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Chapter 1 Uses, product features and main performance parameters

1. Use and product characteristics

The new generation of off-road forklift developed by our company has advanced performance, reasonable structure, convenient operation and maintenance, which is suitable for hydraulic engineering, municipal construction, coal, sand and stone yards, stations, docks, warehouses and other industrial and mining enterprises to fork loose materials, and can be transported for short distances.

1, the machine transmission system one is mechanical transmission; One is hydraulic mechanical transmission. The hydraulic mechanical transmission device is composed of hydraulic torque converter and power shift transmission. The torque converter is matched with the engine to make full use of the engine power and increase the input torque of the engine to make the whole machine have greater tractive force.

The transmission with torque converter has the following advantages: (1) the off-road forklift truck has automatic adaptability. When the external load suddenly increases, the tractive force can be automatically increased to overcome the increased external load. At the same time, the vehicle automatically reduces the speed to avoid the continued increase of the external load and avoid the engine flameout due to the sudden increase of the external load. On the contrary, when the external load is reduced, the vehicle automatically reduces the traction force and increases the speed of the vehicle. (2) Because the working medium of hydraulic transmission is liquid, it can absorb and eliminate vibration and shock from the engine and load. Thus, the engine and transmission are protected, and the life of the forklift is improved. (3) The transmission system equipped with a torque converter can make the off-road forklift drive at any small speed, thereby improving the passability of the vehicle. (4) The off-road forklift is equipped with a torque converter, which can start smoothly and achieve stepless speed change in a large speed range, which can absorb vibration and shock, and improve the comfort of the vehicle. (5) Simplify the operation of off-road forklift trucks and reduce the labor intensity of drivers. Power shift transmission is fixed shaft type, simple and compact structure, small size, easy maintenance. In addition, the shift is light and smooth. After it is assembled with the torque converter, the transmission system has a larger transmission range and better efficiency.

2, the whole machine is connected to the dumping frame, using full hydraulic load sensing steering gear and priority valve composed of full hydraulic load sensing steering system, which is characterized by light steering, flexible and reliable. No matter the size of the steering load, the steering wheel speed is high or low, it can maintain smooth steering. And the whole working process makes full use of the output flow of the oil pump, avoids power loss, and improves the efficiency of the system.

3, the use of wide base low-pressure tires - four-wheel drive, therefore, the traction is large. In addition, due to the use of wide base low pressure tires, improve the passing performance in swamps and soft ground.

Second, the main technical parameters of off-road forklift truck (see the nameplate of off-road forklift truck)

Due to the continuous updating and improvement of the product, we reserve the right to change the parameters and design without prior notice to the user.

The product configuration and technical parameters are different from the actual model. The product configuration and technical parameters shall prevail.

Chapter two main components structure principle and installation adjustment

First, engine system

It mainly includes engine, air filter, radiator, silencer and throttle control system.

1. Engine

The off-road forklift uses the best environmental power. For the structure, performance parameters, use and technical maintenance of the diesel engine, please refer to the diesel engine operating manual.

2, air filter: filter dust and other impurities in the air to improve cylinder liner, piston life.

3, radiator: radiator assembly is composed of water radiator, transmission oil radiator and diesel engine oil radiator, respectively, the circulating water, transmission oil, oil for forced heat dissipation.

4, silencer: reduce diesel exhaust noise, reduce the environmental impact.

The friction surface of the clutch is not allowed to be stained with oil. If oil is stained with kerosene, it should be cleaned and used after cooling and drying, otherwise it will cause the close to slip and accelerate wear.

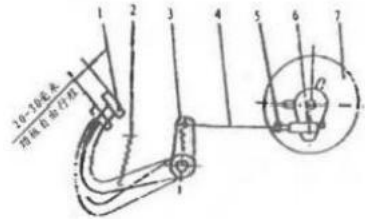


Figure 2-4 Schematic diagram of the clutch operating mechanism

1. Clutch pedal 2. Return spring 3. Drive shaft 4. Clutch pull rod 5. Fastening nut 6. Tie rod connector 7. Clutch tape wheel

2. Clutch adjustment

During the use of the clutch, the parts continue to wear and deform, especially the wear of the driven disc, so that the clearance of the separation lever separation shaft bearing is reduced, so that the three separation lever heads are not on the same plane, and may even make the separation lever head contact with the separation shaft bearing end face, resulting in incomplete clutch separation or slip and other phenomena, so the clutch must be adjusted regularly.

In the case of foot pedal return, the clearance between the end of the separation bearing 1 and the end of the separation lever 3 is 0.5 ± 0.2 mm, see (Figure 2-4) the end of the three separation levers 3 (in contact with the separation bearing), must be ensured in the same turning plane, if not meet the requirements, can be adjusted by adjusting the nut 4 on the screw 5.

Due to the wear of the friction disc of the clutch driven disc, the free travel of the clutch pedal will be correspondingly reduced. If it is not adjusted in time, it will also make the clutch slip and accelerate the wear of the friction sheet, so it should also be adjusted regularly in use. By adjusting the working length of the pull rod 4, the free travel of the pedal can be changed, and the free travel of the pedal is normally 20-30 mm. After adjustment, install the pin, cotter pin and tighten the fastening nut.

3 Gearbox

The transmission part of the gearbox consists of six forward gears and one reverse gear combined with the main and secondary gears. The transmission route is shown in Figure 2-5.

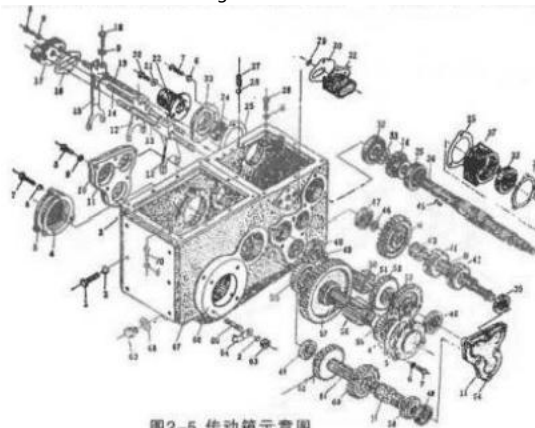


图2-5 传动轴示意图

5. Gland 10.11, III, IV shaft left bearing cover 12.1 VI shaft shift fork 13.1, III, VI gear slide rod 14.11, V gear slide rod 15. Secondary shift fork 17. Slide rod left cover 19. Secondary shift slide rod 22. Power output shaft cover 23. Pressure difference 24. Oil seal SD30×50×1026. Steel ball 27. Spring 28. Bolt M10×3029, interlocking round pin 31. Slide rod oil cap 32, rolling bearing 30633. Retaining ring 34. Shaft gear 35. Rolling bearing 10836.1 Shaft 37. Bearing sleeve 39. Rolling bearing 205401 reverse gear 41. Secondary speed gear 42. Shaft sleeve 43. Shaft sleeve 44. Secondary speed gear 45. Key A8×3546. Stop ring 47. Rolling bearing 10220548. Rolling bearing 30549. IV shaft sleeve 50. Reduction pinion 51. IV shaft 52.11, V slip gear 53.1, III, IV, VI slip gear 54.11, III, IV shaft left bearing cover 55. Rolling bearing 30756. V shaft 57. Reduction gear 58.1, III gear wheel 59. Shaft sleeve 60.11, V gear 61, III shaft 62, auxiliary change sliding gear 63. Nut M1265. Shaft tube fastening bolt 67. Gearbox 69. Oil plug

(2) Transmission shaft

(3) There is an oil nozzle on the universal joint cross shaft, and lubricating grease should be injected every 150 hours.

