

Preface

You are welcome to purchase our LW420F wheel loader.

All the information, including performance parameter, structure principle, maintenance, adjustment and normal trouble shooting are introduced in this manual .In order to keep the loader up in its optimum condition , you should keep this manual at hand and ask the concerning people read it periodically and well-trained to control this manual and related other maintenance usage manual.

The install, specs and structure in this manual can be slight different from the loader because of the continuous improvement in its design and users' changeable requirements .So we ask your excuse, If you want to know about the fresh information regarding the loader or the question about the manual, please consult Xuzhou loading machinery Factory or your agent.

All the information concerning personal safety in this manual have adopted SAFETY ALERT SYMBOL! , So we ask the people including the operator, maintainer and administrator to pay close attention to these information during operation, maintenance, management.

NOTICE:

It's necessary to understand the manual before operation. Also please detailed read the maintain usage manual of related engine, air-condition etc.

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Chapter 1 Applications 、 Technical Performance and Specifications

I 、 Applications

This loader is a construction machinery with a single bucket, front dumping, articulating and of wheel type .It can be widely used in construction work site, port wharf , station and storage mainly used for loading or transporting loose materials such as earth stones , coal and dust, further more it can be used for towing , ground leveling , stacking and piling. And so, it is a high-efficient and multi-function construction machinery.

LW420F has the following advantages:

- 1、 Having articulated frames ,small turning radius、 the loader is very flexible and suitable for narrow places.
- 2、 With torque converter transmission, four-wheel drive, the power of the engine can be fully used , in this case, the torque can be increased so that the loader can has bigger drawing force, and the transmission system can also adjust its speed steplessly in accordance with external resistance, so as to protect the transmission and the engine.
- 3、 Power shift transmission and full hydraulic steering make the operation more convenient.
- 4、 Air push oil and 4-wheel brake system can make the braking more reliable .
- 5、 Having the low-pressure wide-base cross-country tires with the rear axle wiggling around the center ,so the loader has a good cross-country performance , it can travel and work freely on rough terrain.

II 、 Technical specs

(1) Overall dimensions (mm):

Overall length (bucket on the ground).....	6950
Bucket width.....	2750
Overall height (top of the cab).....	3162
Wheel base.....	2660
Tread.....	2060
Min ground clearance.....	455

(2) Specifications:

Rated load.....	4000kg
Bucket capacity (optional).....	2.2m ³
Operating weight.....	13t
Traveling speeds:	
Forward first gear.....	0~11 km/h
Forward second gear.....	0~35 km/h
Reverse first gear.....	0~15 km/h
Max traction force.....	120 KN

Max climbing gradient.....	28°
Max dumping angle.....	45°
Max dumping height.....	2920 mm
Dumping reach.....	1060mm
Max breakout force.....	110 KN
Lift time of the lift arm.....	4.9 s
Total cycling time.....	10.5 s
Min turning radius	
Center of front outside wheel.....	5415mm
Outside bucket.....	6235mm
Turning angle of the frames.....	35°
Wiggling angle of the rear axle.....	±12°

(3) Engine

Model.....	6135K-13b
Type	4 stroke, in line
Rated power	128kw
Rated speed.....	2000 r/min
Unlock temperature.....	70
Max torque.....	686N.m
Speed.....	1300~1500r/min
Starting method	electrical
Flameout method.....	hand control soft axis
(Please consult the diesel engine usage manual about engine's performance parameter)	

(4) Transmission system:

1.Torque converter:

Type.....	single-stage four-element (two-turbine)
Cylinder diameter.....	315mm
Conversion coefficient (k).....	k=4.7
Cooling method.....	oil-cooled pressure circulation
Input oil pressure.....	0.29~0.44Mpa
Out oil pressure.....	0.098~0.19Mpa

2.Transmission

Type.....	planetary type and hydraulic shift
Gears shift.....	2 forward and 1 reverse
Shifting ratio	
Forward I	2.155
II.....	0.578
Reverse I	1.577

Shift oil pump

Working press.....1.08~1.47MPa

Flow/ speed.....127 L/min/2000r/min

3.Front and rear drive

Main reducer

Type.....spiral bevel bear with one-stage reduction

Reduction ratio.....5.286:1

Wheel edge reducer

Type.....one-stage planet reduction

Reduction ratio.....4.26:1

(5) Tires

Specs.....20.5-25

Drive type..... four-wheel drive

Tire inflation.....Front 0.33~0.35MPa

Rear0.27~0.29 MPa

(6) Braking system

Foot brake.....air-assisted hydraulic-disc type brake on four wheel

Brake system pressure.....784~833Kpa

Hand brake.....Soft axle control and inner expanding shoe

(7) Steering system

Type..... fully hydraulic steering

Redirector

type.....BZZ5-800

Gear pump.....CBG 2080

Working pump.....CBGj2100

Steering pole.....FZ2-750-HEaF

Steering cylinders.....Φ90mmX340mm

Flow amplified valve.....YXL-F250F-N7

Max steering angle.....35°

(8) Hydraulic system of working device

Control valve..... DF32.2

Lift cylinder.....Φ140X855

Tilt cylinder.....Φ110X535

Chapter 2 Operation and Use

I 、 Management and use of new loader

The cab of LW420F wheel loader is carefully designed so you will have a happy and comfortable operating environment

First of all, let us know:

Keys : three sets of keys (two keys per set)for each LW420F loader

1. door key
2. key for electric equipment
3. key to loader cover door

Operating plate and pedal

Electric instrumentation

Before delivery, every new loader has been strictly inspected and tested in the factory .But before you put it into operation ,a run-in course of 8-10 hours must be carried out .that is ,from the idling ,progressively increase the load ,travel and operate the attachment with empty bucket ,in this case ,each friction part of the loader can get well meshed ,and thus the loader can be under a ready working condition ,and the service life will be prolonged .

The following items must be followed when operating a new loader

- 1、 Warm-up running must be taken by starting the engine before operation in any season.
- 2、 High speed turning without load to the engine must be avoided especially before the engine is thoroughly warmed up. .
- 3、 Avoid hurry traveling, swift direction turning and unnecessary emergent braking.
- 4、 Check and maintenance in accordance with the regulations.

II、Apparatus inside the lab and control:

- ### 1、Operation mechanism and apparatus (Fig. 2-1)

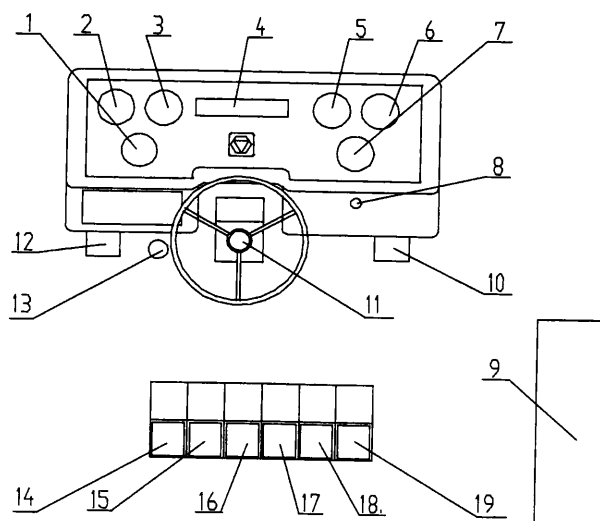


Fig 2-1 Operation mechanism and apparatus

- | | | |
|------------------------------------------|--------------------------------------------------------|-----------------------|
| 1.timer | 8. starting / ignition switch | 14.steering switch |
| 2.oil pressure gauge | 9.fuse box、 flashing amber、
acoustic back-up signal | 15.front lamp button |
| 3.engine water temperature gauge | 10.accelerograph pedal | 16.rear lamp button |
| 4.indicator lights | 11.bugle pushbutton | 17.meter light button |
| 5.torque converter oil temperature meter | 12.brake pedal | 18.stop knob |
| 6.air pressure meter | 13.shift operation handle | 19.spare switch |
| 7. amperemeter | | |

△ **Key switch**

Explanation: Before starting, the shifting lever must be put at its neutral positions. And then turn the starting key to "on" position for the power, slightly depress the throttle pedal, turn the starting key to the starting position.

△ **Before the engine is flameout , you should never turn the key to left and draw it out!**

2、Shift operation : (figure2-2)

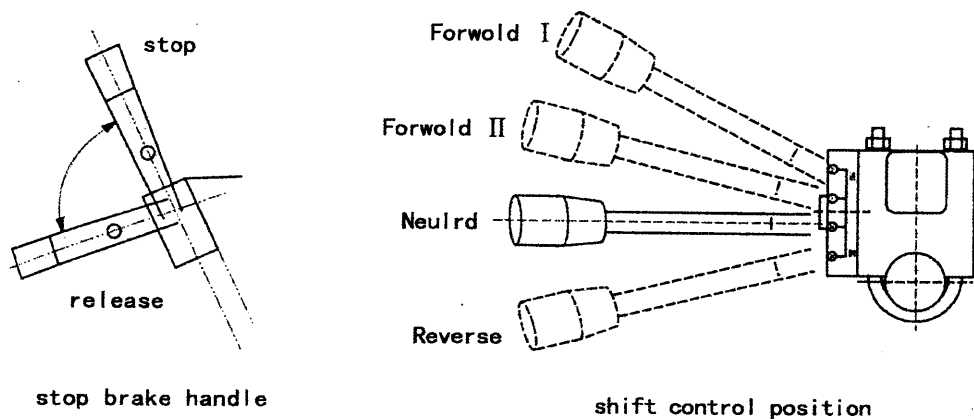


Fig. 2-2

3. Flameout position 、 Working device control: (Fig. 2-3)

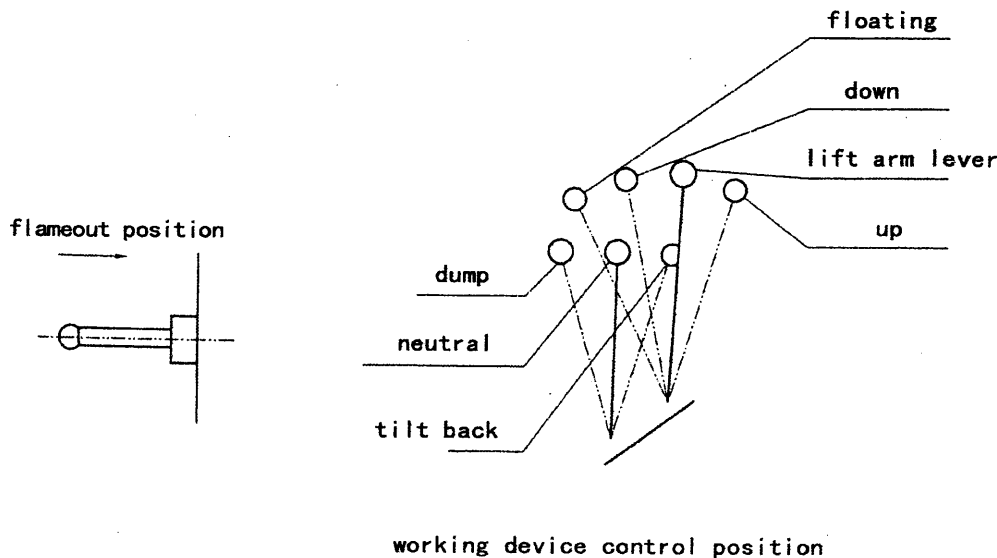


Fig. 2-3

III . Controlling

(I)、 Starting engine

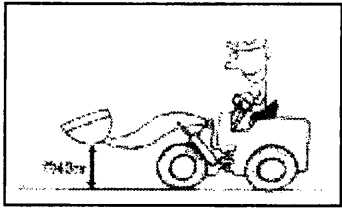
The engine can only be started after affirming each part is normal and every handle must be put at its neutral positions, if parking time is long , please fill fuel into fuel system by hand pump, and unscrew the drain air bolt of oil vapor pump, in order to exhaust the air in fuel system. Before starting, turn the key to "on" position for the power, slightly depress the throttle pedal, turn the starting key to the starting position. If the first starting fails, you must wait about one minute to do the second attempt. If the engine cannot be started after three attempts, please stop starting, lookup the causes, eliminate the failure, and then start again .

Note: each starting time should not exceed 5 seconds.

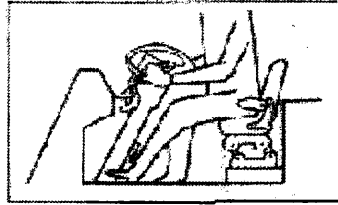
In the winter, before starting , fill hot water into radiator (water tank), that benefit to the starting of diesel engine. After starting, warm the diesel engine at the speed of 600~750r/min, and carefully notice the data of each apparatus, especially notice the data of the diesel engine oil pressure . The loader can only be started when the oil pressure number larger than 0.5Mpa and the barometer data larger than 0.44Mpa.

(II)、 Traveling

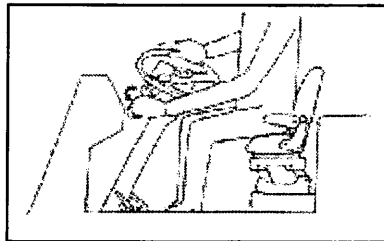
1. When the engine revolving, in order to protect electric elements, key switch must be put in the "on" position.
2. After engine starting, affirm each part is normal, raise the lift arms to carry position.
3. Step on brake pedal, release parking brake.
4. Operate the joy stick, shift the lever to your desired lever.
5. Release brake pedal and step on throttle pedal until the loader accelerates.



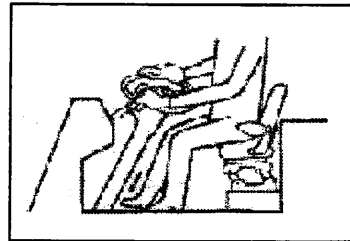
Raise the lift arms and tilt back the bucket to carry position



Step on the brake pedal
release the parking switch



Shift to 1FG.

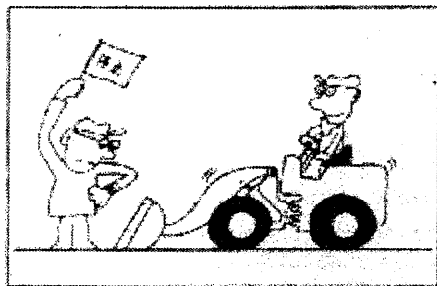


Release the pedal and slightly
step on the throttle pedal to accelerate.

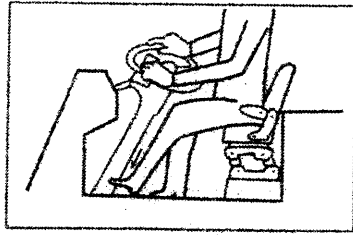
During traveling, from low gear to high gear, or from high gear to low gear, it is no need to step on the brake pedal. **Only after stopping, shifting between forward gear and backward gear can be done and must trample down the brake pedal.**

Shifting between forward and backward gear with high speed is very dangerous!

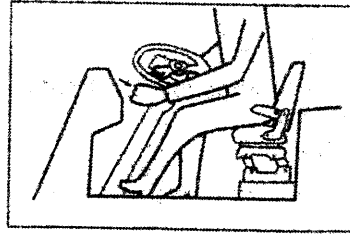
(III)、 Parking



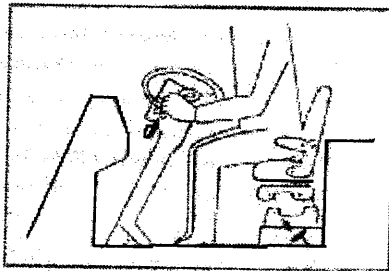
Put the bucket horizontally on the ground.
The park place should be a safe one (plane and large). To park by the process.



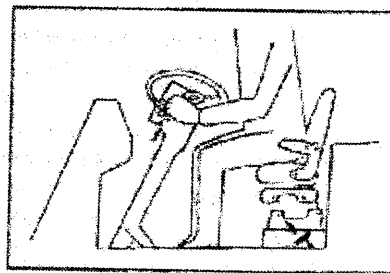
Release the throttle and step on the brake pedal until the loader stop thoroughly.



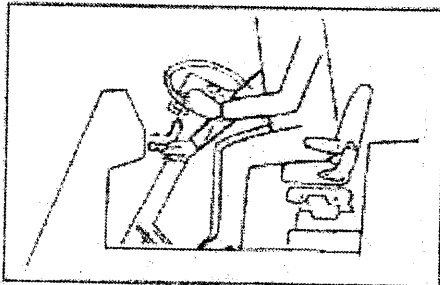
After stopping, move the shifting lever to its neutral;



Let the diesel engine runs for 3~5minutes at 750r/min for each part get cooled .
Then push the flameout pole, stop engine



Strain the hand control pole



Shut off electric appliances key

Notice: In order to prevent accident, don't stop the loader on the steep grade road.

Don't forget to close the key switch, in order to protect the electric appliances.

IV、Working

(I)、Shoveling operation

1. Working preparing

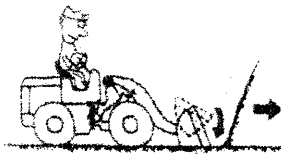
(1) Tidy up the working site, fill and level up the pits, clear out the roadblock that can harm the tires and balk the working.

(2) When shoveling, the speed should lower than 4Km/h.

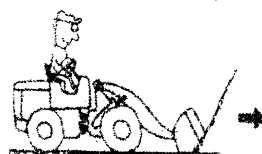
2. Working

The loader working circulation include four process:

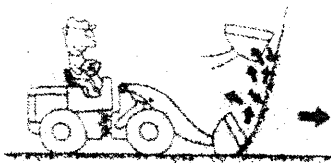
- (1). Shift to I gear, drive the loader to the material heap, when the loader is 1~1.5 meters away from the material heap, drop the lift arm, turn the bucket, make the blade on the ground, keep the bucket incline forward about 3~5° with the ground, insert the bucket into the heap.
- (2). Shift the lift arms lever into raise position, operate the tilt lever to tilt back 2~3 times to get the bucket fully loaded. Fully tilt back the bucket and raise it to carry position.
- (3). After the loader fully loaded, drive it to point of discharge or carrying vehicle, raise the lift arm to dumping height to unload. When the material adhere to the bucket, can come-and-go turn the control pole, let the material shed off.
- (4). Drop the lift arm to carry position, return to the material heap to proceed the next working circulation.



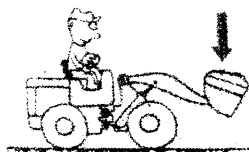
About 1~1.5 miles away from the material Heap, drop the lift arm, turn the bucket.



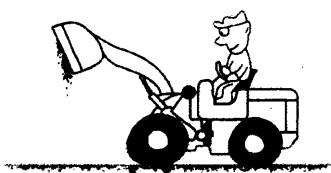
Insert the bucket into the heap.



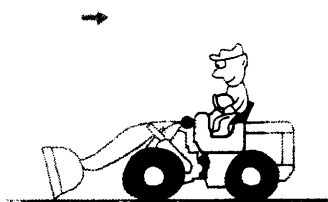
Discontinuous turn the bucket and raise the lift arm



After fully loaded, drive the loader to point of discharge or carrying vehicle



Raise the lift arm to dumping height and unload



Return without the material, proceed the next working circulation

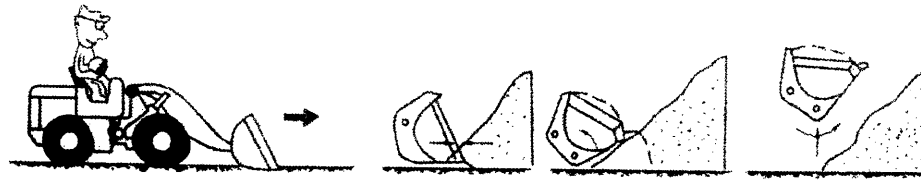
3. Shoveling method

The shoveling method affects the working resistance and the loadage. Shoveling method can be chose in accordance with the condition of the materiel, heap height etc.

