the drive reduction gearbox and its rotation is controlled by the converter in the controller.

The rotating state of the motor is detected by 2 sensors assembled at the back of the motor and then transmitted to the controller.

5.1.2 Oil pump motor

The oil pump motor is assembled at the left frame and drives the main pump, as shown in Fig. 5-1 and Fig. 5-2.

The oil pump motor comprises the lifting relay and the controller assembled inside the counterweight to control starting and stopping of rotation, etc.

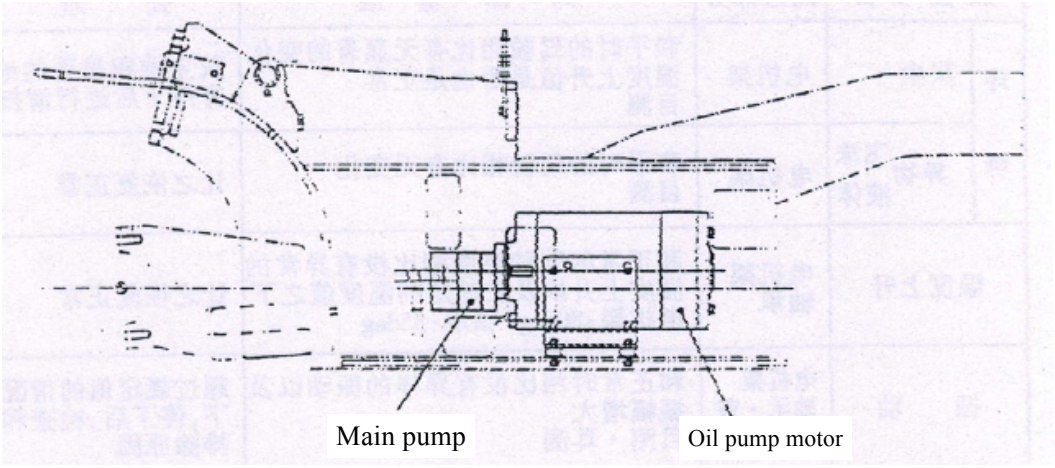


Fig. 5-1 Assembly drawing of oil pump motor

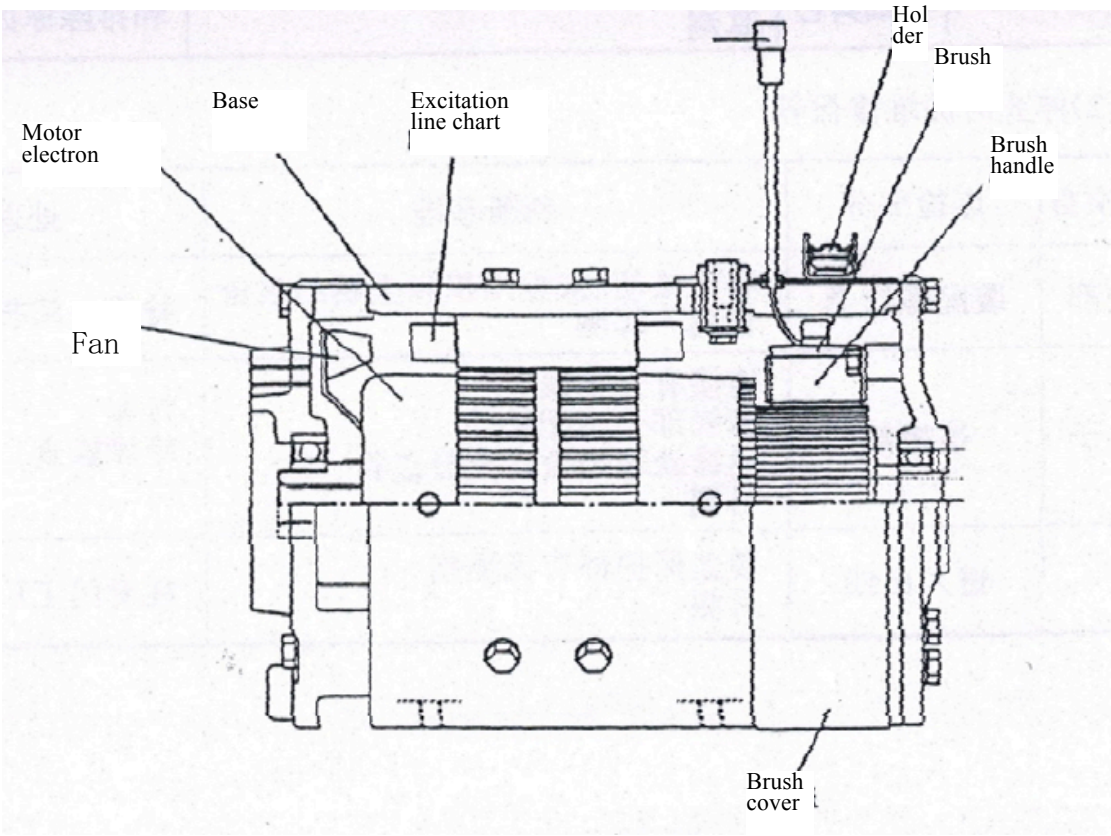


Fig. 5-2 Oil pump motor

5.2 Key points of maintenance

5.2.1 Drive motor

(1) Maintenance during driving

Spot check item		Spot check part	Judgment criteria	Treatment
Environment	Dust	Support	Whether there is any distinct change from driving at ordinary time and whether the temperature rise value is normal. Visual inspection	After stopping at a place with distinct dust accumulation, clean the place.
	Foreign matters: Spray Liquid	Support	Whether there is any change from driving at ordinary time. Visual inspection	Recover it to normal condition.
Temperature rise		Support Bearing	Whether there is abnormal temperature rise when compared with the temperature in case of normal driving and whether the temperature rise is below the specified temperature value. Support: 80deg; bearing: 55deg	Recover it to normal condition.
Vibration		Support Bearing, cover plate or others	Whether there is abnormal vibration and amplitude increase when compared with normal conditions. Visual inspection and acoustic inspection	When the specified value is exceeded, after stopping, check and eliminate the cause.

Abnormal sound	Support Bearing, cover plate or others	There is no abnormal sound and noise increase phenomenon when compared with normal conditions. When auscultation rods and new products are used, perform comparisons. Acoustic inspection	If such situation occurs during driving, after stopping, check and eliminate the cause.

(2) Maintenance during stopping

Spot check item	Spot check part	Judgment criteria	Treatment
Assembly part	Assembly screws	Whether there is any loosening, dust accumulation or rust. Visual inspection and acoustic inspection	Tightening, cleaning and painting
Terminal	Connecting part	Whether the connection is wrong. Whether the connecting part is loosened. Whether the insulation is adequate. Visual inspection	Tightening Insulation inspection
	Incoming and outgoing lines	Whether the covering and protection part is damaged. Visual inspection	Repair at the special factory

(3) Regular spot check

▲ Spot check criteria

For regular spot check, please refer to the following table. However, at the places with much dust and high humidity and in case that the working conditions are very rigorous, the spot check times must be increased.

Driving time	Above 12h/1d	Above 8-12h/1d
Spot check times	Once a year	Once every 2 years

Spot check part	Spot check item	Judgment criteria	Treatment
Rolling bearing	Bearing (sealed)	Grease leakage, abnormal sound and dust accumulation Visual inspection and acoustic inspection	Replacement
Connecting part	Connection surface	Whether there is high roughness of the connection surface due to damages and rust, etc. during assembly. Visual inspection	Cleaning and processing of the connection surface
	Assembly screws	Whether there is any loosening, rust and dust accumulation. Visual inspection and acoustic inspection	Tightening, derusting and replacement
Terminal	Connection surface	Whether there is high roughness of the connection surface due to damages and rust, etc. during assembly. Visual inspection	Cleaning and processing of the connection surface
	Connecting part	Whether the connection is wrong. Whether the connecting part is loosened. Whether the insulation is adequate. Visual inspection	Tightening
	Incoming and outgoing lines	Whether the covering and protection part is damaged. Visual inspection	Repair at the special factory

	Resistance between terminals	0.0063Ω ± 5% (20℃)	Repair at the special factory
Assembly of fixed rotors and rotating rotors	Iron core	Dust accumulation Visual inspection	Cleaning
	Insulation of coil and connecting part	Insulation resistance above 1MΩ (measuring with a 500V high resistance meter)	Cleaning Heating, drying and treatment with varnish

Painting	Damage	Whether there is any damage, discoloration, peeling and rust. Visual inspection	Derusting Re-painting
Cleaning	Dirt and dust accumulation	Whether there is distinct dirt, dust accumulation and rust. Visual inspection	Cleaning and antirust painting

▲ Key points of spot check

Each part shall be subject to spot check according to the following key points:

1. The place with less dust and lower humidity shall be selected.

2. In order to prevent mistakes in the part assembly position and the shaft direction during assembly, the disassembly sequence shall be well recorded. The articles such as screws and gaskets shall be placed into the empty box prepared in advance.

3. When the parts such as supports are dismantled and installed, a wood hammer shall be used for even, equal and slight hitting. Hitting with a metal hammer, etc. may result in breakage of the support.

4. During operation, attention shall be paid to preventing the parts from damages, in particular, it shall be particularly noted that the stator coil and the bearing shall be prevented from entry of water, dust and sand and in particular from damages.

5. The parts which have been disassembled shall be cleaned thoroughly and checked for abnormities. Inadequate or damaged parts shall be made up or replaced immediately.

6. When the coil is wiped with a hard object or gasoline, petroleum or other solvent, the insulation may be damaged. Please do use dry cloth or soft brush.

7. The coil shall be dried when the insulation resistance is very low. When the coil is dried, attention shall be paid to preventing local overheating, and the coil shall be heated to 80T-90T and dried so that the insulation resistance reaches above 1MΩ.

8. The parts such as bolts shall be checked for loosening. In case of loosening, they shall be tightened.

9. For spot check and repair of the bearing, please refer to Item (4) (Repair of Bearing).

10. In case of damages, discoloration and peeling of paint, antirust treatment or re-painting shall be performed.

11. The terminal shall be tightened firmly and the connecting part shall be completely insulated with the insulating tape.