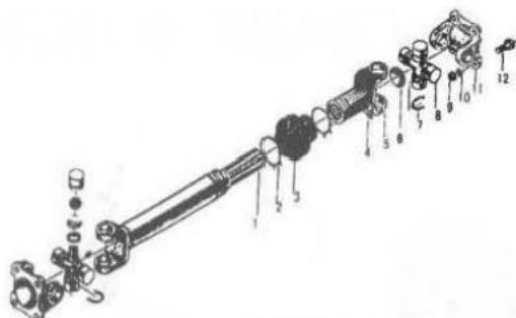


Figure 2-6 Drive shaft

1, shaft tube assembly 2, sheath fastening ring 3, spline sheath 4, oil cup M65, casing fork 6, casing fork plug cover
7, cross shaft clamp ring 8, cross shaft assembly 9, M10x110, spring washer 11, flange fork 12, bolts

(3) Drive axle

The main and passive gears in the drive axle have been selected according to the contact standard, so they can be used for a long time without adjustment, and the original axle needs to be adjusted only when replacing damaged parts or moving due to wear of parts. When adjusting

Note the following:

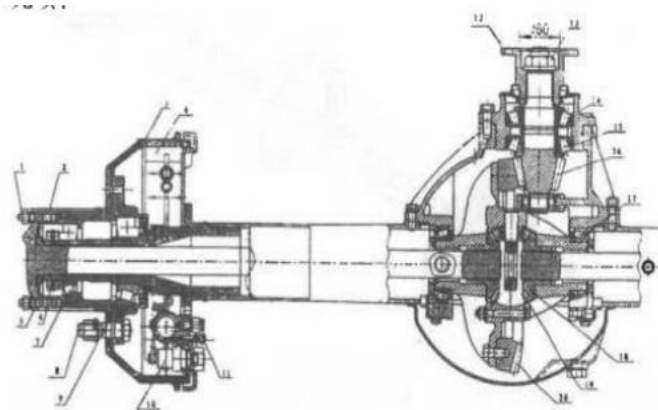


Figure 2-7 Drive axle

1, half shaft bolt 2, wheel hub 3, brake hub 4, shoe (Beijing 130)5, oil seal 49x(100, 102)6, lock mother 7, bearing 75118, tire bolt
9, bearing 781310, brake pump (Beijing 130)11, air relief valve 12, drive shaft adapter 13, nut 14, bearing 2730915, bearing
27522, 2959016, main bevel gear 17, bearing 29590, 2952218, half shaft gear 19, planetary gear 20, passive bevel gear

(1) The bearing clearance of the driving gear is adjusted by the cushion behind the inner seat ring of the inner bearing of the driving gear, which should have no clearance and be able to rotate freely after adjustment.

(2) The tooth side clearance of the main and passive gears, when measured around the flange radius of the driving gear 45mm, the displacement (arc length) should be between 0.2-0.6mm.

(3) After every 100 hours of driving, check the driving axle oil level, the correct parking surface is not less than 10mm lower edge of the refueling port, and it is necessary to add, after every 300 hours of driving, the gear oil should be replaced, and the machine should add 18 hyperbolic gear oil.

(4) After every 100 hours of driving, the wheel housing bearing grease should be replaced once, and the bearing pretightness should be adjusted until appropriate.

(B) Hydraulic transmission system

The transmission parts between the power device and the driving wheel are called the transmission system, and its function is to transmit the power output from the power device to the driving wheel; The transmission system of the machine is mainly composed of diesel engine, hydraulic torque converter, fixed-shaft power shift transmission, front and rear transmission shaft and front and rear drive axle. See 2-10 for transmission system diagram.

The front and rear transmission shafts are modified with NJ130 automobile transmission shafts.

The functions of the main components in the transmission system are described as follows:

Hydraulic torque converter: can make the transmission system has a certain automatic adaptability, that is, with the increase of external load, the speed of the torque converter output shaft automatically decreases, while the torque automatically increases; On the contrary, when the external load is reduced, the speed of the torque converter output shaft automatically increases, and the torque automatically decreases. Therefore, it is equivalent to an automatically adjusted continuously variable transmission within a certain range, and the number of gears of the gearbox can be reduced accordingly.

Off-road forklift truck is equipped with hydraulic torque converter, eliminating the main clutch, it also eliminates the process of operating the main clutch, and the automatic adaptability of the hydraulic torque converter, so that the number of shift is greatly reduced, the fatigue of the driver is greatly reduced, and because of the automatic adaptability of the hydraulic torque converter, the average speed of the off-road forklift truck is improved.

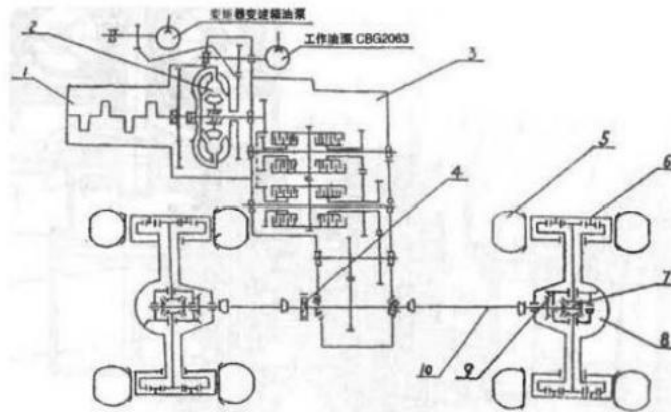


Figure 2-10 Schematic diagram of the hydraulic transmission system

1, diesel engine 2, torque converter 3, transmission 4, hand brake 5, wheel 6, wheel reducer
7, differential 8, drive axle 9, main transmission 10, drive shaft

In addition, the torque converter power is transmitted through the oil, the liquid can absorb and eliminate the vibration and impact from the diesel engine or external load when the power is transmitted, thus protecting the engine and improving the service life of the transmission system and the driver's comfort.

The main function of the gearbox is to efficiently change the transmission ratio between the engine and the drive wheel, thus changing the operating speed and traction of the off-road forklift to meet the needs of the operation and operating conditions. The gearbox can move the off-road forklift forward and backward, and can also cut power to the transmission system when in a high position.

The function of the universal drive shaft is mainly to transmit the power output of the gearbox to the far front and rear drive axle. Even if the axis of the active bevel gear in the main transmission of the front and rear axle and the axis of the transmission output shaft cannot be strictly guaranteed to have the same center line and there is installation error, frame deformation or axis deflection, etc., it can still ensure that the transmission of power is not affected.

The function of the drive axle is to change the direction of the transmission torque through the drive bevel gear that is vertically installed and the driven bevel gear that is engaged with it (the transmission torque axis is 90° direction), and reduce the speed of the transmission output shaft through the main transmission on the bridge. The torque is increased, decelerated through the differential, axle and wheel side, and further reduced to transfer power to the individual drive wheels. In addition, the drive axle housing also plays the role of load-bearing and force transmission. It can be seen that the use of hydraulic mechanical transmission system ensures that the operation can have enough automatic adaptation performance, thus greatly improving the productivity of the operation process, improving the operating conditions of the driver, reducing the driver's labor intensity, and improving the driver's comfort.

1. Hydraulic mechanical transmission (torque converter - transmission)

The hydraulic mechanical transmission is composed of two parts of the hydraulic torque converter and the fixed-shaft power shift transmission of the two gears forward and backward. They are an inseparable whole, which is briefly described as follows:

1. Brief description of structure (see Figure 2-11)

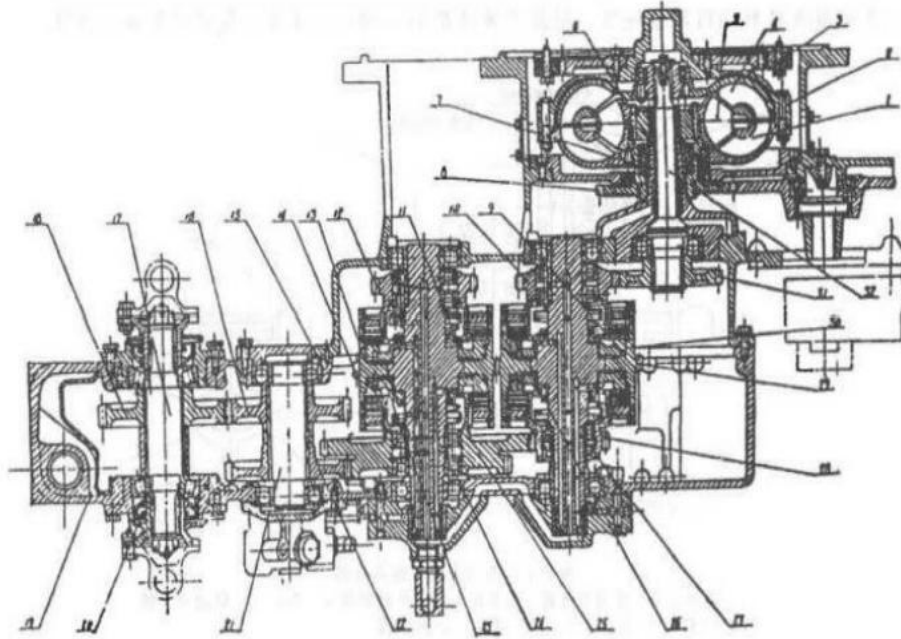


Figure 2-11 Torque converter - transmission box

1. Pump wheel 2. Pump wheel cover 3. Tooth ring 4. Turbine 5. Guide wheel 6. Guide wheel seat 7. Pump wheel hub 8. 31. Drive gear 9 forward gear piston 10. 12. 14. 16. 18. 22. 28. 29. Gear wheel
 11. Reverse gear piston 13. 30. Clutch housing 15. Housing 17. Output shaft 19. Oil baffle 20. Oil seal 21. Intermediate shaft 23. Second gear piston 24. 27. Clutch
 Shaft assembly 25. Double gear 26. First gear piston 32. Vortex shaft

The pump wheel (1) and the pump wheel cover (2) are bolted together to form a closed body. One end of it is connected with the engine flywheel through an elastic plate (3), and the other end, that is, the pump wheel, is supported on the guide wheel seat (6) through a ball bearing. In this enclosure, a turbine (4) and a guide wheel (5) are installed. The turbine is connected to the vortex shaft (32) by involute splines, and the guide wheel (5) is connected to the guide wheel seat by involute splines, and the guide wheel seat (6) is bolted to the torque converter housing. The main gear (8) of the pump is connected to the pump shaft (7) by an involute spline, and the driving gear (8) drives the passive gear.