(1) Once shoveling method

The loader straightly go forward, insert the bucket blade into heap till the bucket motherboard contact with the heap, then stop forward, turn the bucket to the position of

fully loader, raise the lift arm to carry position. (about 40cm away from the ground)

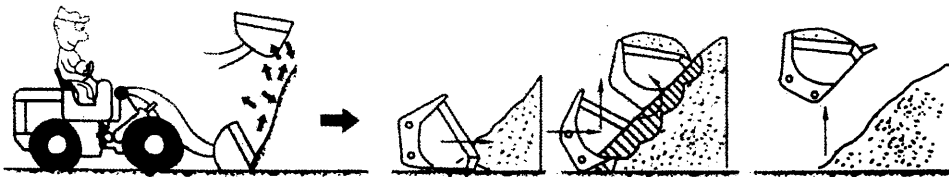


Once shoveling method is the easiest shoveling method. The driver's operation lever isn't severely restricted. But the working resistance is big, deeply insert the bucket into the heap, so request the loader have bigger inserting force, bigger power in order to overcoming the tilt bucket resistance. Only shovel the loose materiel, such as sand, coal, coke etc.

(2) Complex shoveling method

When the loader is going forward, turning the bucket or raise the lift arm to execute shoveling working.

When the bucket insert itself about 0.2~0.5 times of bucket depth in the materiel, the loader go forward at the same time discontinuous tilt the bucket, raise the lift arm till fill the bucket



When adopt the complex shoveling method, it is no need to deeply insert the bucket. Integrate the inserting and the turning and lifting of bucket , decrease the insertion resistance, this make the bucket be filled easily. It is an ideal method, but the driver must be very skillful and experienced .

4. Working in combination with automatic unloading vehicle

The mode has four types:

(1). V-type working method

Keep the automatic unloading vehicle incline about 60° to the direction of the loader to the materiel. After loaded, back move the loader about 3~5m, turn the articulation about 35° , move the loader to the automatic unloading vehicle, then unload. The working circulating time of this working method is the shortest. Working efficiency is higher.

(2). I-type working method

Keep the automatic unloading vehicle in parallel with the working face, timely go

forward or backward, the loader in vertical with the working face, straight go forward or backward, so this working method is be called shuttle working type.

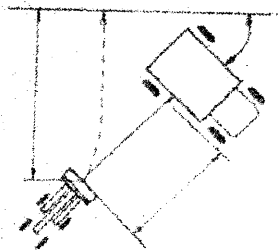
It saves the turning time, but increases the forward or backward times of the automatic unloading vehicle, so adopt this working type, the working circulating time be decided by the drivers. The working method will not have high working efficiency unless the loader matches with the motorcade hard-running transportation.

(3). L-type working method

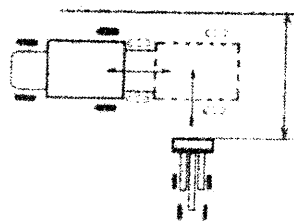
Keep the automatic unloading vehicle in vertical with the working face, load the bucket with material, back move and turn about 90° , then drive to the automatic unloading vehicle, unload, back move and turn about 90° , bear up to the materiel, perform the next working circulation. If carrying distance is short and working area is wide, the loader can match with two automatic unloading vehicles to work .

(4). T-type working method

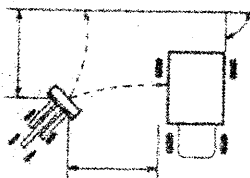
The automatic unloading vehicle in parallel with the working face, away from the working face, load the bucket with material, back move and turn 90° , then turn 90° to the opposite , drive to the automatic unloading vehicle to unload.



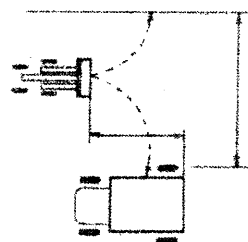
V—type circulating operation



I—type circulating operation



L—type circulating operation



T—type circulating operation

Using method of bucket set level indicatory pole:

When parking the loader, if want to levelly place the bucket, the operator can look the set level indicatory pole at the top of the right turning cylinder. If the indicatory pole and canula tailend are in line, that indicates the bucket has be placed flatly.

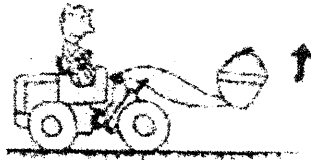
Properly lower the lift arm, place the bucket on the ground.

(II), Portage operation

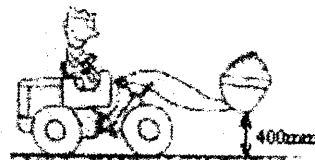
The loader can transport by itself under the following condition.

(1) Road is too soft or the field is not neat, the camion can not work.

(2) When carrying distance less than 500 miles, it is a waste to transport by camion. Carrying distance and road surface condition decided the carrying speed. Lift the bucket to limit position and keep the bucket away from the ground about 400mm, in order to have safety and stability transportation and the good view.



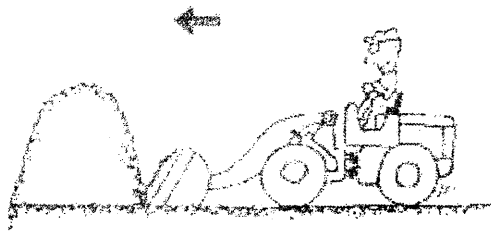
tilt the bucket to limit position
400mm



keep the bucket away form the ground about

(III)、 Bull-dozing operation

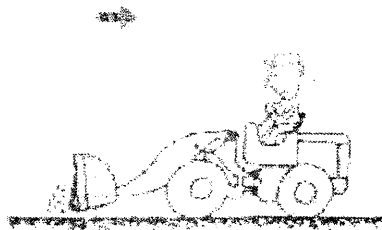
Taking the bucket as a scraper, the loader can perform bull-dozing operation. Loading the bucket fully with earth, and keep it horizontally to the ground, go forward. If the loader is blocked, please raise the lift arm a little and continue going. When control the lift arm, the control pole should be between the dropping and the rising, don't put it on any fixed position, to ensure the bull-dozing operation go on wheels.



(IV) Ground renovation

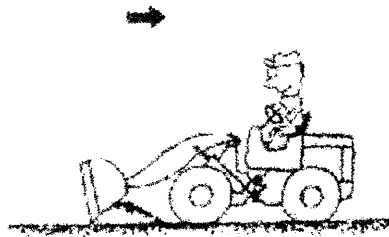
With the help of the cutting edge and bottom plate of the bucket, the loader can perform ground renovation such as earth scattering, leveling and foundation processing.

(1) Earth scattering



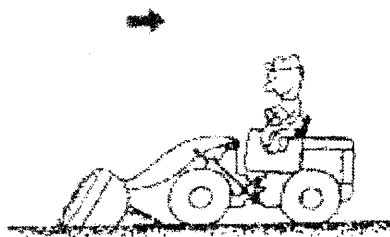
Load the bucket with earth, back move the loader and keep the bucket incline forward about 10° to 15° with the ground, the earth can be scattered smoothly.

(2) Rough leveling



Tilt the bucket completely forward to get the cutting edge touching the ground, and drive the loader backward in low speed.

(3) Fine leveling



Load the bucket with earth, put the bucket horizontally on the ground. Shift the lift arms lever at “floating” position and then drive the loader slowly backward.

(V) Digging operation

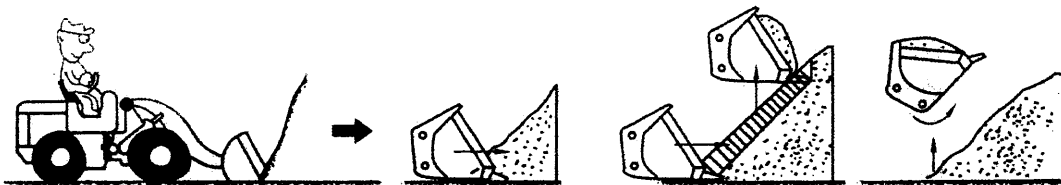
Digging operation is to dig the bucket into earth or soil while the loader is running or stop .

Make the two sides of bucket burdens evenly .

Digging operation includes shoveling operation and earth digging operation.

(1) Shoveling operation

Keep the bucket in parallel with the ground, and push the bucket fully into the heap, and then shift the lift arms lever into raise position, the blade quite the material heap, turn the bucket to carry position. Besides, when it is hard to dig into the heap, slightly tilt the bucket in the ratio of 1 forward and 2 backward, and you must ensure the wheels not slipping.

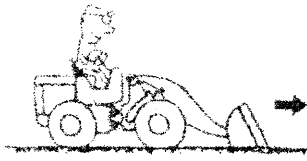


If the wheels slip, please reduce the force on the throttle pedal, to decrease load and avoid forced operation.

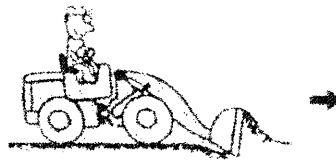
(2) Earth digging operation

Tilt the bucket forward to make a small angle between the bucket and the ground. (The best forward incline angle of the bucket is between 0° to 10°). Control lift arm and tilt lever to adjust the digging depth, at the same time the loader forward. (Pay attention to the condition of

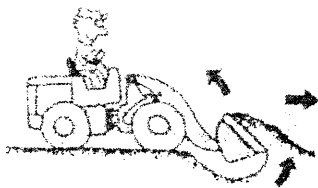
the uneven road when working.)



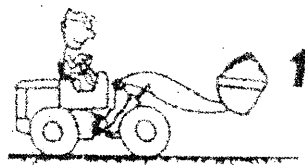
Tilt the bucket forward to make a small angle between the bucket and the ground .



Drive the loader to load the materials into the bucket .Use the lift arms lever and tilt lever to adjust the digging depth.



During working raise the lift arms and tilt back the bucket to load in.



Tilt the bucket back its limit and raise the lift arm to carry position.

(VI) Towing operation

Raise the lift arm to carry position, fix the dragline to the towing pin, step on the accelerator pedal, for the loader move slowly.

Be sure that the braking system of the towed vehicle should function perfectly. The towing cable should be firmly scrapped by the pin.

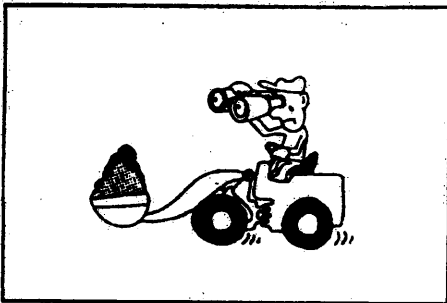
Chapter 3 Safety

This loader is a construction machinery , it can be widely used to transporting , loading , excavating , ground renovating and so on . Correct operation can increase the working efficiency but accidents or troubles will occur if not operate impertinently.

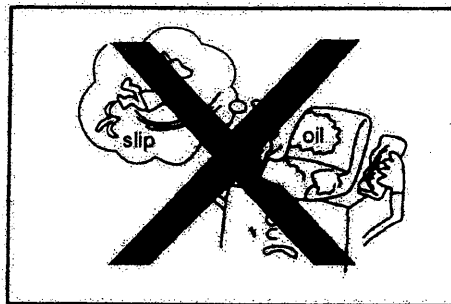
The driver's operation must after the training of traffic rules , loader structure principle , practical operation, and the driver should obey with the safety regulations and traffic rules .

For the happiness of yourself and others , remember that the safety is the utmost important.

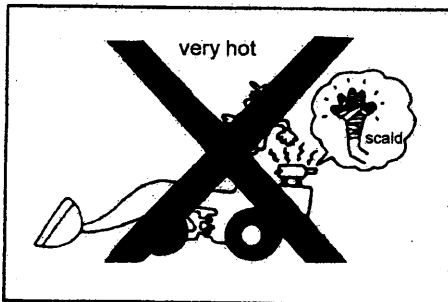
I . general knowledge



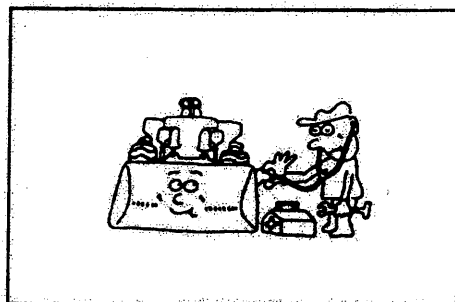
The loader is different with auto in structure . the prepositive working device will obstruct your field of vision . when loading , the weight be concentrated on front wheels , please take the stability into consideration



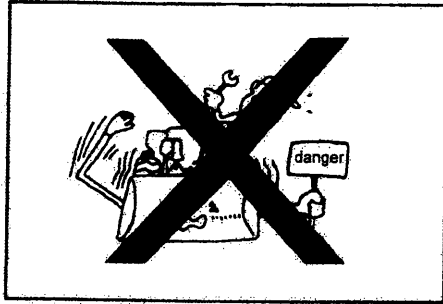
if grease or oil adhere to operation position , please clean it away at once to avoid slipping.



The uncovering of the oil container must be slowly otherwise the compressed air escaped it will injure you . when touching the radiator cover , silencer and other hot parts , take care and don't get your hands burnt .



Checking s should be done correctly before and after operation. If you ignore oil leakage , water leakage , deformation , loosening , abnormal noise , you will have the chance to be knocked down by troubles and serious accidents . so checking should be done regularly.

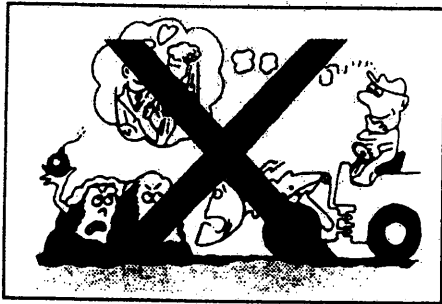


It is very dangerous to check the engine while it is running , especially notice the turning of the leaflets of the ventilator.



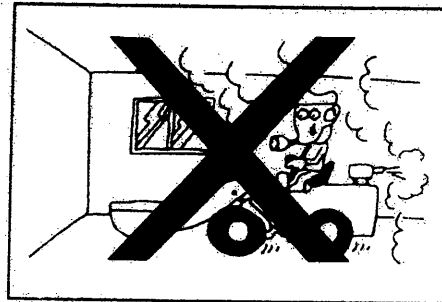
Abnormal condition must be repaired right away.

If any abnormal condition have been found , report to your manager and move the loader to safe place at once . operation can be resumed after the repairing .



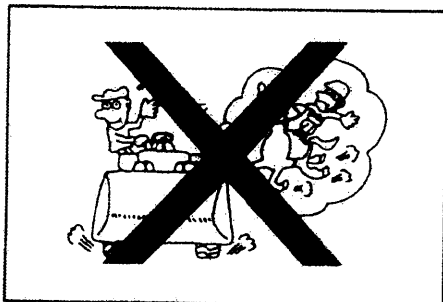
Regulate your health condition.

Never operate the loader when your health is not in good condition . the moment negligence will result severe accident . utmost attentions should be paid to that .



The room must be ventilated when operating indoor .

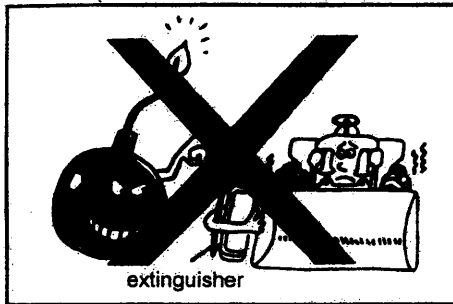
When operating indoor, the exhausted gas is poisonous so the opening of the windows for ventilation is necessary .



The operation should be done while the operator is on seat.

All the operation on control lever must be done when the operator is on seat . don't operate the lever when you are not on seat .

II. before and after the working

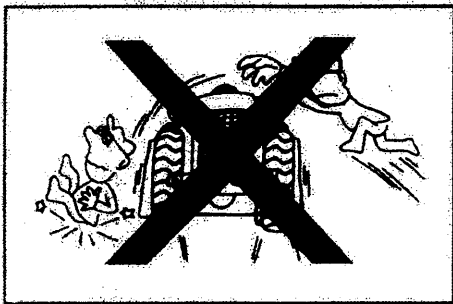


Keep the loader far away from fire.

Fire is very dangerous to your loader , so pay special attentions.

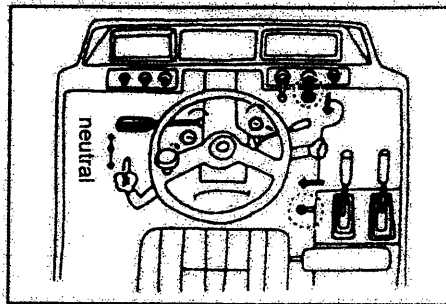
Smoking is strictly forbidden when checking the oil level , replenishing new oil and maintaining batteries.

The engine must be stopped when replenishing fuel oil .



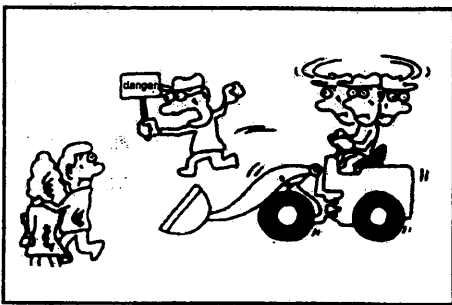
Getting on and off the loader properly , keep your shoes clean.

Jumping on and off the loader is very dangerous , please make use of the ladder of the cab .



When starting and stopping the loader :

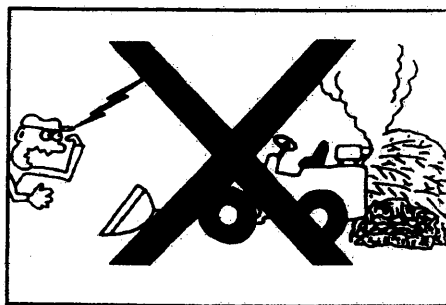
- * make sure the park brake is engaged.
- * make sure the shift lever be put in neutral.
- * make sure the working device control lever be put in neutral .



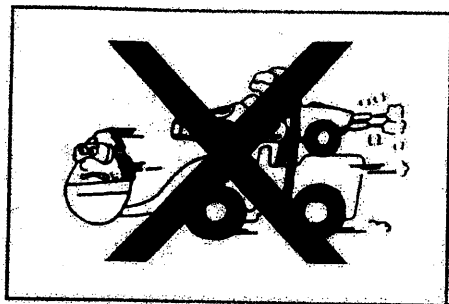
Be sure no person near the loader when starting the loader .

Push the start button in and don't hold it over 10 seconds.

When pulling the engine flameout switch , don't release it until the engine is flameout .

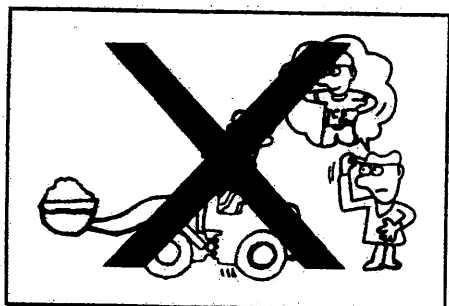


When parking the loader , select a place that no easy burning material such as withered grass and waste paper surrounding the loader , especially the exhauster .

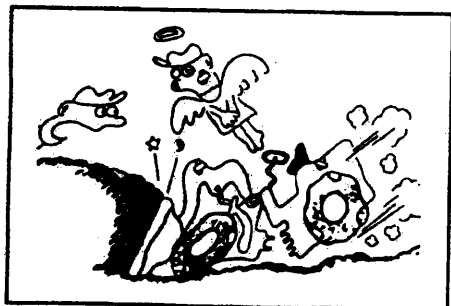


Wild operation is forbidden.
Wild operation is very dangerous .
Always avoid the unnecessary emergency brake , swift traveling and stopping , high speed steering and zigzag traveling.

