CPCD120/140/160-XW25 Forklift Truck

SERVICE MANUAL

Original Instruction

HANGCHA GROUP CO., LTD.

APR.2012 1st EDITION

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Foreword

The manual is the introduction of structure, working principle and serving .etc of 12t-16t series diesel fork truck. For safety and performance of truck, all in charge of operation, maintenance and management must read and comprehend this manual well.

It is forbidden anybody without training and qualification to maintain.

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I. Driving System

Power configure

Engine parameter	Diesel
Type	**QSB6.7**
Rated output kW	119
Rated rpm r/min	2300
Max. torque N·m/speed rpm	731/1500
Forklift model	CPCD120/140/160-XW25

Specification, structure and maintenance, please refer to *ENGINE MAINTENATION MANUAL.*

There is need to check the exhaust quantity after the maintenance or servicing, and ensure that the exhaust gas accord with the table:

Engine power kW	CO (g/kWh)	HC (g/kWh)	NO_x (g/kWh)	PT granule (g/kWh)
130≦P <560	3.5	1.0	6.0	0.2
75≦P <130	5	1.0	6.0	0.3

II. Hydraulic gear-box and torque converter

Data

Model			**Y63270Z/X**
Hydrodynamic torque converter	Type		Two stage, triphase,four element
Hydrodynamic power gear-box	Variety		Electronic shift gear
	Transmission gear ratio	Forwarder gear Ⅰ	1.179
		Forwarder gear Ⅱ	0.645
		Reverse gear Ⅰ	0.844
Oil pressure	Shift gear oil pressure MPa		1.0-1.6
	Torque converter output oil pressure MPa		≤0.50
Mass (kg)			450
Oil capacity (L)			approximate31-32
Using oil type			ATF DEXRON II（Caltex）

Specifications, structure and maintenance methods ,please see 《 **Y63270Z/X Japan** Okamura MODEL TORQUE CONVERTER MAINTENANCE MANUAL》.

III. Drive axle and Carrier assembly

1. Data

Drive axle type	**One step carrier assembly and wheel-end reduction Full floating, direct frame mount, front-wheel drive**
Carrier assembly	One step helical bevel gear
Differential assembly.	Straight tooth gear
Wheel-end reduction	pinions

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Unusual noise Before attempting a correct ion, make sure the noise is coming from the drive shaft-not from the final drive or wheel reduction gear.	·Loose axle mounting bracket bolts.	Tighten.
	·Loose wheel nuts.	Tighten.
	·Other retaining parts loose.	Tighten.
	·Worn or damaged wheel bearing.	Replace.
	·Wheel bearing not properly adjusted	Adjust.
	·Worn sun gear (drive shaft) splines.	Replace.
	·Insufficient lubrication.	Lubricate
Unstable driving Also refer to the Trouble Diagnoses and Corrections in the RA section.	·Loose wheel nut.	Tighten.
	·Deformed road wheel.	Replace.
	·Worn or damaged wheel bearing.	Replace.
	·Loose axle mounting bracket bolts.	Tighten.
	·Wheel bearing not properly adjusted.	Adjust.
	·Improper tire pressure.	Adjust.
Oil leakage	·Worn or damaged axle tube oil seal.	Replace.
	·Final drive improperly installed.	Replace gasket.
	·Loose filler or drain plug.	Tighten.

Specifications, structure and maintenance methods ,please see《MAINTENANCE MANUAL And PARTS ITEM》.

IV. Steering axle

1. General specification

suspension type	Center support, wing type			**axle center**	
Max. Steering angle	Inner wheel	77.6°		Fore-aft clearance（mm）	0～1(forward is no clearance)
	Outer wheel	50°		Fore-aft adjusting shim	
				Thickness（mm）	Part number
Tire pressure	0.83MPa			0.5，1.0，1.5	GX160-220005-000

Kingpin

Axial play（mm）	Less than 0.2
Adjusting shim	
Thickness（mm）	Part number
0．1，0.7，1.0	G160-220014-000

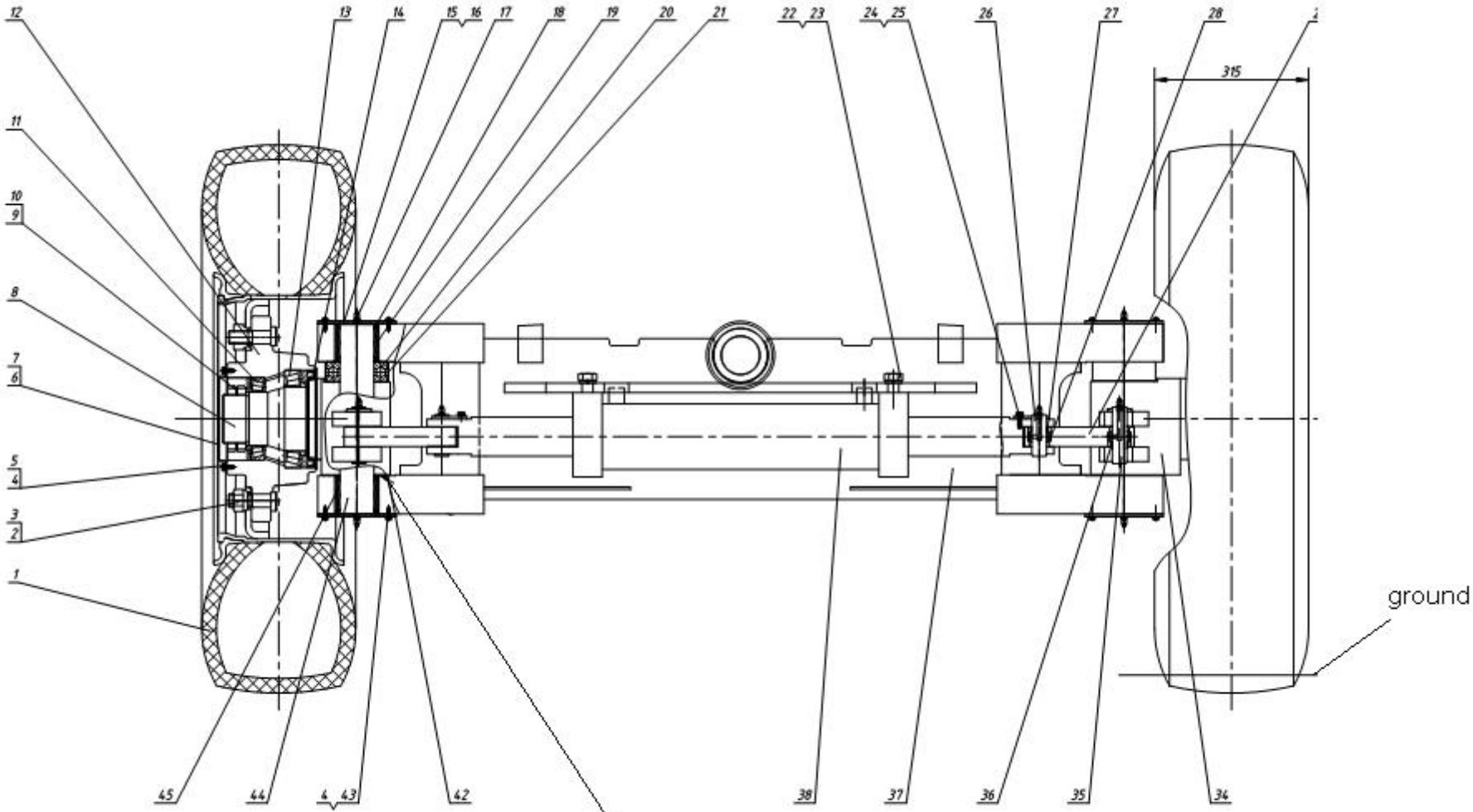
wheel bearing

Pre-tightness	Tighten bearing nut until rotating resistance is felt, from this position; back off bearing nut 1/8-1/6 turn. or wheel hub bolt initial force is less than 10-29N.
Axle play(mm)	Less than 0.08

2. Trouble diagnoses and correction

condition	Probable cause	Corrective action
Unstable driving	·loose wheel nut	tighten
	·wheel bearing out of adjusting	adjust
	·improperly adjusted mount shims	adjust
	·faulty steering system	refer to steering section
Noises	·insufficient lubrication	Apply grease
	·loose bolts and nuts	tighten
	·improperly adjusted mount shims	adjust

3. Steering Axle Structur



Insert 0.1mm thick of shims in the middle of the two thick shims,
so as the axial gap is less than 0.2mm.

1. steering wheels assembly 2.ball nut 3.join nut 6.end cover
7. paper washer 8.left steering spindle 11. bearing 13. bearing 14.oil seal
15.cover plate 17.oil cup 18.O-ring seal 19.steel bushing 20.bearing
21.soldering cup 22.bolt 26.axis pin 27.mounting cap 28.bearing
29.connecting rod 34.right steering spindle 35.axis pin 36.mounting cap
37. steering axis 38.steering cylinder 39.dust ring 40.bearing bushing
41.adjusting shim 44.king pin 45.bearing

Fig 4-1 steering axis

Removal

- **Steering wheel hub**

1) Jack up and support truck body with safety stands.
2) Remove tire.
3) Remove hub cap.
4) Remove spindle nuts and bearing washer.
5) Pull off hub assembly.

Caution：a. Be careful not to drop bearing cone.

6) Remove inner bearing cone.

Caution：b. Be careful not to damage grease seal.

- **Kingpin and steering spindle**

1) Remove ball stud nut and disconnect tie-rod from steering spindle.
2) Loosen lock nut and remove set-screw.
3) Remove grease nipple.
4) Attach a pad to upper end of kingpin, and drive out kingpin.

Caution: hold kingpin to prevent it from dropping。

5) Take off spindle, including thrust bearings and shim as an assembly.

Inspection

1）. Replace spindle if cracked.
2）. Replace thrust bearing if its rollers or roller surfaces are rusted or nicked.
3）. Replace needle bearings if damaged.
4）. Replace bearings and dust-proof cover if damaged.

installation：

To install, reverse the order of removal. Carefully observe the following.

1）Always insert kingpin from lower side.

2）Install thrust bearing with its cover facing up, and adjust axial play less than 0.2mm with shims.

caution：Always place thrust bearing on upper side of spindle, and shims on lower side.

3）Apply grease inside the dust-proof cover and between two rings of thrust bear.
5）Do not apply grease to spindle mating with bearing.
6）Apply grease on needles and balls of bearings.
7）Pack all grease nipples with a sufficient amount of grease.

- **Wheel bearing installation and adjustment**

1) Apply grease or anti-rust oil on contact surface of bearings and 6 spindle nut.

2）Rotate hub slowly. Tighten 6 bearing nut until rotating resistance is felt; turn bearing nut back off 1/6 to 1/4turn from that position.

3）Rotate hub 2~3 turns, make the rollers stay in the right position.

4）Repeat the second step, and install 25 bearing washer and tighten the other 6 bearing nut.

5）Rotate frontward and backward hub 2~3 turns, make sure its axle clearance is less than 0.08mm, and rotated starting torque at hub bolt is less than 25.5N. Otherwise, return to the second step.

Axle center

Removal

1. Jack up and support truck body with safety stands.
2. Remove tire.
3. Disconnect ball joint at tie-rod.
4. Support axle center with a jack.
5. Disconnect piping connectors and remove mounting caps.
6. Remove axle center.

caution：Be careful not to slide jack out of place.

Installation

To install, reverse the order of removal. Carefully observe the following:

Add shims on both sides until fore-aft clearance between steering axle and frame is less than 0.7mm.

V. Steering system

Steering system type	rear wheel steering with power steering
fully hydraulic redirector	line mounted with priority valve ,load sensing
power cylinder	double-action transfixed

1. Trouble diagnoses and correction

condition	Probable cause	Corrective action
Steering wheel failure	Pump damaged or faulty	Replace
	Flow priority valve blocked or damaged	Clean or replace
	Pipes or connections damaged or passage blocked	Clean or replace
Hard steering	Low oil pressure in the flow priority valve	Adjust
	Air in system	Bleed air
	Flow priority valve control pipe blocked	Clean or replace
	Flow priority valve damaged	Check or replace
	Steering gear fails to reset, or orientation shim is broken or of failure	Replace elastic shim
	Power cylinder piston seal damaged	Replace
noises	Insufficient oil in tank	Replenish
	Blocked in the passage or filter	Clean or replace
leakage	Seal on the guide set, piping or connector is damaged	Replace

2. General

The steering system is mainly composed of cycloid fully hydraulic redirector and the power cylinder.

2.1 Cycloid fully hydraulic redirector

It consists of cycloid steering gear, steering column and steering wheel. The assembly position can be adjusted 8°aft-forth to satisfy drivers' needs.

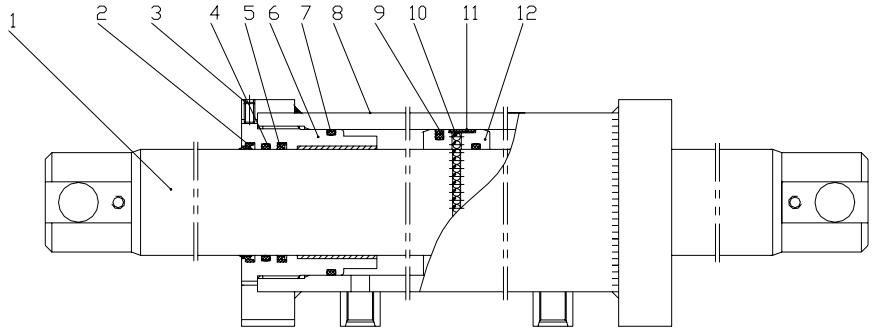
Turn the steering with 1 KG power when the power is off, and it can return about 10°automatically after loosening.

2.2 Fully hydraulic steering

With overflow valve, load sensing. Pressure oil enters stator-rotor set from valve disk and sleeve valve set, then drives rotor turns following with steering wheel, and presses oil into left and right chamber of steering cylinder, then cylinder piston rod forces steering wheel to steer.