Then the variable speed pump and the working device pump are driven by the spline sleeve. The transmission input gear (31) is connected to the turbine shaft (32) by an involute spline. The transmission body has a forward low gear shaft clutch assembly (27) and a backward high gear shaft clutch assembly (24). The follower plate of the discoupling is arranged on the inner splines of the clutch housing (30) and (13) respectively by involute splines, and the clutch master moving plate is arranged on the outer splines of the gears (10), (23), (12) and double gears (25) respectively by involute splines. The gears (22) and (16) are mounted on the intermediate shaft (21) by involute splines. The teeth (18) are mounted on the output shaft (17) by involute splines, and the gear (16) is engaged with (18).

The front end of the transmission output shaft is equipped with a hand brake device, and the upper part of the transmission and the hydraulic converter housing are equipped with a variable speed oil pump and a working device oil pump. In the lower part of the gearbox housing, the suction pipe of the variable speed oil pump is equipped with a filter screen, and there are magnets and oil drain plugs nearby.

2. Working process (see Figure 2-11)

The power from the engine drives the hydraulic torque converter pump wheel (1) to rotate through the elastic plate (3), converting the mechanical energy into the kinetic energy of the liquid body, so that the liquid flows into the turbine (4) at a high speed, and the liquid flows around the turbine blade to form a pressure difference. It also drives the turbine to rotate, even though the kinetic energy of the liquid is converted into mechanical energy and transported through the turbine shaft. After flowing out of the turbine, the liquid enters the guide wheel (5) When the working liquid changes its rotating motion after passing through the guide wheel, the working liquid exerts a torque on the guide wheel, and the guide wheel exerts an equal and opposite reaction torque on the working liquid. The torque converter is used to change the torque.

When the speed joystick and the reversing joystick are in a neutral position (i.e. neutral), the gears (31), (10) and (12) are idling, and the power from the turbine cannot be output, so the car stops moving.

When the reversing control lever is in the forward position and the speed control lever is in the low gear position, the pressure oil (1.2MPa~1.4MPa) from the main pressure regulator valve on the torque converter housing enters the transmission control valve, and the pressure oil from the control valve passes through the pipeline and the forward low gear through the oil end cover, and enters the clutch piston through the oil channel in the center hole of the clutch housing shaft. The piston moves under pressure to engage the main and slave friction plates of the clutch. The power input by the input gear (31) is transmitted to the output shaft (17) through the gear (12), (14), (29), (28), (25), (22), (16), (18) to drive the front and rear transmission shaft to rotate. And then through the front and rear drive axle drive wheel rotation. Achieve a forward gear.

When the reversing joystick is in the forward position and the speed joystick is in the high position, the same as the first gear, the pressure oil enters the clutch piston to engage the main and passive friction plates, and the power is transmitted to the output shaft through the gear (31), (12), (25), (22), (16), (18), so that the front and rear drive shaft rotate. The wheels are driven by the front and rear drive axle. Achieve forward second gear.

The process of reverse gear and reverse gear is the same as that of forward gear. Don't repeat the narrative. Its transmission route is:

Backward gear: The power input by the input gear (31) is transmitted to the output shaft (17) through the gear (10), (28), (25), (22), (16), (18) to drive the front and rear transmission shaft to rotate, and the wheel is driven by the front and rear drive axle. Implements one step backward.

Reverse second gear: power input by the input gear (31) through the gear (10), (29), (14), (25), (22), (16)

(18) To the output shaft (17) to drive the front and rear transmission shaft rotation. Through the front and rear drive axle, drive the wheels to turn. Achieve reverse second gear.

3. Shift clutch

The gearbox is equipped with four shift clutches, namely, forward clutch, reverse clutch, I clutch, II clutch. The basic structure and working principle of these four clutches are the same. The diagram below shows the structure of the shift clutch.

The shift clutch is a wet multi-disc clutch. The driving plate 2 and the driven plate 3 each have four pieces, the outer spline of the driving gear 1 is the driving hub of the clutch, which is supported on the shaft 7 with two bearings, and the outer spline of the driving gear is the same as that of the driving plate 2

The internal spline is connected and can be moved axially on it, and the external spline of the slave plate 3 is connected with the internal spline of the passive hub 4 and can also be moved axially on it. One end of the spring 6 is held against the left end face of the piston 5, and the other end is supported on shaft 7 by the spring support disc 9 and the clasp ring 8. When the pressure oil passes through the oil channel A into the oil chamber on the left side of the piston 5, the piston overcomes the spring force and moves to the left, pressing all the driving and driven pieces tightly, and combining the clutch to transmit power.

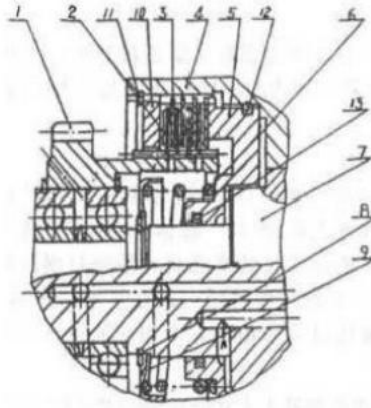


Figure 2-12 Structure of the shift clutch

1, driving gear 2, driving plate 3, driven plate 4, passive hub 5, piston 6, spring

7, shaft 8, 11, clamp ring 9, support plate 10, pressure plate 12, 13, sealing ring

Second, hydraulic torque converter, transmission oil circuit system (see Figure 2-13)

The variable speed gear pump (12) mounted on the torque converter housing at the upper left of the transmission draws oil from the variable speed tank oil pan through the filter screen (3). The output pressure oil from the gear pump enters the main pressure regulator (6) through the oil filter (11) into the main pressure regulator in two ways, all the way to the transmission control valve (5), (1.2-1.4 mpa); One way through the main regulating valve into the hydraulic torque converter pump wheel (torque converter pressure valve controls the pressure of the oil entering the torque converter is 0.4~0.6MPa).

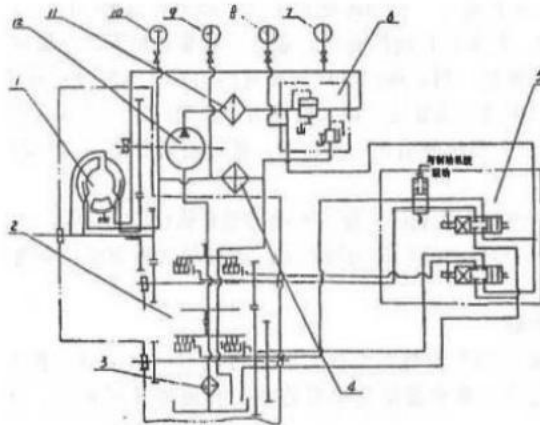


Figure 2-13 Schematic diagram of the torque converter-transmission oil circuit system

1. Torque converter 2. Transmission 3. Filter 4. Cooler 5. Transmission control valve 6. Main pressure regulator 7.8.9. Pressure gauge 10. Temperature gauge 11. Oil filter 12. Oil pump

The oil at the outlet of the torque converter (the torque converter lubricating valve controls the outlet oil pressure of the torque converter to be 0.25~0.3MPa) through the oil

The cooler (4), entering the forward, low oil end cover and backward high oil end cover, lubricates the bearing, gear and cooling clutch plate from the two clutch housing shaft watering holes. And then it flows back to the bottom of the gearbox.

The oil temperature of the hydraulic mechanical transmission is generally 80°C-100°C. Maximum instantaneous do not exceed 120°C, such as

If the oil temperature is too high, stop and cool down.

Transmission control valve (see Figure 2-14)

The transmission control valve consists of a speed valve, a reversing valve and a cut-off valve.

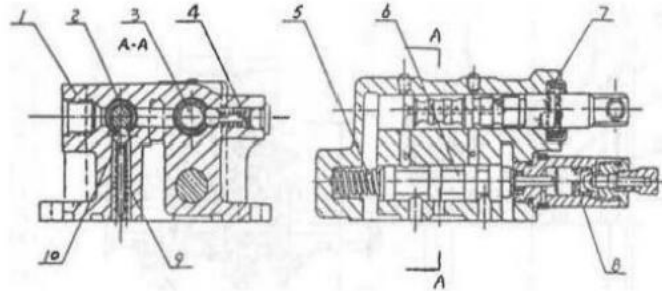


Figure 2-14 Transmission control valve

1 valve body 2 Variable speed slide valve 3 Reversing slide valve 4 spring 5 Cut off slide valve 6 oil seal 7 Cut off piston 8 Copper ball

The speed valve - the speed spool stem (2) is positioned by the spring (9) and the steel ball (10). Pulling the spool stem (2) can put the transmission in neutral, first gear and second gear respectively.