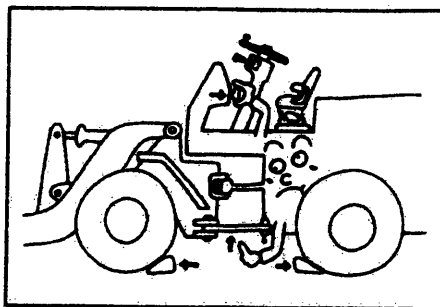
III. in driving



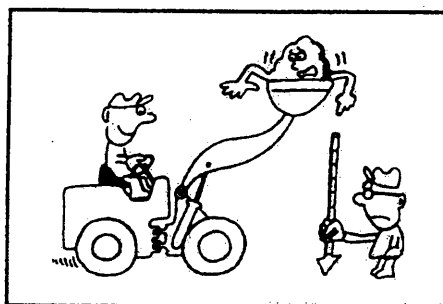
Before you move the loader , press the horn button to sound , be sure the safety is affirmed .
Attend if someone or obstacles around the loader .



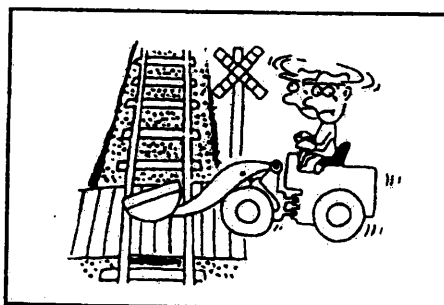
Don't dash with high speed!



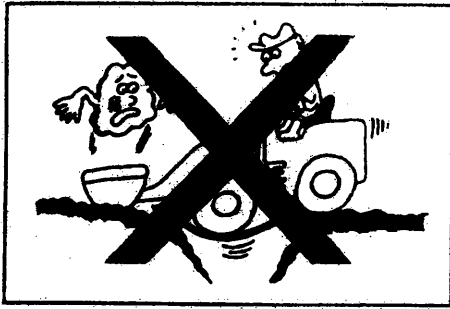
When parking
Park the loader in flat place and lay down the bucket horizontally on the ground , pull the parking brake . if the parking on slope is unavoidable , use the wedge and pull out the key .



It is very dangerous to travel with the bucket highly raised , it is necessary that keep the correct the transporting condition .



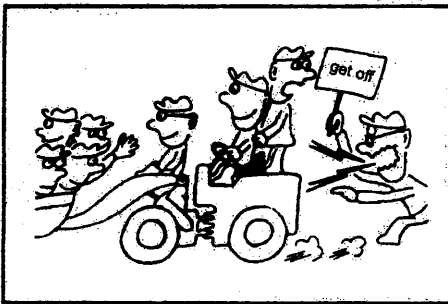
The operator must obey the traffic rules when driving on normal road and don't incur traffic jam . accelerate your speed when crossing a railway .



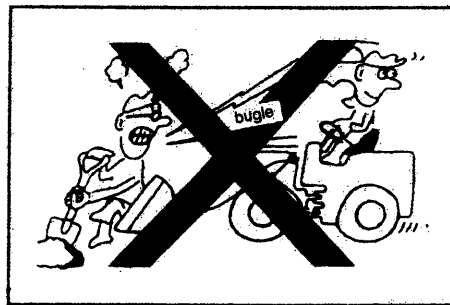
Investigate the road before operation.
Investigation should be made on the road conditions , bridge strength , environmental terrain and geology of the worksites .



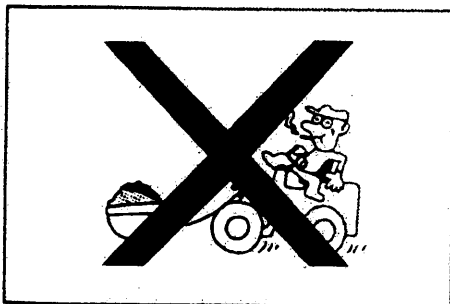
Obey the regulation .
choose the speed according to the actual working condition , so you must familiar with your loader .
At the same time , get cooperator know the type and function of your loader , move path and working method.



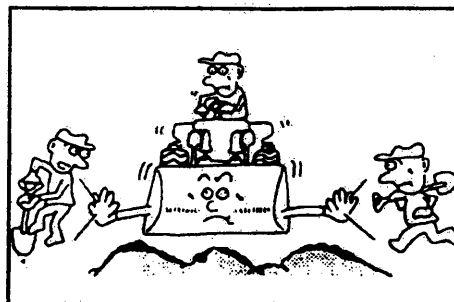
The loader is for loading and not a man carrier .
The hitchhiking is very dangerous , no passengers except the driver is permitted to be carried by the loader .



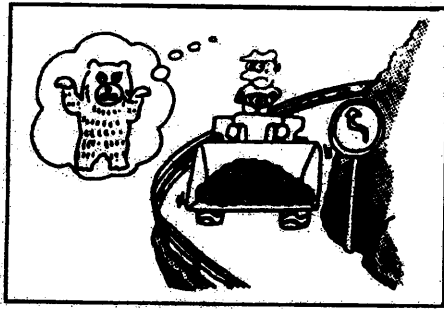
Little negligence also can result great disaster .
Don't look around when operating , always notice the surrounding people and push the horn button sometimes.



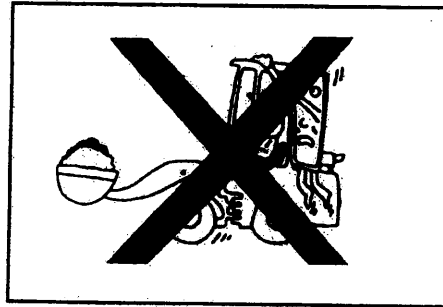
Stretch arm or leg out from the cab may injure you . Don't put your arm or leg on control device .



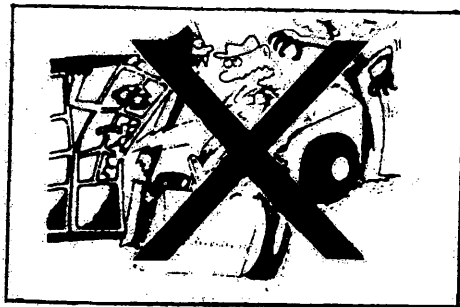
Pay more attention when the sight is limited.
No person be allowed getting into the working area except the guider .



When driving on narrow road or the visual field is limited , decrease your speed , avoid the imprudent operation.

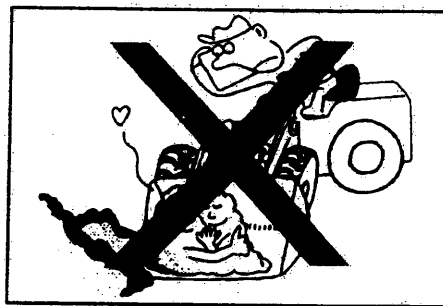


Don't drive with the cab door is open.



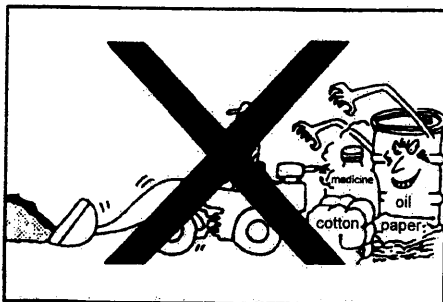
Notice the obstacles.

When obstacles are in your way , such as the roof of a building and the upper part of a great , travel or steer slowly to avoid colliding.

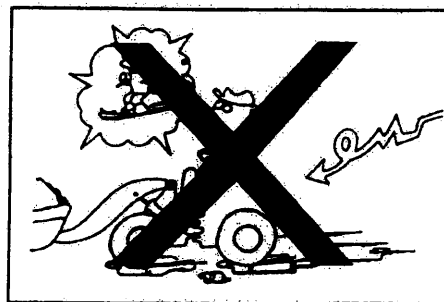


Notice that what are in your surrounding .

When you travel or steer in limited place , your surroundings must be noticed and speed decreased. Make sure there's no obstacle around . when the road surface is bad , the load will not keep silent , so drive carefully to avoid steadiness losing of the load.

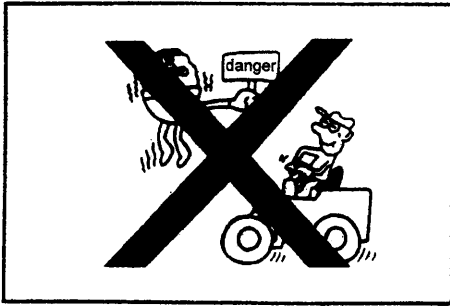


Keep away from dangerous place . If the air released from the exhauster is jetted to the easy burning objects , or the exhauster is near to them , fire will be easily lighted . so when you are near the easy burning or dangerous materials such as oil , cotton , paper , withered grass , special attentions must be paid .

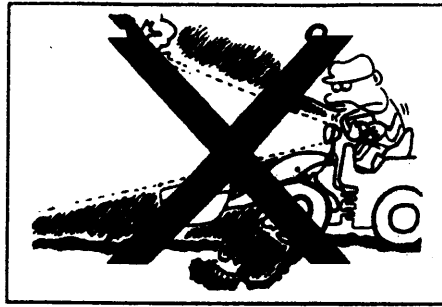


Watch the road surface carefully.

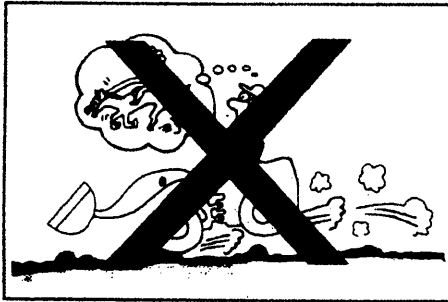
Avoid high speed driving , high speed steering and emergency brake when driving on slipping road .



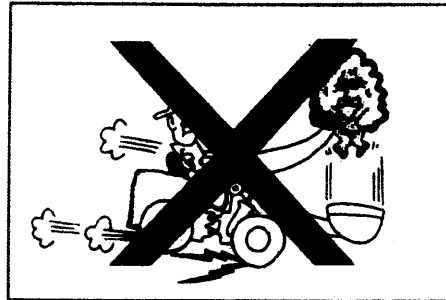
It is dangerous that driving with the bucket highly raised because it can result the unstable . The correct position of the bucket in traveling is to be lowered and titled against the limit block on the lift arms and kept a certain clearance from the ground .



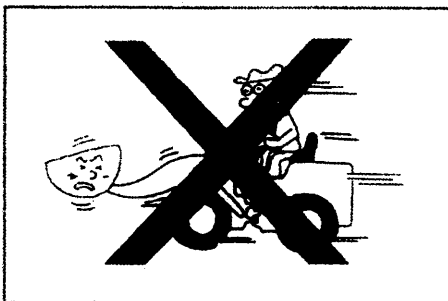
Be careful when operating at night.
You will easily have a false impression to the distance and the terrain at night choose the suitable speed according to the illumination ,
At the same time , turn on the front and head lamps .



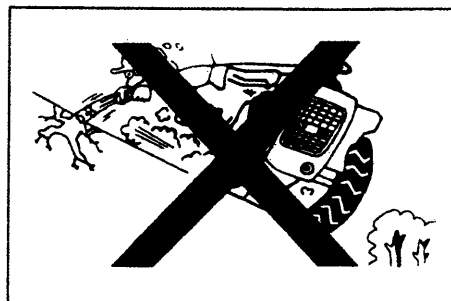
When driving on rough terrain or on roads being covered by miscellaneous stuff , the steering wheel will happen to be out of control to cause a overturn , so the decrease of speed is necessary . and if driving across a damp and loose ground , pay more attention to the wheels and braking effect .



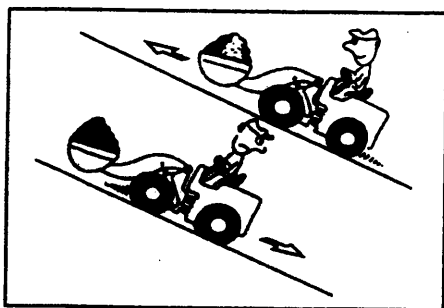
The violent action of the bucket is dangerous .
If you operate the bucket violently , the load in the bucket will be thrown out or the loader may get overturned .



The engine should be run smoothly.
If you operate violently , the loader will get a shock to cause an unexpected results .

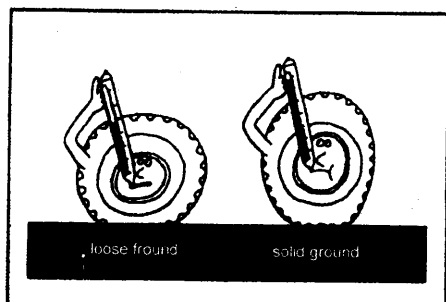


Don't driving transversely or change direction on a slope , it may cause the loader upside down . avoid the dangerous operation



When driving on a slope , the center of gravity of loader will be shift onto the front or rear wheels , so careful operation is needed . (don't apply emergent brake) Go forward when driving up a slope , and backward when down. Don't swerve on a slope .

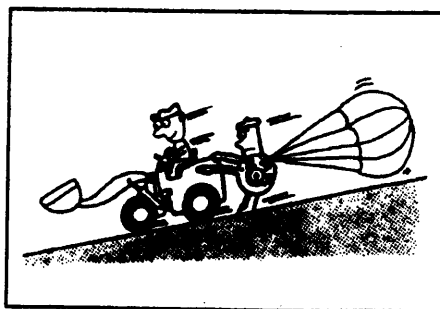
IV. loading and unloading



Keep the tyre air pressure in good condition. Adjust the tyre air pressure according to the working purpose and the terrain .



The operation on working device must be correct .



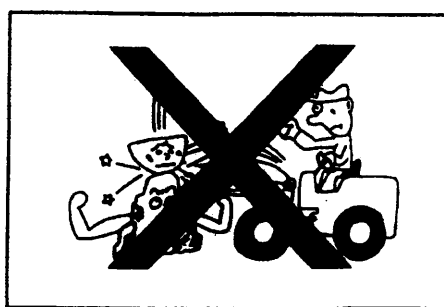
Don't operate the shift lever when get down a slope .

If the speed exceed the gear speed , please trample the pedal to decelerate.

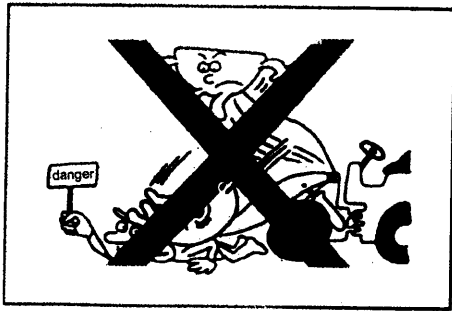


Don't overload .

The overload is extremely dangerous . before working , you must confirm the weight and center of gravity of the load to avoid overload .

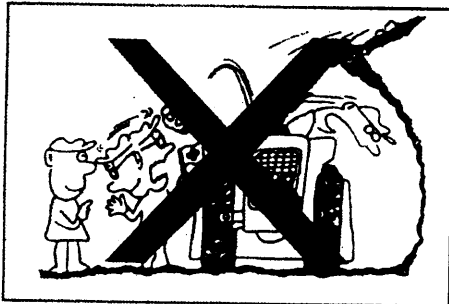


Don't use the loader as all purpose machine . Loading , scraping , stirring or pushing load with the head or one part of the working device , will be an important reason of failure or accident.

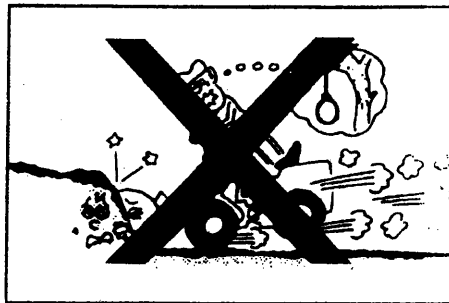


No person be permitted to near the working area .

Because the working device may move in many directions , it is dangerous to enter the working area . when maintenance is necessary , fix the working device with post or wedge and then do the maintaining.

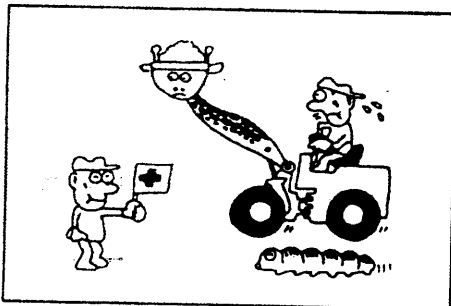


When working on cliff or easy cave in place , please take safety measures and assign a guider .



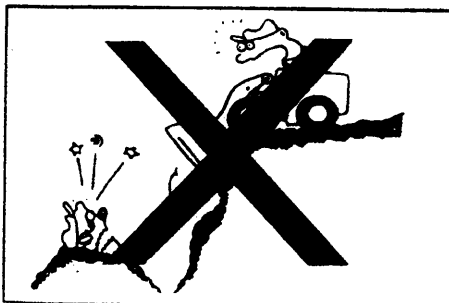
High speed dashing is equal to suicide .

High speed dashing not only can damage the loader but also can injure the operator . never try it . Inspect the environmental conditions in advance and then work.

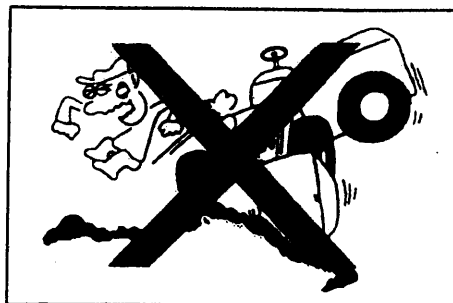


More attention should be paid when the bucket is at its highest position .

When the bucket is at its highest position , the loader may lose its stability . in this case , the movement of the loader should be very slow and be careful when dump.

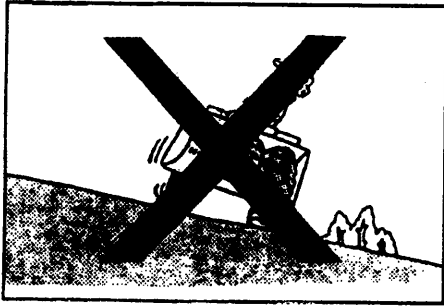


Pay attention to the dumping spot when dump from higher place .

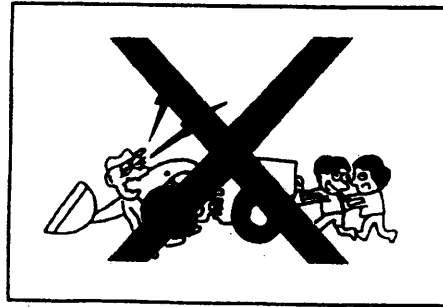


Keep the loader upright with the load.

Operaaatingl from a slant direction can make the loader lose its balance , so please avoid it .



It is dangerous that run the loader on slope.
Watch the terrain condition , don't raise the bucket when the loader in slant position otherwise the loader may overturn .

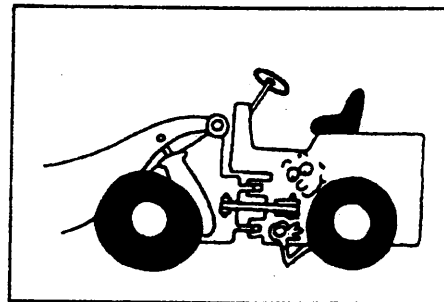


Check the tyre .
The checking about tyres should be applied from the side .
If one tyre should be dismantled , others should be blocked .

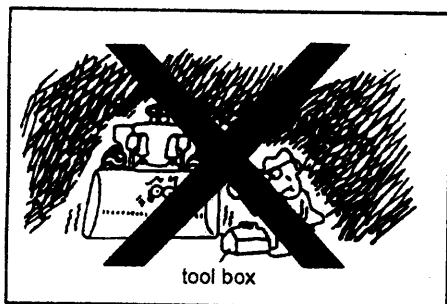
V. others



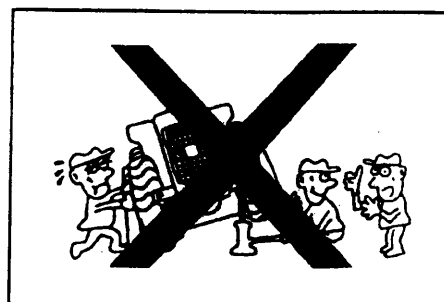
When operating , the operator should wear a safety hat and protection clothes .
Sometimes because of the content of operation , safety glasses , gloves and mask should also be worn.