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12. After completion of assembly, it shall be checked carefully whether there is any remaining part and whether the articles such as screws have been tightened. Then the shaft shall be rotated by hand to find any abnormities and then trial run shall be performed after confirmation of no abnormities.

13. The motor shall be stored at a place without moisture, dust, basicity or other hazardous gas, and both ends of the shaft shall be applied with antirust oil and wrapped with oil paper or film cloth, etc. for storage.

(4) Spot check and repair of bearing

The bearing life varies with the specific situations such as the load size and the driving conditions. If the bearing is hot or generates abnormal sounds, please replace it.

Since the sealed bearing is sealed with high-quality lithium base grease, it can be effectively lubricated and has the structure preventing dust intrusion and it can be used without adding grease for a long time.

The sealed bearing shall be replaced according to the following period:

Driving time	8-12H/1d	12H-/1d
Spot check times	Once every 6 years	Once every 3 years

In particular, in case of use at the places with much dust or where the grease is deteriorated due to hazardous gases and solvents and may flow out, the replacement period shall be shortened according to the situations.

▲ Assembly of bearing

As shown in the diagram, insert a steel pipe towards the inside diameter of the bearing or use a holder.

When the motor bearing is loosened, attention shall be paid to prevention of over 60℃ - 80℃.

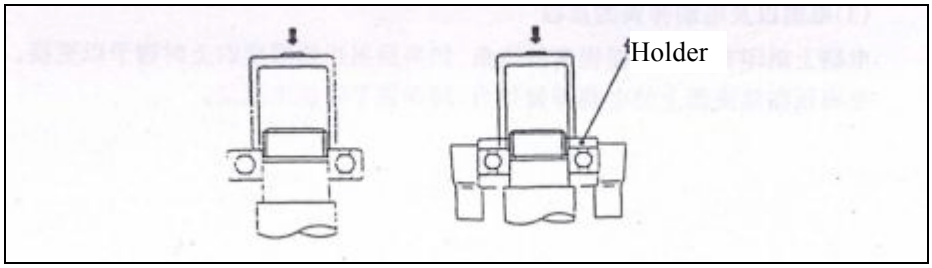


Fig. 5-3

▲ Disassembly of bearing

A detacher shall be used to dismantle the bearing.

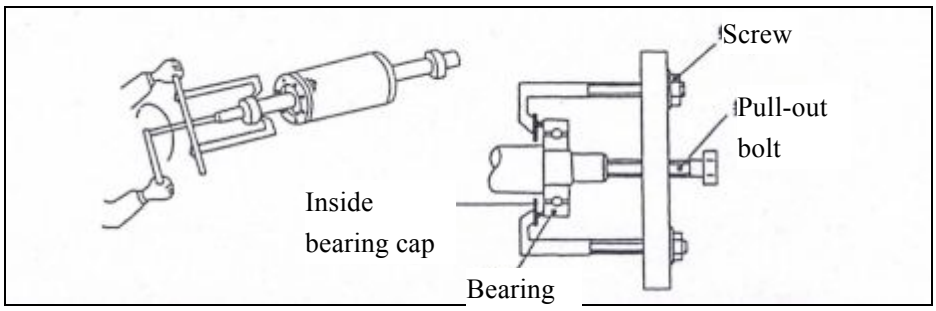


Fig. 5-4

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5.2.2 Oil pump motor

(1) Ball bearing

When the bearing generates abnormal sounds or it is sintered, please dismantle the bearing from the rotor spindle.

During dismantling, please use a small detacher to apply a force to the outer circle of the bearing for dismantling and please do not reuse the dismantled bearing.

During assembly of a new bearing, use a cylindrical working position apparatus to apply a force to the inner circle of the bearing.

(2) Measuring the insulation resistance

Connect the (-) terminal of the instrument to the base of the motor and connect the (+) terminal to either side of 2 terminals. If the pointer of the instrument is below 0.5MQ, it is normal.

If the measured value is not above 0.5MΩ, clean the carbon electrode in the motor with compressed air. If a dryer is available, please use the dryer for drying and then re-measure the value.

If the re-measured value is still below 0.5MΩ, please replace the motor.

(3) Spot check of brush and brush spring

The brush is engraved with the line indicating the wear degree. If the wear exceeds the limit, please replace the brush. The brush spring tension of the brush pressed on the rectifier shall be measured with a spring balancer.

(4) Inspection of rectifier

The rectifier is the most important part in the motor. If adhered, oil or impurities will result in abnormal wear of the brush and reduction of the working efficiency of the rectifier. Therefore, compressed air or clean dry cloth shall be used for cleaning.

When the rectifier surface becomes rougher, it shall be subject to fine grinding with 500# or 600# emery paper and then cleaned carefully. When the rectifier surface is too rough, it is necessary to correct it by means of cutting.

After cutting, the thickness of the mica sheet shall also be corrected.

Repair of the rectifier requires special mechanical tools, therefore, it shall be delivered to a special repair shop for repair.

▲ Reference values of inspection criteria

(mm)

		Benchmark value	
Axial thrust		Standard	1.0
		Limit	1.8
Bearing lubricating grease		Name	Compound SRL
Coil resistance (Ω)		Electric axis	0.0173
		Magnetic field	0.0106
Carbon brush	Drive motor	Standard thickness	28
		Wear limit	15
	Oil pump motor	Standard thickness	28
		Wear limit	15
	Steering motor	Standard thickness	22
		Wear limit	12

6. Battery and charger

6.1 Overview

List of performance parameters

Item \ Type	1-1.5t forklift truck	2-2.5t forklift truck	3t forklift truck
Battery			
Capacity	400AH/5h	630AH/5h	500AH
Name	24-DA-400	9PZS630	40-DA-500
Voltage	48V	48V	80V
Specific gravity of electrolyte	1.280g/cm^3	1.280g/cm^3	1.280g/cm^3
Weight	690kg	1100kg	1530kg
Charger			
Form	Intelligent control, single-phase AC stable voltage charger	Intelligent control, single-phase AC stable voltage charger	Intelligent control, three-phase AC stable voltage charger
Rated power	4.5KVA	5.5KVA	6.5KVA
Power supply voltage	220V/50HZ	380V/50HZ	380V/50HZ
Suitable battery capacity	570AH	800AH	350-520AH
Output	72V	72V	80V
Current	50A	80A	80A
Weight	60kg	75kg	90kg

6.1.1 Battery

The battery is formed by series connection of 24 2V small batteries (48V), with the steel plate box as the shell, as shown in Fig. 6.1.

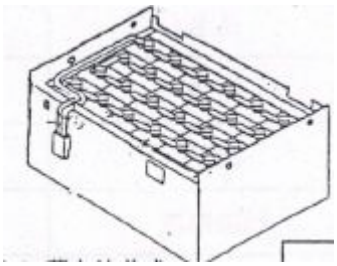
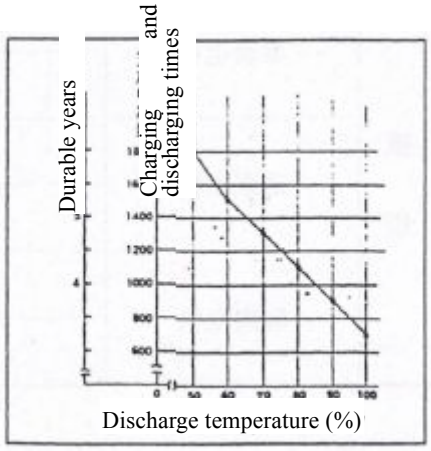


Fig. 6.1 Battery assembly

▲ Usage of battery

When the battery is in use, the most important issue is to prevent excessive discharging. The deeper the discharging is, the shorter the life is. (Fig. 6.2)

The depth of discharge is obtained by determining the specific gravity, and the approximate standard is shown in Fig. 6.3.



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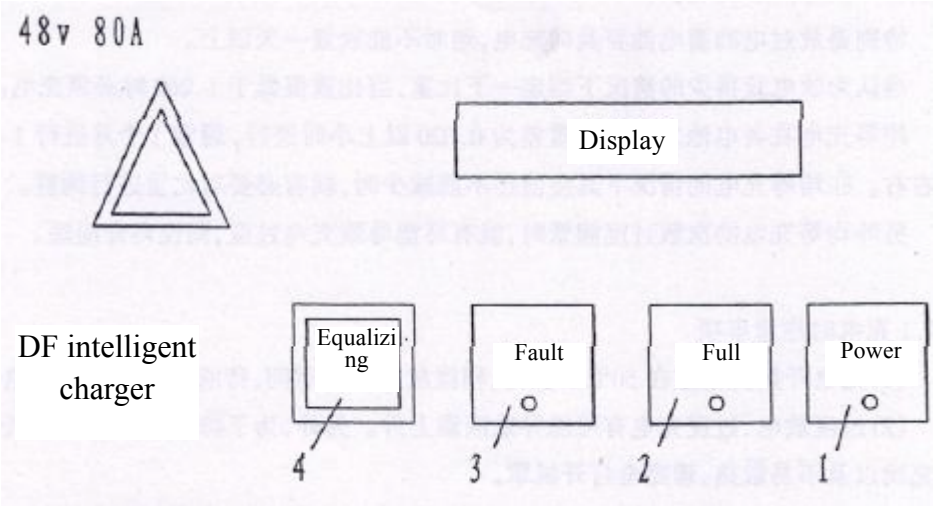
In addition, the amount of the electrolyte shall be confirmed at the 10^{th} day. When the amount is inadequate, distilled water shall be made up before charging.

Fig. 6.2 Relationship between depth of discharge and service life (example)

6.1.2 Charger

The charger comprises three function modules, i.e. the controller, the power block and the transformer. It realizes intelligent closed-loop control, has charging and fault status indication and performs automatic detection of the battery, dynamic tracking and closed-loop control, so as to always keep the battery in the best critical state of charging electrochemical reaction.

▲ Charger panel



(1) When the power socket is plugged in and the air switch is turned on, the power "1" indicator will be lit.

(2) When the electric quantity of the battery is full, the full indictor "2" will be lit and meanwhile the display will display "-Full" and the floating current.

(3) When the charger fails, the fault indicator "3" will be lit and meanwhile the display will display "DC•FIND". See the instructions for details.