Reversing valve - reversing slide valve stem (3) is positioned by spring (4) and steel ball. Pull the slide valve stem (3) to place the gearbox in neutral, forward and reverse gear respectively.

The combination of reversing valve and speed valve can achieve forward first and second gear, and reverse first and second gear. Its work in exchange

For example, when the slide valve stem (3) is pulled out, the pressure oil extracted from the main pressure regulator enters the reversing valve and flows into the forward clutch of the gearbox through hole a. The pressure oil pushes the piston to engage the main clutch and the driven friction plate, and the gearbox is mounted forward in gear. At this time, when the slide valve stem of the speed valve is in the forward first or second gear position. At this point, the speed is achieved to advance one gear or advance two gear. Similarly, when the reversing valve stem is pushed, the pressure oil flows into the gearbox regressive clutch from the b hole, and the pressure oil pushes the piston to combine the main and slave moving disc of the clutch and hang the regressive gear. At this time, when the speed valve stem is in first or second gear, the speed realizes the regressive gear or second gear.

The function of the speed valve is the same as that of the reversing valve

Shutoff valve

The cut-off valve is composed of a control valve assembly (8), a spool (6), and a spring (5). When the off-road forklift is driving on the road do not step on the system

When the actuator pedals, the shutoff valve is in the position (Figure 2-14), the reversing valve is in the forward position, and the pressure oil leads from hole a to the forward clutch cylinder. When the driver presses the brake pedal, the pressure oil from the brake system enters the piston of the control valve assembly (8), which moves under the pressure oil, pushes the ejector rod to move the spool (6), and compresses the spring (5). At this time, the oil circuit from hole a to the forward clutch of the gearbox is cut off. Therefore, the main and slave plates of the forward clutch are separated and no longer transmit torque, which contributes to the braking of the off-road forklift truck.

Three, drive axle

The drive axle of the machine is divided into front axle and rear axle.

The gearbox has no front and rear axle release mechanism, and the front and rear axle of the machine is the drive axle, that is, four-wheel drive.

1. Brief description of structure:

Figure 2-15 shows the structure of the drive axle. It is mainly composed of axle housing, main drive (including differential), half shaft, wheel edge reducer and tire hub assembly.

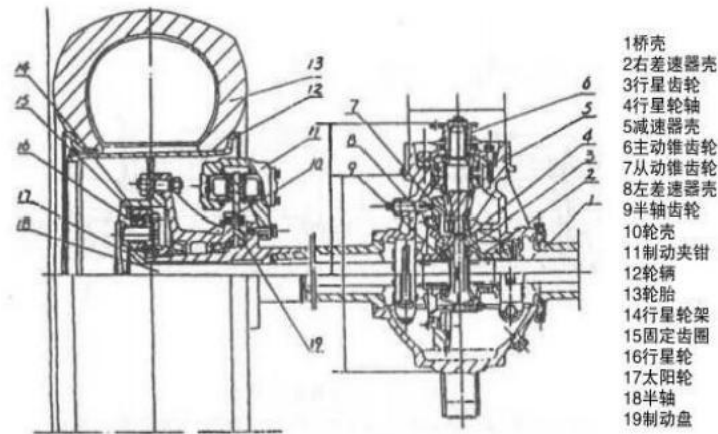


Figure 2-15 General view of the drive axle

The axle housing is mounted on the frame and takes the load from the frame and transfers it to the wheels. The axle housing is also the mounting support body of the main actuator, half shaft and wheel edge reducer.

The main drive is a helical taper gear reducer, which transmits the torque and movement from the drive shaft. The differential is a planetary gear transmission composed of two conical straight gear half-shaft gear, cross shaft and four conical straight gear planetary gear left and right differential housing. It has a differential effect on the different speeds of the left and right wheels. And the main transmission torque and movement to the shaft.

The left and right half shafts are fully floating, and the two ends of the half shafts are connected with the half shaft gear and the sun gear of the wheel reducer by involute splines. So the axle sends the torque and motion from the main drive through the differential to the wheel retarder.

The wheel reducer is a planetary mechanism. The inner gear ring is fixed on the wheel support at both ends of the axle housing by splines, it is fixed, the planetary frame and the wheel box bolt are fixed into one, therefore, the hub and the planetary frame rotate together, and the dynamic force passes through the semi-axis, and the sun wheel is transmitted to the planetary frame.

The principle of wheel planetary transmission can be seen in Figure 2-15. As can be seen from the figure, the sun wheel driven by the half-shaft with splines connected with it rotates in the same direction with n too speed, and the planetary gear combined with the sun wheel rotates in the opposite direction, because the tooth ring is fixed, so the planetary frame is driven in the same direction with the speed n frame and the sun wheel, and the n frame is less than n too.

The tire hub assembly is the main walking part. The tire used in this machine belongs to low pressure wide base tire. Its section size is large, the elasticity is good, the ground pressure is small. On the soft base road, the subsidence is small, the passing performance is good, and on the convex and convex road, the buffering can be good. In short, the tire has good off-road performance and traction performance on the bad working road surface.

The brake is caliper disc type. The brake disc (19) is fixed on the wheel hub (10) and rotates with the wheel. The clamp (11) is fixed on the drive axle housing (1), and one clamp is installed on the left and right of each drive axle. Each clamp contains two pairs of pistons.

During braking, the pressure oil from the master brake pump enters the clamp and enters each piston through the oil channel and tubing in the clamp, pushing the piston and the friction plate to press against the brake disc (19), generating braking torque and stopping the wheel from rotating.

2. Working process (see Figure 2-15)

The power output by the engine, through the torque converter, transmission shaft to the active spiral bevel gear (6), drive the driven bevel gear (7), torque is transmitted to the driven bevel gear, This torque is transmitted through the left and right differential housing (2) and (8) integrated with the driven bevel gear to the cross shaft (planetary gear shaft)(4), and then through the four planetary bevel gears (3) mounted on the cross shaft to the left and right two conical half-shaft gears (9), if the ground resistance moment to the half-shaft axis is equal, Then there is no relative motion between the planetary gear and the half shaft gear, and the half shaft rotates at the same speed as the differential housing and the driven large helical gear. It is as if the left and right driving wheels are driven by a shaft connected together.

If for some reason, the resistance distance between the left and right wheels and the ground contact on the semi-axis axis is not equal, and the moment difference between them is greater than the torque required to overcome the internal resistance when the planetary gear rotates, the planetary gear will rotate around its own axis, and it will play the role of differential. When the planetary gear rotates around its own axis, the planetary gear causes this half shaft gear to rotate in the opposite direction to the right half shaft gear. So the car can make turns.

4. Drive shaft

The transmission shaft is mainly composed of universal joint, expansion joint and transmission shaft, etc. The universal joint is composed of universal fork (1), clamp ring (2), needle roller (3), cross shaft (6), universal joint sleeve fork (8), etc. (see Figure 2-16). The main function is to transfer torque and rotation when the Angle changes, and the expansion joint is composed of a pair of internal and external spline shafts. This can allow the total length of the drive shaft to expand, but the length of the spline should ensure that the drive shaft in a variety of working conditions, that is, do not break and do not tip dead, the drive shaft tube is made of steel coil circular tube, used to transfer torque and rotation.

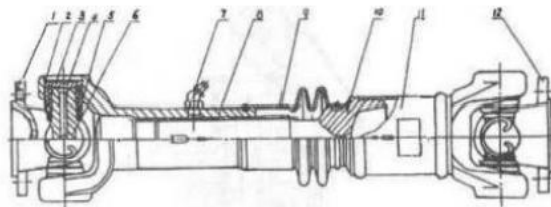


Figure 2-16 universal joint drive shaft diagram

1, 12, universal joint fork 2, clamp ring 3, needle roller 4, sleeve 5, felt oil seal 6, cross shaft 7, butter nozzle

8, universal joint sleeve fork 9, dust jacket 10, drive shaft tube 11, universal joint fork

Drive shaft adjustment and maintenance should pay attention to:

A. Spline shaft and cross shaft must be greased regularly according to regulations;

B. The fixing bolts of the drive shaft should be checked and fastened when maintaining the car;

c, the universal joint fork at both ends of the drive shaft is located in the same plane, and marked with an arrow mark, should be careful not to dislocation when disassembling or trimming.