2.3 Steering oil cylinder

Steering cylinder is of double-action piston type; each end of piston rod is connected to tie-rod and spindle in turn. Hydraulic oil from fully hydraulic steering gear makes the piston rod move left and right to steer truck.

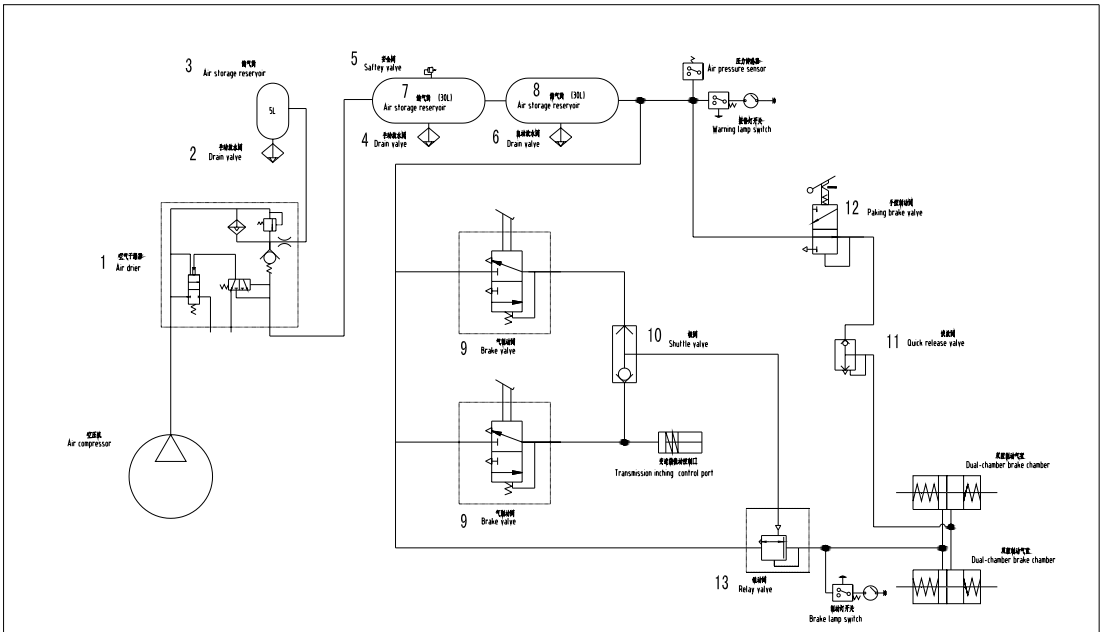


1. piston rod 2.LBI seal ring d80 3. bolt 4.O-ring seal 80X5.3
5.ISI seal ring d80 6. guide set 7.O-ring sea 100X5.3 8.cylinder body
9.glan-ring D110 10.steel ball 11.support ring 12.piston

Fig 5-1 steering cylinder

VI. Brake system

Brake system uses air pressure braking system, its supply devices and gears are air pressure type. Its control devices are composed of brake pedal framework, air- brake valve, hand brake valve, oil-water separator combination valve, air tank, safety valve, brake air-chamber, drain valve, shuttle valve, relay valve, quick lease valve, etc. Air compressor feed in oil-water separator combination valve compressed air by engine, then the air flows from check valve to air tank (with safety valve and hand water release valve), one way to hand control valve, parking brake chamber to control parking brake; another way to air brake valve, shuttle valve, relay valve, run brake air chamber to control run brake. The air circuit has drain water and filter device to ensure air source is clean. Taking antirust treatment to air brake system pipe and air tank.



序号 Item	名称 Name	代号 Code	性能参数 Performance parameter			备注 Remark
7	储气筒 Air storage reservoir	GX160-515000-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
6	自动放水阀 Drain valve	GX160-510800-000	工作压力	Work pressure	0.8MPa	
			工作温度	Work temperature	-30-80°C	
13	继动阀 Relay valve	GX160-510100-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-30-80°C	
5	安全阀 Saftey valve	GX160-510500-000	开启压力	Open pressure	875kPa	
			工作温度	Work temperature	-30-100°C	
12	手控制动阀 Paking brake valve	GX160-510110-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
4	手动放水阀 Drain valve	GX160-517000-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
11	快放阀 Quick release valve	GX160-510200-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-30-80°C	
3	储气筒 Air storage reservoir	QJ800-510009-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
10	梭阀 Shuttle valve	GX160-510120-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-30-80°C	
2	手动放水阀 Drain valve	QJ800-510020-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
9	气制动阀 Brake valve	GX160-510300-001	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
1	空气干燥器 Air drier	QJ800-510005-000	排气压力	Exhaust pressure	784kPa	
			工作温度	Work temperature	-40-80°C	
8	储气筒 Air storage reservoir	GX160-510900-000	工作压力	Work pressure	784kPa	
			工作温度	Work temperature	-40-80°C	

Fig. 6-1 brake system diagram

1 Air dryer

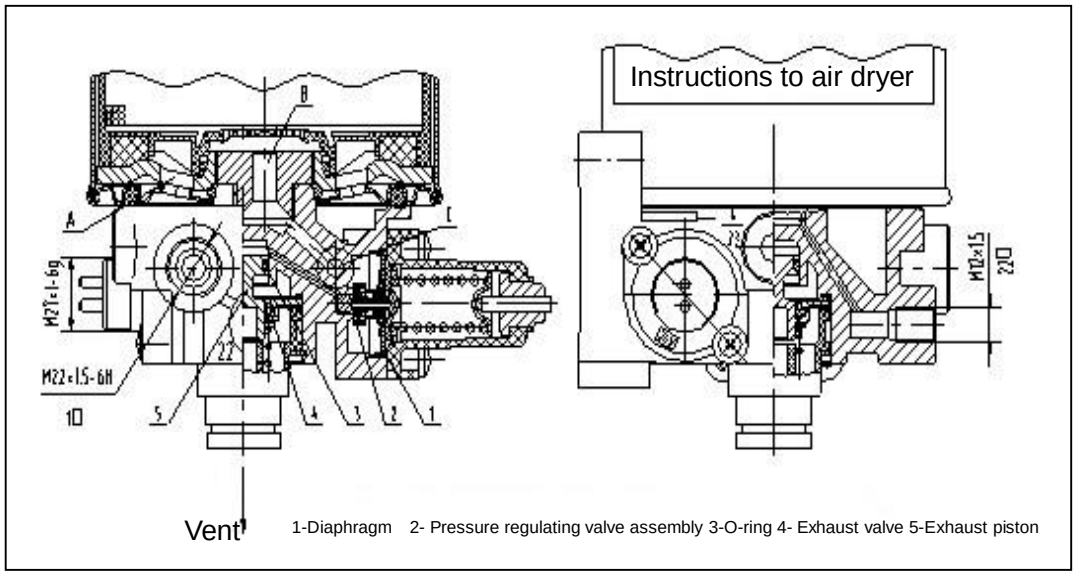


Fig.6-2 Air dryer

1.1 Usage

The air dryer is used in automobile and engineering vehicle braking system, because the condensed water in the compressed air from air compressor is the main reason for pipeline rust and the failure of lubricating film, if the environment temperature is lower, there maybe the risk of pipeline frozen. All this will drop the system reliability, reduce service life, or even generate brake failure. The air dryer, by means of oil water filter and the molecular sieve, can effectively remove water and greasy dirt in the compressed air, and then take molecular sieve regeneration, to purify compressed air.

1.2 Working principle

Compressed air from air compressor, enters cavity A through the air dryer intake mouth 1, and enters the middle of the molecular sieve through shell, filter and dry the compressed air by molecular sieve, and clean air will reach mouth C through mouth B, after through air outlet mouth 21, inflate the air storage tank. When the air pressure of air storage tank reaches opening pressure value, gas enters the lower diaphragm cavity, overcomes the upper adjusting spring force, promote the diaphragm move up, airflow enters the upper exhaust piston cavity, push down the exhaust piston, open the lower exhaust valve, get the vent compressed air, water and impurity discharged into the atmosphere through the vent, make the air compressor in the no-load running state; when the air pressure of air storage tank drop to the closing pressure value, lower diaphragm cavity pressure is not enough to overcome the adjusting spring force, diaphragm assembly moves down, the vent valve moves up to shut the valve under the action of spring, thus the valve continues to supply air storage tank gas. In the exhaust process, the input compressed air of regeneration cylinder flow to drying cylinder through mouth B, drive water staying around the drying cylinder top and drying shell flow into valve body vent in opposite direction to inlet, and discharge to the atmosphere.

1.3 Technical parameter

1. Withstand voltage：1.3MPa；
2. Opening pressure：784±20kPa；
3. Closing pressure：654～724kPa；
4.Heater voltage：24V，100W；
5. Working temperature：－40～+65℃。

1.4 Installation and connection size

1.Installation size：3-M12×1.5－6H screwed hole（isosceles triangle），base space is 105，and height is 72.

2. Connection size：air inlet M22×1.5-6g，air outlet M22×1.5-6H（connect gas holder），M12×1.5－6H（connect 5L regeneration gas holder）.

1.5 Easily damaged parts

No.	Name	Fig. No.	Quantity
1	O-ring	EQ153-3512028	1
2	Exhaust valve	WSL-1109038	1
3	Diaphragm	EQ153-3512032	1
4	Pressure regulating valve assembly	EQ153-3512040	1

1.6 Common fault, fault diagnosis and corrections

No.	Common fault	Fault diagnosis	Corrections
1	Air leakage in vent	Exhaust valve damage	Replace exhaust valve
2	Low opening pressure	Part wear as adjusting screw	Rotate the adjusting screw downward properly Note: according to vehicle pressure gage, adjust product technical parameter.

2. Safety valve

2.1 Structure and Principle

Compressed air flowed from inlet, when the inlet pressure is greater than 850kPa, the safety valve A opens air on the air brake pipe from the role of security protection to ensure that the inflating air brake pipe pressure does not exceed 900kPa.

Safe working pressure: 850 ~ 900kPa. Inlet M16 × 1.5-6g is the connecting thread.

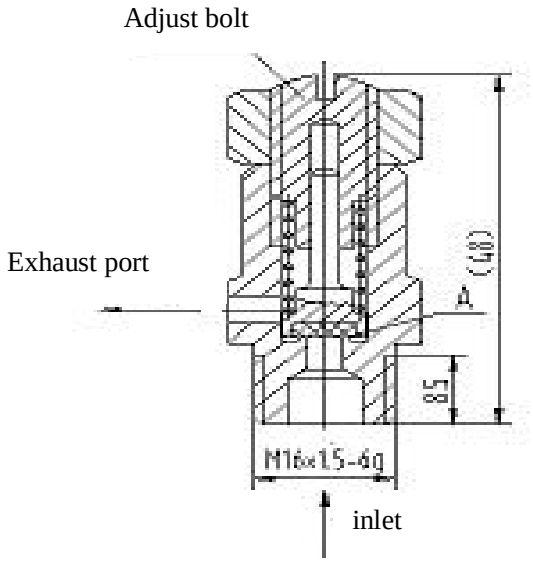


Fig.6-3 safety valve

2.2caution when use

Before the factory, the adjustment bolts on safety valve assembly have been set, users are not free to self-adjust, demolish.

2.3Common faults, failure analysis and troubleshooting

Common faults	failure analysis	troubleshooting
Valve port leakage	Rubber safety valve stem assembly damage	Replacement safety valve assembly

Wearing parts

Name	Figure No.	No.
Safety valve stem assembly	150-3511051A	1

3Automatic release valve

3.1Structure and Principle

Automatic release valve is used to pump air brake pipe reservoir of pool water, through the pressure fluctuations in value (pressure drop 0.03 ~ 0.1MPa) automatically from the exhaust water; achieve automatic deflation function; while parking users also can manually operate button for fast water drainage.

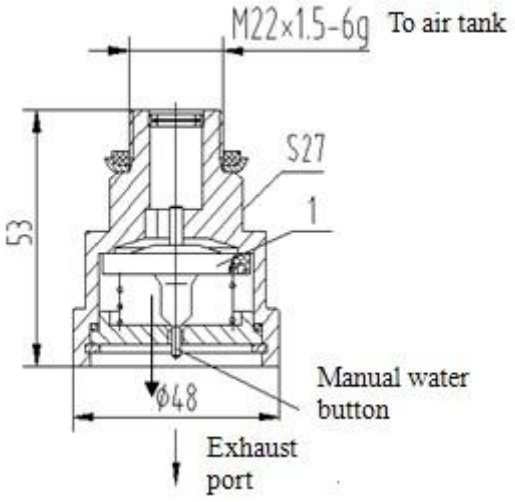


Fig.6-4 Automatic release valve

Rated working pressure	800kPa
Installation and connection dimension	M22×1.5-6g
	Exhaust down

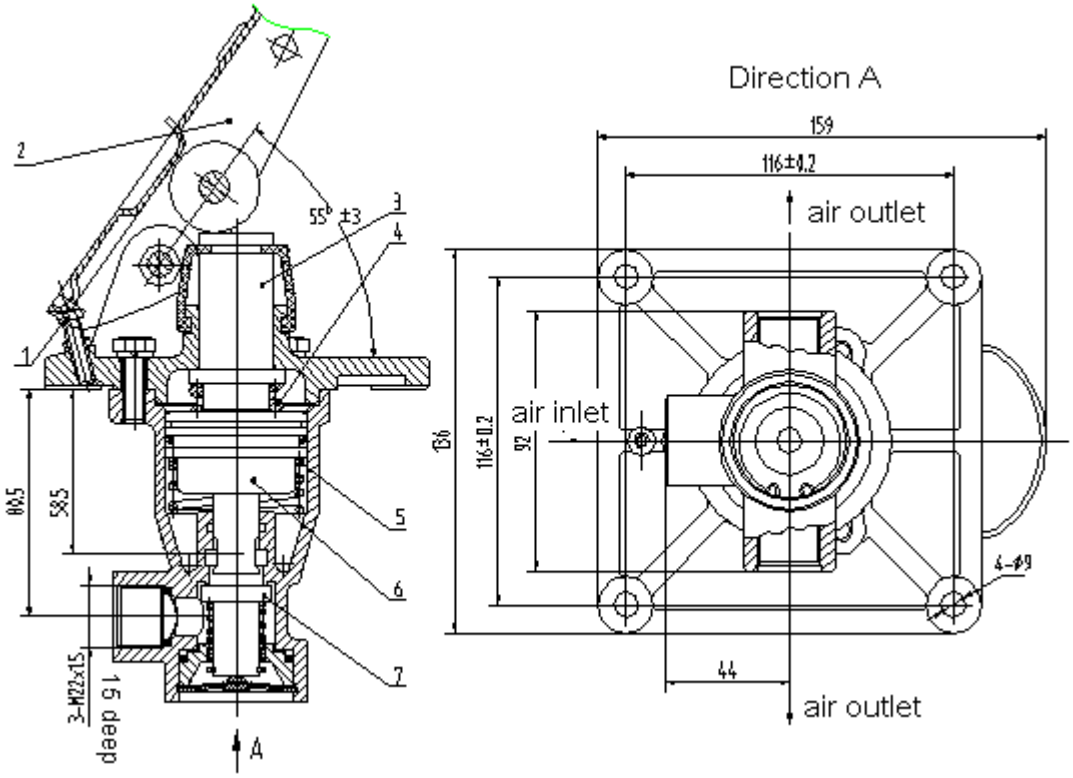
Wearing parts

Name	Code	No.
Membrane inlet assembly	PY20-1305030	1

4.Air brake

4.1Structure and Principle

When pressing on the bake pedal 2, through push rod 3, the balance spring 4 is forced to pull piston 6 down and open inlet valve 7, compressed air flows from inlet to outlet. When loosing pedal 2, return spring 5 pushs pistons 6 up, inlet valve 7 returns back to close the way between inlet and outlet, the residual gas emissions from the exhaust.