(4) When equalizing charge is required, the equalizer switch shall be pressed down and then the power shall be turned on. At this time, the equalizing indicator "4" will be lit and the display will display "-JH--". When the switch is pressed down again, the charger will be recovered to normal condition.

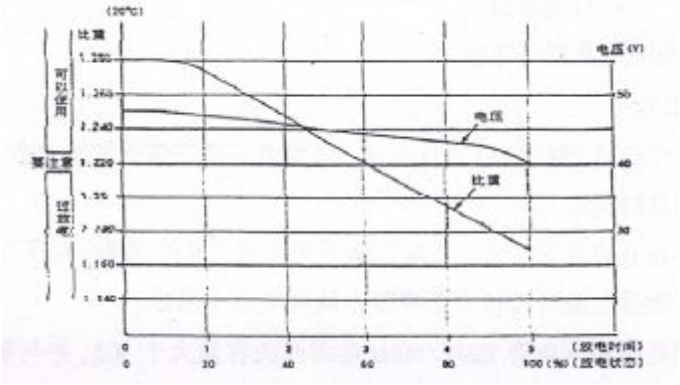


Fig. 6.3 Example of reduction of specific gravity

6.2 Charging of battery

The discharged battery must be charged in time and the battery stored in the discharged state for a long time may be sulfated to deteriorate the performance. When the vehicle is out of service for a long time, after it is fully charged, it shall be subject to supplementary charging once a month.

In particular, the discharged battery shall be charged in time and shall not be stored for more than one day.

When the discharge quantity is deemed as small, the specific gravity shall be determined. When the value of the specific gravity is lower than 1.260, the battery must be charged. Equalizing charge shall be performed when the difference of the specific gravity of each battery is over 0.020h and it is usually performed about once through four times a month. When the difference can't be reduced in case of equalizing charge, it is necessary to adjust the specific gravity. In addition, too frequent equalizing charge may result in overcharge and shorten the service life.

6.2.1 Precautions during charging

(1) When the liquid temperature is above 50℃ before charging is started, the liquid shall be placed for certain time and the battery shall be charged after the liquid temperature is reduced.

(2) Over discharge and overcharge may result in liquid temperature rise. In addition, in order to prevent gas from being fully filled and difficult heat radiation in the charging process, the hood shall be fully opened.

▲ Temperature conversion of specific gravity

The specific gravity of the electrolyte varies with the liquid temperature. Generally, the specific gravity of the electrolyte is based on 25℃, and the conditions other than 25℃ shall be calculated according to the following formula.

$S25=St + 0.0007(t-25)$

S25……specific gravity @ 25℃

St……specific gravity @ t℃(measured value)

t……liquid temperature (measured value)

6.2.2 Usage and charging method of charger

(1) Daily charge

After the operation of the forklift truck is stopped (after charging) or during the operation, when the low battery voltage alarm is displayed on the LCD meter, the battery shall be charged in time according to the following key points:

a. The forklift truck shall be stopped at the designated position, the key switch of the forklift truck shall be rotated to the "OFF" position and the battery power plug shall be pressed down. When the battery shall be replaced, it can be lifted out of the forklift truck as specified.

b. It shall be confirmed that the power switch capacity of the charger input

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power supply 220V/50Hz is greater than 30A and matches with the battery to be charged.

c. It shall be checked that the battery electrolyte level shall be 15-25mm higher than the protective floor slab or located within the scale range specified by the hole plug.

d. The battery cable plug shall be correctly and reliably connected to the corresponding charger.

e. The air switch shall be turned on, the charger will display the current system version, the current battery voltage and the maximum charge current, and the charger will enter the automatic detection state.

f. After completion of the detection process, the charger will enter the charging process of the formal charging program and display the voltage [**.*U], the current [**.*A], the charging time [H**.**] (expressed as **h**min) and already charged ampere-hours [***AH] in a rolling manner.

g. When the full indicator is lit, it indicates that the battery is fully charged, the charger will enter the automatic floating state, and the floating charge current is about 1-3A.

h. After completion of charging, the air switch shall be turned off and the battery cable plug shall be disconnected from the charger.

i. Before usage of the forklift truck, it shall be confirmed that the specific gravity of the battery electrolyte has been increased to the value in the following table.

Liquid temperature	Specific gravity
@5℃	1.294
@15℃	1.287
@25℃	1.280
@35℃	1.273

(2) Supplementary charging

When the operation is completed, it is suggested that the charging sequence at the rest time should be basically the same as that of daily charge.

Equalizing charge

When the battery is 100% over discharged, the cylinder shall be made up with distilled water or the determined specific gravity of the electrolyte of all cylinders at the determined liquid temperature shall be converted to the specific gravity at 25℃. When the difference exceeds 0.02 or other battery requirement, equalizing charge shall be performed according to the following sequence:

After the same operation as daily charge, the "Equalizing" charge function key shall be pressed down. At this time, the "Equalizing" indicator will be lit, the charging will enter the equalizing charge state automatically, and -JH- indication, etc. will be

displayed in the charging process. After the battery is subjected to full equalizing charge, the "Equalizing" charge function key shall be manually pressed down to release such function. The charger will be recovered to the normal state.

7. Hydraulic system

7.1 Overview

The hydraulic system comprises parts and components such as a working oil pump, a multitandem valve, a lifting cylinder, a tilting cylinder and a pipeline. The hydraulic oil is supplied by the oil pump directly connected with the motor. The multitandem valve distributes the oil to each cylinder.

Type / Item	l-1.5t forklift truck	2-3t forklift truck
Main pump		
Form	Gear type	Gear type
Name	CBT_D-F412.5	CBT_D-F416.5
Displacement	12.5ml/rev	16ml/rev
Drive mode	Motor connection	Motor connection
Steering oil pump		
Form	Gear type	Gear type
Name	CBW-F306	CBW-F306
Displacement	6ml/rev	6ml/rev
Drive mode	Motor connection	Motor connection
Control valve		
Form	Plunger type	Plunger type
Name	CBT-F15D	CBT-F15D
Regulating pressure	14.5MPa	14.5MPa
Lifting cylinder		
Form	Single-acting piston, with a shutoff valve	Single-acting piston, with a shutoff valve
Inside diameter of cylinder	Φ45mm	Φ50mm
Outside diameter of piston rod	Φ36mm	Φ40mm
Travel	1495mm (lifting height: 3000mm)	1495mm (lifting height: 3000mm)
Tilting cylinder		
Form	Double-acting piston	Double-acting piston
Inside diameter of cylinder	Φ63mm	Φ70mm
Outside diameter of piston	Φ30m	Φ32mm
Travel	167mm	167mm
Steering cylinder		
Form	Double-acting piston type	Double-acting piston type
Inside diameter of cylinder	Φ70mm	Φ70mm
Outside diameter of piston	Φ50mm	Φ50mm
Travel	160mm	160mm
Hydraulic oil tank		
Capacity	18L~23L	25L~28L

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7.1.1 Multitandem valve

The multitandem valve is a two-piece four-body type, the hydraulic oil from the working oil pump is controlled by the multitandem valve rod and the high-pressure oil is distributed to the lifting cylinder or the tilting cylinder. The interior of the multitandem valve is installed with a safety valve and a self-locking valve. The safety valve is arranged at the top of the oil inlet of the multitandem valve to control the system pressure; the self-locking valve is arranged on the tilted valve plate and mainly used to prevent the tilting cylinder from causing serious consequences due to mis-operation of the joystick without any pressure source. A check valve is installed between the oil inlet and the oil suction of the lifting valve plate and between the oil inlet of the lifting valve plate and the oil inlet of the tilting valve plate respectively. The appearance of the multitandem valve is shown in Fig. 7-1.

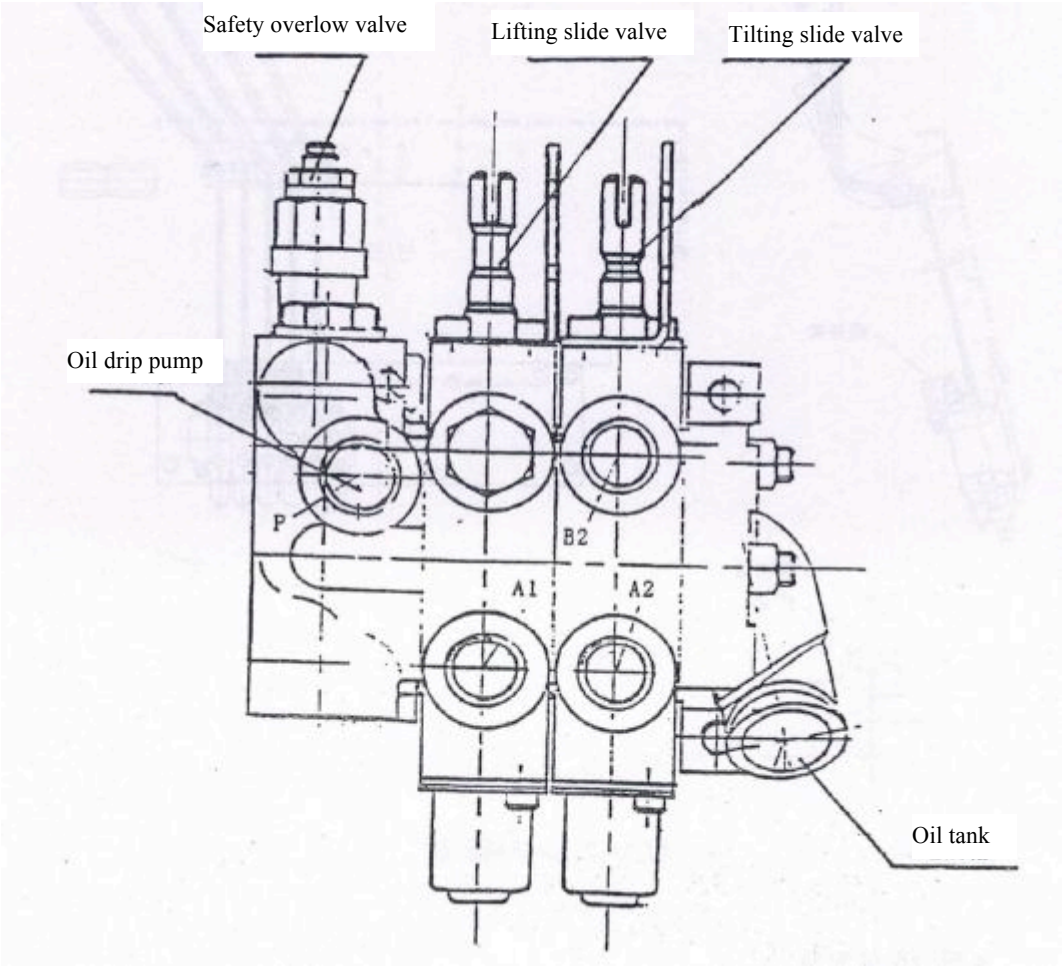


Fig. 7-1 Outline diagram of multitandem valve

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(1) Control of multitandem valve

The multitandem valve is controlled by the joystick, all joysticks are installed on a connecting shaft, which is fixed on the dashboard through the support, and the joystick controls the slide valve through the connecting rod.