Third, the braking system

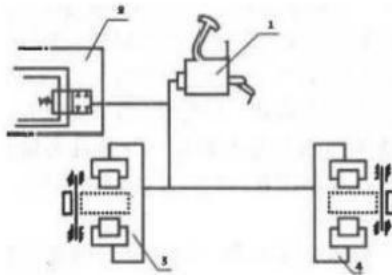


Figure 2-17 Schematic diagram of the braking system

1, brake master pump 2, transmission control valve cut valve 3, front axle pump 4, rear axle pump

Braking system includes foot braking system and hand braking system two sets of independent braking system. Foot brake system adopts single pipeline hydraulic caliper disc brake (see Figure 2-17), mainly composed of brake master pump, oil storage cup, caliper disc brake, brake

When the pedal is pressed to push the ejector rod of the master brake pump, the high-pressure oil generated by it is respectively input into the dynamic pump of the front and rear bridge clamp plate, so that the piston extends out the brake disc. At the same time, the high pressure oil of the brake master pump enters the piston of the variable cut-off valve, pushes the slide valve down, and cuts off the oil circuit of the forward or backward clutch of the reversing slide valve.

The main and slave moving friction plates are quickly separated, the power is cut off, and the front and rear Bridges are not driven, so that the braking is rapid

Brake system Quick distribution valve clutchable Reliable. handmade

The dynamic system is used for the driver to leave the vehicle or park on the ramp. The parking brake adopts the external beam drum hand brake. The following describes the main components of the system:

(1) Brake master pump

The structure is shown in the figure:

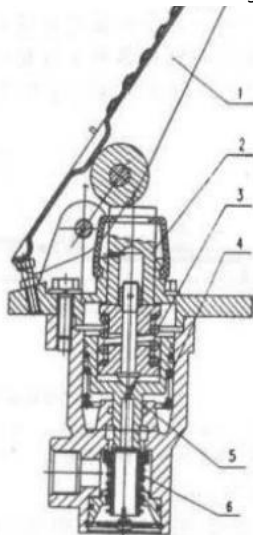


Figure 2-18 Brake master pump

1, pedal 2, ejector lever 3. Balance spring 4, return spring 5, piston 6, air intake valve

(3) Hand brake

The external beam drum hand brake is used to brake the output shaft of the transmission to achieve the goal of stopping the vehicle on the slope. The hand brake is connected with the hand brake lever through the wire rope. During braking, the wire rope is pulled by the hand brake joystick, so that the friction sheet is held tightly and pressed on the brake hub to produce braking effect. The brake is lifted, the hand brake lever is returned to the original position, the tension is eliminated, and the friction sheet is returned under the action of the spring, so that the friction sheet is separated from the brake hub.

(4) Clamp disc brake

The caliper disc brake is composed of an inner caliper (2), an outer caliper (5), a friction plate (12), a piston (9) and a brake disc (1).

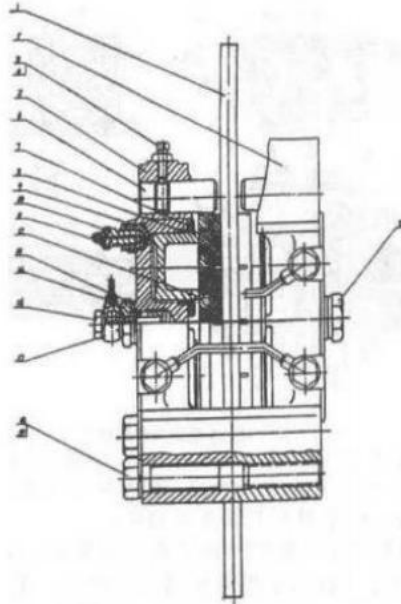


Figure 2-19 Clamp disc brake

1 Brake disc 2. Inner pliers 3.4. Fastening screws and nuts 5. Outer pliers 6. Pin shaft 7. Dust cover 8. Seal ring 9.

Piston 10. Bleed nozzle

11. Rubber cap 12. Friction plate 13. Washer 14. Screw plug 16.20. Hollow screw 17.23. Gasket 18.19.? Bolt washer

Foot brake system use precautions:

1. The oil cup of the master brake pump is filled with mineral brake fluid. When it is found that the oil is insufficient, it should be added in time.
2. the hydraulic system mixed with gas will affect the braking performance, after replacing parts, cleaning the system to exhaust. Here's how:
 - a, remove the dirt in the hydraulic pipeline, oil storage cup, refueling port, air discharge nozzle, etc.;
 - b. Fill the oil storage chamber with brake fluid;
 - c. Put a transparent tube for air discharge on the vent mouth, and put an oil tray on the other end of the tube to collect the discharged oil;
 - d, open the air nozzle, and continuously step the brake pedal until the liquid column is discharged without bubbles. Tighten the vent nozzle before releasing the brake pedal. When deflating, if the liquid level of the oil storage chamber is lower than the specified value, it should be replenished in time to avoid air re-entering the system.

Four, the working device hydraulic system

It is mainly composed of gear pump, priority valve, multi-way reversing valve, boom cylinder, working oil tank and pipeline.

Pressure oil from the gear pump through the priority valve to the multi-way reversing valve. The oil is delivered to the boom cylinder by manipulating the corresponding slide valve. When the working device does not work, the oil is returned to the tank by the oil filter through the middle oil passage of the multi-way reversing valve.

Multi-channel directional valve structure and working principle:

The multi-way reversing valve (see figure) is mainly composed of a safety valve (1) oil intake valve body (2) boom reversing valve (3) and a return oil valve body (4). For the detailed structure and working principle, please refer to the "Z series multi-way reversing valve Instruction Manual"

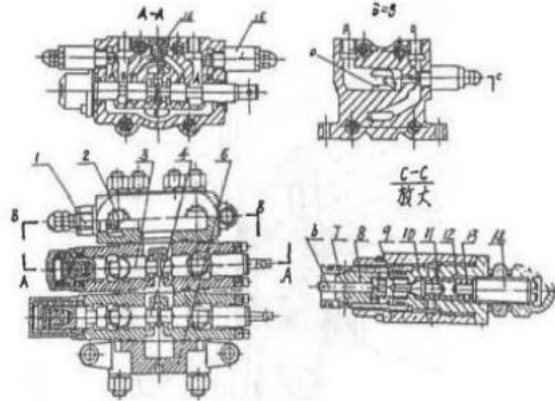


Figure 2-20 Structure of the multi-channel directional valve

1, safety valve 2, oil intake valve body 3, tipping bucket reversing valve 4, boom reversing valve 5, oil return valve body 6, slide valve 7, sleeve 8, main spool 9, 13, spring 10, seat 11, pilot spool 12, body 14, adjusting bolt 15, oil refill valve 16, check valve

The oil cylinder is a double-acting single-rod piston type oil cylinder, which is mainly composed of a cylinder head 1, a steel cylinder 4, a piston 2, a piston rod 5 and a seal. When the pressure oil enters the a oil channel, the oil pushes the piston to the right. The oil on the right side of the piston flows back to the tank through the b oil channel, and the piston rod is extended. In the same way, when the b oil channel is fed, the a oil channel returns the oil, the piston rod moves left, and the piston rod retracts. Because the piston rod and the piston are connected together, the oil pressure has a different area on both sides of the piston, and under the same oil pressure, the left side of the piston is subjected to a large force.

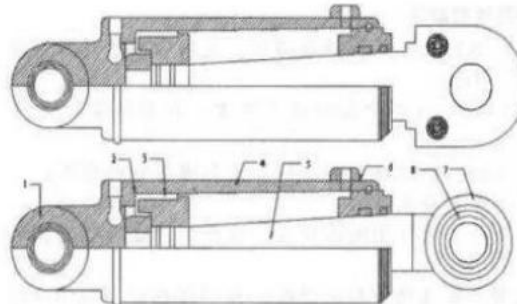
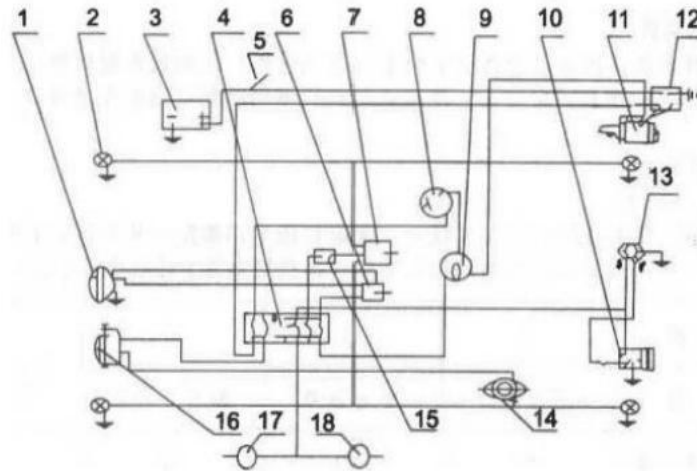


Figure 2-21 Schematic diagram of the cylinder structure

1, cylinder head 2, piston 3, Ya-type sealing ring 4, cylinder 5, piston rod 6, guide set 7, earring 8, cylinder liner

Chapter III Electrical equipment

Single cylinder machine electrical system adopts AC voltage 12 volts, four cylinder machine 24 volts, negative grounding system.