1.screw 2.pedal 3.push rod 4.balance spring
5.return spring 6.piston 7.inlet valve

Fig.6-5 air brake valve

4.2 Proper use and maintenance methods

4.2.1 Caution

1） Ensure that the pedal firmly connect with the valve body, screw-adjust valve clearance should be adjusted well (to ensure that the pressure roller mandrills screw down surplus amount of not more than 0.5mm), and tight nut.

2）M8 bolts through the 4-φ9 hole are firmly connected.

3）Piping connections should be recognized inlet, outlet. Interface marked "1" for the inlet, interface marked "2" outlet, interface marked "3" exhaust.

4.2.2 Attention of maintenance

1)Please be in accordance with the corresponding replacement of wearing parts in kind when replacing wearing parts, damaged fasteners(bolts, nuts) in the process of replacement must be replaced, and ensure that the installation is in place, solid and reliable, and may not damage other parts.

2）The movement location of air brake parts should be used grease for maintenance. If the brake is failed or weak, it has to check the wearing parts of air brake valve and brake system.

3）Replacement may not be installed without a qualified pilot.

4.3 Common faults, failure analysis and troubleshooting

Common faults	failure analysis	troubleshooting
Non-working state leakage	Rubber Parts damage	Replace wearing parts or replace product assembly
Working state leakage	Rubber Parts damage	replace wearing parts or replace product assembly
Exhaust of sorts	Piston stuck	replacement product assembly
	Pedal wheel does not adjust well with the mandrills	Manually re-adjust screw so that the pedal on the mandrel wheel just contacts appropriate, (the pressure roller mandrills screw down surplus amount of not more than 0.5mm)

5.Shuttle valve

5.1Structure and Principle

Actually it is a special three-way valve. The output pressure of frontward and backward cavity in dual-chamber may not be inconsistent, so they both pass into the shuttle valve. Shuttle valve only allows higher pressure compressed air to flow through outlet, through relay valve to driving brake air chamber.

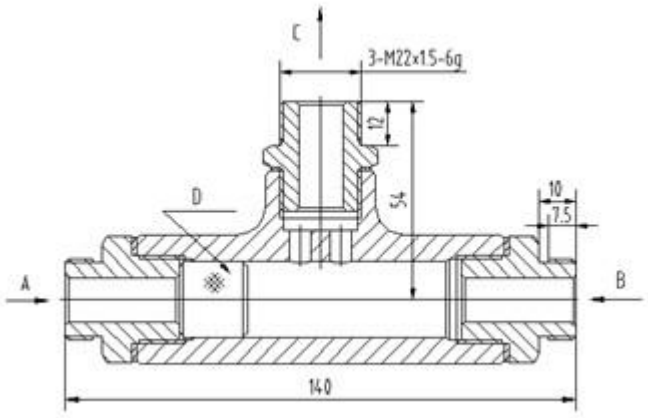


Fig.6-6 shuttle valve

Compressed air flows from the A mouth, the air pressure will push the piston D to the B-side, because the both sides of pistons D are rubber, thus it can guarantee non-air leak from outlet, so that pressure can outflow from the outlet C; Similarly, if the air flows into the inlet B ,the pressure will outflow as the same way outflows from the outlet C. Rated working pressure is 784kPa.

Maintenance should be to protect the interface thread.

5.2 Common faults, failure analysis and troubleshooting

Common faults	failure analysis	troubleshooting
Valve port leakage	Rubber plunger valve damage	Replace the valve plunger

Wearing parts

Name	Fig.No	No.
Valve plunger	SUSH-3527013	1

6 relay valve

6.1Structure and Principle

Compressed air does not flow through the air brake but direct charges into the lane brake chamber so as to shorten the supply route to reduce the braking time lag.

1） Brake

The pressure from control valve entering 4, pushes piston down, closes the valve, opens the intake valve so that air pressure from the reservoir pushed by pump opens intake valve, flows from outlet 2 to brake air chamber, at the rated working pressure, the gas outlet pressure is controlled by the air intake pressure with a direct proportion .

2) Loosening the brake: after loosening control intake4 air pressure, then the piston is moving up, and exhaust is opening, brake pressure in the chamber will be deflated into the atmosphere through the exhaust port.

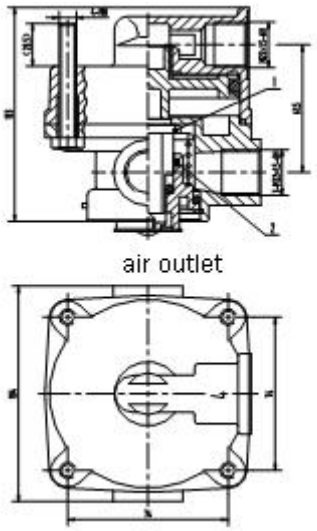


Fig.6-7 relay valve

1. Exhaust valve assembly 2.O-ring

Technical parameters

Rated working pressure	784kPa
Initial balance pressure	≤50kPa
Connection dimension	Outlet :2-M22 × 1.5-6H, inlet: M22 × 1.5-6H Control of air intake: M22 × 1.5-6H

6.2 Proper use, maintenance and Cautions

(1) Caution

1) Installed in the installation board with 74 × 74 interval, the exhaust outlet is down, then tightens the 4-M8 nuts, and it shall not be loosen.

2) Piping connections should be recognized inlet, outlet and control of air intake. Interface marked "1" for air intake, interface marked "2" for the outlet, interface marked "3" for the exhaust port, and interface marked "4" for the control of air intake.

(2) maintenance, maintenance of attention

1) When founding severe wear wearing parts, or leakage, grave wearing parts should be immediately replaced.

2)Please be in accordance with the corresponding replacement of wearing parts in kind when replacing wearing parts, damaged fasteners(bolts, nuts) in the process of replacement must be replaced, and ensure that the installation is in place, solid and reliable, and may not damage other parts.

3) Replacement may not be installed without a qualified pilot.

6.3Common faults, fault analysis and troubleshooting

Common faults	**fault analysis**	**troubleshooting**
Non-working state leakage	O-ring wear	replace wearing parts or replace product assembly
Working state leakage	Intake valve assembly rubber parts damage	replace wearing parts or replace product assembly

Wearing parts

Serial number	**Name**	**Fig. No**	**No.**
1	O-ring	GB3452.1-92	1
2	O-ring	HFC-3527033	1
3	Inlet valve assembly	HFC-3527020	1

7. Hand-controlled brake

7.1 Structure and Principle

When parking or emergency brake, hand-controlled valve can be used to brake --- emergency brake chamber is connected with atmospheric air chamber, so that parking brake or emergency braking can take effect while exhausting and reducing pressure. When loosening the brake the car can be paring--- emergency air chamber is connected with the reservoir pump.

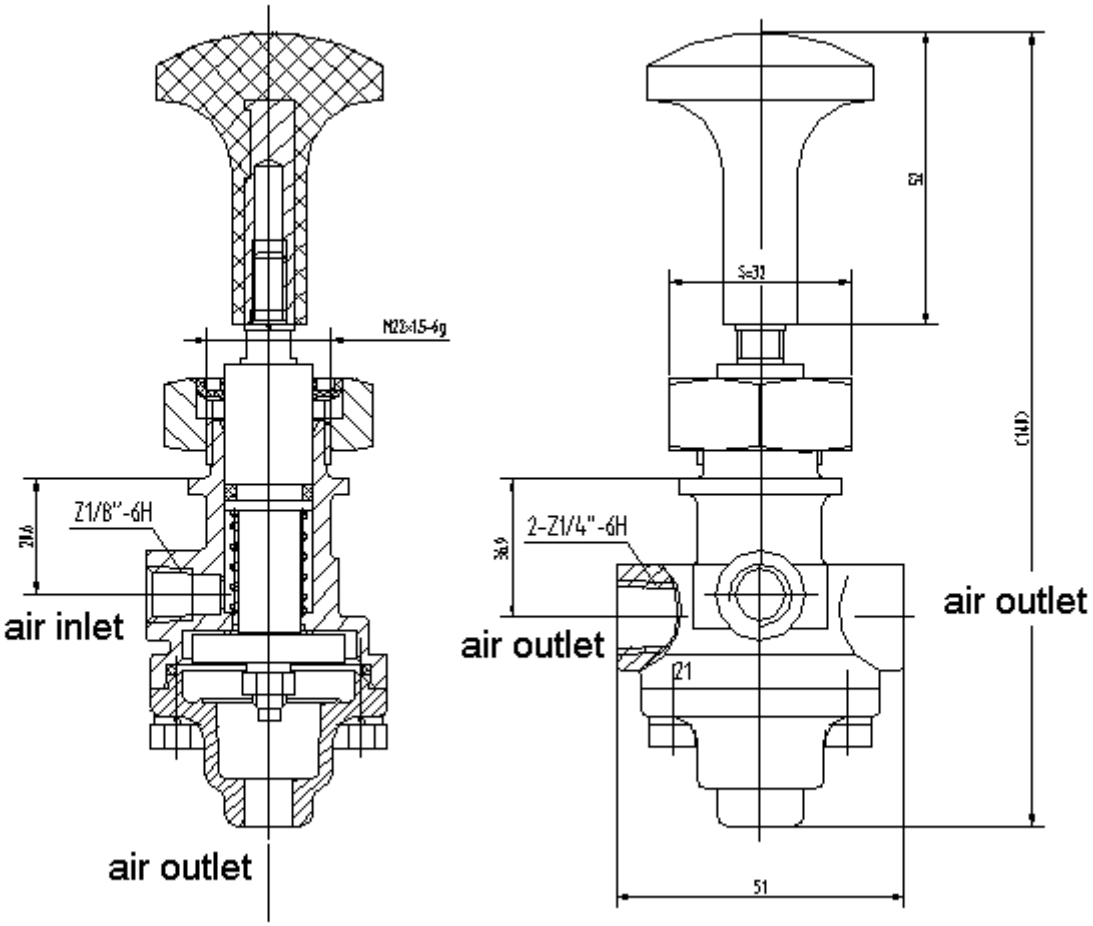


Fig.6-8 Hand-controlled brake

Its working state is braking deflated. Namely: When the system pressure is as low as 240 ~ 310kPa, or a pipeline is ruptured, manual brake can automatically be took off to release the interior air brake pressure of spring energy storage system, the spring energy storage on the drive shaft can implement effective emergency braking. When emergency or stopping happens, the driver lifts the button at the same time which plays the role of the above, so that the vehicle can safely stop. Because it belongs to a result of deflated brake, so it is safe and reliable.

Rated working pressure	784kPa
Insurance pressure	240～310kPa
Installation, connection dimension	Intake: Z1/8 " Outlet :2-Z1/4 "

7.2 Proper use and maintenance methods

(1) Caution
1)When installing, after M22 × 1.5 thread seal nut is screwed off, then screwing sealed nut and tightening through the installation of plate.
2)Recognizing each interface when connecting: Marked "1" for air intake; marked "2" for the outlet, marked "3" for the exhaust port.
3)

(2) maintenance
1)Please be in accordance with the corresponding replacement of wearing parts in kind when replacing wearing parts, damaged fasteners(bolts, nuts) in the process of replacement must be replaced, and ensure that the installation is in place, solid and reliable, and may not damage other parts.
Replacement may not be installed without a qualified pilot.
2)The movement location of emergency brake parts must be maintained with high-temperature resistant grease. If the brake is failed or weak, it has to check the brake system and emergency brake of wearing parts.

7.3 Common Faults and fault analysis and troubleshooting

Common Faults	fault analysis	troubleshooting
Non-working state leakage	Rubber parts wear	Replace wearing parts or replace product assembly
Working state leakage		

Wearing parts

Serial number	name	Fig. No.	No.
1	Mandrels ring	CT-3526064	1
2	Valve base ring	CT-3526061	1
3	Rubber valve assembly	CT-3526050	1

8. Quick release valve

8.1 Structure and Principle

The function of the quick release valve between the hand-controlled brake and brake air chamber is :when releasing the manual brake button, the route of parking brake air chamber and the time can be shorten, and ensure the front wheel brake is loosen rapidly. Air flows from the air brake inlet to quick release valve, the pressure acts on the tympanic membrane to close exhaust valve, so that it make the outer part of tympanic membrane bend downward, after that, the air flows from outlet to brake chamber through the surrounding clearance of membrane. Lifting the brake, the air pressure of inlet releases through air brake valve, the pressure below tympanic membrane will be pushed. When closing the top intake channel, and opening the exhaust channel of lower body, the braking pressure in the chamber is deflated into the atmosphere through exhaust port.
Rated working pressure: 784kPa.
Connection Size: inlet M22 × 1.5-6g; outlet 2-M22 × 1.5-6g.