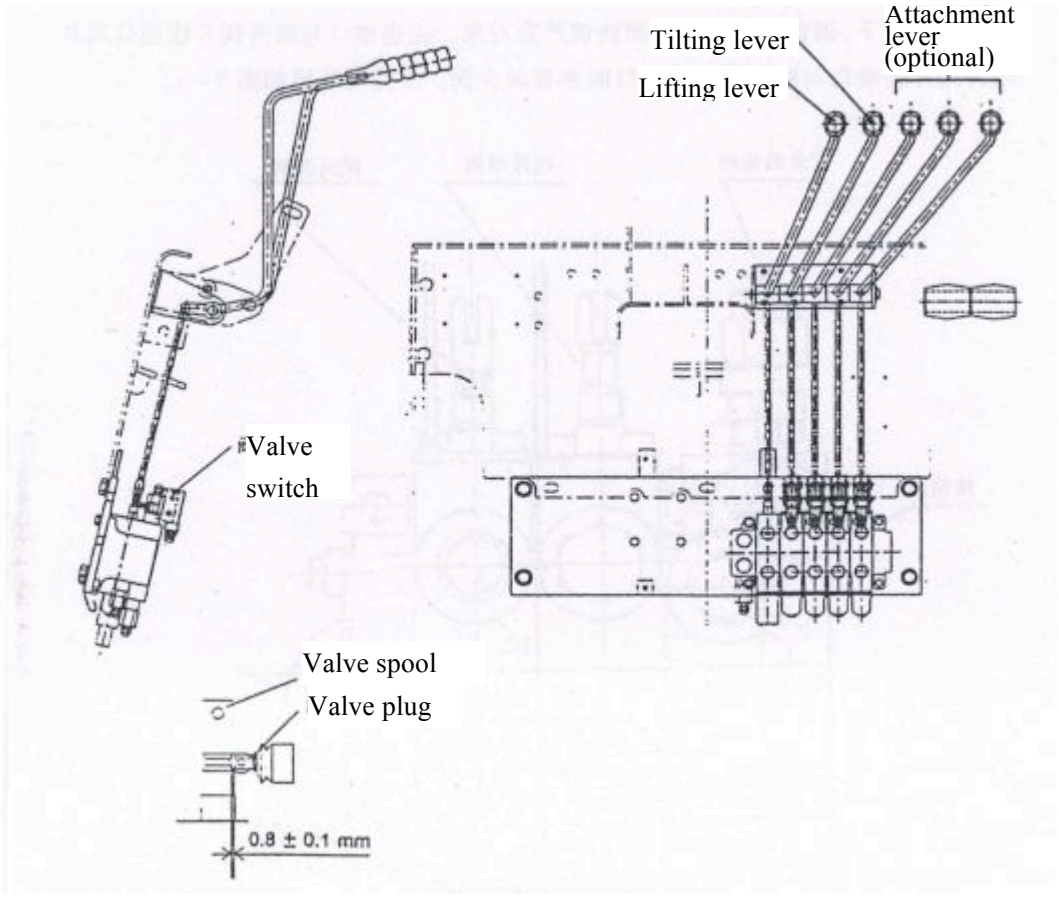


Fig. 7-2 Control of multitandem valve

▲ Installation of valve switch

The spool of the valve switch shall be pressed inside by 0.8±0.1mm, so as to place it at [ON].

At this time, the center of the spool of the valve switch and the center of the cam shaft shall be kept consistent.

(2) Pressure regulating method of safety valve (Fig. 7-3)

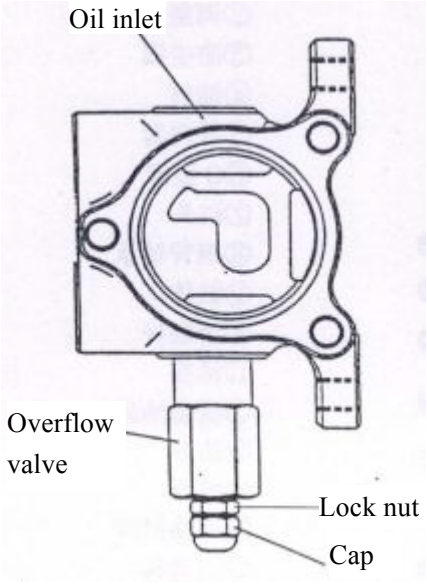
The pressure of the safety valve has been regulated before delivery of the safety valve and the user shall not regulate the pressure at will, otherwise it will endanger the system and the vehicle; if the oil pressure is different from the specified value (see the following table), according to the test method specified in JB/T3300, the professional personnel shall perform such regulation by the following steps:

(a) Loosen the measuring hole plug screw at the inlet of the multitandem valve and install the oil pressure gauge able to measure 20MPa.

(b) Operate the tilting lever and measure the pressure when the cylinder travels to the bottom.

(c) When the oil pressure is different from the specified value, loosen the lock nut of the overflow valve and rotate the adjusting screw left and right to regulate the oil pressure to the specified value. When the pressure is high, rotate the screw to the left; when the pressure is low, rotate the screw to the right.

(d) After completion of adjustment, tighten the nut.



Pressure regulating value

	1-1.5t	2-2.5t
Pressure regulating value of safety valve	14.5MPa	17.5Mpa
Pressure regulation of steering gear	5.5MPa	6.3MPa

Fig. 7-3 Pressure regulation of safety valve

7.1.2 Lifting cylinder

The lifting cylinder is a single-acting piston type comprising a cylinder block, a piston rod, a piston and a cylinder head, etc. For the series forklift trucks, two lifting cylinders are installed behind the outer mast, the bottom is fixed on the outer mast lifting cylinder base with pins and bolts, and the bottom of the cylinder (i.e. the top of the piston) is connected with the beam on the inner mast.

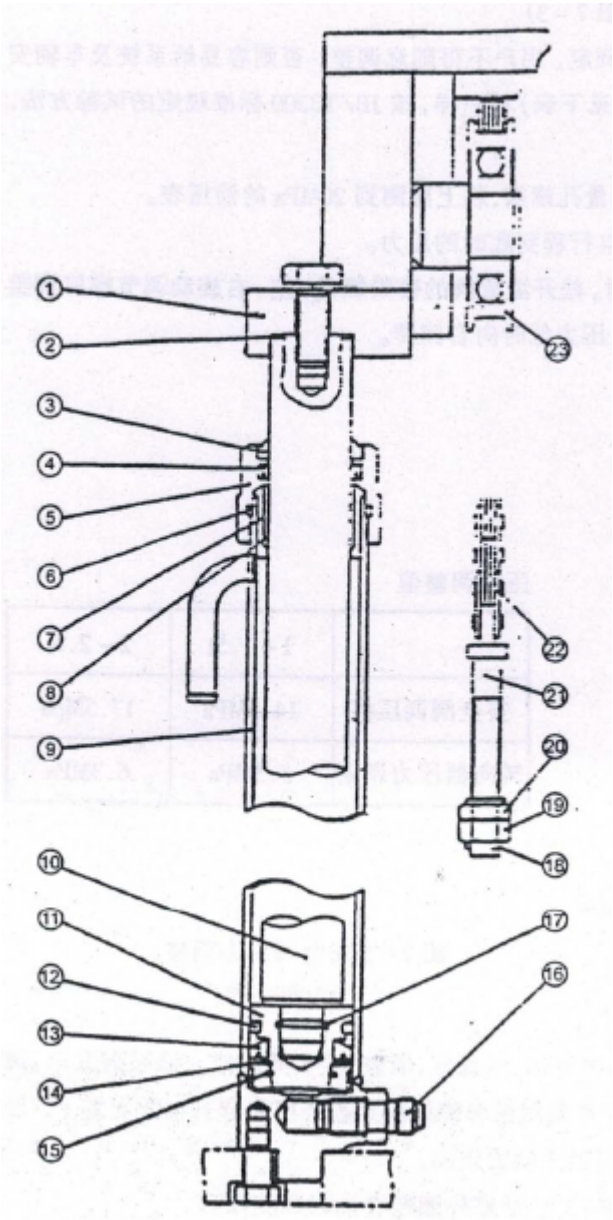
The piston is fixed on the piston rod using elastic wires, and the outer ring of the piston is installed with an oil seal and a support ring.

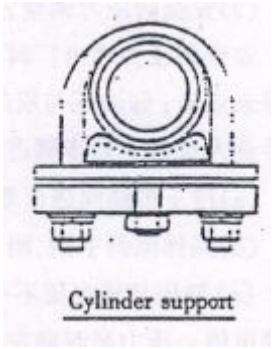
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The bottom of the cylinder is installed with a shutoff valve used for safety protection when the mast is elevated and the high-pressure pipe is broken suddenly.

The cylinder head is installed with a steel-backed bearing and an oil seal to support the piston rod and prevent dust from entry.

The lifting cylinder is shown in Fig. 7-4.