1. Front and rear headlights 2. Turn signal 3. Battery 4. Fuse box 5. Power switch 6. Dual switch 7. Steering switch 8. Ammeter 9. Starting switch 10. Generator 11. Electric starter 12. Starting relay 13. Regulator 14. Horn button 15. Flasher 16. Horn 17. Water temperature gauge 18. Oil pressure gauge

1. Battery

The model of the battery is single-cylinder N120-12V, four-cylinder N140-24V, its function is to supply power to the starting motor when the engine starts, when the engine is working normally, if the voltage of the generator is lower than the voltage of the battery, the power is supplied to the machine battery to charge, in order to store part of the electric energy.

Note when using:

- 1, often maintain the charging state, such as long-term use, at least once a month should be charged.
- 2, often check the height of the electrolyte level, the liquid level should be higher than 10-15 mm, insufficient can add steamed filling water. If the electrolyte leakage loss is known, the electrolyte with a specific gravity of 1.28 should be added.
- 3, should often check whether the battery vent is blocked, remove the external soil and stolen goods, wipe the spilled electrolyte, and coated with a thin layer of calcium-based grease on the electrode to prevent corrosion.
- 4, do not overuse the starter.
- 5, the battery should be fastened to avoid damage by shock.

2. Generator and regulator

1. Alternator:

There are two terminals marked "armature" and "magnetic field" on the generator and a ground pin marked "ground". They shall be connected to the terminals marked with the same text on the relay regulator and the "ground" screw to the "ground" screw on the relay regulator.

Both ends of the generator are bolted on the generator support; There is also a generator leg to adjust the tension of the triangle belt.

2, relay regulator:

The relay regulator is composed of three devices: interceptor, regulator and current limiter.

The relay regulator is marked "armature", "magnetic field", two terminals and a ground screw. The "armature", "magnetic field" and ground screw terminals on the side of the base shall be connected to the corresponding terminals and ground screws on the generator. The "battery" terminal is connected with the "-" terminal of the ammeter, and the "+" terminal of the ammeter is connected with the "-" pole of the battery.

It is found that the regulator is not working properly or after 1000 hours of use, a skilled electrician is required to adjust it.

3. starter

Its use is: the battery supply power to start the generator. The movement of the starter gear is driven by electromagnetic drive, and has a unidirectional roller clutch, which can prevent the starter armature from being damaged with the high-speed rotation of the engine after starting.

4. Others

1. Fuse box

When a fault occurs in the circuit and the current is overloaded, the fuse can be automatically blown, thus ensuring the complete work of the electrical equipment. There are four fuses in the fuse box assembly, and the use and working current of each file are shown in the following table:

Number of files	1	2	3	4
use	Main fuse	Charging circuit	Headlight, taillight	Turn signal lamp
Working current (ampere)	30	20	6	6

If the circuit is found to be abnormal, should immediately check the fuse box corresponding to the fuse is blown, according to the blown fuse file, check the protected component. After troubleshooting, remove the protection wire plate, unplug the moving head, remove the standby fuse on the upper end of the fuse board about 60mm, tightly around the fixed mounting head, then pull back the mounting head, and install the fuse board into the original position of the fuse box.

2, ammeter:

Ammeter is used to indicate the charging and discharging current of the battery. When the generator charges the battery, the pointer is inclined to "+"; Otherwise, it is "-", and no current through means zero.

3, electric lock:

After the key is inserted into the lock hole, pull it to the right, and all electrical appliances except the motor are connected. Pull to the right again, turn on the starter and start the engine. In order to protect the starting motor, it is required to pull the electric lock key to the left immediately after the engine starts.

4, the switch: the switch controls the entire electrical system, shut down, the power should be disconnected, so as not to discharge the battery.

Chapter Four driving operation

Before driving and operating, we should be familiar with the structure, technical maintenance, and operation methods of off-road forklifts, so as to ensure safe driving and improve the life and productivity of forklifts.

The following safety matters should be noted when driving and operating:

- 1, the driver must go through the study of traffic rules, mechanical structure, operation methods, etc., and read the instruction book.
2. Passengers are not allowed anywhere except inside the driving room.
- 3, always pay attention to the working state of each department reflected by the instrument.
4. It is strictly prohibited to move under the boom during operation.
- 5, the engine should be stopped immediately to prevent steering failure caused by accidents.

First, off-road forklift running-in

The off-road forklift truck has been comprehensively inspected and tested before leaving the factory. When the new car is used, it must be tested, and the new car without test run shall not be formally used. The test run can make the friction parts of the machine run in, avoid failure, so as to ensure the reliable work of the off-road forklift and extend the service life. However, being used in a harsh working environment at the beginning will significantly shorten the service life of the machine.

The first 100 hours of new car use should be new car switch-in.

(1) Empty car test run (about 8h)

- 1, after the machine starts, first run at low speed for 5 minutes, and then gradually increase to the highest speed for 10 minutes.
2. Manipulate the working device to make the boom rise, fall and turn for about 15 minutes.
- 3, empty car driving, forward and backward grades respectively from low speed to high speed, driving should be smooth left and right steering and braking.

The following work will be carried out after the empty car test run for eight hours:

- 1, a comprehensive inspection of the bolts and nuts, especially cylinder head bolts, exhaust pipe bolts, front and rear axle fixing bolts, wheel hub nuts, steering wheel fixing nuts, etc., should be fully inspected. Once.
- 2, clean the oil filter and fuel filter element.
- 3, check the fan belt tightness is appropriate.
- 4, check the battery electro-hydraulic specific gravity and liquid level reserves, tighten the battery cable bolts, check the electrical system connection, generator power supply status, lighting and turn signal and other working conditions.
5. Check the amount of transmission oil. When the engine is idling, the oil level should be in the center of the oil mark.
6. Check the tightness of hydraulic system and brake system.
7. Check the connection of each joystick and throttle component.

(2) Operation test run (about 20h)

1. Carry out the operation according to the operation manipulation method.
2. During the operation test run, in addition to checking the inspection items of the empty car test run, the off-road forklift truck should be observed

Fork loading capacity in the same material.

3. The loading and unloading load shall not exceed 70% of the common load during the on-off period.
- 4, in the running period fork loading easy material is appropriate, the action should not be too fast.

(3) In the process of operation test run, pay attention to the following points:

1. Whether the bolts and nuts of each connection part are loose or not.
2. There is no normal sound in each rotating part.
3. Whether the reading of each instrument panel is normal.

- 4, each system has three leakage phenomenon (refers to oil, gas, water).
- 5, steering, braking is flexible and reliable.
- 6. Whether the working device works normally.
- 7, except in emergency situations, avoid sudden start, sudden steering and sudden braking.
- 8, should pay attention to the lubrication of the off-road forklift, according to the specified time to replace or add lubricating oil or grease.
- 9, should often pay attention to the transmission, clutch, front and rear axle, wheel hub and brake, brake drum temperature, if there is overheating phenomenon, should find out the reason to eliminate.
- 10, avoid high temperature and heavy load work.

Two, the use of off-road forklift

(1) Precautions for use

- * Be careful not to go near the edge of the cliff.
 - * When building a levee, filling or unloading material down a cliff, unload one pile first and then push the previous pile against the next pile.
 - * When the material falls over the cliff or the machine reaches the top of the slope, the load is reduced, resulting in increased speed leading to danger, so be sure to slow down.
 - * When loading unstable materials, such as round, cylindrical or sheet materials, lifting the working device, the material may slide onto the cab, causing serious damage.
 - * Avoid raising the working device when loading unstable materials.
 - * If the working device suddenly stops the landing action may cause the machine to tip over.
 - * Under load, pay special attention to operate the working device carefully.
 - * Perform only permitted cross-mount jobs; performing other jobs may result in serious accidents.
 - * Do not work in fog, snow, heavy rain and other conditions of poor visibility until the weather improves and visibility changes
- Work only when you are good.
- * When working in tunnels, Bridges, power lines and other places with height restrictions, avoid the bucket hitting other objects.
 - * Especially when working in narrow areas, indoors and where there are other machines, in order to prevent accidents caused by encountering other objects, the machine should travel at a safe speed.
 - * Keep your foot on the foot brake pedal only when necessary.
 - * The foot brake pedal can be repeatedly pressed only when necessary.
 - * When going downhill, make the foot brake pedal, the engine can assist in braking if necessary, and the neutral block is prohibited.
 - * When lifting the big arm, otherwise the cylinder and rocker arm are damaged, the responsibility is own. (2) Driving empty

1. Start the engine

Check for people or obstacles, then sound the horn to warn and start the engine. Before starting, each lever should be placed in a neutral position, and then insert the key into the switch, and turn one position in the clockwise direction, turn on the power, step on the accelerator, and then start the engine. The continuous rotation of the starting engine shall not exceed 15 seconds. If the engine cannot be started, start again after an interval of 30-40 seconds. If you fail to start for three consecutive times, check the cause and start again.