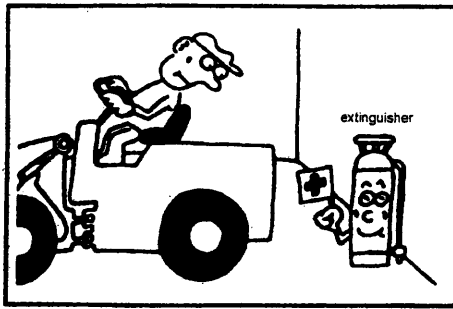
Fix the loader by safety lock post when maintaining .



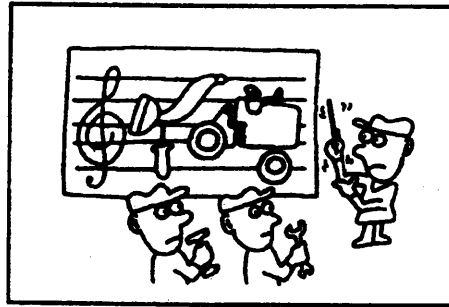
Don't use the flame to check the dark area.
Pay more attention when inspect the battery and the electrical equipment.



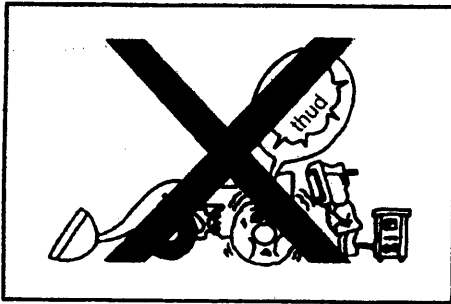
When you jack up one side , don't allow other person get into the other side .



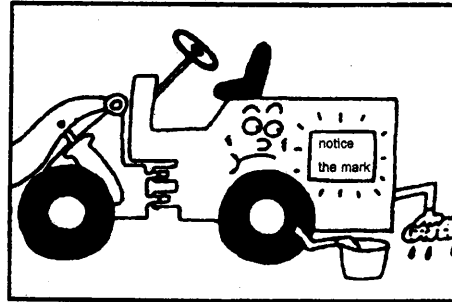
Prepare the extinguisher before work in a building, and familiar with its place and usage.



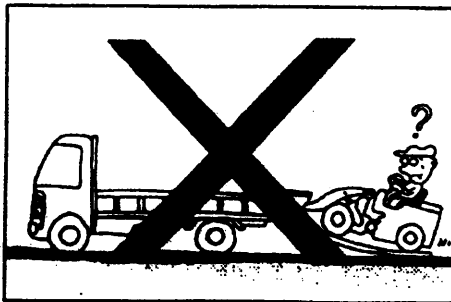
Repairing procedure should be programmed. When the loader is to be repaired , or parts to be dismantled , the working director should be selected firstly and work be done in accordance with his programmed procedure.



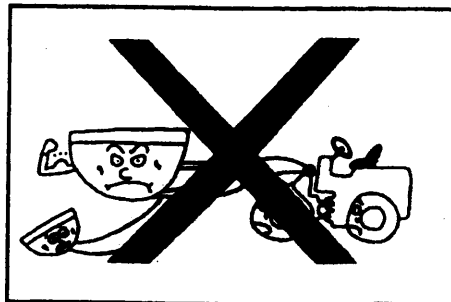
Don't perform welding near the tyre because that can make the tyre explode .



Obey with the marks. The most important points are marked on the loader and must be obeyed strictly . replace or clean the mark when it is peel off or dirty.



When using the gangboard to transport the loader , the size , width and strength should be considered , and a suitable gradient should also be kept to ensure a safe loading .



Don't reconstruct on the site. Never reconstruct the loader on site which may influence the functions , safety and strength of the loader or its bucket.

Chapter 4 Main structure

The loader is composed of engine, transmission system, steering system, braking system, frame, work device, hydraulic system, cab and electric system.

I .Engine

The engine of LW420F is composed of diesel and air filter and exhaust pipe and cooling system. The further details of engine be introduced in the operation manual accompanying with the engine.

Notice:

1. In the cold weather , when the loader be transported in long distance and the cooling liquid didn't be added with anti-freezer, please open the diesel outlet switch, drain the water out from water pump and oil cooler and water tank and torque converter cooler.
2. If there is water in the cooling liquid and oil sump, except check the diesel, you must check the torque converter oil cooler filter is right or cracked.
3. Check the fixing screws of the fan are fastening or not in the operating process.
4. The cooling water adopted rain water and tap water and precipitated river water, don't use the well water because the well water contain more mineral material, it is easy to produce furring which effect the cooling effect badly. When the loader is in the cold zone or in winter, anti-freezer should be putted into the cooling water, so as to avoid the icing. The common prescription of anti-freezer liquid as follows:

(a) alcohol 43%	glycerin 15%	water 42% (weight ratio)
(b) glycol 50%		water 50% (cubage ratio)
(c) glycerin 66.7%		water 33.3% (weight ratio)

II .transmission system

Transferring system is mainly composed of torque converter and transmission, hydraulic torque converter, transmission oil way system , transmitting shafts, driving axles and wheels, The principle shown in Fig.4-1.

1. Torque converter and transmission

(1). Principle of transmission structure

Transmission, torque converter, diesel engine, these main parts are integrated as a whole. (Fig 4-2)

Transmission is composed of tank, overrunning clutch, planetary transmission mechanism , friction clutch , cylinder piston , transmission pump , transmission control valve .oil filter , shaft , and gear such main parts .

The torque converter impeller (10), rotating housing (27) and engine flywheel connected by spring plate are integrated as a whole, and its rotational speed is the same with the diesel engine's . The power of diesel engine transmitted to the impeller , and then to the stage I turbine (8) and the stage II turbine (7).

The power of torque converter stage II turbine (7) is transmitted to the input gear (12) of the transmission through turbine delivery gear (4) , the power of stage I turbine is transmitted to the

delivery gear of stage I , turbine (3) and then to the outer ring gear of the big overrunning clutch (15), when the external load is small , the rotating speed of the transmission input gear (12) is higher than that of the outer race gear of the big overrunning clutch (15), therefore big overrunning clutch roller (13) is released . Outer race gear (15) of big overrunning clutch rotates idly , only the stage II turbine works.

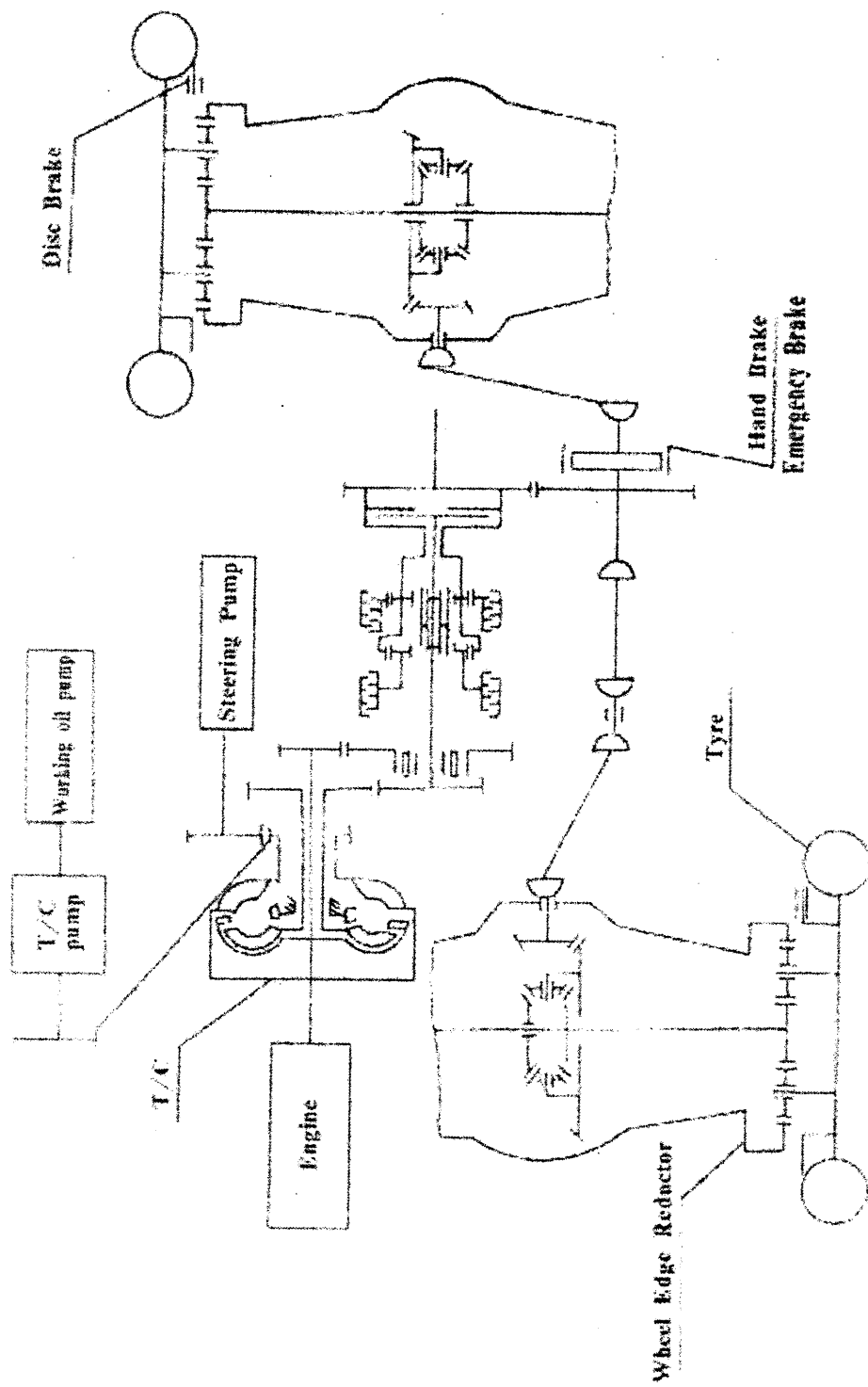


Fig. 4 - 1 Transferring system principle

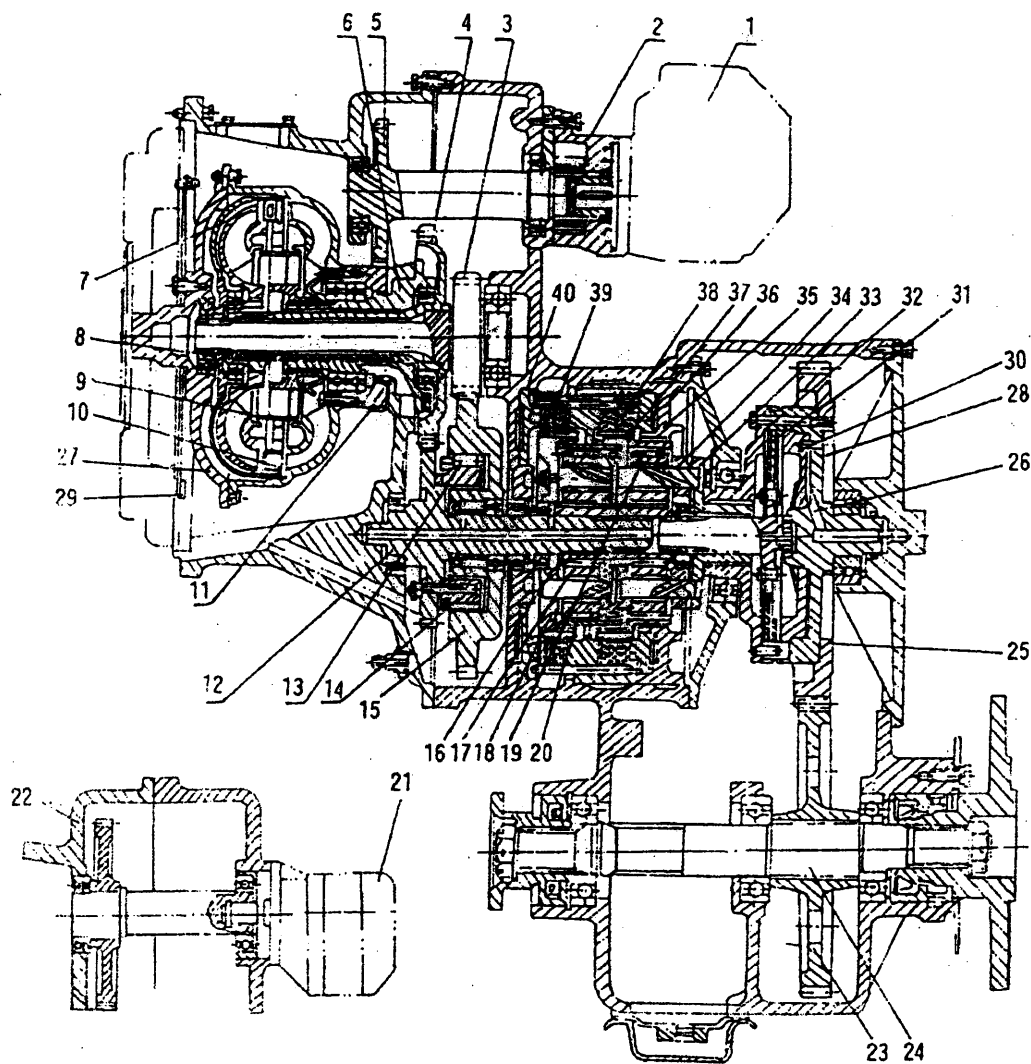


figure 4-2 Torque Converter-Transmission

1. hydraulic implement pump 2.transmission gear pump 3.stage I turbine delivery gear
 4.stage II turbine delivery gear 5.transmission gear pump input gear 6.carrier assembly
 7.stage II turbine 8.stage I turbine 9.stator 10.mpeller 11.distributor driving gear
 12.transmission input gear 13.big overrunning clutch roller 14.big overrunning clutch cam 15.outer
 ring gear 16.sun gear 17.reverse planetary gear 18.reverse planetary carrier 19.gear I planetary
 gear 20.reverse inner ring gear 21.steering pump 22.steering pump input gear 23.transmission
 delivery gear 24.delivery shaft 25.delivery gear 26.gear II input shaft 27.wheel shell 28.gear II
 cylinder 29.spring plate 30.gear II piston 31.gear II friction disc 32.gear II pressed disc
 33.reverse-gear and gear-I coupling disc 34.gear I planetary carrier 35.gear I cylinder 36.gear I
 piston 37.gear I inner ring gear 38.gear I friction disc 39.reverse friction disc 40.reverse piston

The increase of the external load decrease the rotation speed of the transmission input gear (12) , if the speed of input gear (12) is lower than that of the big overrunning clutch outer race gear (15) . The roller (13) is meshed. The power from stage I turbine is transmitted to the big overrunning clutch cam (14) by the roller . As the cam (14) and the input gear (12) are connected with bolts , stage I and stage II turbines work simultaneously .

The transmission is a hydraulic shift gear box with three gears: two forward and one reverse.

Forward gear I

Gear I piston (36) actuated by oil pressure moves leftward , gear I friction clutch (38) is engaged . Gear I inner ring gear (37) is braked , power is transmitted from the input gear (12) to the gear I planetary gears (19) through sun gear (16) . As gear I inner gear (37) is braked , gear I planetary carrier (34) rotates and transmits power through coupling disc (33) to gear II pressed disc (32) and gear II cylinder (28) and then to output gear (25) . And this is the power output of gear I .

Forward gear II

Oil pressure moves the piston (30) leftward , gear II friction clutch (31) is engaged and power is transmitted from input gear (12) through sun gear (16) to gear II input shaft (26). As gear II friction clutch (31) is engaged , power is transmitted to gear II pressed disc (32), and through gear II cylinder (28) to delivery gear (25) as the power output of gear II .

Reverse gear

Oil pressure causes the reverse piston (40) to move rightward, and the reverse gear friction clutch (39) is engaged . The reverse gear planetary carrier (18) is held fixedly. Power is transmitted from input gear (12) through sun gear (16) to reverse gear planetary gear (17). As reverse gear planetary carrier (18) is braked , power is transmitted reverse through reverse gear inner ring gear (20) to gear planetary carrier (34) , and through coupling disc (33), gear II pressed disc (32) and gear II cylinder (28) to delivery gear (25) as power output of reverse gear .

The transmission includes 3 pumps: the transmission gear pump (2) , hydraulic implement pump (1) and the steering gear pump are mounted on the transmission housing . The torque converter impeller is connected with the distributing gear (11). The distributing gear (11) meshes with the transmission gear pump input gear (5), steering pump (21) is driven by steering gear pump input gear.

(2) Hydraulic system for torque converter and transmission.

Working oil in the transmission sump is pumped by transmission gear pump to the pressure control valve through an oil filter (in which there is a by-pass valve. If the oil filter is choked, the oil will flow through by-pass valve. The oil pressure controlled by the by-pass valve is 0.080-0.098 MPa) (Fig.4-3). The pressure oil flows through a small hole in the pressure control valve rod (2) (Fig. 4-4) to the upper end of the pressure control valve rod, pushing the rod to the down part. The pressure oil be distributed in two ways, one way leads to torque converter through inlet pressure reducing valve. The other to the speed selection valve rod cause the pressure oil to enter different clutch cylinders, which accomplish gear changing. At the same time the pressure oil flows through a small hole to the left end of the slide valve on the left side of the pressure control valve and forces the slide valve to move rightward for the

purpose of ensuring a constant oil pressure of 1.08-1.47 MPa when braking, compressed air enters clutch cut-out valve and pushes the air valve rod to the right, making the pressure oil flow back to the oil tank through oil returning hole. Now the pressure oil at lift end of slide valve is also cut out, the oil opens the non-return valve under the force of the spring and the oil returns to the tank with all speed. At this time, the oil in the cylinder also flows back to the tank release the clutch, and the transmission automatically assumes neutral.

The oil from the torque converter flows to the cooler to be cooled, and then through lubricating pressure valve enters transmission to lubricate and cool it. The control pressure of lubricating pressure valve is 0.098-0.19 MPa.