① Upper beam
② Regulating pad
③ Dust ring
④ Oil seal
⑤ Guide sleeve
⑥ O ring
⑦ Cylinder head
⑧ Steel-backed bearing
⑨ Cylinder block
⑩ Piston rod
⑪ Piston
⑫ Piston oil seal
⑬ Oil seal
⑭ Seat ring
⑮ Snap ring
⑯ Shutoff valve
⑰ Spring lock ring
⑱ Cotter pin
⑲ Lock nut
⑳ Adjusting nut
㉑ End connector
㉒ Chain
㉓ Chain wheel

Fig. 7-4 Lifting cylinder

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▲ Working conditions of shutoff valve

The bottom of the lifting cylinder is installed with a shutoff valve (Fig. 7-5) used to prevent the goods from sudden descending when the high-pressure hose is broken suddenly. The oil from the lifting cylinder passes the slide valve of the shutoff valve, and the oil holes around the slide valve generate a pressure difference in both cavities. When the pressure difference is less than the spring force, the slide valve will not act. If the high-pressure hose is broken, a great pressure difference will be generated to enable the slide valve to move to block the surrounding oil holes and only allow a little oil to flow through the small hole at the end of the slide valve, so as to enable the fork to descend slowly.

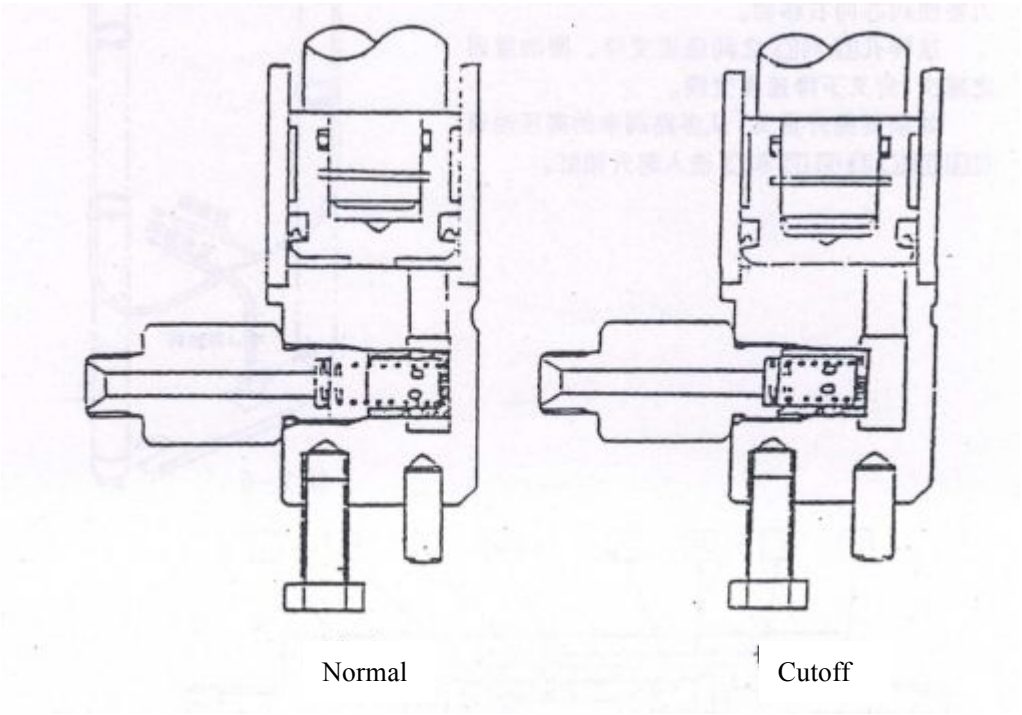


Fig. 7-5

7.1.3 Speed limit valve

The speed limit valve controls the descending speed of the fork and it is used for safety in case of accidents such as breakage of the high-pressure pipe. Refer to Fig. 7-6.

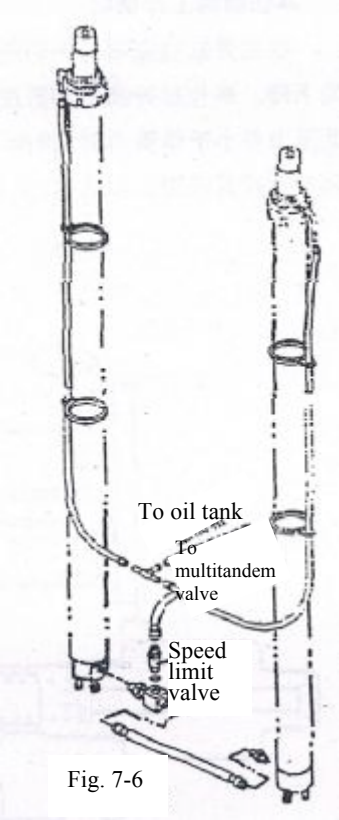


Fig. 7-6

▲ Working conditions of speed limit valve (Fig. 7-7)

The return oil of the lifting cylinder enters the valve □ and returns to the multitandem valve through □□□□□ and □.

When much oil flows through the valve plug hole □, the pressure difference generated by the valve plug enables the valve plug to move towards the right.

Thus, the passage between the holes □ and □ becomes narrower, the return oil amount is reduced accordingly and the descending speed of the fork is reduced.

If the fork is to be elevated, the high-pressure oil from the multitandem valve enters the lifting cylinder through □□□□□□□ and □.

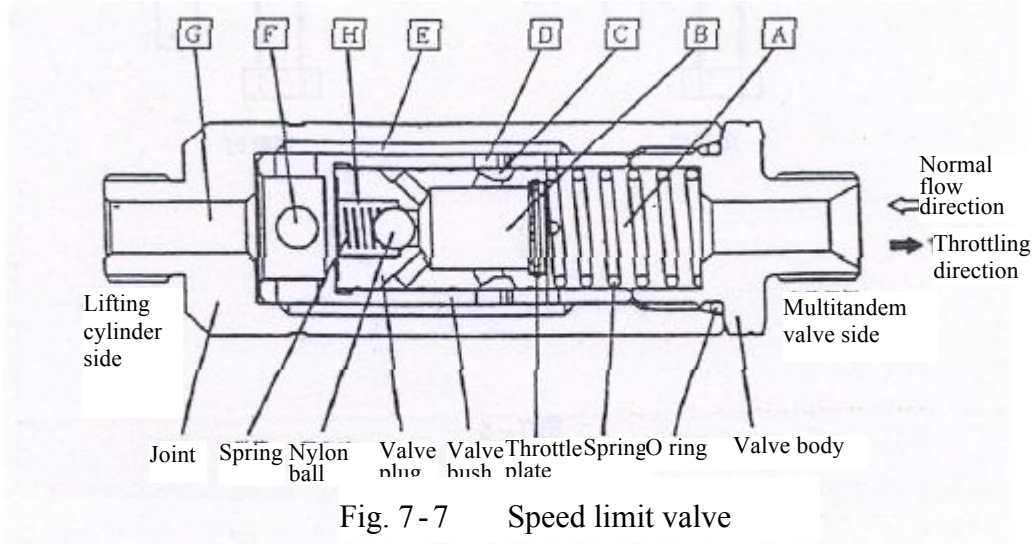


Fig. 7-7 Speed limit valve

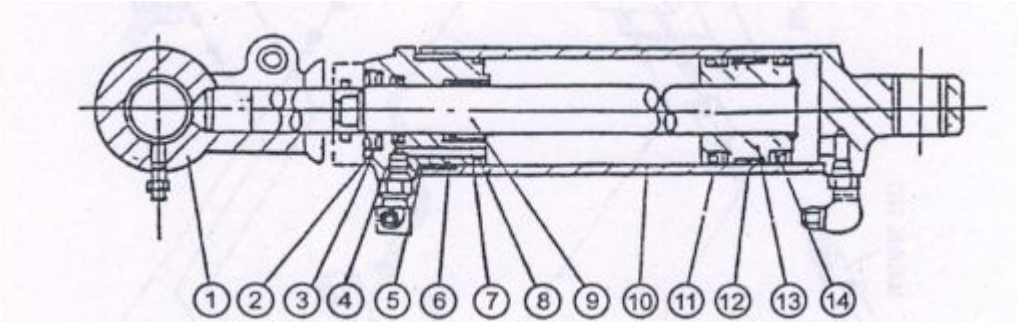
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7.1.4 Tilting cylinder

The titling cylinder is a double-acting type, the piston rod is connected with the mast through the ear ring, the bottom of the tilting cylinder is connected with the frame using pins, and both sides of the forklift truck are installed with a tilting cylinder respectively.

The tilting cylinder mainly comprises a piston, a piston rod, a cylinder block, a cylinder bottom, a guide sleeve and a seal, the piston and the piston rod are welded structures, the outer edge of the piston is installed with a support ring and two Y_X seal rings, the hole in the guide sleeve is press-fitted with a bush and installed with the Yx seal ring, the collar and the dust ring, the bush supports the piston rod, the seal ring, the collar and the dust ring can prevent oil leakage and dust and they are rotated onto the cylinder block along with the O ring, as shown in Fig. 7-8.

When the tilting slide valve is pushed forward, the high pressure oil enters from the cylinder bottom to push forward the piston, so as to enable the master to tilt forward; when the slide valve is pulled backward, the high-pressure oil enters from the front end of the cylinder block to push the piston backward, so as to enable the mast to tilt backward.



①Ear ring	②Dust ring	③Collar	④Yx seal ring
⑤O ring	⑥Guide sleeve	⑦Bearing	⑧O ring
⑨Piston rod	⑩Cylinder block	⑪ Yx seal ring	⑫ Support ring
⑬ Piston	⑭ Yx seal ring		

Fig. 7-8 Titling cylinder

7.1.5 Hydraulic oil tank

The hydraulic oil tank is located on the right tank body of the frame, the oil tank is installed with the sucked oil filter, and the oil return pipeline is installed with the return oil filter, so as to guarantee supply of clean oil.

(1) Replace the oil filter.

① Loosen the drain plug to drain oil.

② Clean the oil tank cover plate and dismantle the screw of the cover plate. .

③ Dismantle the oil suction pipe and the oil return pipe.

④ Dismantle the oil tank cover plate.

⑤ Dismantle the return oil filter and replace it with a new oil filter.

⑥ Dismantle the sucked oil filter and replace it with a new oil filter.

⑦ Remove the old pad on the cover plate, replace it with a new pad and re-apply the sealant. Sealant: Three Boo 400# or equivalent product.

⑧ Install the oil tank cover plate and connect the oil suction pipe and the oil return pipe.

7.1.6 Hydraulic pipeline

See Fig. 7-9 for the hydraulic pipeline of the hydraulic system.