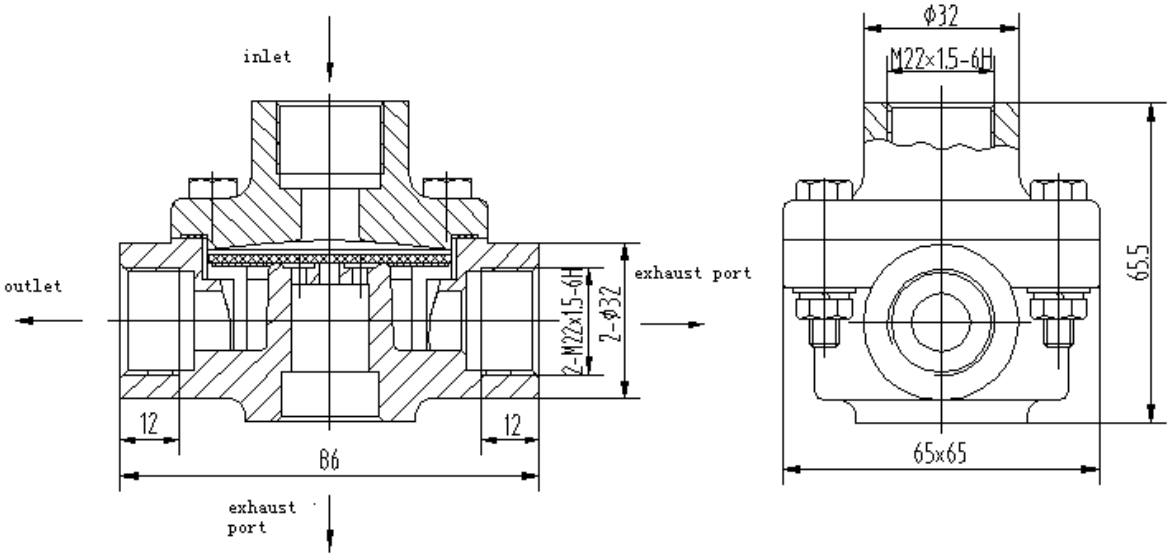


Fig.6-9 quick release valve

8.2 Proper use and maintenance methods

(1) Caution

Connecting pipe with three thread interfaces, the exhaust is downward.

(2) Maintenance

1) When found leakage then should immediately replace the wearing parts.

2) Please be in accordance with the corresponding replacement of wearing parts in kind when replacing wearing parts, damaged fasteners(bolts, nuts) in the process of replacement must be replaced, and ensure that the installation is in place, solid and reliable, and may not damage other parts.

3) Replacement may not be installed without a qualified pilot.

8.3 Common faults, failure analysis and troubleshooting

common faults	failure analysis	troubleshooting
Exhaust leak	Parts of the exhaust valve has dirt	Clean pipe
	Membrane damage	Replace membrane
Interval between top and bottom body leak	seal washers aging	Replace washers

Wearing parts

Serial No.	Name	Fig. No.	No.
1	tympanum	JN441-3516012	1
2	Seal washer	JN441-3516014	1

9 Combination brake chamber

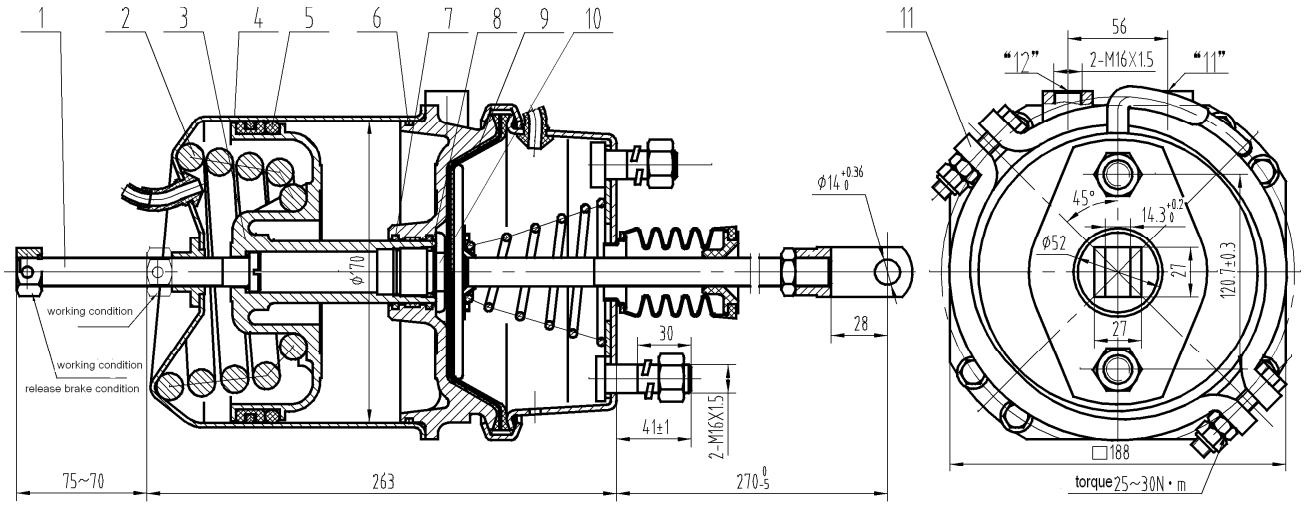
Combination brake chamber is composed of front and rear air chambers which are unattached .one is driving brake chamber, driving brake takes effect when inflating and increasing pressure. It is also called as inflatable braking room. Another is parking--emergency brake chamber, parking brake or emergency brake takes effect when exhausting and reducing pressure. When it inflating and increasing pressure, it becomes weak even it will loose brake, so it is called inflatable braking room.

Inflatable braking room is for driving brake, deflated spring brake chamber is for parking and emergency brake.

9.1 Structure and working principle

There are both inflatable brake room and deflated brake chamber in it. It generate force for the wheel brake by filling and deflating , inflatable braking chamber (11 cavity) is for the driving brake, deflated brake chamber (cavity 12) is for parking and emergency braking, the main features of spring brake chamber is that it can get a mechanical braking force by the release of spring energy.

Working pressure: 0.8MPa; work trip 55mm



1.adjusting bolt 2.energy storage spring 3.piston 4.stored energy cylinder block assy 5.O-ring 170X86 6.O-ring 164X3.1 7.O-ring 33.7X5.1 8.O-ring 19X2.4 9.diaphragm 10.seal plug screw 11.clamp

Fig.6-10 brake chamber

9.2 Caution

Warning !：Extremely dangerous

1、For internal structure of combination brake chamber, demolition ,assembly, adjustment and replacement of wearing parts, must be done by professional manufacturers;

2、Demolition and assembly must use special tools to prevent the spring wounding.

1)"11" inlet to driving brake chamber; "12" inlet to emergency brake chamber;
2) When Loading, the air flows into emergency brake chamber ,screwing the adjustment bolts from supplied state to work state;
3)Vehicle was moving locked when driving, should promptly screw adjustment bolts to lift the brake state (that is, supply status)
4)When driving brake chamber leak a little, can screw bolts on hoop down by wrench ;
5)Prevent bump ,do not damage the exhaust pipe, exhaust pipe shall not be loaded, pull;
6)Do not take down without special equipments, that is to guard against the spring wounding.

9.3 Description of demolition and repair

1)Please confirm whether the adjustment bolts is screwed back before demolition and repair, which is lift brake state and supplied state. And remove nut of adjustment bolts.
2) Put the spring brake chamber lifted brake state on compactor and compact it, then can use wrench to unscrew bolts on hoop to remove hoop. Remove clamping device, then can replace wearing part 1 membrane.
3) When the pressure of inlet 12 is 600 kPa, piston is push back, and then screw adjustment bolts about 30mm. After releasing pressure, seal-plug can be removed with special wrench, then replace wearing parts 2(o-ring 19×2.4). Removing fastening bolts on connecting cover with wrench, then can replace wearing parts 3(o-ring)
4)Put the storage cylinder assembly on special compactor and compact it, then remove adjustment bolts, take out storage piston to replace wearing part 5(0-ring170×8.6）)

9.4 Safety precautions

1)It is important to have a special compacter with spring-proof device to disassemble spring brake chamber slowly, prevent the spring hurting people. To ensure safety and prevent spring hurting people, it is forbidden anybody to stand in direction of spring ejecting.
2) When assembling compact storage spring with compacter, the adjustment bolts must be screwed to specified depth (adjustment bolts showing 60mm outside), then pressure of compacter can be released.

Wearing parts

Serial number	Name	No.
1	membrane（item 9 in fig.7-9）	1
2	O-ring19×2.4（item 8 in fig.7-9）	1
3	O-ring33.7×5.1（item7 in fig.7-9）	2
4	O-ring164×3.1（item 6 in fig.7-9）	1
5	O-ring170×8.6（item 5 in fig.7-9）	1

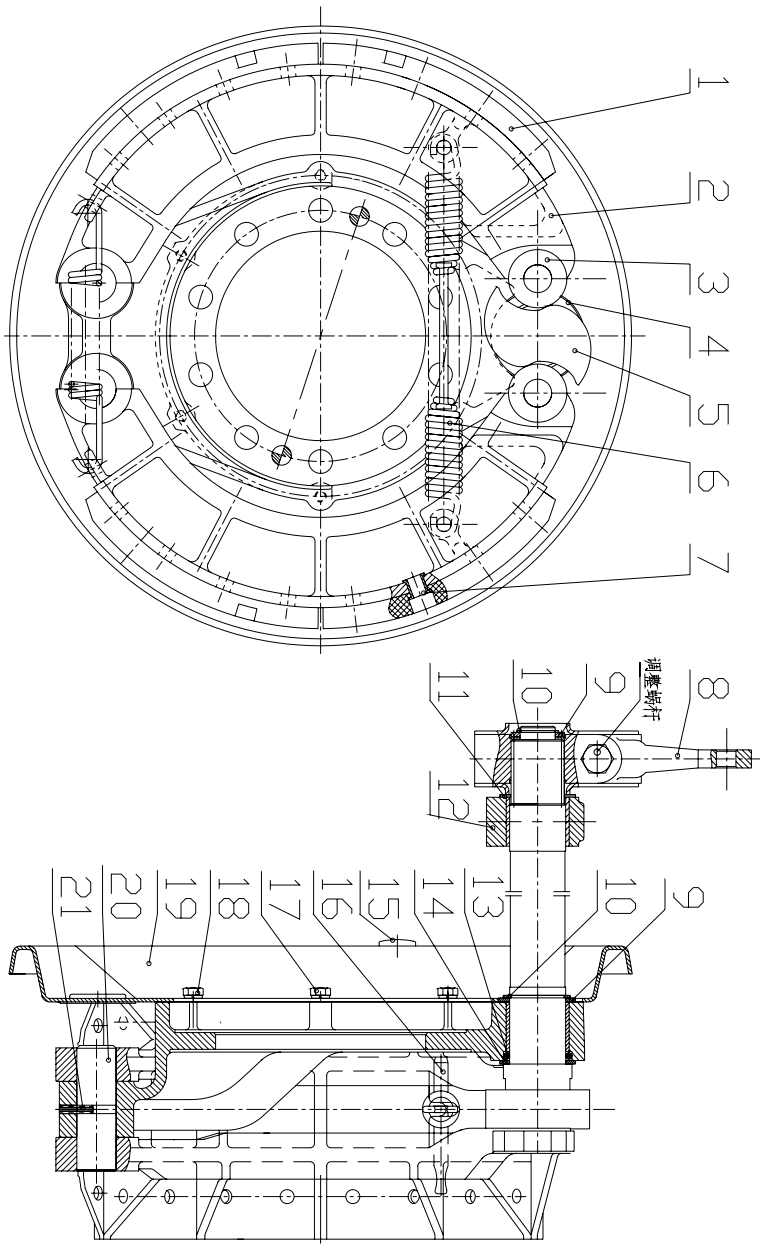
10. Pressure sensors, alarm lights switch

The reserve pump of the brake circuit is equipped with pressure sensors and alarm lights switch, when the pressure of the reserve pump reduced to a certain pressure (pressure below 0.4MPa) due to several times consumption, the barometer installed in the right seat will be displayed that the pressure value is less than 0.4MPa, alarm pressure switch on the panel in front of the driver will be non-stop flashing lights to warn the driver, pay attention to the low pressure of the storage air chamber. At that time, the drivers should

be immediately stopped, and when the pressure value is higher than 0.4MPa and the alarm light switch goes out, the drivers can continue travel.

11. Shoe brake

Shoe brake is composed of brake hub, brake shoe, air chamber assembly and the cam bodies. Structure Chart:
Chamber specifications: 32/30 inch (line / in)
Rated pressure: 0.8MPa
Braking torque: 21.5/17 (line / in)
Available friction thickness: 9mm



1、friction plate 2、horseshoe 3、roller wheel 4、bottom bushing
5、camshaft 6、return spring 7、horseshoe rivet 8、 adjustment arm with lengthening 9、shim 10、check ring 11、washer 12、cam stent
13、O-ringφ49×φ40 14、shim 15、jam 16、hanging spring pin 17、bolt
18、bolt 19、dust cap 20、shoe-axis 21、elastic column pin

Fig.6-11 Brake

Its working principle is that, taking use of spring and pressure（0.3~0.4Mpa） of spring brake chamber to transfer the power to brake shoe through adjusted arm, camshaft, to make brake shoe tighten brake drum, so it can generate brake torque to brake wheels. When parking, air is discharge all from driving brake chamber (12) and parking brake chamber (11) to brake truck by spring force, when normal driving, air flows in driving brake chamber, and the air in parking brake chamber is discharged to overcome spring force, so that it lifts brake shoe to ensure normal driving. When driving brake, air flows in parking brake chamber, and flows out the driving brake chamber, to ensure brake by pressure and spring force.