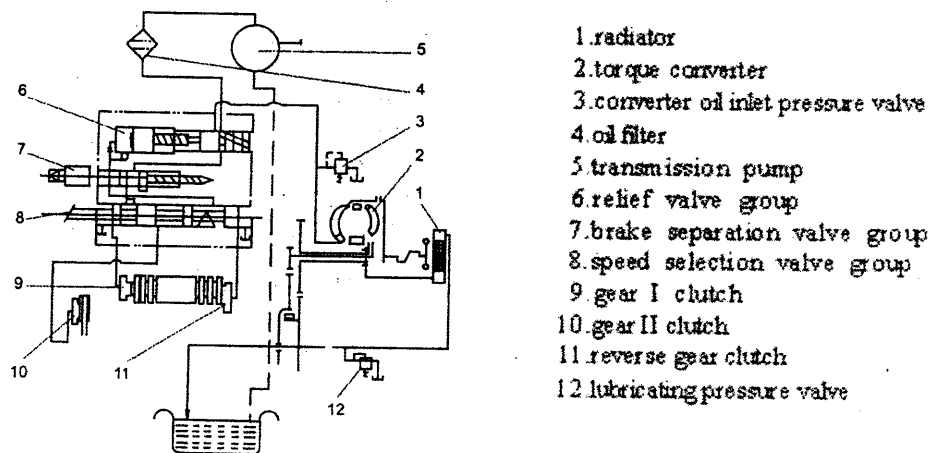


Fig. 4-3 hydraulic system of the transmission and torque converter

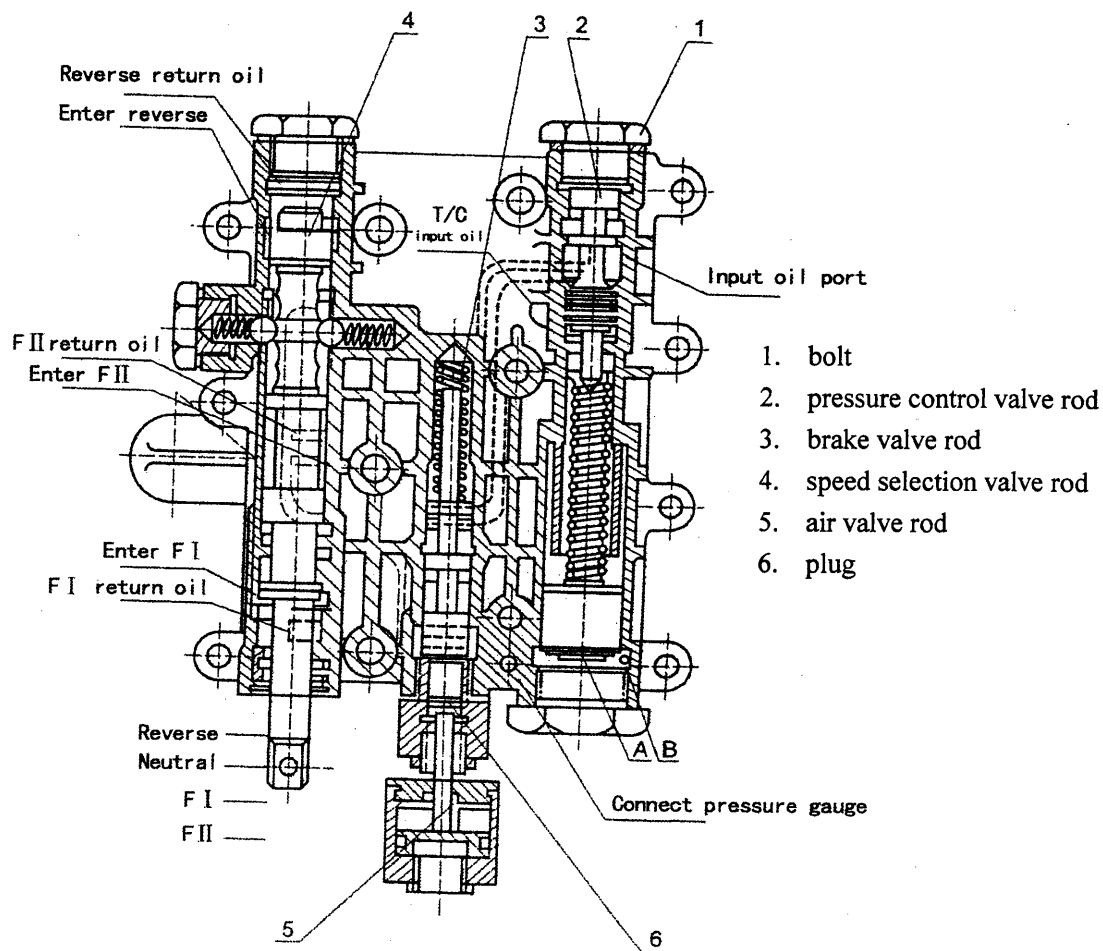


Fig. 4-4 transmission hydraulic control valve

(3). Maintenance of torque converter and transmission

The working condition of the transmission and torque converter has a lot to do with the performance of the loader, therefore, the following points, in addition to routine maintenance, require your constant attention.

a. Working oil level in the transmission

Before starting the engine, there are two oil drain cocks on the right side of the transmission, the upper oil drain cock as the utmost oil level. Check that oil should flow out from the drain cock on the right side of the transmission.

b. Working oil pressure of torque converter and transmission

The inlet and outlet pressure of the torque converter have been adjusted in the factory. The working oil pressure reading of the transmission, after the engine starts, should be 1.08-1.47MPa. Check if you find anything abnormal.

The abnormal working pressure of transmission often relates to the leakage of transmission oil

pump or to the jam in the transmission hydraulic control valve and how pressure will cause slip and wear to the clutch plates , and will even cease the running of the machine.

c. Oil temperature

The max oil temperature should not exceed 110℃ in normal operation and driving . Stop the machine to be cooled and check it if the oil temperature runs up to the allowance.

d. The oil in the transmission should normally be renewed after 600-hour running, if you find the oil goes bad or mixes up with debris, clean and check the system, and then renew the oil of the required grade.

2. Transferring shaft

Every transferring shaft includes transferring shaft and sleeve fork and gimbal.

It is convenient to disassembly and assembly the front and rear transferring shaft. The screwing torque to the nut is 44.1~49N.m

The transferring shaft has be balanced , so paying attention when you dismantle the transferring shaft : the relative position of the gimbal , the two gimbal forks at the two side of the transferring shaft must be in the same plane, the assembly must be in accordance with the arrow .

Gimbal must can turns freely after assembled with key shaft and key sleeve , the blocking never be permitted occurring . The number of rolling pin shouldn't be added or reduced at random.

Please pour the lubrication grease into gimbal rolling pin bearing according to regulated time .

The connection bolt of transferring shaft (No.8 in Fig 4-5) is made of alloy steel. Don't mixed with another kind of bolt and don't be replaced by another bolt.

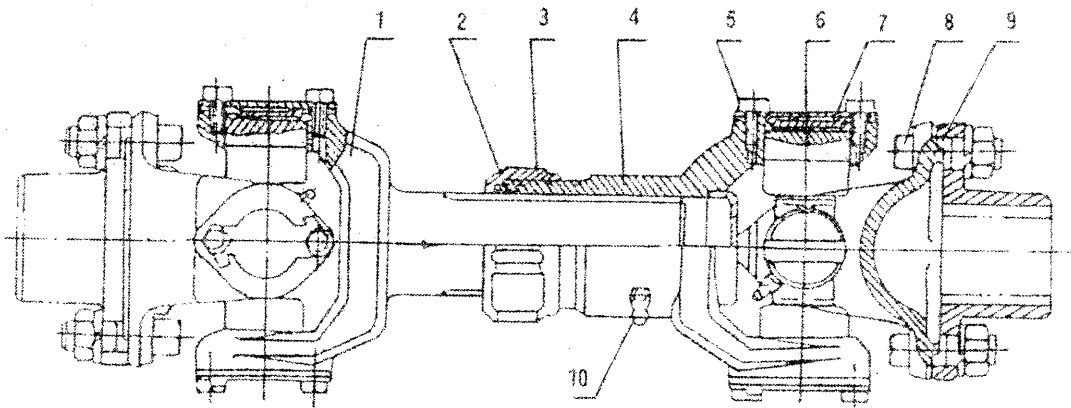


Figure 4-5 transferring shaft structure

1.key shaft fork 2.oil seal 3.oil seal cover 4.sleeve pipe fork 5.gimbal 6.supporting flake
7.lock flake 8.bolt 9.oil cup

3. Driving axle

The driving axle includes front driving axle and rear driving axle , the difference is spiral taper gear of main transferring couple rotates toward different directions . The front is left and the rear is right , other organization is same .for the purpose of increasing towering force and country-cross performance , the loader adopts 4-wheel driving .

The structure of driving axle as figure 4-6. It is composed of shell and main transferring device and side shaft and rim reduction and tire and rim and so on .

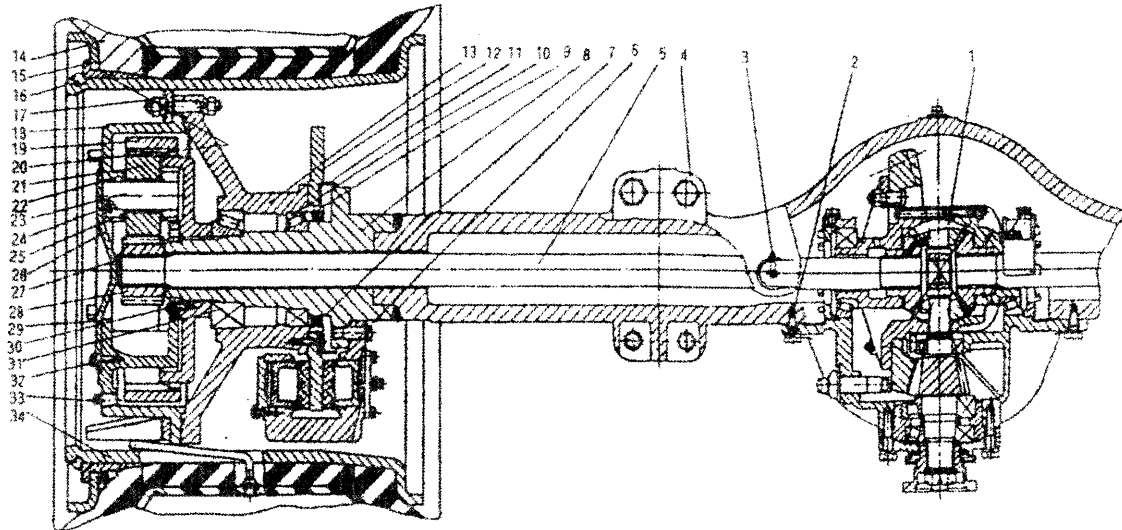


figure 4-6 driving axle

1.main transferring device 2.bolt 3.breathe pipe 4.bolt 5.side shaft 6.disc brake 7.oil seal
8.rim supporting shaft 9.ring 10.bearing 11.dust proof cover 12.brake disc 13.hub 14.tire
15.hub rim 16.lock ring 17.hub bolt 18.planetary wheel bracket 19.inner gear
20.fender ring 21.planetary wheel 22.washer 23.planetary gear shaft 24.steel ball 25.rolling
bearing 26.cover 27.fender ring 28.sun wheel 29.seal washer 30.nut 31.bearing 32.bolt
33.bolt plug 34.hub

The shell be installed on the frame, suffering the load that from frame and transferred it to tire , it is the installing shell of main transferring device at the same time .

The main transferring device is 1-stage spiral taper reduction , as figure 4-7 . Its function is increasing torque and decreasing the rotating speed , and change the direction of transferring movement .

Differential is composed of two taper gear and “cross” shaft and four taper planetary gear and l/r differential , its function is differentiate the different speed of left and right wheel , and transferring the torque and movement to side shaft.

The left and right side shaft is full floating , its function is transferring the torque and movement to rim reducer.

Rim reducer is a planetary gear transferring device . The inner gear ring be fixed on rim supporting shaft , planetary bracket be fixed with rim to rotating ,its moving executes attained from side shaft and

sun wheel , its role is increasing the torque and reducing the rotating speed to attain the proper speed .

The tire and rim is the main traveling device , the loader adopts 20.5-25 tire which is low pressure wide base tire, the area of its section is large , the elasticity is good , this it help to well country-cross ability .

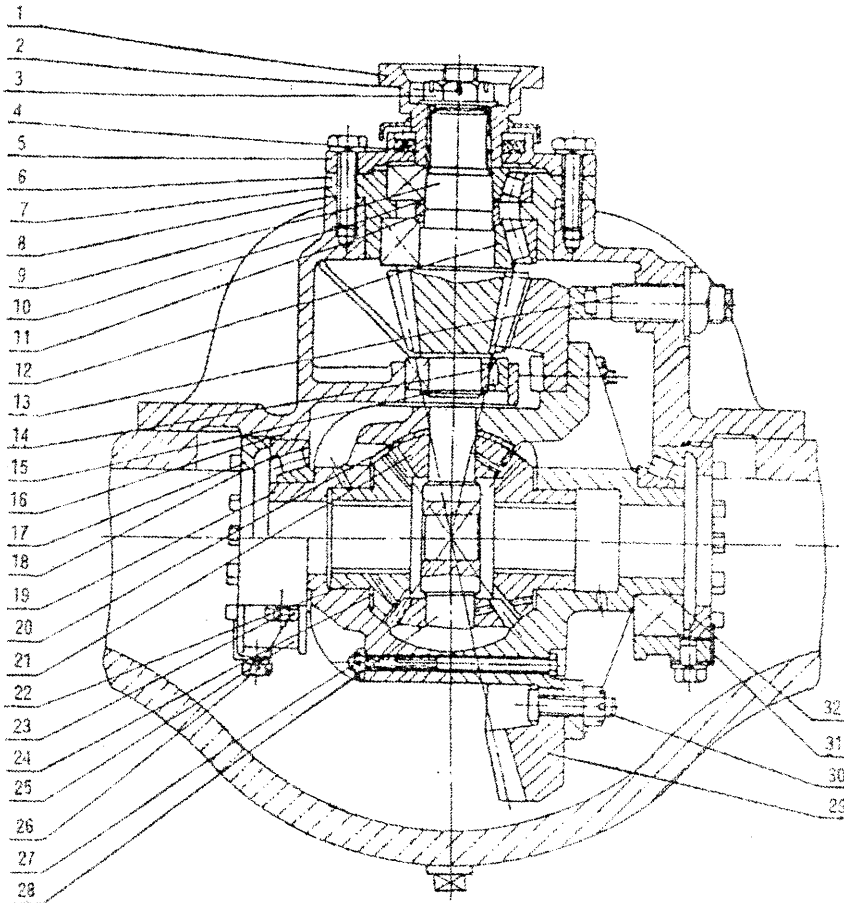


figure 4-7 main transferring

1.input flange 2.pin 3.nut 4.oil seal 5.seal cover 6.bearing sleeve 7.bolt 8.adjustment shim 9.main spiral taper gear 10.shim 11.shaft sleeve 12.bearing 13.bolt 14.bearing 15.fender ring 16.supporting bracket 17.adjustment nut 18.bearing 19.differential 20.planetary gear shim 21.planetary gear 22.side shaft gear 23.bolt 24.gear shim 25.bearing socket 26.bolt 27.bolt 28.cross shaft 29.spiral taper gear 30.bolt 31.lock flake 32.differential right shell

III、Steering system

(I)、The system includes the BZZ5-800 full hydraulic steering redirector, YXL-F250F-N7 priority valve and the CBGj2080 gear pump. The system's advantages as following :

- a. The steering system has flow priority. No matter how high or how low the load pressure is and how quickly or how slowly the steering wheel turns, the oil to steering circuit is adequate .So the action of steering is smooth and safe.
- b. The oil from steering pump can not only flow to the steering circuit to maintain its normal work, but also supply the auxiliary circuit. This can eliminate the loss of power and increase the system efficiency.

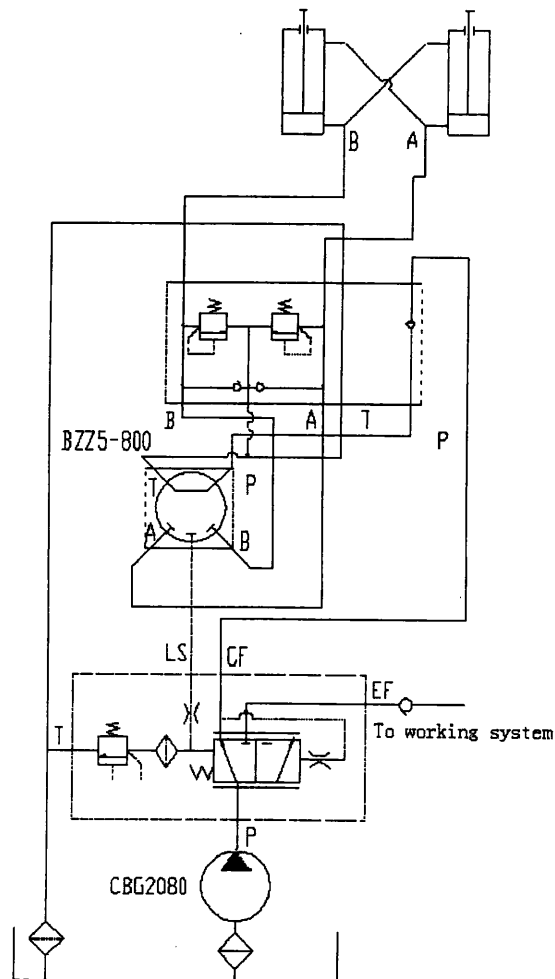


Figure 4 – 8 Steering system principle diagram

(II)、Working principle

The loading sensing full hydraulic redirector and the steering cylinders consist of a position control system. The movement of the piston rod is in direct ratio to the angle translocation of the redirector's spool. The cycloid motor is a measuring instrument . (It act as a pump when steering with flameout), It translates the oil into the angle translocation of the redirector's valve sleeve. The angle

translocation of the valve sleeve and the valve spool decides the open area of the divided oil window. The turning speed of the steering wheel is more higher and the relative angle movement is more bigger, the open area of the divided oil window is more bigger. If the steering wheel stops to work and the relative angle translocation is zero, the divided window will close automatically which can actualize the feedback control. The return spring makes the valve sleeve go over the dead area and be aimed at the spool. The priority valve is a element of fixing difference decreasing pressure. No matter how to change the load pressure and the supply oil of the pump, the priority valve can maintain the differential pressure of the variable throttle port C1 in the redirector not to change ,then can ensure the flow to the redirector is equal to the turning speed of the steering wheel multiplying the output volume of the redirector.

When the redirector stays at the neutral position, the engine don't work and the pump gives no oil, the control spring of the priority valve pushes the spool to the right side and connects with the port CF. After starting the engine, the oil divided to the port CF flows via the neutral throttle port CO in the redirector and brings a pressure decreasing. The pressures of the port CO's two transmit to the priority valve spool's two sides and bring a hydraulic pressure force. The hydraulic pressure force is balance the spring force and the hydraulic kinetic force which makes the valve spool stay at a balance position. Because the hydraulic force of the port CO is very big, a small flow can bring a differential pressure to push the spool moving left, the port EF will be bigger and port CF will be smaller, so the fluid flowing to circuit CF is little.

When turning the steering wheel, there's a relative angle translocation between the spool and the valve sleeve of the redirector. When the movement comes to some valve, the neutral throttle CO will close completely. The oil flows via the variable throttle port C1 of the redirector and brings a pressure decreasing. The pressures of the port C1 two sides transmit to the priority valve spool's two sides and force it to find a new balance position. If increasing the speed of the steering wheel, at the moment the fluid flows via the redirector is less than the turning speed of the steering wheel multiplying the output volume of the redirector, the turning speed of the valve sleeve directed by the measure structure is lower than that of the spool to the valve sleeve becomes increasing, and the open area of the variable throttle port C1 becomes bigger. At the moment if you want to keep the differential pressure of the port C1's two sides before the speed's changing, there must be a more bigger flow, then it can push the priority valve spool to move left. With the steering wheel's turning speed increasing, the open area of the port CF in the priority valve will becomes bigger. At last, the oil flows via the priority valve to the redirector is equal to the turning speed of the steering wheel multiplying the output volume of the redirector.

When the steering cylinders come to the end sides, if you continue to turn the steering wheel, the oil can't flow back to the steering cylinders. Then the load pressure becomes increasing rapidly, and the differential pressure of the variable throttle port C1's two sides becomes decreasing rapidly. When the pressure of the steering circuit is higher than the adjusted pressure of the safety valve, the valve will open. The pressure oil flows via the throttle port C2 and brings s pressure decreasing. The pressure decreasing. The pressure decreasing transmitts to the priority valve spool's two sides and pushes the spool to move left. Then it can make the open area of the port CF become smaller and that of the port EF become bigger. The pressure of the steering circuit will decrease.

When steering with flameout, the measuring instrument acts as a pump. The output oil pushes the pistons of the steering cylinders to move. The oil from the returning chambers of the cylinders flows via the check-valve in the redirector and returns to the upside of the variable throttle port C1.