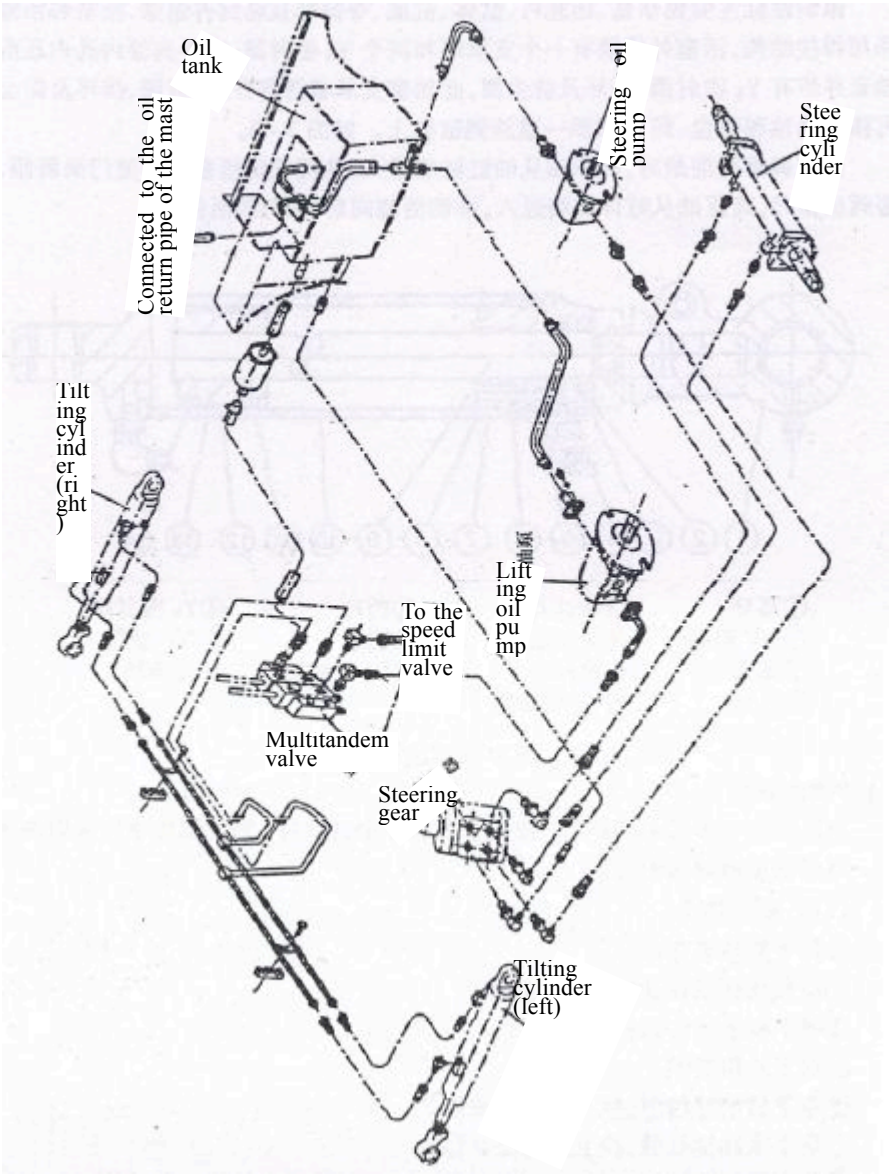


Fig. 7-9 Hydraulic pipeline

7.2 Maintenance and regulation

7.2.1 Maintenance of lifting oil pump

(1) Disassembly

Before disassembly, it shall be cleaned thoroughly. The dismantled parts shall be placed on clean paper or cloth and the parts shall not be contaminated or damaged.

(a) The flange of the pump shall be clamped on the vice bench.

(b) Dismantle the connecting bolt ⑪the pump cover ⑤and the pump body ①(See Fig. 7-16.)

(c) Dismantle the lining ⑥the drive gear ②and the driven gear ③.

(d) Dismantle the seal ring ⑦and the collar ⑧from the front and rear end covers.

Note: If the seal ring is not replaced, do not dismantle it from the front end.

(2) Inspection

Check the disassembled parts and clean them with gasoline (except for rubber parts).

(a) Inspection of pump body

If the contact length between the inner cavity of the pump body and the gear is greater than 1/2 of the perimeter, replace the pump body.

(b) Inspection of lining

Check the contact surface of the lining. If the surface is damaged or the lining thickness is less than the specified value, replace the lining.

Specified value of lining thickness: 4.94mm.

(c) Front and rear pump covers

If the discoloration (brown) of the inner surface bush exceeds the range of 150°, replace it.

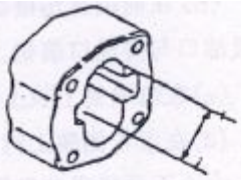


Fig. 7-10

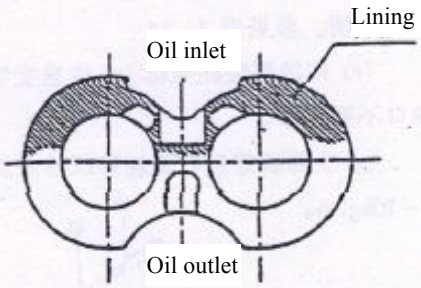


Fig. 7-11

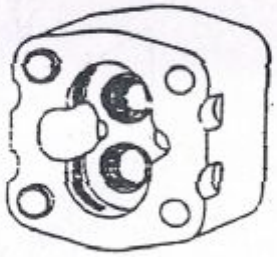


Fig. 7-12

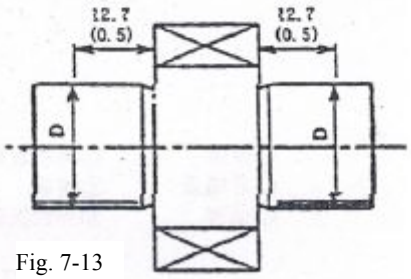


Fig. 7-13

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(d) Check the drive and driven gears from the front and the back. In case of excessive wear, replace a pair. If the dimension D is less than the specified value, replace them in pairs.

(e) Based on the demand, replace the seal ring, the bush seal, the collar oil seal and the spring collar.

(3) Assembly

(a) Install a new seal ring and a new collar on the front end cover of the pump.

(b) Install the lining in the groove of the front end cover and do not confuse the oil suction with the oil drain.

(c) Install the drive and driven gears on the front end cover.

(d) Install the lining at the gear side to enable the groove to align with the gear point. Do not confuse the oil suction side with the oil drain side.

(e) Install a new seal ring and a new collar in the groove of the rear cover. Refer to Fig. 7-14.

(f) Install the rear cover on the pump body and do not confuse the oil suction with the oil drain.

(g) After complete installation, tighten the connecting bolt to the specified torque of 9-10kg.m.

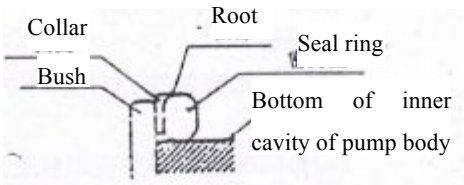


Fig. 7-14 Bush seal

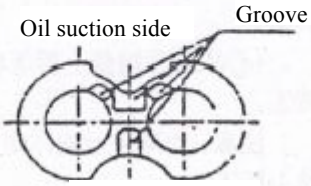
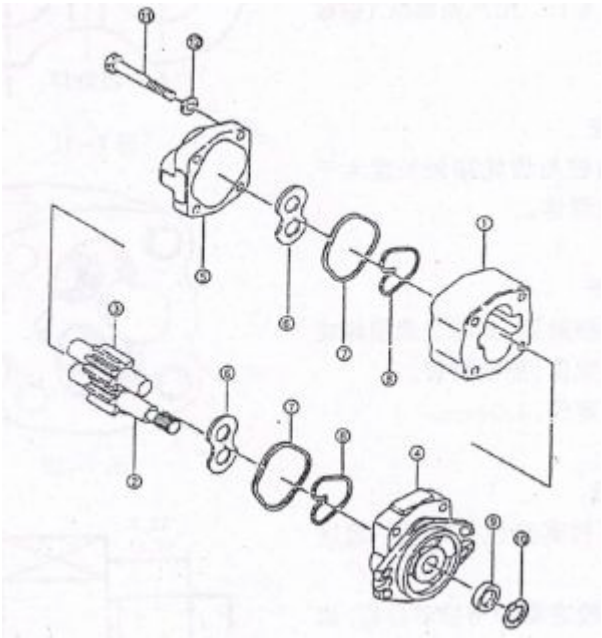


Fig.7-15 Lining



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①Pump body	②Drive gear	③Driven gear	④Front end cover
⑤Rear end cover	⑥Lining	⑦Seal ring	⑧Collar
⑨Oil seal	⑩Snap ring	⑪ Bolt	⑫ Washer

Fig. 7-16 Gear pump

(4) Commissioning

Commission the oil pump to check whether the running is normal. Perform the oil pump test preferably on the test bench, or test the pump on the forklift truck according to the following steps:

(If the oil pump is disassembled and repaired due to serious wear or blockage of the pump due to the hydraulic oil, replace the hydraulic oil and the filter before commissioning on the forklift truck.)

(a) Install the pump on the forklift truck and install the pressure gauge at the pressure detection opening on the multitandem valve.

(b) Loosen the adjusting screw of the overflow valve, so as to enable the pump to rotate at the speed of 500-1000rpm for about 10 min and ensure that the oil pressure is lower than 10Kg/cm^2.

(c) Increase the pump speed to 1500-2000rpm and run for about 10 min.

(d) Keep the pump speed at 1500-2000rpm to increase the pressure by 20 - 30Kg/cm^2 for each time, and run for 5 min until 175Kg/cm^2. Then make each oil loop work for 5 min and replace the return oil filter.

When the oil pressure is increased, pay attention to detection of the oil temperature, the temperature of the pump surface and the rotating sound. If the oil temperature or the pump surface temperature rises excessively, reduce the load to reduce the oil temperature and then continue the test.

(e) After the test, keep the overflow pressure at 175Kg/cm^2 and measure the flow. Measure the oil flow through the lifting speed.