2. Start and drive

Do not suddenly increase the throttle until the engine idles for 5 to 10 minutes.

Continuous idling or no-load high-speed operation of the engine shall not exceed 20 minutes.

Necessary spatio-temporal retransmission motor, gradual loading, medium speed engine.

(1) Gently press the accelerator pedal. Run the engine at medium speed for about 5 minutes without load.

(2) Only heat the hydraulic oil temperature in cold areas, the method is as follows: During the heating process, check whether the engine speed is stable. Continuously push forward and pull back the bucket position control rod to increase the hydraulic oil temperature. The release time at the pickup position must not exceed 10 seconds. During this operation, the oil reaches a safe pressure, which will increase the hydraulic oil temperature faster.

(3) After the preheating operation is completed, check whether the indicator is normal.

(4) Run the engine at low load until the engine water temperature reaches the normal value.

(5) Check whether the exhaust color, sound or vibration is abnormal. If there is an anomaly, repair it immediately.

(6) Whether each control handle is flexible and reliable.

(7) The steering wheel is not loose.

(8) Whether braking is reliable.

(9) Whether the movement of the working device is normal.

* Before driving, check that the surroundings of the vehicle are safe, and then sound the horn before starting. No people standing behind the bus.

There is a blind spot in the back of the car, so you should be very careful when driving.

(1) Make sure that the transmission lever is in neutral position and the parking brake handle is in the braking position.

(2) Insert the key into the power switch and turn it clockwise to the on position.

(3) Press the start button, and slightly oil, you can start.

(4) The continuous rotation of the starting vehicle shall not exceed 15 seconds. If the vehicle cannot be started, start again after an interval of 30-40 seconds. If you fail to start for three consecutive times, check the cause and start again.

(5) After starting, the engine idling at low speed for 5 minutes, the reading of each instrument should be normal.

(6) Press the brake pedal and release the parking brake handle to release the brake.

(7) Step down the clutch pedal and place the high and low speed joystick in the desired gear. Move shift lever to desired position.

(8) Step on the pull door pedal, slowly release the clutch pedal to start gently, and then start the vehicle, the machine can run.

3. Shift gears

* When driving at high speed, do not suddenly change gear. When changing gear, use the brake to slow down and then change gear.

Shift gears by following these steps:

Press the clutch pedal and move the gear lever to the desired position.

When working, use only the second or third file.

4. Stop and turn off the engine

(1) Reduce the throttle and reduce the speed of the off-road forklift truck.

Step on the clutch pedal, then step on the brake pedal, when the off-road forklift truck stops, put the gearshift lever in the neutral position, pull the parking brake handle to the brake position, and brake.

(3) Release the clutch, brake pedal, reduce the accelerator to idle the engine.

(4) flameout pull wire forward, oil pump stop oil supply, engine immediately flameout, and then push back to the oil supply position. (5) Turn the key of the starting switch to the "OFF" position and turn off all power supplies.

In addition, pay attention to the bucket flat on the ground before parking, turn off the power.

(7) Other assignments

The machine can be directly used for earth-moving, leveling, digging, traction and other operations; If the corresponding working device is replaced, it can also carry out a variety of operations, such as grabbing wood and pushing snow.

Note: The installation of the working device must be approved by the manufacturer or sales office and carried out under its guidance.

Safety precautions

- 1, the driver must have a formal driving license, familiar with the machine instructions and engine instructions, and in accordance with the provisions of the use, repair, maintenance.
2. No one is allowed to stand under the boom.
- 3, must slow down when turning, prohibit sharp turns and brakes, in rain and snow weather shall not be high-speed driving, and pay attention to avoid turning on the slope.
4. It is strictly prohibited to go downhill and turn when the engine is turned off, so as to avoid accidents caused by hydraulic steering failure.
- 5, do not allow overload operation driving.
6. In addition to tightening the handbrake for ramp parking, the wheel should be padded with triangular wood.
- 7, always pay attention to whether the meter reading is normal.

Chapter V Technical maintenance

The working conditions of off-road forklift trucks are harsh, often driving and working on uneven construction sites, and the parts are vulnerable to strong vibration or collision, making the machine parts loose or damaged. Therefore, in order to ensure the good performance of the forklift, normal operation, and extend the service life, in addition to being familiar with the structure of all parts of the machine, it is necessary to regularly check the technical status of the machine as required, and carefully carry out technical maintenance: This chapter mainly introduces the technical maintenance of parts other than the engine, and the technical maintenance of the engine is carried out by referring to the engine manual.

First, off-road forklift oil and lubrication precautions

1. When filling fuel oil, hydraulic oil and grease, the oil injection tool container and the oil injection part should be scrubbed clean to prevent water, sludge and debris from entering the oil.
2. When filling various oils, the machine must be in a horizontal position. In addition to the oil level indicator device for observation, generally until the oil plug overflow. The transmission dipstick is on the transmission cover.
3. When filling lubricating oil, the dirty oil should be drained, and the cleaning oil should be injected into the original working oil level. In the case of no-load, the engine should run for a few minutes, after stopping the operation, the cleaning oil should be drained, and then the clean new oil should be added.
4. Under different working conditions at low or high temperature, the type of working oil and lubricating oil should be replaced according to the actual situation and use requirements.

ii. Types of oil for off-road forklift trucks (see Table 5-1)

Table 5-1 Types of oil used for off-road forklift trucks

Item type	Off-road forklift truck
Fuel tank	Summer (above 10°C)0, winter (below 10°C)-10 diesel
Oil pan	CC40 in summer (above 10°C), CC30 diesel oil in winter
Transmission, drive axle	18# hyperbolic gear oil
Hydraulic tank	Winter 46, Summer 68 anti-wear hydraulic oil (national standard oil)
Each filling nozzle	Combined calcium base lubricating oil
Brake fluid	Add "912" synthetic brake fluid
Hydraulic torque converter	8# hydraulic transmission oil

Three, lubrication

Correct lubrication can greatly reduce the friction resistance of the machine and the wear of the parts, thus extending the service life of the machine.

Please pay attention to the preceding precautions when lubricating oil. Please select the lubricating oil according to Table 5-1.

Please lubricate the engine according to the engine instructions.

Fourth, routine maintenance

Routine maintenance is carried out before, after and during each shift operation, and its content is not much and the time is short, but it is extremely important for normal operation and reducing accidents. The main work of routine maintenance is:

1. Keep the exposed parts of the machine clean before and after operation.
2. Check whether the fasteners are loose and lost, and tighten and complete.
3. Whether the parts are damaged or not.

4. Check whether the lubrication is sufficient.
- 5, check all fuel tanks (fuel tank, working oil tank, brake master pump), the oil level must be sufficient. 6. Whether the engine cooling water is sufficient.
7. Check whether the wire connector of the electrical system is loose and whether the battery power is enough.
- 8, check each instrument, the light is complete and good.
- 9, check whether the manipulation is flexible and reliable.
- 10, check whether there is oil leakage, water leakage after starting, there is no normal sound.
11. Test whether the braking is reliable and the steering is flexible.

Five, regular maintenance

(A) Weekly technical maintenance (about 50h after work)

In addition to routine maintenance items, the following items need to be carried out.

1. Check whether the pedal travel of the foot brake meets the requirements, and adjust it if it does not.
2. Tighten the front and rear transmission shaft connection bolts, drive axle connection bolts and tire nuts.
3. Check the liquid level height and electrohydraulic specific gravity in the battery single cell (the specific gravity is 1.24-1.27 at 15°C), if it is not enough to add steam storage water and charge.
- 4, the injection nozzle pressure injection calcium grease.

(2) Monthly technical maintenance (about 200h after work)

In addition to daily and weekly technical maintenance items, the following items need to be added:

1. Measure tire pressure. If insufficient, qi should be replenished.
- 2, clean fuel oil, hydraulic oil filter.
- 3, check the brake system for oil leakage or damage.
4. Check and tighten wheel hub bolts, brake discs and bearing cover bolts.

(3) Quarterly technical maintenance (about 600h after work)

In addition to daily, weekly and monthly technical maintenance items, the following items should be added:

- 1, check the leakage of multi-way valves and various cylinders, if there is a serious phenomenon of the working device down, it should be repaired and excluded.
- 2, check the brake main pump cup is damaged.
- 3, adjust the hub bearing clearance, and make the brake disc outer face runout less than 0.20mm.