Brake block working surface should be kept clean, if it is polluted slightly, acetone and gauze can be used to remove, or it should be replaced with new pieces. If friction block assembly wears to trench of friction material, friction block assemblies should be replaced. Replacement of friction plates must be replaced in pairs.

Adjust description of brake assembly: after connecting the brake and air chamber adjust arm with support pin, and then adjusting worm on adjust arm. At first, adjusting brake shoe to tighten brake drum ,then adjusting backward till when hear the sound of three "click" ,at this point the gap of brake shoe and brake hub is between 0.3 ~ 0.7mm, and the gap of the two brakes may not be more than 0.5mm.

VII. Hydraulic system

1.Data

Control valve

Lift truck type	12t~16t
Model	CDB-F20HC12-03a（2 spools） CDB-F20HC12-05e（4 spools）
type	Double-slide valve, with tilt-lock valve
Adjusting pressure	21Mpa（can lift 110% of rated load, can't lift 125% rated load）
Rated flow rate L/min	260

2.Trouble diagnoses and corrections

Main pump

Trouble	Probable cause	Corrective action
No oil from oil pump	Low oil level in tank.	Add oil to specified level.
	Clogged suction pipe or strainer.	Clean oil line and tank. If oil is dirty, change.
Low deflate pressure on oil pump.	Worn bearing damaged backup ring and O-ring.	Replace faulty parts.
	Maladjusted relief valve.	Readjust to specified pressure using pressure gauge.
	Air in oil pump.	Retighten suction side pipe. Add oil in oil tank. Check pumps oil seal. Do not operate pump until bubbles in tank disappear.
Noisy oil pump	Cavitation due to crushed suction hose or clogged strainer.	Adjust or replace crushed hose and clean strainer.
	Air being sucked from loose suction side joint.	Retighten each joint.
	Cavitation due to too high oil viscosity.	Replace with new oil having proper viscosity for temperature at which pump is to be operated. to operate when oil temperature is normal.
	Bubbles in hydraulic oil.	Determine cause of bubbles and remedy.
Oil leaking from oil pump	Faulty oil seal on pump, faulty O-ring or worn sliding surfaces on pump.	Replace faulty parts.

Control valve

Trouble	Probable cause	Corrective action
Pressure of relief valve is not steady or too low.	Loose of pressure-adjust screw.	Readjusted and retighten.
	Distorted or damaged pressure-adjust spring.	Replace.
	Worn or blocked relief valve core.	Replace or clean.
	Pump abated.	Examine and repair pump.
Fork tilt forward when control lever is used while engine is off.	Worn or damaged tilt lock valve.	Replace valve core and tilt lock valve as an assembly.
	Broken tilting lock spring.	Replace spring.
	Damaged tilt valve plunger O-ring.	Replace O-ring.
Mast is unstable when tilting forward.	Malfunctioning tilt relief valve.	Replace tilt relief valve assembly.
Lowering distance of mast is big when spool valve is in the centre.	Valve body and spool valve is worn and clearance between them is too great.	Replace spool valve with specified clearance.
	Spool valve is not in centre.	Keep being in the centre.
	Cylinder seal abated.	Examine and repair cylinder.
	Taper valve is worn or blocked by dirt.	Replace or clean taper valve.
Spool valve is not return neutral position.	Damaged or distorted reposition-spring.	Replace spring.
	Dirt exists between valve body and spool valve.	Clean.
	Blocked control device.	Adjusted.
	Not coaxial parts at reposition	Reinstall.，be coaxial
Leakage	Damaged O-ring.	Replace.
	Faulty seal of joint.	Check and retighten.
	Loose seal plate.	Clean seal plate and retighten blots.
	Loosed lock-nut of relief valve and connect-nut between plate and plate.	Tighten.

3. Pump

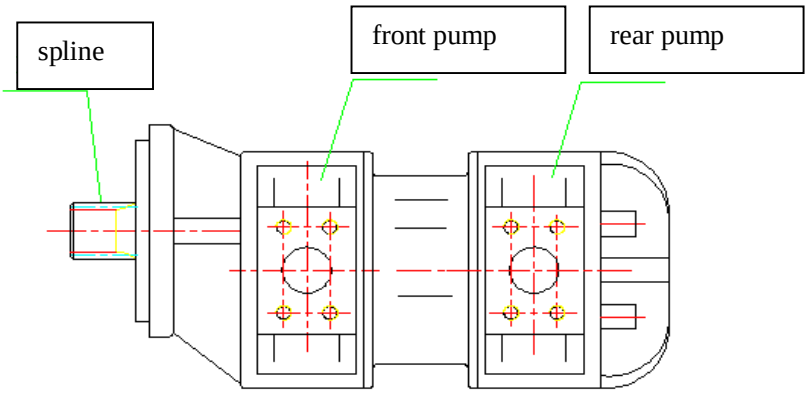


Fig 7-1 double gear pump

The CBG-Fa2050/2040-216L double gear pump is used as main pump in the hydraulic system of 12t. The CBG-Fa2063/2050-216L double gear pump is used as main pump in the hydraulic system of 14t-16t. Front pump supply control valve oil directly; rear pump connects with priority valve, ensure pump to supply steering system oil preferentially, excess flow is to control valve. This pump is full cast part with high intension; it also uses axis clearance auto compensation and radial hydraulic balance technique. It has following advantages, anti-high pressure, high reliability, high efficiency, and little noise.

4. Control valve

The control valve is section model, which is made up of input, output and slide valve. Flow valve is installed in the entrance with main relief valve.

Main relief valve is used to control the pressure of oil circuit. Its pressure has also been adjusted in the factory, so please don't adjust it at will.

Slide valve is used to control tilt hydro cylinder and lift hydro cylinder, and it can change the flux to control hydro cylinder by maneuvering the tilt and lift lever.

Tilt slide valve is equipped with front-tilt self-lock valve.

Oil from hydro cylinder returns to oil box from output, and every piece of valve is sealed by maneuver "O-ring. At the same time, there is a clappet valve.

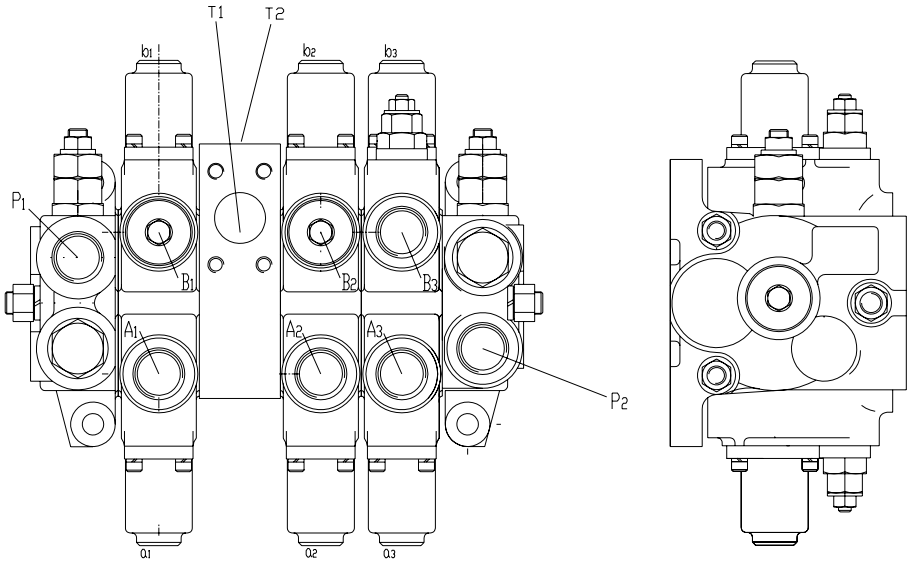


Fig.7-2 control valve,2sec

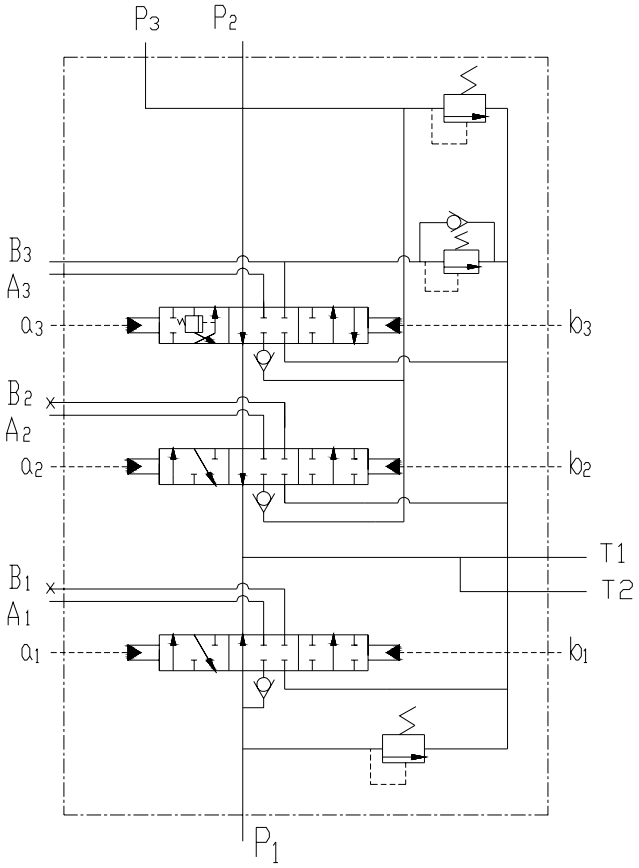


Fig.7-3 schematic diagram control valve,2sec

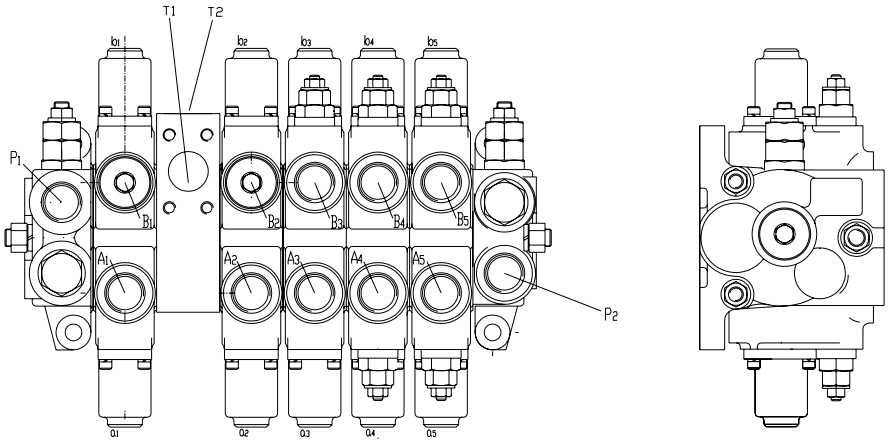


Fig.7-4 control valve,4sec

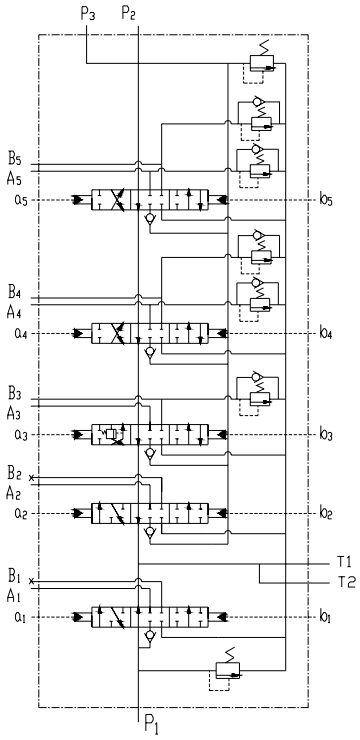


Fig.7-5 schematic diagram control valve,4sec

Safety valve pressure adjustment:

1） Truck stay at level and solid ground, pull up handle brake button, and make parking brake work.

2） Connect pressure gauge with safety valve pressure hole.

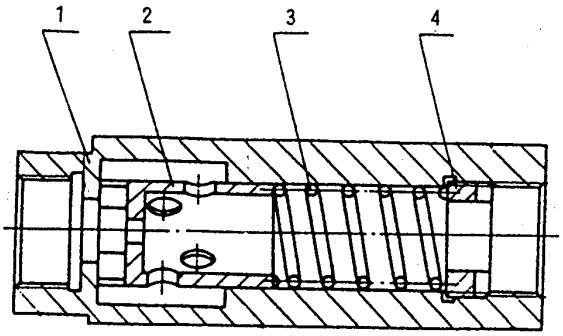
3） Start engine, run idle 2-3min.

4） Adjust safety valve's pressure; stabilize its valve at 21MPa.

5. One-way check valve

To limit the descend speed of lift hydro cylinder, install one-way governed speed

valve to control the recycle oil flux, and this can limit the descend speed of hydro cylinder and protect the circuit when lift circuit is explosion.