Note: The models of the steering oil pump and the lifting oil pump are different, but their maintenance methods are basically the same and they are not further described herein.

7.2.2 Fault diagnosis

If the hydraulic system fails, find out the cause and implement necessary repair according to the following table.

(1) Multitandem valve

Fault	Cause	Repair method
The pressure of the lifting oil loop can't be increased.	Blockage of the slide valve	Cleaning after disassembly
	Blockage of the oil hole	Cleaning after disassembly
Vibration The pressure rises slowly.	Blockage of the slide valve	Cleaning after disassembly
	Inadequate exhaust	Adequate exhaust
The pressure of the steering oil loop is higher than the specified value.	Blockage of the slide valve	Cleaning after disassembly
	Blockage of the oil hole	Cleaning after disassembly
The specified oil flow can't be reached.	Improper regulation of the overflow valve	Regulation
Noises	Improper regulation of the overflow valve	Regulation

	Wear of the sliding surface	Replace the overflow valve.
Oil leakage (exterior)	Aging or damages of the O seal ring	Replace the O seal ring.
The set pressure is low.	Damages of the spring	Replace the spring.
	Damages of the valve seat surface	Regulate or replace the overflow valve.
Oil leakage (interior)	Damages of the valve seat surface	Correct the valve seat surface.
The set pressure is high.	Valve blockage	Cleaning after disassembly

(2) Oil pump

Fault	Cause	Repair method
Small oil discharge amount	The oil level in the oil tank is low.	Refuel to the specified amount.
	The oil pipe or the oil filter is blocked.	Clean or replace it based on the demand.
Low pressure of the pump	The lining is damaged. The support is damaged. The seal ring, the bush seal or the collar is poor.	Replacement
	The overflow valve is regulated improperly.	Regulate the pressure of the overflow valve to the specified value with a pressure gauge.
	There is air in the system.	Re-tighten the oil pipe at the oil suction side. Refueling Replace the oil seal of the oil pump.
Noises during running	The oil suction pipe is damaged or the oil filter is blocked.	Check the pipe or repair the oil filter.
	The oil suction side is loosened and leaks.	Tighten the loosened place.
	The oil viscosity is too high.	Replace with the oil with the viscosity adapted to the pump running temperature.
	There are air bubbles in the oil.	Find out the cause and take measures.
Oil leakage of pump	The pump oil seal or the seal ring is damaged.	Replacement
	The pump is damaged.	Replacement

8. Lifting system

8.1 Overview

The lifting system is a two-stage roller type vertical lifting system comprising inner and outer masts and a fork arm carrier.

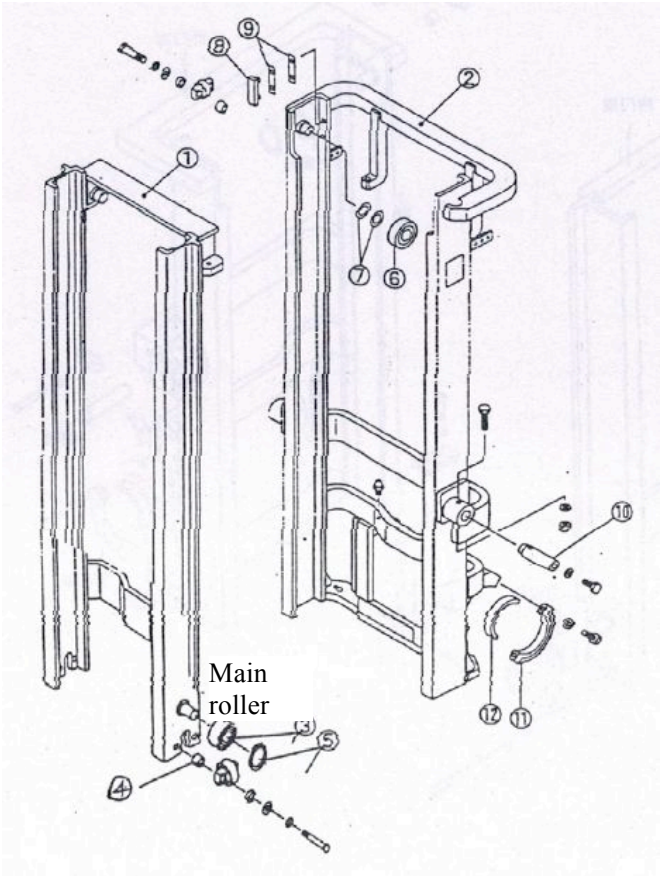
8.1.1 Inner and outer masts (Fig. 8-1 and Fig. 8-2)

The inner and outer masts are welded parts. The bottom of the outer mast is installed on the drive axle using the support.

The middle of the outer mast is connected with the frame through the titling cylinder and it can be tilted forward and backward under the action of the tilting cylinder.

The channel steel of the outer mast is C type, and the top is installed with the main roller and the side roller.

The channel steel of the inner mast is J type, and the bottom is installed with the main roller and the side roller.



1. Inner mast
2. Outer mast
3. Main roller
4. Gasket
5. Snap ring
6. Main roller
7. Gasket
8. Slider
9. Gasket
10. Pin
11. Hough
12. Bush

Fig. 8-1 Inner and outer masts (1-1.5t)

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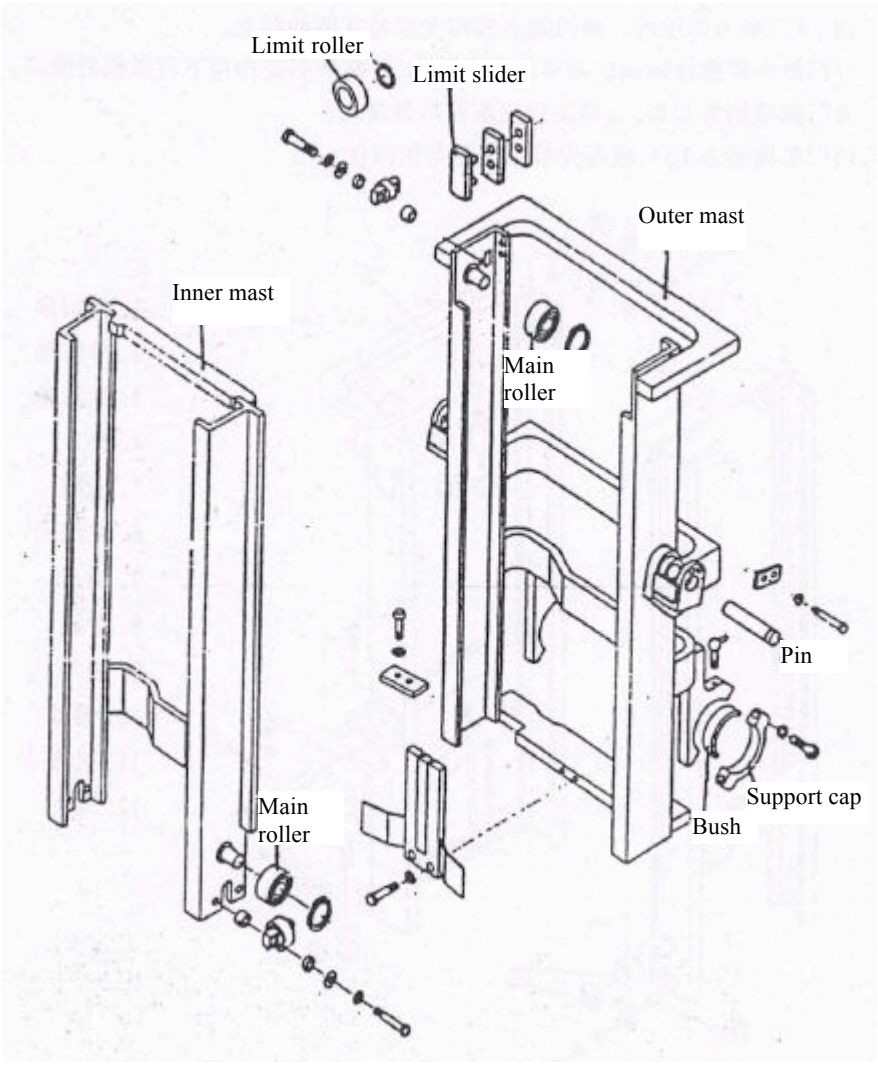


Fig. 8-2 Inner and outer masts (2-2.5t)

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8.1.2 Fork arm carrier

The fork arm carrier rolls in the inner mast through the main roller, the main roller is installed on the main roller shaft and locked by the snap ring, the main roller shaft is welded on the fork arm carrier, and the side roller is fixed on the fork with bolts. It rolls along the wing of the inner mast and it can be regulated with the regulating pad. In order to prevent the rolling clearance, 2 fixed side rollers are used to roll along the outside of the inner mast wing. The longitudinal load is borne by the main roller. When the fork is elevated to the top, the roller on it will be exposed from the mast top. The horizontal load is supported by the side roller. See Fig. 8-3 and Fig. 8-4.