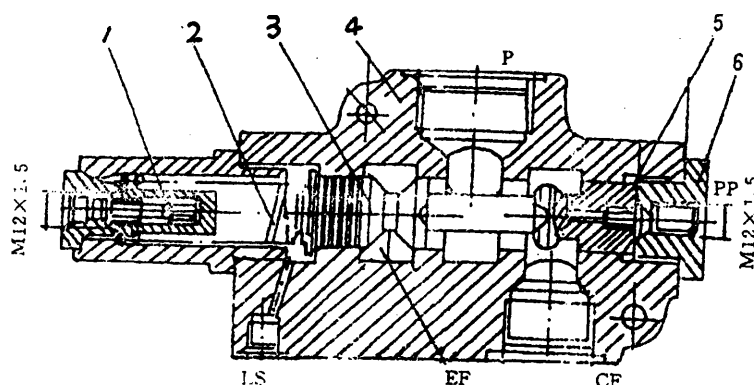
(III)、Main elements

1.YXL-F250F-N7 Priority valve

(1) Main specification

- a. Nominal flow : 250 l/min
- b. Safety valve adjusting pressure : 14 MPa
- c. Control pressure : 0.7 MPa
- d. Max pressure loss from port to ef : $\Delta p < 1.2 \text{ MPa}$

(2) The structure of the priority valve



YXL-F250F-N7

- 1.safety valve assembly 2.control spring 3.spool 4.valve body 5.screw 6.plug

(3) Attention of maintenance

a. Working medium

Normal working temperature of hydraulic oil used about $+30 \sim +60^{\circ}\text{C}$. Normal working consistency is about 17~23cst. Permissive temperature range of oil is about $-30 \sim +90^{\circ}\text{C}$. Permissive consistency range is about 10~300cst, precision of the filter oil $>40\mu\text{m}$.

b. Spring selection of steering safety valve

Open pressure of the steering safety valve had been adjusted by customer 's requirement when it was out factory . If customer own need adjust ,you should select high stiffness spring .

c. The method of excluding air

Before working for the system fixed priority valve , you must open steering safety valve to let the air out from the pipes and valve body . You can continue rotating the steering wheel when the piston rod of cylinder gets to its end or opening the scale directional valve connected to the port CF the priority valve .

2. Full hydraulic redirector and the valve block

The spool of the BZZ5-800 cycloid full hydraulic redirector has no reaction, that is to say, the

force effected on the wheels can't be transmitted to the steering wheel. The high pressure oil in the neutral position returns to the oil tank directly. The output volume of the rotator is 800ml/r. The redirector is very small and light. You can operate it very easily and flexibly. The operating torque of the steering wheel is no more than 4N.m when the pump works. The left and right free turning angle of the steering wheel is no more than 9°. It works very reliably. (The structure shown as fig 4-9). The FKAR valve block connected with the redirector consists of the input check valve, two secondary pressure relief valves, two refill valves and a pressure relief valve. The check-valve can prevent the oil from flowing back and prevent the steering wheel from steering freely. The primary pressure relief valve is used to limit the adjusted pressure is 16MPa. No permitting to adjust it at random. The two secondary pressure relief valves can prevent the steering circuit from the high pressure impacting and ensure the circuit's safety. The adjusted pressure is 17.5MPa. You can't adjust it at random. There're four ports in the valve block. The port P is connected with the inlet pipe, the port O is connected with the oil tank, the port R is connected with the right steering cylinder, and the port L is connected with the left steering cylinder. They can't be connected wrong, otherwise there will be no steering, or if you turn the steering wheel left, the machine will turn right .

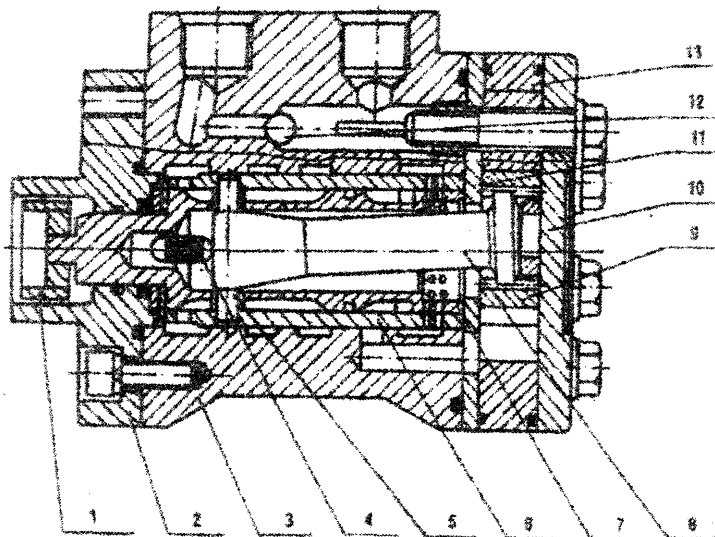


figure 4 - 9 BZZ5-800 Steering Control Units

1.joint block 2.frnt cover 3.valve body 4.spring plate 5.pin 6.valve sleeve 7.spool 8.shaft
9.rotator 10.rear cover 11.space plate 12.ball 13.stator

(IV)、Attention of the hydraulic system operation and maintenance

1) Hydraulic oil must be the regulated high quality and clean hydraulic oil.

2) After use the loader 1200 hours, you must replace the work oil as the following order.

①Control bucket turns backward and raise the lift arm to highest position, stop the engine, then utilize the gravity to turn forward the bucket and lower the lift arm, drain off the oil in the cylinder completely.

- ② Please drain old oil before oil temperature have not decrease.
 - ③ Disassemble the plug of the bottom of the oil tank and the hose fixed on the bottom of the lift and tilt cylinders, use the coal oil clean the tank and the oil filter.
 - ④ After supplying new hydraulic oil, operate the lift arm and tilt bucket several times to discharge air in the cylinders.
- 3) When disassemble the hydraulic units, please select clean work place, prevent dust , pollution and debris falling into the units .
- 4) After maintenance and assembly, check the original rubber oil seal and o-ring, replace the defect and replace the all original seal gasket.
- 5) When disassemble the hydraulic units, don't strike and bump them, avoid of damage.

IV、 Working hydraulic system

1. Working principle

This system is used to control the action of the bucket. The working principle shown as (fig 4-10). It consists of oil tank, pump, hydraulic control valve lift cylinder, tilt cylinder and pipes .

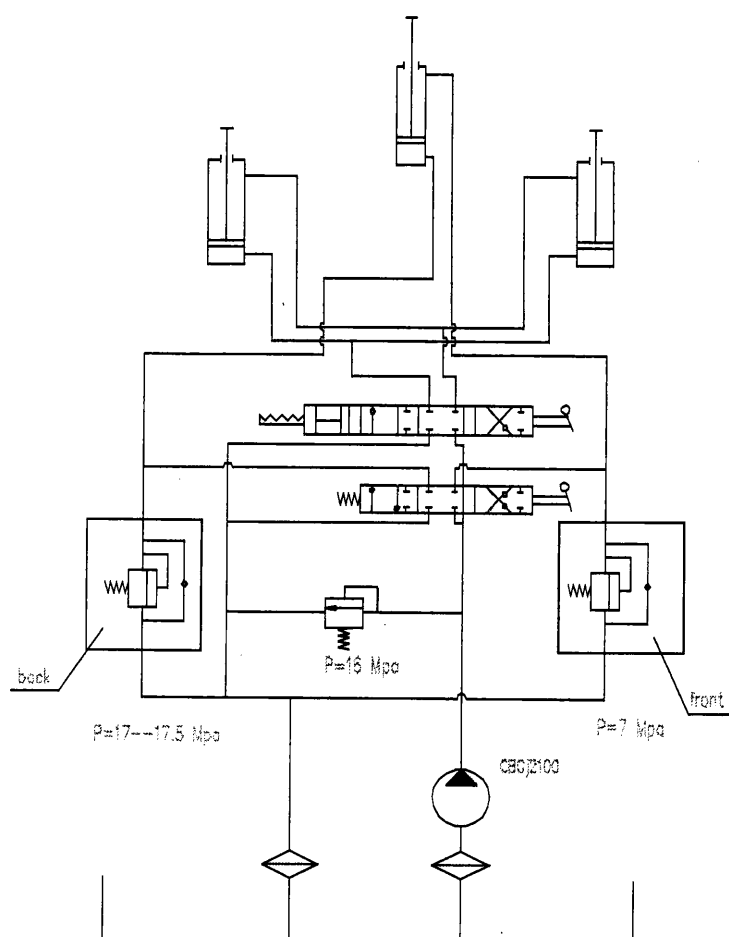


figure 4 – 10 Working hydraulic system

When the working device don't work, the oil from pump returns to oil tank directly via the hydraulic control valve.

When it is necessary to dig or unload , push the bucket tilt control lever forward or backward. The oil from pump goes into the front or rear chamber of the tilt cylinder to dump or tilt the bucket. When it is necessary to lift or drop the lift arm , push the bucket lift control lever forward or backward. The oil from pump goes into the upside or underside chamber of the lift cylinder. Via the hydraulic control valve. Then the arm and the bucket will raise or lower.

When outside load exceed the ability of system or the lift arm cylinder piston get to the end , the pressure oil will open the main safety valve and go to the oil tank.

When the front chamber pressure of the tilt cylinder reaches the set pressure of the relief valve, the oil will open the valve and go to the rear chamber then to the oil tank via the hydraulic control valve. When the bucket need float, push the lift control lever forward for two positions, the oil from pump will go into the two chambers of the lift cylinder and connect with the oil tank via the hydraulic control valve. The oil pressure in the cylinder is low, the bucket stays at floating position and works near to the ground.

2. The structure of the hydraulic control valve

The model of the valve is DF-32 (showed as fig 4-11). It consists of two way directional valves and a safety valve. Bucket valve stem has three positions, lift arm valve stem has four positions. It is the tandem and parallel circuit. There're check-valves in the valve spool. They can prevent the oil from flowing back to avoid the bucket and arm nodding.

The tilt spool can return the neutral position automatically. But the lift arm need manual operation.

The port P is the inlet port and connected with the pump. The port O is connected with the oil tank the port H and F are connected with the front and rear chambers of the tilt cylinder. The port K and N are connected with the upside and underside chambers of the lift cylinder.

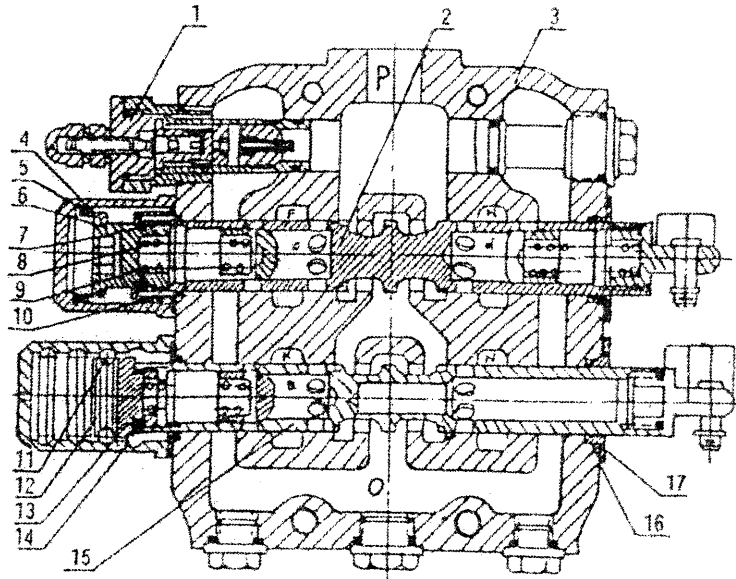


figure 4 – 11 hydraulic control valve

1.Safety valve 2.Tilt control spool 3.Housing 4.Cover 5.Return 6. Limiting post
7.O ring 8.Spring 9.Check-valve 12.Spring 13.Limiting post 14.Cover 15.Lift control
spool 16.O ring 17.dustproof ring

3. Attention of the hydraulic system operation and maintenance

(1) If the working pressure is higher or lower than 14MPa, please adjust it. The method as following, screw off the plug on the oil inlet tube of the valve, connect it with a pressure watch, then start the engine and let it run at about 1800r/min, put the tilt control lever at the neutral position, lift the lift arm to the limited position, then you can adjust it until the pressure is 14MPa.

(2) Hydraulic oil must be clean hydraulic oil and after using the loader 1000 hours, you must replace the work oil according to the following order.

- a. Drain out the waste oil before the oil temperature drops , so it can discharge the debris and dust .
- b. Raise the lift arm to the highest position, stop the engine, then utilize the gravity to turn forward the bucket and lower the lift arm, drain off the oil in the cylinder completely.
- c. Disassemble the plug at the bottom of the oil tank and the hose fixed on the bottom of the lift and tilt cylinders, clean the tank and the oil filter.
- d. After supplying new hydraulic oil, operate the lift arm and tilt bucket several times to discharge air in the cylinders.

(3) When disassemble the hydraulic units, please select clean work place, prevent dust, pollution and debris falling into the units.

(4) After maintenance and assembly, check the original rubber oil seal and o-ring, replace the defect and replace the all original seal gasket.

(5) When disassemble the hydraulic units, don't strike and bump them, avoid of damage.

V. Brake system

The function of brake is stop the loader or parking the loader for longer time on plain or slope.

The loader has two brake system:

1. Driving brake system : apply to common brake , and speed controlling . The loader adopt air push oil 4-wheel disc clamp brake , its advantage is stable brake , safe and reliable , structure is simple , maintenance is easy .

2. emergency and stopping brake system: brake executed after stopping or emergency braking when running brake is abated.

Driving brake system

1. structure and principle

The system is air push oil 4-wheel clamp disc brake system. It is composed of air compressor (1), oil water separator combination valve (2), air reserve (3), barometer (4), brake controller (5) boosting pump (6), brake clamp (7) and electromagnetism valve(8).

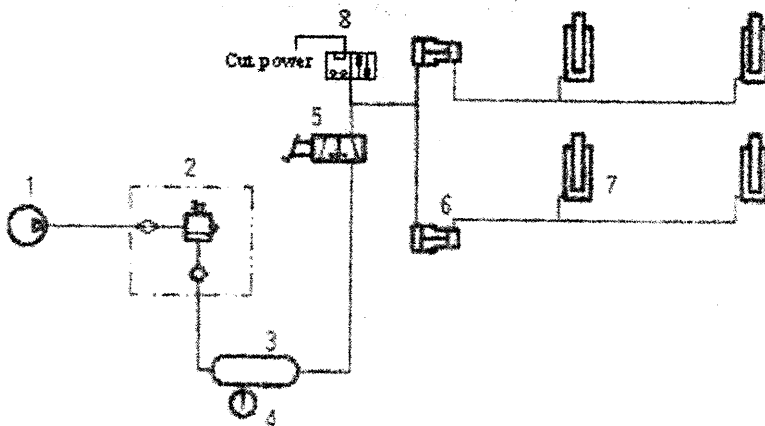


figure 4-15 brake system principle

1.air compressor 2.combination valve 3.air reserve 4.barometer

5.brake controller 6.booster cylinder 7.brake clamp 8. electromagnetism valve

The air compressor be driven by engine , the pressurized air enter into air tank through oil water separator combination valve , the pressure is 0.68~0.7mpa . Step the brake controller (5) down, the air

enter into front and rear boosting pump (6), push the piston and friction plate and brake disc of brake clamp (7) to execute the braking . When release the pedal , the air of boosting pump be discharged out from brake controller , the braking condition is released.

2.main element

(1). The oil water separator combination valve

This valve is a group valve composed of a oil-water separator and a air pressure adjust valve . The function of the valve is adjusting the working pressure of the brake system at rated range , ensure the brake system safety , separate the oil and water in the compressor air , drain it through unload course . Screw off the wing nut , you can inflate the tires .

This valve mainly consisted of housing , upper and lower cover , inner oil and water separate chamber , filter , check , check-valve , safe valve , air adjust unit and air -liquid drain valve , its structure as fig. 4-13.

The air pressure adjusting valve consist of control piston (6), upper valve (23), lower valve (20), adjusting spring (2), adjust screw (4) and the film drum (21) and so on . lower chamber of the film drum is connected with system air way through plug (22) . lower valve (20) outlet by way of D chamber of the air-liquid drain valves . the air-liquid drain valves consist of piston (16) , draining valve (18) and lower housing (17) , valve seat , spring and so on . the valve body interface main has : compressor air way interface I (inlet) , air tank interface O (outlet) , drain chamber A and so on .

The working principle of the multi-function unload valve as following .

① oil-water separate part

The compressed air with oil and water from compressor , pass through I into multi-function unload valve . Due to change direction and speed of the following , specific gravity of the oil and water exceed the air gravity , on the inertia force action , oil and water condense on the multi-function unload valve lower housing chamber wall , then flow along the wall , pass oil-collector (19) into chamber C. Compressed air gets rid of oil and water pass filter element assy (10) , check-valve (8) , from outlet O into air tank . Oil and water amass store up the chamber C , when pressure reach rated , they will auto drain with compressed air .

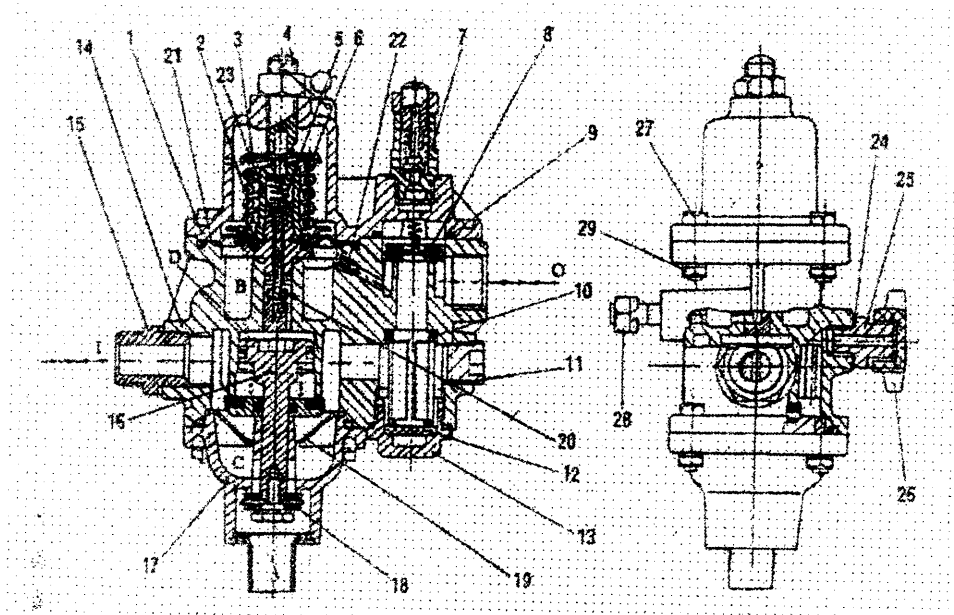


figure 4-13 The oil water separator combination valve

1.upper cover 2.adjust spring 3.spring support 4.adjust screw 5.inner spring 6.control piston
7.safe valve 8.check-valve 9.O-ring 10.filter element assembly 11.cone plug 12.filter ring
13.filter plug 14.housing 15.joint 16.exhaust piston 17.lower cover 18.drain valve
19.oil-collector 20.lower valve 21.film drum 22.plug 23.upper valve 24.seal washer 25.joint
26.wing nut 27.bolt 29.nut

② air pressure adjusting part

Because the end of plug (22) is apart with outlet , the air pressure from (22) into chamber B is system pressure . When the pressure of chamber B below min. Force of adjust spring (2) , lower valve (20) closed . In the wake of system pressure raise , the pressure of chamber B will continue up , when it reach enough get over min. Force of the spring , push the film drum with control piston (6) to up , at this time , the center vent closed by upper valve (23) , seal off airway . The piston (6) continue to up , the valve (20) open , the compressed air in the B pass lower seat abscissa and vertical hole into chamber D , push exhaust piston (16) lower , then open the drain valve . This time , chamber A drain oil , water and compressed air , check-valve (8) cut off , stop supply to air tank . Up to the pressure in B lower to adjusted value , the control piston (6) and exhaust piston (16) again return the air again go into air tank.