1. Valve body 2. Valve core 3. Spring 4. Orientation nut

Fig. 7-6 Governed speed valve

6. Hydraulic system principle diagram

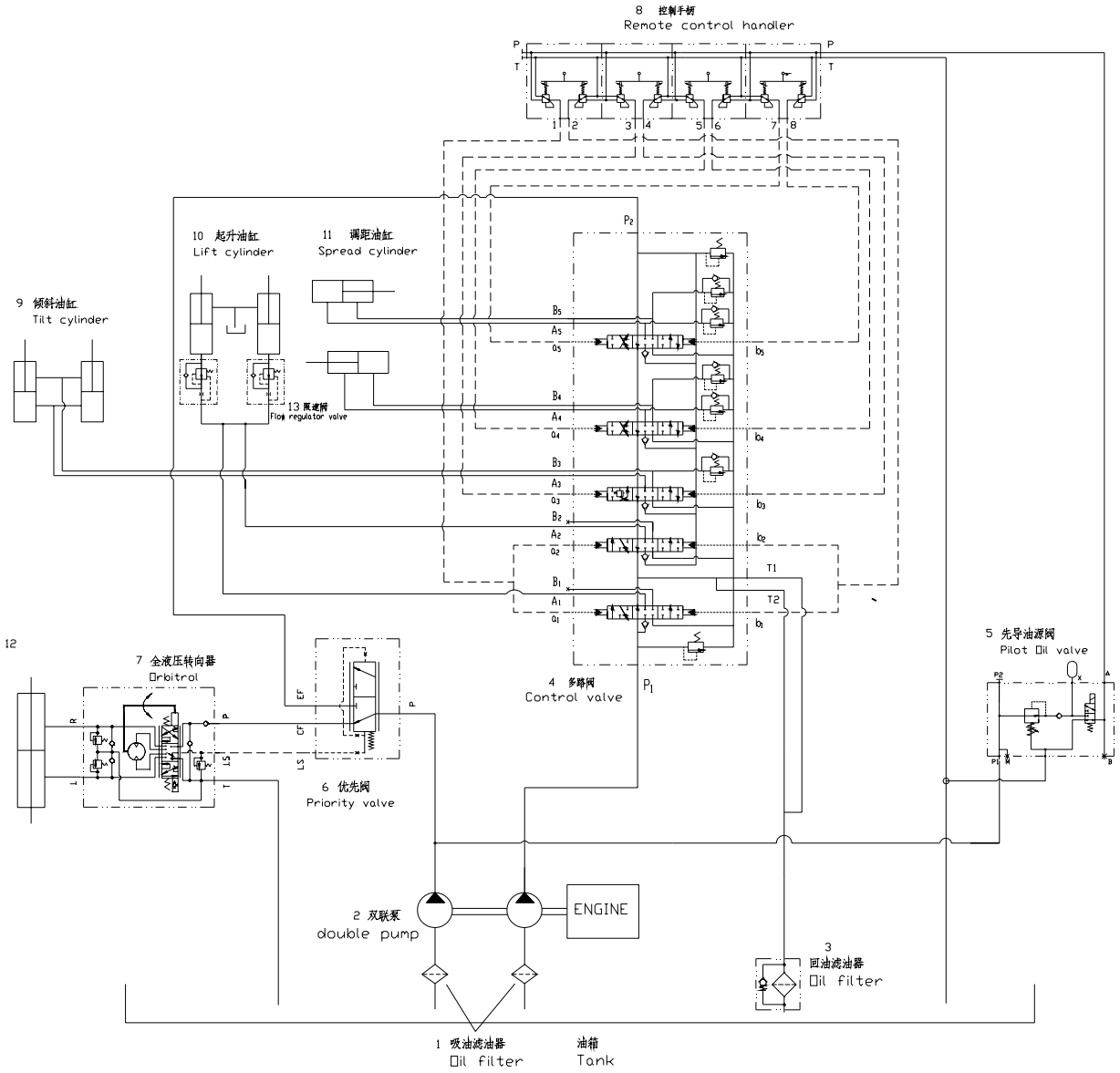


Fig.7-7 hydraulic system principle diagram

2 spools pump is the power source of hydraulic system, it supply high pressure hydraulic oil to system by engine. Front pump make oil flow to control valve, rear pump make oil flow to priority valve, distribute from priority valve to steering system , by feedback from load, according to requirement of steering, give priority to supply steering oil. After supplying steering enough flow, excess flow is distributed to control valve. When the lift and tilt valve are on the middle location, high pressure oil flow back to oil tank directly; When pushing lifting spool, it is that bottom of lifting cylinder piston connects with low pressure line and then piston rod drops by deadweight and weight of cargo. In this time, oil from lifting cylinder goes by unidirectional speed limiting valve so as to control the falling speed. When operating tilting spool, high pressure oil goes to front house of tilting cylinder and another connects with low pressure line so as to make mast tilt forward or backward.

VIII. Electrical system

CAUTION：

· To guard against a short circuit, take off jewelry ornaments and disconnect the ignition switch and battery ground cable, before starting to check any part of electrical system.

ACCOUNT

· The different colorful wire is chosen for the different part of the electrical system. To differ from different colorful wire, color is denoted by one or two letter. Identify carefully that the cable of accumulator has been disconnected before repairing the electrical system.

Cable color：

B: black	R: brown	G: green	U: blue
O: orange	R: red	W: white	Y: yellow
S: gray	P: purple		

Main wiring harness use homochromatic wire. Other wire use double color.

B/W: black and white

G/Y: green and yellow

INSPECT

Inspect all electrical circuit according wiring diagram. You should make short circuit or open circuit test with the test lamp or multimeter. Before inspection ,ensure that：

1. Each electrical component or cable is securely fastened its terminal.
2. Each terminal is firmly in place and free from rust and dirt.
3. No cable covering shows any evidence of cracks, deterioration or other damage.
4. Each terminal keeps a safety distance with adjacent metal parts.
5. Every cable is fastened to its proper connector or terminal.
6. The wiring is kept away from any adjacent parts with sharp edges.
7. The wiring disconnect to each rotating or moving parts.
8. The length of the wire linking the fixed part and unfixed part should be enough to shake.
9. The wiring keeps a safety distance with the high temperature thing such as the vent-pipe.

FUSE SYSTEM

FUSE

DISASSEMBLE

1. Turn key switch “OFF”.
2. Compact the nut on the cover of the fuse box, and open the cover.
3. Disconnect the fuse from the box.

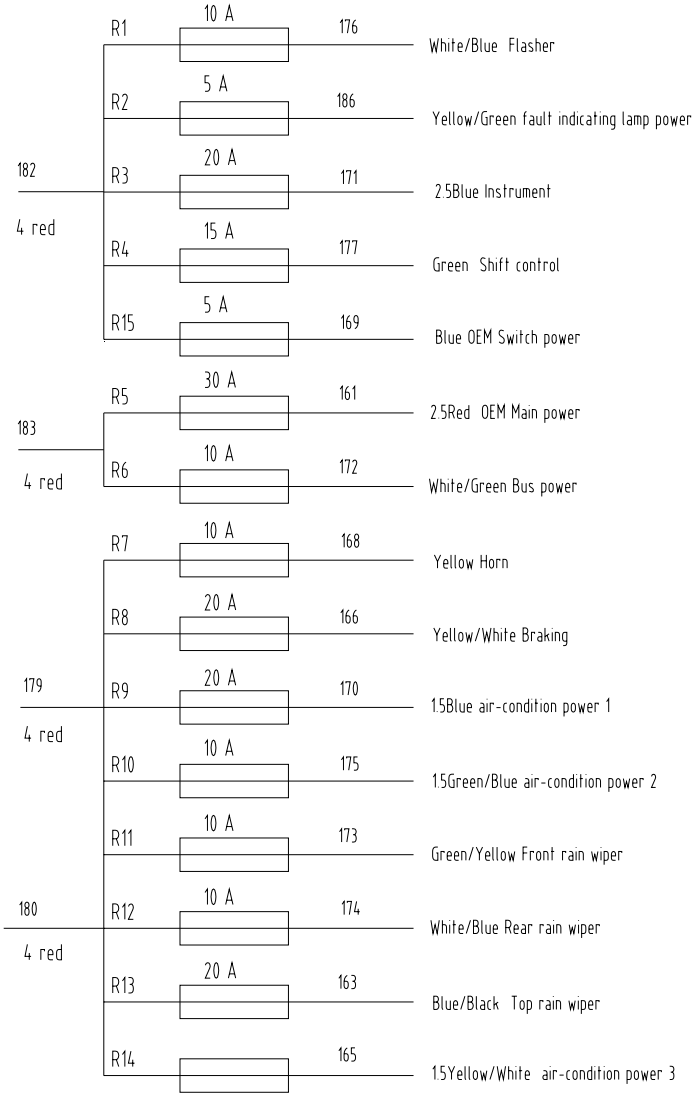
Account

If the fuse is blown，replace with new one, refer to the figure.

① If a fuse is blown，please be sure to eliminate cause of problem, then replace it.

② Never use fuse higher than specified rating.

Principle diagram



Fuse table

Location		Capacity	Application parts
1	Fuse 1	80A	Start relay,brake light,horn
2	Fuse 2	80A	key switch

LIGHTING SYSTEM

BULB SPECIFICATIONS

Location	**wattage**
Front big lamp	24V/35W
Front work lamp	24V/35W
Front and rear turn signal lamp	24V/10W/21W
Rear light/reverse lamp Combination rear lamp Turn light Reverse light Width light	24V/35W 24V/21W 24V/21W 24V/10W
Combination meter lighting Alarm light	24V/2W 24V/2W

Combination switch:

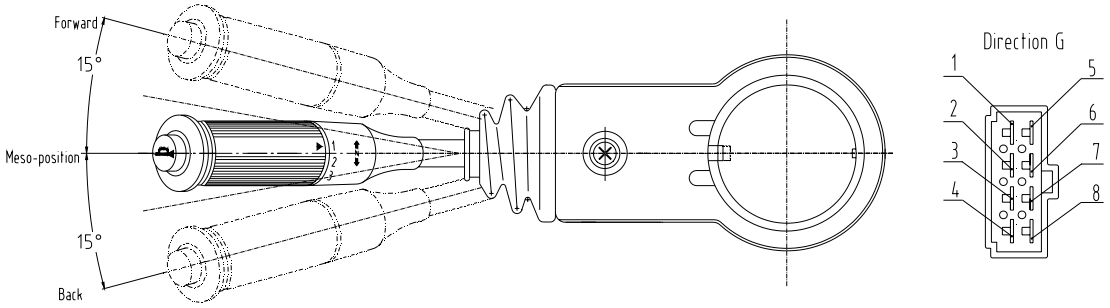
Disassemble

1. Remove the combination instrument and steering wheel.
2. Wrest the screws, and disconnect the wiring connector
3. To install reverse the order of removal.

INSPECTION

Check the continuity the location in turn signal lamp and the combination switch of lighting.

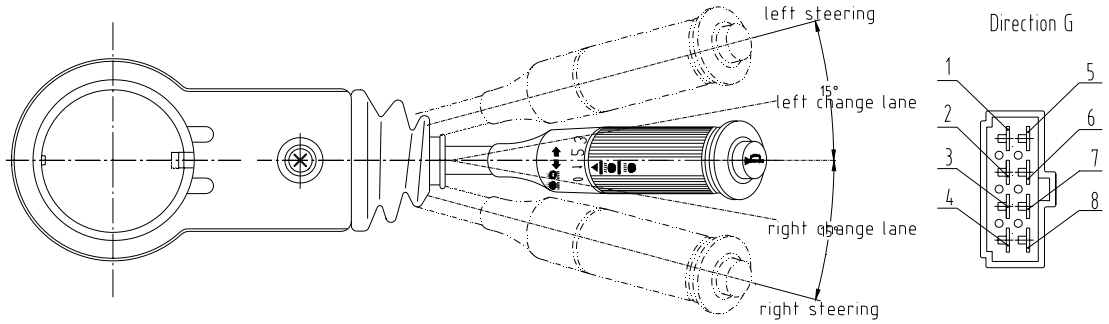
Shift handle



terminal / wire color / hand shank position	1	2	3	4	5	6	7	8
	Violet Yellow	Yellow Green	Blue Yellow	Red	Brown Yellow	Green	Grey	Black Yellow
neutral		○						
forward	○	○						
back		○	○					
3 shift				○	○			○
2 shift				○		○		○
1 shift				○			○	○

note：“○”means on。

Light combination switch handle



terminal / Wire color / Hand shank Location	1	2	3	4	5	6	7	8
	Violet Yellow	Yellow Green	Blue Yellow	Red	Brown Yellow	Green	Grey	Black-Yellow Yellow
Turn left	○	○						
Turn right		○	○					
Go straight		○						
0				○				
1				○	○			○
2				○		○		○
3				○			○	○

note：“○”means on。

Work light: head big light, head small light, front work light, rear work light/reverse light, combination rear light.

REMOVAL & INSTALL

1. Remove securing nuts of the big lamp
2. Take apart the wiring connector
3. Remove bolt、lens, then replace faulty bulb with new one.
4. To install, reverse the order of removal.

Meter, sensor and relay

Check whether relay circuit is on or not, connect or disconnect with ring as appropriate voltage(supply by battery) ,then uses multimeter (Ω)to check whether contact loop is on or not.

REMOVE & INSTALL

INSTRUMENT ASSEMBLY

1. Remove fixing bolt of instrument cover.
2. Open the instrument cover, see fig follow, disconnects the wiring connector of instrument and key switch. Never wash the electrical system using water and water vapour after you connect the instrument to the electrical system.
3. To install, reverse the order of removal.
4. To install, reverse the order of removal.

Oil pressure gauge 、water temp. gauge、hour meter and warning lamp

1. Remove the fixing bolt of panel, and take apart panel form cover of panel.
2. Remove the bolt from PC
3. Remove the fixing bolt of instrument from PC, and remove the instrument.
4. Remove the caution light from the PC, (all of caution light can be removed from the combinational instrument).
5. To install, reverse the order of removal.

Key (start) switch

Remove the combinational instrument

1. Disconnect the wiring connector.
2. Remove the ring nut, washer, spacer, meter panel.
3. To install, reverse the order of removal.
4. To install, reverse the order of removal.

INSPECT

Check the continuity between terminals with multimeter.

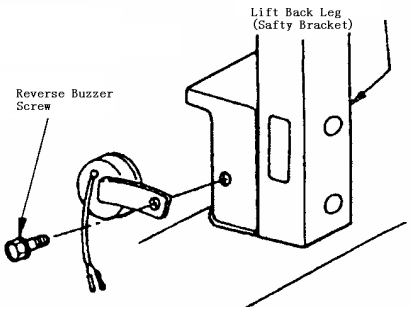
shift	rated load(A) / code	B1	B2	M	S	G1	G2
preheat	30	○	○			○	
off		○	○				
run	20	○	○	○			
start	50	○	○	○	○		○

Note: "○"means on.