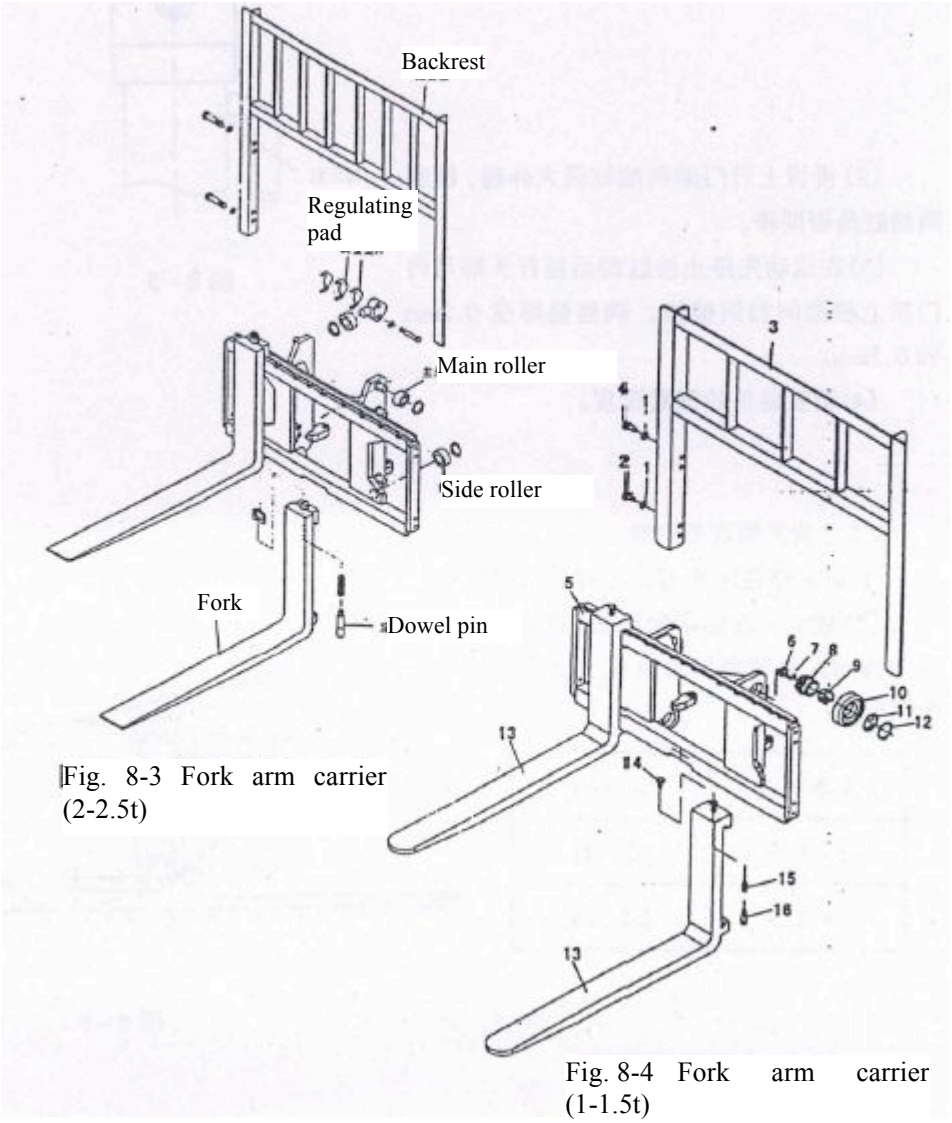


Fig. 8-3 Fork arm carrier (2-2.5t)

Fig. 8-4 Fork arm carrier (1-1.5t)

8.2 Maintenance and regulation

8.2.1 Regulation of lifting cylinder

During dismantling and replacement of the lifting cylinder, the inner mast or the outer mast, the travel of the lifting cylinder shall be regulated again. The regulating method is as follows:

(1) Install the piston rod head without any regulating pad into the beam on the inner mast.

(2) Slowly lift the mast to the maximum lift of the cylinder and check both cylinders for synchronism.

(3) Add a regulating pad between the piston rod head of the cylinder stopped firstly and the beam on the inner mast. The thicknesses of the regulating pads are 0.2mm and 0.5mm respectively.

(4) Regulate the tightness of the chain.

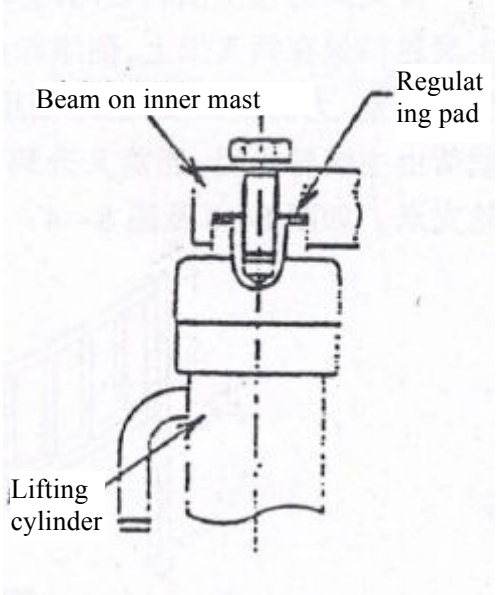


Fig. 8-5

8.2.2 Height regulation of fork arm carrier

(1) Park the vehicle on the level ground and keep the mast vertical.

(2) Make the bottom of the fork contact the ground and regulate the adjusting nut of the end connector at the top of the chain, so as to enable a distance A between the main roller and the fork arm carrier.

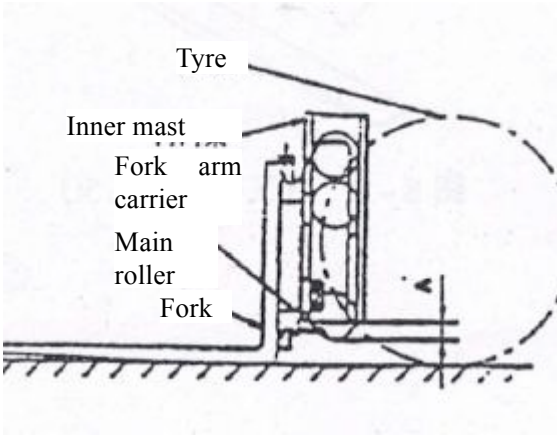


Fig. 8-6

Type	A mm
1-1.5t	36-41
2-2.5t	24-29

(3) Lower the fork to the ground and tilt it backward in place. Regulate the end connector at the top of the chain and regulate the nuts to keep the tightness of both chains equal.

8.2.3 Replacing the roller of the fork arm carrier

(1) Install a pallet on the fork and park the vehicle on the level ground.

(2) Lower the fork and the pallet to the ground.

(3) Dismantle the end connector at the top of the chain and dismantle the chain from the chain wheel.

(4) Lift the inner mast (①in Fig. 8-8).

(5) Reverse the forklift truck (②in Fig. 8-8) after confirmation that the fork arm carrier has been disengaged from the outer mast.

(6) Replacing the main roller

(7) Dismantle all spring collars and dismantle the main roller using the pull tool. Pay attention to keeping the regulating pad.

(8) Confirm that the new roller and the replaced roller are the same, install the new roller in the fork arm carrier and lock it with the snap ring.

8.2.4 Replacing the mast roller

(1) Dismantle the fork arm carrier from the inner mast by the same method to replace the roller of the fork arm carrier in 8.2.3.

(2) Drive the forklift truck to the level ground and pad the front wheels by 250~300mm.

(3) Tighten the hand brake and pad the rear wheels with wedges.

(4) Dismantle the fixing bolt of the inner mast of the lifting cylinder. Lift up the inner mast. Pay attention to keeping the regulating pad at the head of the piston rod.

(5) Dismantle the connecting bolt between the lifting cylinder and the bottom of the outer mast. Dismantle the lifting cylinder and the oil pipe between both cylinders. Do not loosen the joint of the oil pipe.

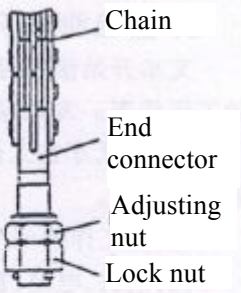


Fig. 8-7

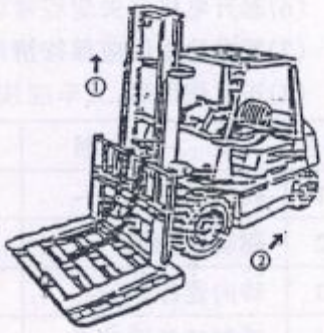


Fig. 8-8

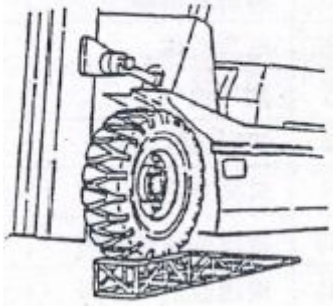


Fig. 8-9

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(6) Lay down the inner mast and dismantle the main roller at the bottom of the inner mast. The main roller at the top of the outer mast will also be exposed from the top of the inner mast.

(7) Replacing the main roller

(a) Dismantle the main roller at the top using the pull tool and do not lose the regulating pad.
(b) Install the new roller and the regulating pad dismantled in Step (a).
(8) Lift up the inner mast until all rollers enter the mast.
(9) Install the lifting cylinder and the fork arm carrier according to the steps opposite to dismantling.

9. Maintenance of battery forklift truck

When the forklift truck is in use, it must be operated with care and regulated in time. The maintenance and repair enables the forklift truck to keep good working conditions for a long time. Therefore, the following measures shall be taken.

(1) After the first 100h of a new forklift truck, the gear oil in the differential and the decelerator shall be replaced and all fasteners shall be re-tightened.

(2) After the first 200h, the clearances in the drive and driven gears in the decelerator shall be re-adjusted.

(3) The motor, electric control and battery pack shall be maintained as specified in the instructions.

(4) All plug connectors shall be checked once every month.

(5) The forklift truck shall be prevented from water and shall not be flushed with a water gun. On rainy days, it shall not be used outdoors.

(6) For the lift motor switch, the dirt on the photoelectric coupler shall be cleaned frequently.

(7) The battery surface shall be kept clean and dry and the dirt shall be cleaned frequently.

(8) After normal operation, the forklift truck shall be maintained regularly according to the following table.

S/N	Item	Maintenance content	Maintenance period	Remarks
1	Steering wheel bearing	Replace the lubricating grease.	1000h	
2	Drive wheel bearing	Replace the lubricating grease.	1000h	
3	Steering linkage system	Replace the lubricating grease.	1000h	
4	Each moving point of hand brake	Add the lubricating grease.	200h	
5	Foot brake pin	Add the lubricating grease.	200h	
6	Drive axle body	Replace the gear oil.	2400h	
7	Brake oil	Add	From time to time	
8	Tilting cylinder pin	Add the lubricant oil.	400h	
9	Kingpin	Replace the lubricating grease.	1000h	
10	Hydraulic oil tank and filter screen	Clean	1000h	
11	Hydraulic oil	Replace	1000h	
12	Lifting chain	Replace	3000h	Replace it at any time when any damage is found.

13	High pressure hose	Replace	3000h	Replace it at any time when any damage is found.
14	Lift motor switch	Clean off the dirt of the photoelectric coupler.	200h	
15	Carbon brush of travel motor	Check	1000h	
16	Carbon brush of lift motor	Check	1000h	
17	Carbon brush of steering motor	Check	1000h	

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