③ safety appliance

If air pressure adjusting part of multi-function unload valve does not work with the air pressure increasing , air pressure of safe valve (7) will increase , once the pressure more than safe valve spring force , the valve will be opened , and the pressure air will be exhausted , which protect the braking system .

④ inflate for tires

Screw off wing nut (26), connect hose , and the compressed air through filter into tire .

(2) brake valve (Fig.4-14)

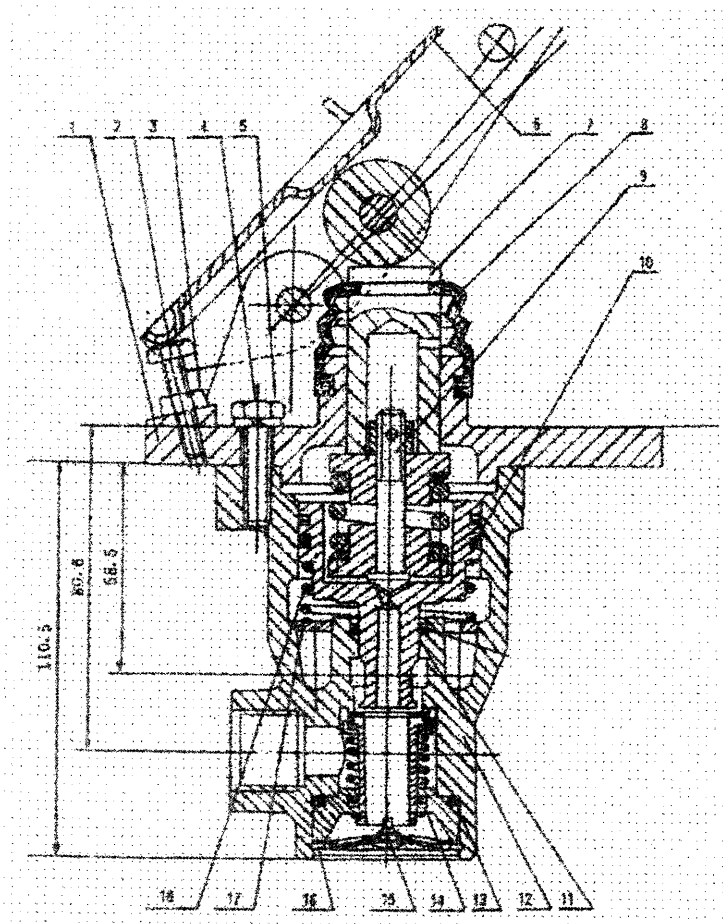


Figure 4-14 brake valve

- 1.support 2.bolt 3.nut
- 4.bolt 5.washer 6.pedal
- 7.tappet 8.dusty cap
- 9.balance spring
- 10.O-ring
- 11.piston 12.valve body
- 13.O-ring 14.valve assy
- 15.exhaust valve
- 16.snap support
- 17.spring support
- 18.spring

The brake valve working procedure , step the pedal (6) , tappet (7) press down the balance spring (9) , push the piston (11) , open the valve (14), the compressed air from air tank enter air master via valve inlet and outlet . When loose pedal , the power force on the piston is withdraw , piston moves upward on the effect of spring and air pressure , valve close , compressed air from air tank is cut off , air in air-way to air master exhaust . At this time , brake action loose .

(3) booster device

Fig.4-15 shows the structure of booster device, which is made up with part chamber and main hydraulic pump.

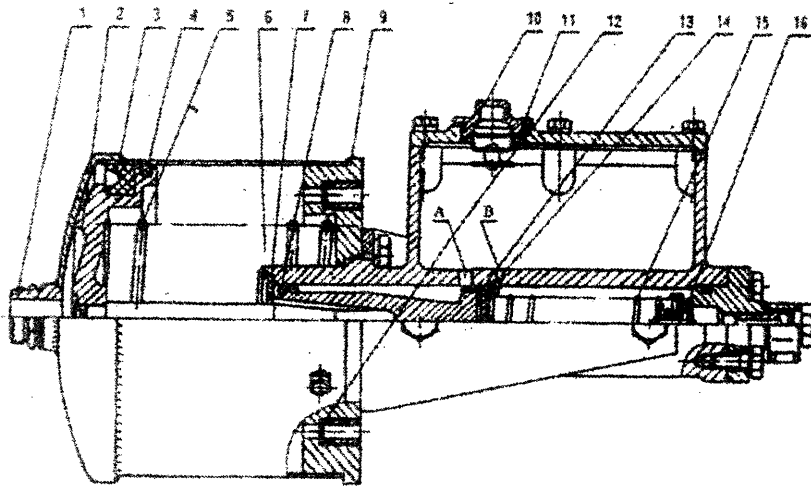


Fig. 4-15 booster device

- 1.joint 2.piston 3.Y-seal ring 4.belt seal 5.spring 6.lock ring 7.trusting
8.leather ring 9.cover 10.oil cup 11.gasket 12.screen 13.piston 14.leather cup
15.spring 16.oil-back valve

When braking , compressed air push piston (2) against the force of spring (5) , move piston (13) o main hydraulic pump rightward by rod . Brake oil comes into being high pressure in main hydraulic pump , open the valve of oil-back valve (16) , enter oil cylinder of the brake clamp . The oil pressure is 10MPa when the air pressure is 0.68-0.7MPa .

If you loose the brake pedal , compressed air will return from joint (1), piston (2) and (13) will reset by spring force , brake oil returned to main pump through oil pipe , the main pump reset . If the brake oil is too much , it will follow into oil storage chamber via hole b. If you loose the brake pedal too fast , brake oil will not return main pump following piston in time , there will come into being relative lower pressure in it , as a result , brake oil in oil storage return to main pump through hole a and six port in end of piston . When you step brake pedal down again , the brake efficiency shows more appear .

When port in valve (16) was shut , the oil pipe remains certain pressure against the air invading system from joint or brake leather cup .

(4) disc brake

Fig.4-16 shows double cylinder symmetrically fixed clamp . Disc (7) was fixed on rim revolving with wheel , clamp (1) fixed on axle casing . Each axle has four disc brakes which has four pistons .

When brake pressure oil from booster device enter into each piston cylinder via oil pipe (10) , piston (5) push friction pad (4) to press on disc (7) , and come into being brake torque . If brake relieved , the piston (5) will be reset by springing of rectangular seal ring (2) . Clearance between fiction pad and disc becomes gibber , the moving distance of piston will be more than transform of rectangular seal ring (2) , and there will come into being a relative moving between piston (5) and rectangular seal ring (2) , which fills the wear and tear of fiction pad . Three long axial grooves of fiction pad act as mark of the amount of wear and tear . You must renew the friction pad before the wear and tear amount is above the

bottom of groove . Loosen the lock screw (12) , pull out pin (8) then you can renew the friction pad (4).

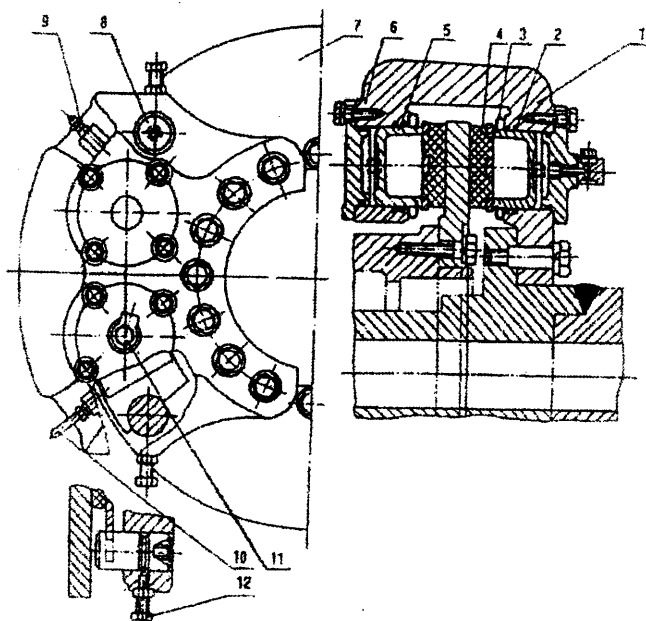


Fig.4-16 disc brake

1.clamp 2.rectangular seal ring 3.dusty ring 4.friction pad 5.piston 6.upper cover
7.brake disc 8.pin 9.drain air plug 10.oil pipe 11.joint 12.trust screw

3. Checking brake feathers

Braking effect is directly related to your safety and working efficiency , you must check if the brake system works very well . After repairing it , the brake distance must less than 9 meters when the loader runs at speed of 24km/h on straight and dry road . The loader must brake quickly without deviation after you lightly step on pedal when the loader runs at sped of 30km/h.

4. Maintenance

- 1) Clean: you must clean it to make it work well
- 2) Check: you must check brake system if it leaks , all joint loosened , main bump oil level is normal , oil pipe is straightly way and rubber part is aging .

VI、 Electrical system

The electric equipment includes battery , start motor , charging generator , relay , gauges and lamps

The voltage is DC24V.

1.Charger

(1). battery

Adopts two 6-QA-195 (DC12V). When the battery be used normally , it no need to dismantle when charging and discharging .If the battery be left unused long time , please dismantle it and charging it every month .

Cleaning : As the top part or terminals are easily polluted ,and that will be the main reason of electricity escaping, they must be cleaned consequently. In order to prevent the salinization by the sulfuric acid (white crystals resulted from sulfuric acid with lead), the batteries should be cleaned and grease or vaseline applied on the terminals.

Electrolyte level: It is normal when the surface of the electrolyte is 10 to 15mm higher than the electrodes.

Gravity gauging: Gauge the specific gravity of the electrolyte with hydrometer. If the values of each battery are different, corresponding charging should be performed to make them even. Correct specific gravity is 1.260 @20°C. Specific gravity values at temperatures other than 20°C should be calculated in accordance to relative calculation chart.

The dead line of the specific gravity value is 1.160, so never have it to be lower than this value.

If the gravity drops down sharply, electrodes, generator and fan belts should be checked for their fastening.

Management of batteries: In cold winter, the frozen temperature of the electrolyte is about -35°C when fully charged. The battery troughs will be damaged ,so measures should be taken to protect them. As the protecting method, you will have no worry when the batteries are charged 75% of their full capacity. And it is also effective when the gravity is raised up to 1.28 ± 0.005 , but do not exceed that. In hot summer: As the water inside the electrolyte may easily get vaporized, they must be checked once a week and distilled water be replenished. In very hot place, it also works if the gravity decreases to 1.22 ± 0.01 when charging ends.

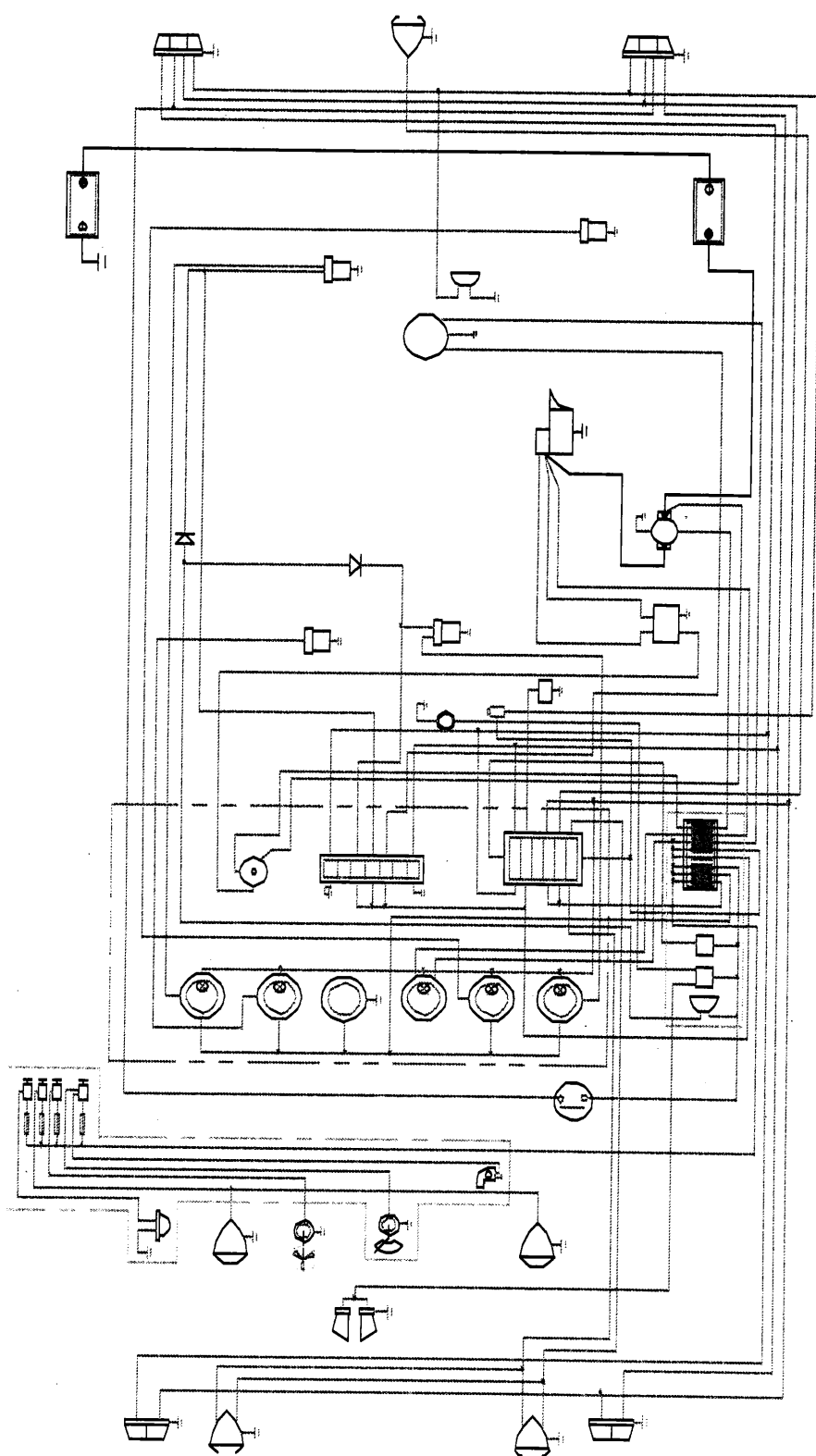
Electrolyte : The electrolyte can only be replenished with distilled water or refined water. If the batteries are still under operation when the level of the electrolyte drops down the minimum level, the electrodes may be corroded and the operation life of the batteries shortened. When replenishing in cold winter, perform that before starting then engine, and never replenish after operation to avoid freezing.

▲ Near the batteries As explosive gas may release out surrounding the batteries, flame is forbidden to be held near them.

▲ If electrolyte gets on your skin (hand face or eye), wash immediately with fresh water. Drink plenty of water if it happens to get into your mouth. Specialized doctor should be seen after your first aid.

2.The starting part

The part be composed of ignition switch , electrical resource switch , start motor . Put the ignition switch at on to open the electrical resource switch , then put the ignition switch at start , the start motor begin to work and rotate with the engine flywheel . The starting time should not exceed 10 seconds . The interval between starting should not exceed 3 minutes . Don't restart the engine before it stops completely . Inspect the connecting wires and battery level and oil supply of the diesel engine before put it into operation .



ELECTRIAL PRINCIPI F DRAWING

Chapter 5 Inspection and Maintenance

A high performance loader depend on normal maintenance. It is a wrong thinking that it is no necessary to maintain the loader as long as the loader is normal ..

Correct maintenance will prolong the operating life, and troubles can also be found and fixed earlier, and thus the repairing time and cost be saved.

I 、 Inspections before and after operation

(1) Before operation, check

- * Water level of the radiator.
- * Oil levels inside the sump of the engine.
- * Oil levels inside the fuel tank, hydraulic reservoir and transmission.
- * Seal of each oil hose, water hose, air hose and their connectors.
- * Connections of the batteries.
- * Reliability of service brake and park brake.
- * Flexibility of each control lever and shift them into their neutrals.
- * Inflation of each tyre.
- * Fastening of the rim bolts, axle bolts and other screws.

(2) After operation, check and maintenance

- * Fuel level.
- * Check oil level and cleanness of the oil sump. If the oil is found over leveled and diluted, reason should be found out and cleared.
- * Leakage from each hose and their connectors.
- * Fastening, seal and overheating of transmission, torque converter, hydraulic pump, steering devices, axles and brake clippers.
- * Fastening of all the pins and bolts on wheel rims and transmitting shafts.
- * Empty the radiator when the environmental temperature is below 0°C (except with antifreeze).
- * Check the brake liquid is enough or not .
- * Clean the oil water separator and drain the water in the air tank.
- * Lubricate each grease point as required in the time schedule.

Reasonable inspections and maintenance are necessary to your loader. Be careful not to cause any accident or hurt yourself. If something abnormal is found during your inspection, mark it first and fix it after all the checking items.

When inspection is carried out with the bucket highly raised, make sure that it cannot fall down.

Fire is strictly forbidden when checking or maintaining. No smoking is permitted and fire extinguisher must be hand.

II. Periodical inspection and maintenance

(1) Time schedule for periodical maintenance

This standard has been scheduled according to normal working time and conditions. If the working condition is too bad, adjustment should be performed as soon as possible. The time intervals listed in the following forms is decided with the time accumulator of the loader.

Legend: ● check ★ replenish ◇ change △ clean

Checking item	Engine					Every 1000hrs
	Checking time	Every 10hrs	Every 50hrs	Every 100hrs	Every 250hrs	Every 500hrs
Engine oil level and pollution		●	◇ Only 1 st after 25 hours		◇ If the engine is turbo charged per 200 hours	
Water level in radiator		●				◇, ★
Fuel level		●				
Air filter strainer		●				
Drain the debris in fuel filter and clean it				Change it once at least per one year		
Engine oil strainer					★ Every 150hrs	◇
Fan belt tension		●			● Every 150hrs	★ Every 150hrs Every 600 hours
Fastening bolts on cylinder heads						★ Every 600 hours
						● every 1200 hours

Air valve seam						● every 300 hours		● every 1200 hours
Injecting time								● every 1200 hours
Vepourization								● every 1200 hours
Cylinder compressing pressure								● every 1200 hours
Feed lubricant into inject pump and speed regulator								◇ every 1200 hours
Shim and turning of the turbo charger								● every 1200 hours
Fastening of each bolt							● every 600 hours	
Air exhausting	●							
Water pump and fan bearing			△ Grease					
Function of accelerator pedal	●							
Electric system								
battery	Electrolyte level		●					
	Specific gravity				●			
Charge function			●					
Cables and terminals								
Function of apparatus, lamps and horn	●							
Wear and contaminant of starter and generator						●		

Steering device					
Function of steering cylinders	●		△ Grease		
Hydraulic rubber hoses					◇ Every 4 years
Play of steering wheel	●				
Chassis articulating pin and steering pin			△ Grease		
Transferring system					
Oil level in transmission	●			◇ Only 1st time	
Fastening of transmitting shaft bolts	●			● grease	
Breather on the axle casing					★
Oil changing of differential				◇ Only 1st time	◇ every 2000 hours
Oil replacement in final reducer				◇ Only 1st time	◇ every 2000 hours
Transmission strainer					△
Hose filter core					◇
Tires and their inflation pressure	●				
Function of shift handle	●				
Working device					
Play and function of control lever	●				● grease
Condition of lift arm and bucket	●				
Weariness of teeth and cutting edge	●				
Condition of cylinders	●				

Oil level of oil tank		● Debris					◇ every 2000 hours
Filter in oil tank							◇
Grease				△			
Brake system							
Brake pipes	●						
Brake oil and leakage	●						
Brake function	●						
Effect of brake valve pedal	●						
Weariness of brake friction plate		●					
The fastening of the brake bolt				●			
Function of hand brake	●						
Weariness of parking brake friction plate				●			
Weariness of parking brake drum					●		
Others							
Overall cleaning	●						
Fastening of main bolts	● Only 1st time			●			
Leakage	●						
Hoses	●						
Abnormal noise of pumps and valves	●						
Abnormal of previous day	●						

(2)、 Periodical maintenance

In order to ensure the traveling without troubles and the long working life of the loader, proper lubrication and maintenance are necessary. As the loader operation life is prolonged and operating cost is decreased, the time and cost for scheduled periodical maintenance can be greatly compensated.