REVERSE BUZZER

REMOVE & INSTALL

1. Disconnect the wiring connector, and then remove the bolt.
2. To install, reverse the order of removal



HORN

REMOVE & INSTALL

1. Remove the wiring connector of the horn
2. Remove the bolt and horn.
3. To install, reverse the order of removal.

Instrument inspect

name	purpose	Graduation arrange	Normal	remark
water temperature meter	Engine cool water temperature	40℃-55℃ yellow 55℃-110℃ green 110℃-120℃ red	Green zone	Cease and check when point is near red zone
oil capacity meter	Engine fuel capacity	0-1/10 red 1/10-1 green	Green zone	Adding oil when point is near red zone
timing meter	Accumulative total engine operate time	4 integers, 1 decimal fraction		
oil pressure meter	Engine lubricate grease pressure	0～0.2～0.4～0.8MPa	≥0.1 MPa	< 0.1 Mpa cease and check

WARNING LAMP INSPECT

Description	Function	Lamp light（warning）	Light blank (normal)	Remarks
Charge warning lamp	Indicate the alternator voltage up to its rate, whether charge battery or not.	The alternator doesn't generate electricity or voltage is lower , without inflating.	The alternator is at normal condition	When running at idle speed, the light turns off because voltage is high.
Brake warning lamp	It indicates the accumulator's oil pressure	The oil pressure of accumulator is low.		When light turns on, you should check the oil pipe.

Repair of starter/dynamotor

starter		
phenomenon	reason	settlement
Not rotate	Battery capacity is not enough	Change battery or charge
	Electric circuit break	Repair or change electrical layout, starter delay and so on
	Electromagnetism switch shatter	Change and repair electromagnetism switch
	Pinion doesn't joggle well with line roll gear	Change or repair
	Brush doesn't contract well	Adjust brush location, clean the surface of brush
	Brush abrasion	change
	Armature circuit break	Change armature circuit
Starter rotates but the engine can't rotate	Pinion doesn't work well	change
	line roll gear shaft isn't good	repair

Dynamotor			
phenomenon		reason	settlement
Charge indicator shine	Can't charge	Adjuster shatter	Change shatter
		Magnetic field connection shatter	change
		Diode shatter	change
		Reed lead break or contact badness	Repair or change
		Fuse shatter	Repair
	Charge current is small	Surge magnet circuit shatter	change
		Diode shatter	change
		Reed lead contact badness	Repair or change
		Electricity load is too high	Reduce electricity load
		Strap strain badness	Adjust
	Change current too big	Adjuster shatter Current output circuit fastener loose	Change Repair
	Battery liquid surface descend	Battery shatter	Change or add liquid
others	Dynamotor sound abnormal	Adjuster shatter	Change
		Bearing/brush don't contact well	Repair or change
		Strap strain badness	Adjust

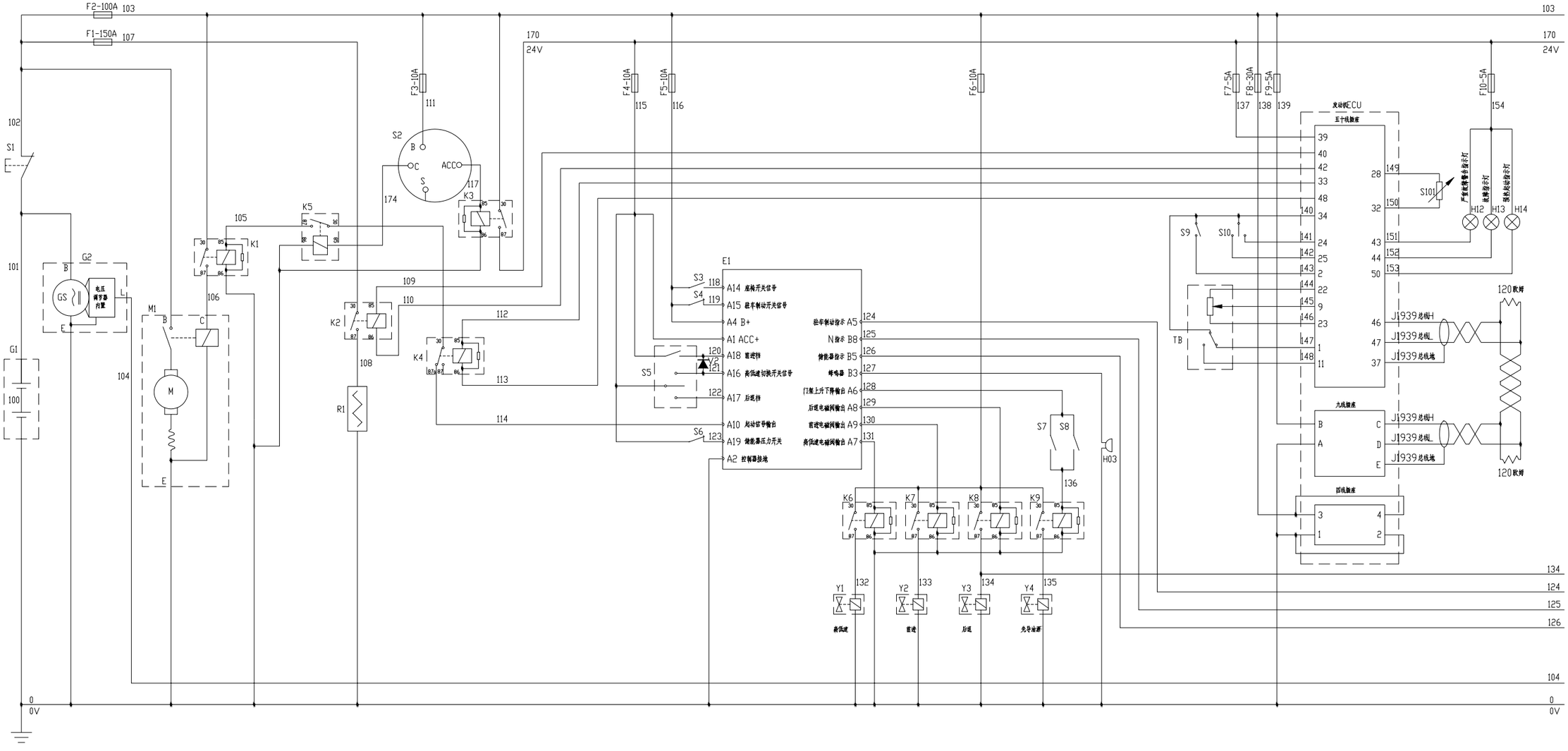


Fig 8-1 CPCD120/140/160-XW25 electrical system(Ⅰ)

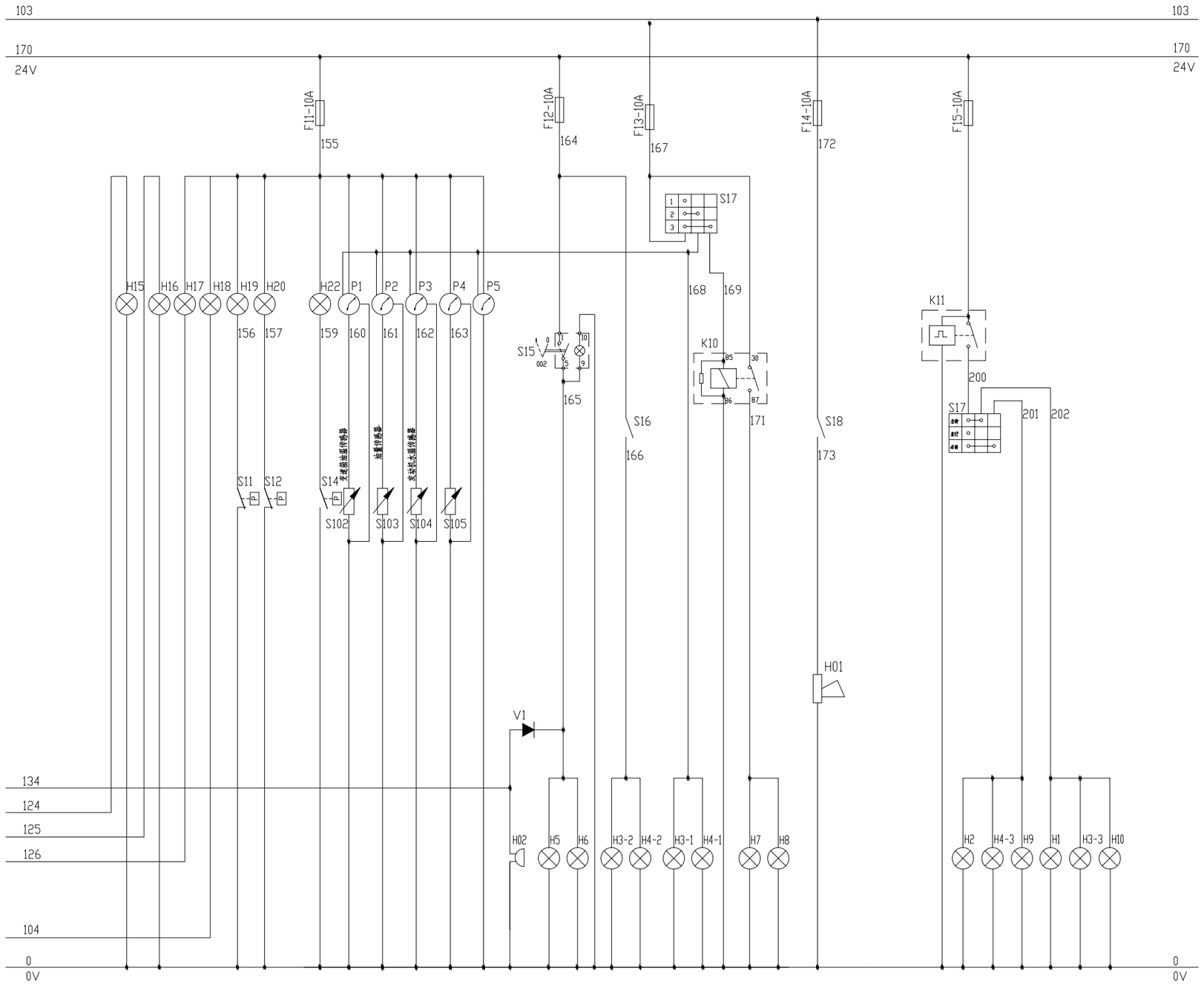


Fig 8-2 CPCD120/140/160-XW25 electrical system(Ⅱ)

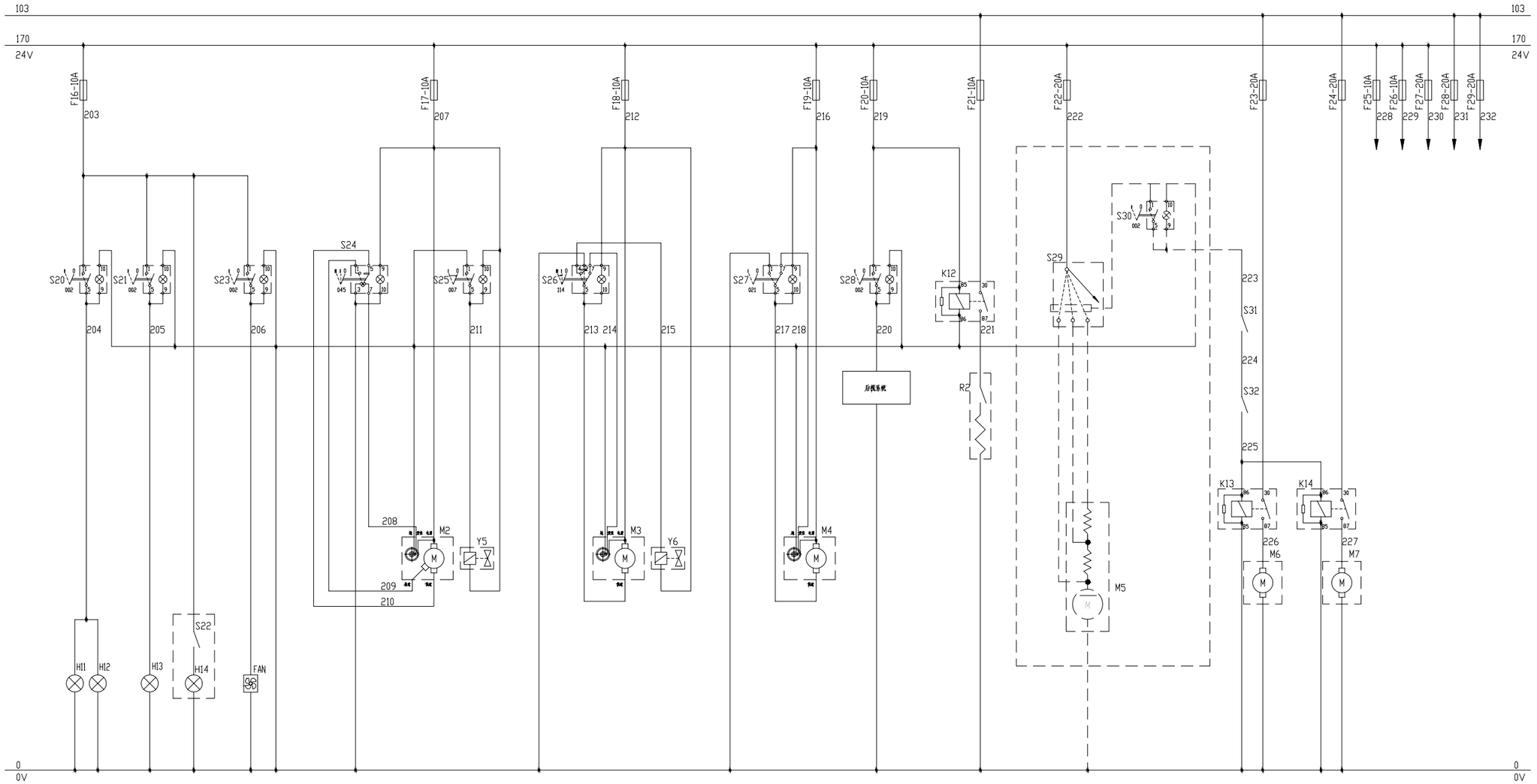


Fig 8-3 CPCD120/140/160-XW25 electrical system(Ⅲ)

IX. Lifting system

1. Assemble debugging data

Debugging data Double mast

Mast type		**Standard type and lifting height of 3～4.5 meter**	**Lifting height >4.5～5 meter**	**Lifting height > 5～6.5 meter**
Mast tilting angle	Forward	6^0	6^0	3^0
	Backward	12^0	6^0	6^0
Fork arm carrier		Adopt combination roller and side roller.		