(4) Technical maintenance every six months (about 1200h after work)

In addition to daily, weekly, monthly and quarterly technical maintenance items, the following items should be added:

- 1, replace all fuel and oil circuit system oil, hydraulic system oil, gearbox, front and rear axle gear oil and brake oil. And clean the pipes, tubing, filters, etc, and then inject the purified new oil.
2. Disassemble and clean the brake master pump and check the braking effect.
- 3, check the front and rear bridge, the main conveyor gear mesh, if the main and driven bevel gear clearance is too large, it should be adjusted within 0.2-0.34mm.
- 4, check the working device and frame, there is no deformation, weld fracture phenomenon.

Winter technical maintenance

1. Replace winter lubricating oil and fuel oil.
- 2, winter temperature below 0°C, must use antifreeze.
- 3, the battery discharge rate shall not exceed 25%, should always maintain a high charging rate.

The sixth chapter is the common faults and troubleshooting methods of off-road forklift truck

For engine faults and troubleshooting methods, please refer to the engine manual.

First, the whole machine

Fault characteristics	cause	Elimination method
The diesel engine cannot run after starting	<ol style="list-style-type: none"> 1 Is not in gear 2 Torque converter leakage 3 The torque converter oil temperature is too high 4 The torque converter impeller is damaged 5 The cut-off valve stem of the variable speed control valve cannot be returned 6 The variable speed pressure is low and the clutch is slipping 7 Disc brake 8 The torque converter oil level is not enough 9 Variable speed pump failure 10 Main pressure regulator spring is broken 	<ol style="list-style-type: none"> 1 Put the gear on 2 Replace the oil seal 3 Clean the heat sink 4 Remove the torque converter and replace the impeller 5 Disassemble and check the reason why the cut-off valve does not return and eliminate it 6 Adjust the voltage to 1.2-1.4 mpa 7 Release the oil pressure to the brake disc 8 Add oil to specified oil level 9 Troubleshooting or replacement of variable speed pump 10 Replace the pressure regulator spring
underdrive	<ol style="list-style-type: none"> 1 Diesel engine output power is insufficient 2 The transmission pressure is too low, and the clutch slips 3 The torque converter oil temperature is too high 4 Torque converter leakage 5 Hand brake is not released 6 Disc brake 	<ol style="list-style-type: none"> 1 Check 2 Adjust the voltage to 1.2-1.4 mpa 3 Clean the heat sink 4 Replace the oil seal 5 Release the hand brake 6 Release the oil pressure to the brake disc

Second, the transmission system

Fault characteristics	cause	Elimination method
There is an abnormal sound when the torque converter is working	<ol style="list-style-type: none"> 1 Machine friction and wear 2 Poor gear meshing 3 Poor lubrication 	<ol style="list-style-type: none"> 1 Disassemble, repair or replace 2 Reassemble and adjust 3 Improved lubrication
Oil leakage	<ol style="list-style-type: none"> 1 Oil seal burning aging, deterioration 2 Bolt Loosening 	<ol style="list-style-type: none"> 1 Replace the oil seal and improve lubrication 2 Tightening Bolts
Low efficiency	<ol style="list-style-type: none"> 1 Poor lubrication oil temperature is high 2 Improper assembly 3 Parts manufacturing quality is not good 4 High oil level stirred oil loss 	<ol style="list-style-type: none"> 1 Improved lubrication 2 Readjust the assembly 3 Replacing Parts 4 Drain oil to specified oil level
Bridge housing High temperature	<ol style="list-style-type: none"> 1 Poor lubrication 2 Improper gear and bearing assembly 	<ol style="list-style-type: none"> 1 Improved lubrication 2 Adjust as required
Can't be mounted	<ol style="list-style-type: none"> 1 Low variable oil pressure 2 Shift lever position is incorrect 	<ol style="list-style-type: none"> 1 Adjustment 2 Remount the gear or check the transmission control valve

Three, variable speed oil circuit system

Fault characteristics	cause	Elimination method
Excessive oil temperature	<ol style="list-style-type: none"> 1 Run for a long time with load 2 Oil level does not move 3 Oil channel plug, radiator blocked 4 Oil pump friction 	<ol style="list-style-type: none"> 1 Stop temporarily or idle in place for a while 2 Replenish oil 3 Check the oil circuit and radiator and clean and remove dirt 4 Disassembling and Repairing
Gear change Low average pressure	<ol style="list-style-type: none"> 1 Transmission pool oil level is too low 2 Oil leakage in main oil passage 3 Gearbox oil filter is blocked 4 Variable speed pump failure 5 Variable speed control valve regulator valve spring failure 	<ol style="list-style-type: none"> 1 Add oil to the specified oil level 2 Check the main oil passage 3 Clean or replace the oil filter 4 Disassemble and check or replace the variable speed pump 5 Replace the pressure regulator spring
Certain shift Low velocity pressure	<ol style="list-style-type: none"> 1 The piston seal ring is damaged 2 The sealing ring in the oil circuit is damaged. 3 The oil baffle leaks oil 	<ol style="list-style-type: none"> 1 Replace the sealing ring 2 Replace the sealing ring 3 Check for leaks and remove them
Random file	<ol style="list-style-type: none"> 1 Shift valve positioning steel ball dislocation 2 The control lever clearance increases 3 Sealing ring leakage 	<ol style="list-style-type: none"> 1 Rematch 2 Repair or replace parts 3 Replace the sealing ring

Four, steering system

Fault characteristics	cause	Elimination method
Steer the direction Disk effort	<ol style="list-style-type: none"> 1 Oil pump, valve and steering cylinder wear, flow is insufficient 2 Pipeline shabu 3 Insufficient steering pressure 	<ol style="list-style-type: none"> 1 Repair or replace the oil seal of the oil pump valve and cylinder 2 Repair the components in the pipeline 3 Check and adjust the relief valve
Keep turning when the steering wheel returns	<ol style="list-style-type: none"> 1 The return shrapnel inside the steering gear is damaged 2 The oil distribution sleeve is stuck between the oil distribution shaft or the oil distribution sleeve is stuck between the valve 	<ol style="list-style-type: none"> 1 Disassembly, repair and replacement 2 Disassemble the steering gear for repair
Insufficient steering torque	<ol style="list-style-type: none"> 1 The steering overflow valve pressure is too low 2 Serious internal leakage of steering gear 	<ol style="list-style-type: none"> 1 Adjust the overflow pressure to the specified value 2 Repair the steering gear
System leakage	<ol style="list-style-type: none"> 1 Loose joint 2 Oil seal wear 	<ol style="list-style-type: none"> 1 Tighten the connector 2 Replace, oil seal

Five, the working device hydraulic system

Fault characteristics	cause	Elimination method
Insufficient lifting force or steering force of the boom	<ol style="list-style-type: none"> 1 Cylinder oil seal is worn or damaged 2 Priority valve excessive wear valve stem and valve body The gap exceeds the specified value 3 Pipe system leaks 4 Serious internal leakage of working oil pump 5 Improper adjustment of the safety valve The system pressure is low 6 The suction pipe and filter are blocked 	<ol style="list-style-type: none"> 1 Replace the oil seal 2 Disassemble and repair the gap to reach the standard Set or replace 3 Locate the leak and remove it 4 Replace the oil pump 5 Adjust the system working pressure to the specified value 6 Clean the filter and change the oil
System pressure is insufficient or no pressure	<ol style="list-style-type: none"> 1 Safety valve failure 2 The diverter valve slide valve is stuck or the damping hole is blocked. 3 The leakage in the system is large <ol style="list-style-type: none"> a. The overload oil supplement valve fails b. The clearance of the reversing valve is too large c. The cylinder seal is damaged 4 Oil soft leakage 5 The oil temperature is too high 6 Pump empty 	<ol style="list-style-type: none"> 1 Clean and replace the spring 2 Cleaning and checking 3 Inspection and maintenance 4 Demolition and Repair 5 Suspend work 6 Clean the oil filter and reduce pipe resistance
The reversing valve is faulty	<ol style="list-style-type: none"> 1 The displacement and positioning device is damaged 2 Valve stem is deformed or stuck 	<ol style="list-style-type: none"> 1 Check for repair or replacement 2 Clean or replace
Excessive oil temperature	<ol style="list-style-type: none"> 1 Oil pump friction, pipeline resistance 2 Insufficient oil level 3 Long-term work with load, poor heat dissipation 	<ol style="list-style-type: none"> 1 Remove and repair oil pump to reduce pipeline resistance 2 Add oil to the specified oil level 3 Stop and rest
Improper oil level	<ol style="list-style-type: none"> 1 Insufficient oil level 2 The oil filter is blocked 3 The viscosity of the oil is too high to freeze 4 Air is injected into the oil pump 5 Oil pump wear 	<ol style="list-style-type: none"> 1 Add oil to the specified oil level 2 Clean the oil filter 3 Replace the recommended oil or heat dilution, but be sure to pay attention to safety when heating, and open the tank cap 4 Repair or replace the seals 5 Repair oil pump