Inspection and adjustment

Place	Assembly clearance	Repair clearance（mm）
Mast to lift roller	0.3～1.25	0.4～1.4
Mast to bearing board	0.2～1	0.3～1.2
Inner mast to carriage side	0.3～1.25	0.4～1.4
Lift chain deflection	25～30 mm	

Tightening torque

Place	Model or Lifting capacity	N·m
Lift chain lock nut	Small 16t	4000～4300 (M45×3)
Mast support cap blot		58～78（M12）
Lift cylinder bolt		638～850（M24）
Lift cylinder fixing bolt（U type）		189～252（M16）

	Mast dimension (mm×mm×mm)	weight（kg）
16t	3030×2370×895	4800

2. Failure diagnose and corrections

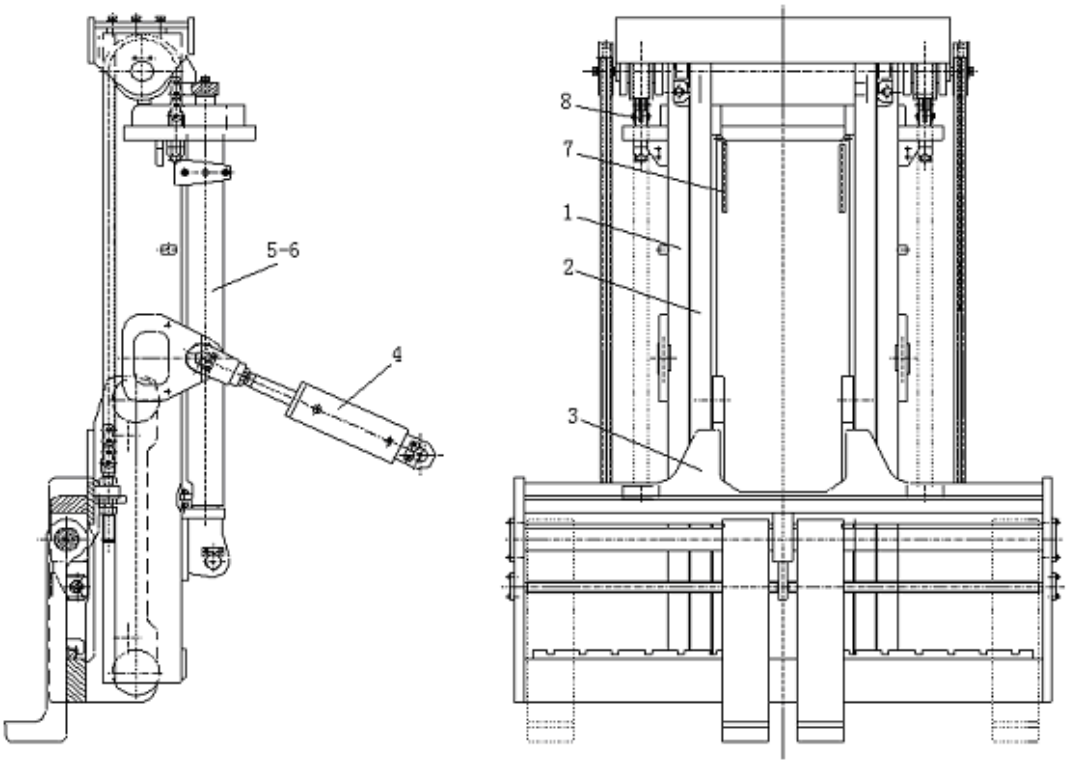
Condition	Probable cause	Corrective action
Fork arm carrier or mast tilt by itself.	1.Tilt cylinder and ring abraded excessively	Replace piston ring tilt cylinder.
	2. The hydraulic control valve spring is inoperative.	Replace it.
The fork arms carrier moves up and down sluggishly.	1. Caused by piston jamming or bent piston rod.	Replace the faulty parts.
	2. Too much dirt is accumulated in the cylinder.	Strip it down and clean.
Forks are lifted or lowered unsmooth.	1. Carriage bracket assembly out of adjustment.	Adjust clearance with thrust metal and carriage side roller.
	2. Insufficient clearance between inner and outer masts or rollers and mast.	Adjust clearance with rollers.
	3. Biting foreign materials between moving part.	Remove foreign materials.
	4. Insufficient lubrication.	Apply grease on contact surfaces of sliding parts.（butter）
	5. Bent carriage bracket assembly.	Repair or replace.
Forks are lifted unevenly	1. Lift chains out of adjustable.	Adjust lift chains.
Lift roller does not rotate	1. Grease stiffened or dirt accumulated on lift roller and mast sliding surfaces.	Clean and lubricate lift rollers.
	2. Improperly adjusted lift roller.	Adjust.
Excessive mast noise	1. Insufficient lubrication.	Lubricate.
	2. Improperly adjusted lift roller, side roller and back-up metal.	Adjust.
Insufficient lift power or no lift movement.	1. Excessive wear occurs between the oil pump body and gears, causing too much clearance.	Replace the worn parts or the oil pump.
	2. The lifting jack piston Yx-ring has worn, resulting in excessive inner leaks.	Replace Yx-ring.
	3. Springs of the multiple control valves and its relief valve are inoperative oil leaks.	Replace.
	4. Excessive wear occurs of the hydraulic control valve, resulting in excessive oil leaks.	Replace.
	5. Oil leaks occur between the hydraulic control valve sections.	Dismantle for regrinding the joint surfaces and reassemble the valve.
	6. Leakage occurs in the hydraulic pipe.	Tighten the joint nuts and inspect the seal for damage.
	7. The hydraulic oil temperature is too high. Oil viscosity is too low and the rate is insufficient.	Change the wrong hydraulic oil or stop operation for reducing the oil temperature. Find out the reasons for high oil temperature and eliminate the trouble.
	8. The load carried is beyond the designed capacity.	Observe the lifting capacity limit.
Forks does not adjust setting-up	1. The ring of Setting-up cylinder and ring abraded excessively	Replace ring
	2 Fork's shaft rust seriously	Clean and lubricate
	3. Fork is turn back by foreign materials	Clean

Double high visibility mast

Double mast is composed of outer mast which can't lift and inner mast which can lift. Lifting jack bottom is fixed on outer mast below cross beam, oriented with pin. Piston rod extremity is joined with upper cross beam of inner mast; cylinder body is fixed on outer mast fixation board with U-bolt. Commonly free lift range is 200mm, which is difference with different tonnage. Two lifting jacks are laid out back of outer mast to realize high visibility.

Fork arm is hung on fork arm carrier by hook. roller and side roller are installed on the fork arm carrier. The roller and side roller are also installed on bottom of inner mast.

Pressure oil from hydraulic control valve is entered into lifting jack by unidirectional speed limiting valve, forced piston and piston rod rising, thereby forced inner mast rising. At the same time one end of lifting chain on inner mast is fixed on outer mast, the other is joined with fork arm carrier. Fork arm carrier and fork arm is rising with inner mast rising to realize aim of lifting goods.



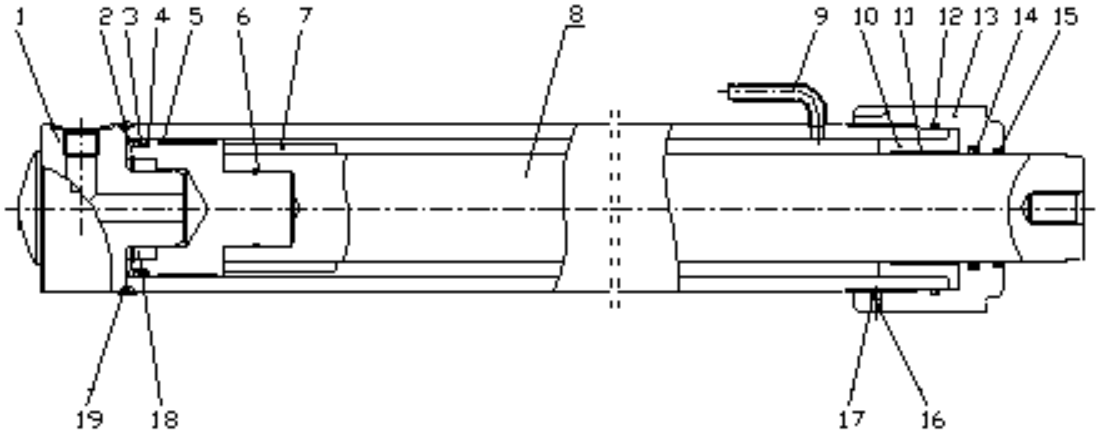
1.Outer mast 2.Inner mast 3.Fork arm carrier 4.Tilt cylinder

5. Left lift cylinder 6.Right lift cylinder 7.Lift oil circuit 8. Chain

Fig 9-1 Double high visibility mast

Lift cylinder

Lift cylinder is single-action piston mode, and it composes of cylinder head, piston rod, cylinder block, piston etc. Caution when using:1,avoid damaging piston rod, and keep seal ring seal well;2, if piston rod's surface has exudates oil when uses normally, please check whether piston rod's surface has woolly grain or not, can change o-ring seal and piston.

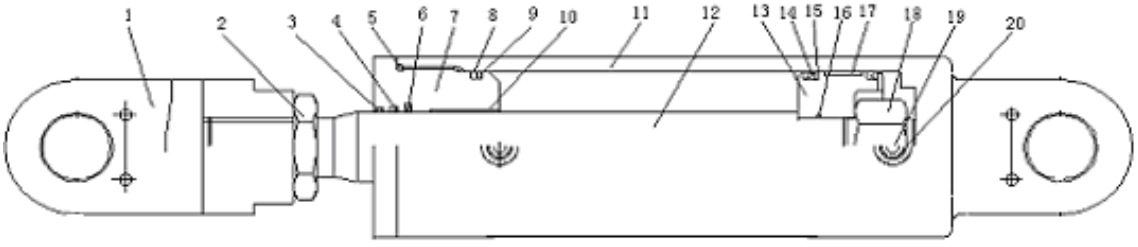


1. Cylinder blocks 2. Piston 3. Seal ring 4. Catch 5. Support ring 6.Check ring
7. Separated sets 8. Piston rod 9. oil return pipe 10. Bearing block
11. Steel Backing bearing 12. O-ring seal 13.cylinder head 14.Seal ring
15. Dust ring 16.Bolt 17.Plug 18.Bush 19. Check ring

Fig.9-2 lift cylinder

Tilt cylinder

Tilt cylinder is double-action piston mode, when the rake angle of front and rear is not accord with its requirement, or the cation of two cylinder piston do not move in the same time, can adjust the nut location of piston rod to reach requirement, then lock the nut. The caution is same with lift cylinder.



1. Tier rod 2.Thin nut 3.Dust ring 4. Seal ring 5. O-ring seal
6.Site seal 7.guide sleeve 8.check ring 9.O-ring seal 10. Steel back bearing
11.Cylinder block 12.Piston rod 13.piston 14. Seal ring 15. Check ring
16.O-ring seal 17. Support ring 18. Slotted nut 19. Pin 20. Joint

Fig. 9-3 tilt cylinder

Load backrest extension

Load backrest extensions have height, width, and size openings sufficient to minimize the possibility of the load falling toward the mast when the mast is in a position of maximum rearward tilt.

The size of openings in the load backrest extension not exceed 150 mm in one of the two dimensions.

The installing holes of load backrest extension see the following fig.

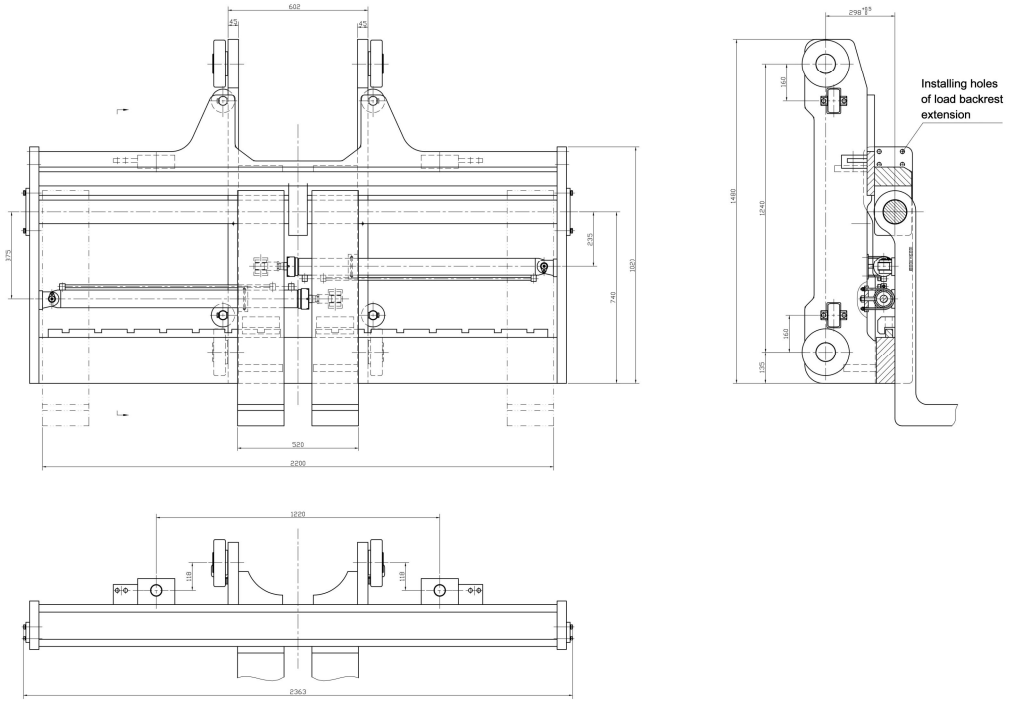


Fig. 9-4 Load backrest extension