The periodical maintenance is divided into six time modes:

50hrs, 100hrs, 250hrs, 500hrs, 1000hrs, 2000hrs.

a. Maintenance every 50hrs

- 1) Fastening the connecting bolts of front and rear transmitting shaft.
- 2) Check the oil level in brake booster.
- 3) Check the oil level of transmission.
- 4) Check accelerator pedal operating and shift.
- 5) Feeding grease to chassis articulating pins, transmitting shaft, rear axle supports and steering pins.
- 6) Fuel tank

Loose the drain plug at the bottom of fuel tank, for draining of precipitate and mixed water with fuel oil.

b. Maintenance every 100hrs.

- 1) Check the fastening of fixed bolts of the wheel rims.
- 2) Check the oil level of front and rear axles.
- 3) Lubricate the rear axle articulation pin with grease.
- 4) Clean the air filter element.
- 5) Measuring the inflation pressure of tires.

The inflation pressure of tires should be measured in the cold state before operating, front tires: 343Kpa, rear tires: 294Kpa

- 6) Check the engine oil level, fill the engine when it is not enough.

c. Maintenance every 250hrs

The following maintenance is made after only first 250 hours working:

- | | |
|---------------------------|----------------------------|
| ✧ The fuel filter | replace the filter element |
| ✧ The transmission filter | replace the filter element |
| ✧ the engine valve gap | checking and adjusting |

- 1) Replace engine oil.
- 2) Checking and refilling the battery and clean the surface, rub the vaseline on the tie-in.
- 3) Check the working device, front and rear frame, every welding slot, fixed bolt, whether have crack or become loose; screw down tire nut
- 4) Check parking brake drum wearing condition.
- 5) Adjust the tension of fan belt.

Press the central point between engine pulley and fan pulley, (about 6kg force). The

normal tension flexibility of the belt is about 10mm. After adjustment, fixed bolts and must should be tightly fastened.

6) Lubrication: lubricate the bucket pin, bucket lever pin, pitman arm pin, tilt cylinder pin, lift cylinder pin, steering cylinder pin.

d. Maintenance every 500hrs

At the same time, maintenance every 50,100,250hrs should be made.

- 1) Replace the transmission oil and clean the sump filter.
- 2) Fastening connecting bolt of axles and frame.
- 3) Adjust parking brake gap.
- 4) Replace the diesel oil.
- 5) Lubrication: pour the main transmission shaft and front and rear transmission shaft with grease.
- 6) Check the weariness of disc brake.

If the weariness of brake gasket over the tolerance, the failing brake is very dangerous, when the weariness approach to the limit, please check it frequently.

e. Maintenance every 1000hrs

At the same time, maintenance every 50,100,250,500hrs should be made.

- 1) Replace the gear oil of axle.
- 2) Replace the hydraulic oil, clean the oil tank filter; clean the transmission and torque converter breather.
- 3) Check and adjust the brake booster, replace the brake oil, jack the frame and turn the wheel, check the brake flexibility.
- 4) Clean the diesel tank filter.
- 5) Lubrication: lubricate articulate pin, front and rear transmission shaft, the main transmission shaft.
- 6) Adjust the turbine supercharger impeller gap, screw down each of tight-part of turbine supercharger.

f. Maintenance every 2000hrs

At the same time, maintenance every 50,100,250,500,1000hrs should be made.

- 1) Maintenance engine according to engine manual.
- 2) Maintenance torque converter and transmission.
- 3) Dismantle and check the rear and front axles, rim reducer and differential.
- 4) Dismantle and check the redirector, steering valve, proofread its steering angle.
- 5) Through the decrease of the working cylinder, check the seal of the distribution valve and working cylinder, and measure hydraulic system working pressure.
- 6) Check the welding slot of working device and the frame.
- 7) Check the welded joint of wheel rim and revise the transfiguration of it.

III. Supply of water and oil

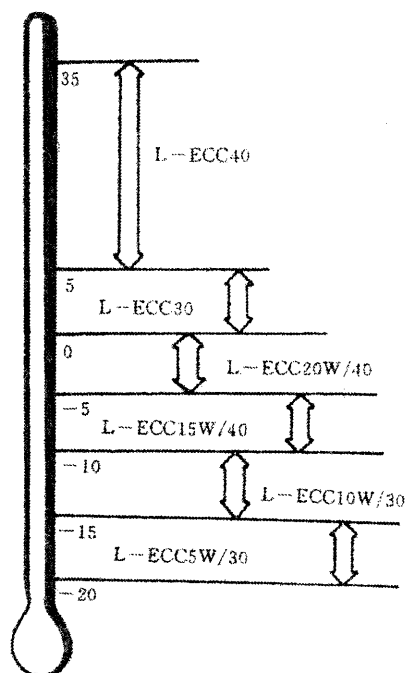
Oil brand and volume

Type	Descriptions		Volume (L)	Standard number
	Summer	Winter		
Fuel	No.0 or 10 light diesel	No.-10 or -35 light diesel	200	GB252-87
Engine oil	L-ECC40	L-ECC30	28	GB11122-89
Transmission oil	No.6 or 8 Hydraulic transmission oil		45	
Hydraulic oil	L-HL46	L-HL32	180	GB11118-89
Driving chassis	L-CLE85W/90 gear oil		36	GB7631-89
Brake oil	HZY3 integrated brake oil		6Kg	GB12981-91
Grease	L-XACFA3 lithium grease		4Kg	GB7631.8-90

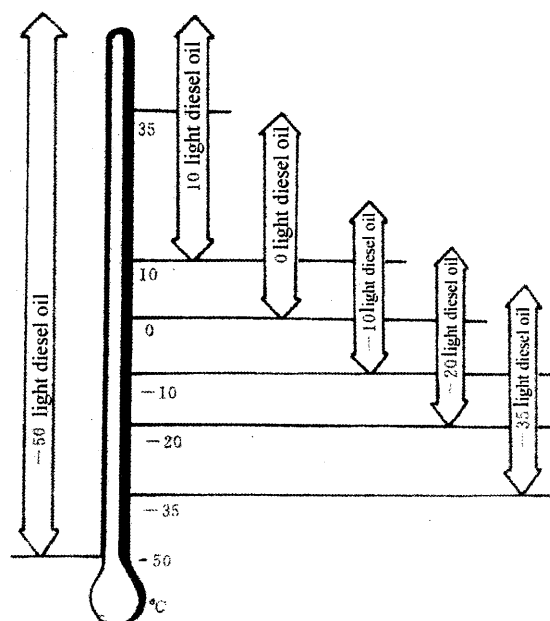
Notice:

The loader has been filled with anti-high temperature brake liquid, which can't be mixed with other brand. If it is need to replace it with new brake liquid, only vegetable brake liquid can be accepted and clean the brake system in advance.

Please choose the 40CC# or 40CD# supercharged oil according to the diesel engine manual about the supercharged engine



Light diesel oil use range(GB252-897)



Lubrication oil use range (GB11122-89)

Reference list of oil and lubricants

(1) ENGINE OIL

Oil name and brand		Similar brands			
		MOBIL	SHELL	CALTEX	CASTROL
CC grade fuel and oil GB11122-89	Summer L-ECC40 Oil	Delvac special 20W/40	Rotella SX40; Rotella TX40, 20W/40; Rotella DX40	Custome five Star Motor Oil 40,20W/40 RPM Delo 100、200 oil 40	Deusol CRX40 Deusol CRB40
	Winter L-ECC30 Oil	Delvac special 10W/30	Rotella SX30, 10W/30; Rotella TX30; Rotella DX30	Custome five Star Motor Oil 30; RPM Delo 100、200 oil 30, 10W/30	Deusol CRX30 Deusol CRB30

Note: the quality level of china's CC grade diesel oil is equal to that of foreign same product. Its product standard is drawn in accordance with the CC grade oil standard in SAEJ183-84. L-ECC40=CC40, L-ECC30=CC30

(II) HYDRAULIC TRANSMITTING OIL

Domestic oil name and brand	Viscosity (50℃) Mm ² /s	Similar brands		
		BP	CALTEX	ESSO
6# hydraulic transmitting oil	3.5~6.5	Hydraulic TF-C2	Torque fluid 175; Rpm Torque Fluid No..5	Standard Torque Fluid G7
				Rotella 10w

- Notes: ① No.6 hydraulic transmission oil is of the enterprise standard of Lanzhou Refinery and Daqing Petrochemistry General Factory, it can also be replaced by No.22 hydraulic transmitting oil .
- ② No.6 hydraulic transmission oil is mainly used in torque converters and hydraulic couplers for construction machineries. It is similar to PTF-2 in foreign standard, identically such a SAEJ1285-80 and Allison C-2.

(III) hydraulic oil

Domestic oil brand	Viscosity (40℃) mm ² /s	Similar brands				
		BP	CALTEX	CASTROL	ESSO	MOBIL
L-HM32 L-HM46 (GB11119-89)	28.8~35.2 41.4~50.6	Energol HLP65	Rando oil HD32	Hyspin AWS32	Nuto H44 Standard NH-45	D、T、E、 24
		Energol HLP80	Rando oil HD46	Hyspin AWS46	Nuto H44 Standard NH48	D、T、E、 25
L-HV32 L-HV46 *(GB7631.2-87)	28.8~35.2 41.4~50.6	Energol SHF80 Energol SHF100	Rando oil HD AZ	Hyspin AWH46 Nuto	Nuto H44 Vnivis J58 nuto H48	D、T、E、 13EP D、T、E、 23 D、T、E、 15
					Hydro- kiretic Tellus T27 46	

(IV) GEAR OIL

Domestic oil brand	Viscosity (40℃) mm ² /s	Similar brands			
		BP	CALTEX	ESSO	MOBIL
L-CLE90 L-CLE 85/90 (GB7631.7-89)	13.5-24.0	Hypogear Ep Multigear 80-90 85-140	Multi Purpose thuban EP	ESSO gear oil GX Standard gear oil	Mobilube HD Spirax EP Heavyduty HD90 HD80w-90

Notice: divide the quality standard of gear oil into three kinds (CLC、CLD、CLE)in according with the quality standard of API. CLE is equal to the GL-5 of the quality standard of API.

(V) BRAKE OIL

Domestic oil brand	Classification	Similar brand		
		BP	ESSO	MOBIL
HZY3 integrated brake oil (GB12981-91)	SAE 1703C	Brake Fluid Disc-brake Fluid	Brake fluid HD400	Hydraulic Brake fluid Donax B

(VI) LUBRICATION GREASE

Domestic Oil brand	Similar foreign brands					
	BP	CALTEX	CASTROL	ESSO	MOBIL	SHELL
L-XACFA3	Universal grease	Marfak all purpose Mdy Tex grease		Estan EP	Mobil- grease Special (Mos2)	Retinax Anl (Mos2) Alvania EP
	Chassis	Ener- grease L21M	Marfak all purpose Marfak Multi purpose	MS Grease MS3 Grease	Mobil- grease Special Mobil grease MP	Retinax AM (Mos2)

1. Notes for feeding of oils

- 1) All the oil including fuel, transmission oil, hydraulic oil, brake oil and various lubricants must be pure, and they must meet the quality requirement of the regulations, and can only be used after being precipitated for a certain period of time.
- 2) All the filling tools containers and oil inlets be cleaned, to avoid water or dirt trapped into oil.
- 3) When check the oil level, the loader must be horizontal both in longitudinal and transverse directions.
- 4) Oil of different viscosity must be used under different environmental temperature; the oil scheme in previous section must be strictly followed.
- 5) Leakage must be inspected after each refilling or oil changing.

2. Supply of hydraulic oil tank

- 1) Oil level checking: check the level indicator of the hydraulic oil tank, keep oil surface above the middle mark of the indicator and must replenish oil if surface is below that of the indicator.

Attention: When check the oil level, the bucket should be placed horizontally on the ground while the engine is stopped.

- 2) New oil can be filled after the following procedures:

- ① Lift the lift arm to highest position, then shut off the engine. Tilt the bucket and lower the lift arm by dead weight to release the oil inside the cylinders thoroughly.
- ② When the oil is still warm, screw off the plug on the bottom of the oil tank to drain out dirt and debris. Disassemble the flange cover, clean the oil inlet and each filter. Replace the filter if damaged.
- ③ Replenish the new oil through the inlet, till the specified position. It is forbidden to fill directly without the presence of oil inlet filter.
- ④ After replenishing new oil, let the engine run at low speed and operate the working device to make its various movements several times to deaerate the system. After this, the oil surface will go down a little bit, check the level again and replenish if necessary.

- 3) Drain out the debris

Water and debris accumulate inside the oil tank can be drained out from the drain plug.

3. Fuel tank filling

- 1) Level checking

The oil level should be know from the fuel gauge fixed on the instrument panel.

- 2) Drain out the debris

Water and debris accumulated inside the fuel tank can be drained out from the drain plug on the bottom of fuel tank. Inlet and outlet filters should be cleaned periodically. Replace if damaged.

4. Filling to brake oil

There are two oil cups.

- 1) oil level checking

check the height of brake oil, the height from oil surface to oil-inlet is 15~25mm, if it is not enough, please refill.

2) replace new oil

Replace all oil according to lubrication schedule, at the same time cleaning the cup mouth and replace the filter net.

Loosen the exhaust mouth, step down the pedal some times, until drain the old oil form oil cups and pipes. Pour the new oil form oil cups, let out some new oil from exhaust mouth. In the end, the oil surface of oil cup must be at the specified position.

Don't mix different brands, the mineral oil can't be used as brake liquid!

If replace different brands brake oil, should drain the old oil, clean the system use the new brands brake oil.

5. Supply of transmission and torque converter

1) Level checking

Pull out the dipstick of transmission and plug it in after being cleaned. Plug out again to check the oil level. If the oil level stays between the upper and lower marks of the dipstick, it is to say that the level is correct. Replenish if the level is lower than the lower mark till it reaches the upper mark.

When check the oil level, please keep the engine running.

2) Oil replacing

Except periodical replacing (every 1000hrs), if the oil is found gone bad or mixed with debris, the system should be checked and cleaned, the oil should be replaced.

When replacing, drain the old oil form transmission, replenish the new oil through the inlet. Let the engine run at low speed to deaerate the system. After this, the oil surface will go down a little bit, check the level again and replenish if necessary.

6. Supply of axle gear oil

1). Oil level checking

Screw off the filling plug of main drive on the axle case, if the oil surface is just at the inlet, the level is proper, refill if not enough.

2). Oil replacing

Drain the lubricant through the drain plugs on main drive and wheel rim reducer.

Screw off the oil plug on main driver and wheel rim reducer, fill in new oil, until the new oil overflows from the inlet. (At this time, the arrows on the reducers should point up) Screw on the plugs again when done.

7. Supply of engine oil

1) Level checking

Pull out the dipstick and plug it in after being cleaned. Plug out again to check the oil level.

If the oil level stays between the upper and lower marks of the dipstick, it is to say that the level is correct. Replenish if the level is lower than the lower mark till it reaches the upper mark.

Level checking, should be done before operation or 15 minutes after the engine stopped.

After level checking, the oil pollution and mixed debris should also be checked. If it is over polluted, it must be replaced with new oil.

2) Oil replacing

Drain the old oil through the drain plug on the oil sump, and then fill with new oil through the inlet till the upper mark on the oil dipstick.

Start the engine and let it run at a low speed for a while, then stop the engine to check the level again, if not sufficient, replenish.

The oil level should not exceed the upper mark.

Engine oil should only be replaced while the engine is still warm.

8. Supply of cooling water

1) Water replenishing

If the water temperature becomes too high, first check the water level inside the radiator and replenish it. At the same time, you must also check if the holes of the radiator element clogged or hoses burst. The cover of radiator should be fastened to avoid evaporation.

2) Water replacing

The cooling water and radiator internal cleaning cooling water can be replaced only when the radiator is cold. Screw off the cover, and then open the drain cock on the bottom of the radiator, the water can then be drained out.

After replacing, start the engine to make the water level a little bit lower. Then stop the engine to refill the water again.

When internal cleaning is to be performed, first fill the radiator fully with water and run the engine with a high speed to make the water circulating. Drain the water again through the cock. Keep the engine running at idle speed, while filling the radiator with fresh water until clean water flows out from the drain cock.

Attention: When the engine just stops or is running, never open the radiator cover. High temperature water will burst out to burn you.

If it is necessary to open, cover it with a cloth and then screw it off slowly to open.

3) Notes

① Rain water, city water and precipitated river can be used as cooling water. Well water can be used only after softening of it.

② At the environmental temperature below 0°C, antifreeze can be added to protect the cooling system, from freeze. If no antifreeze is added, all the cooling water should be drained out through the drain cocks of diesel, water pump, radiator and air conditioner to protect them from cracking. The cooling water draining is unnecessary after addition of antifreeze, while high quality antifreeze must be used.

③ When the environmental temperature goes over 30°C, the engine is easy to get overheated. Better park your loader in a shadowed place.

④ In order to prolong the service life of the engine, its running at a low speed for about 5 minutes, till water is cooled is necessary after operation, and then stop the engine.

IV. Inspection and Maintenance to each part

1. Engine

The details of the engine listed in “operation maintenance manual” attached to the engine for detailed instructions.

2. Electrical system

A. battery

Clean the batteries, and check the quantity and specific gravity of electrolyte.

Cleaning

In order to prevent the salinization by the sulphuric acid (white crystals result from sulphuric acid with lead), the batteries should be cleaned and grease or vaseline applied on the terminals.

Electrolyte level

It is normal when the surface of the electrolyte is 10 to 15 mm higher than the electrodes. Specific gravity of the electrolyte should be gauged before replenish.

Gravity gauging

Gauge the specific gravity of the electrolyte with hydrometer. If the values of each battery are different, corresponding charging should be performed to make them even.

Correct specific gravity is 1.260@20°C specific gravity values at temperatures other than 20°C should be calculated in accordance to relative calculation shame.

The dead line of the specific gravity valve is 11/60, so never have it to be lower than this valve.

If the gravity drops down sharply, electrodes, generator and fan belts should be checked for their fastening.

Management of batteries

In cold winter, the frozen temperature of the electrolyte is about -35°C when fully charged.

The battery troughs will be damaged if frozen, so measures should be taken to protect them. As the protecting method, you will have no worry when the batteries are charged 75% of their full capacity. And it is also effective when the gravity is raised up to 1.280, but do not exceed that.

In hot summer: as the water inside the electrolyte may easily get vaporized, they must be checked once a week and replenished distilled water. In very hot place, it also works if the gravity decreases 1.220 ± 0.01 when charging ends.

Electrolyte: the electrolyte can only be replenished with distilled water or refined water. If the batteries are still under operation when the level of the electrolyte drops down the minimum level, the electrodes may be corroded and the operation life of the batteries shorted.

When replenishing in cold weather, perform that before starting the engine, and never replenish after operation to avoid freezing.

The batteries should be kept clean.

As the top part or terminals are easily polluted, and that will be the main reason of electricity

escaping, they must be cleaned consequently.

When assembling electrode terminals, grind them first and then clamp fast.

Before you perform the inspection to the electrical system, be sure to disconnect the negative terminal (-) of the batteries first.

Near the batteries: as explosive gas may release out surrounding the batteries, flame is forbidden to be held near them.

If electrolyte gets on your shin (hand, face or eye), wash immediately with fresh water (city water). Drink plenty of water if it happens to get into your mouth. Specialized doctor should be seen after your first aid.

B. Wires and fuses

Always notice the connections and protection peel of wires, and the clamping of the fuses.

When one line malfunctions, the fuse of this line should first be checked. If the fuse is to be replaced, causes should be found out, and then furtherly check the lamp bulbs and disconnection.

The fuses locate at upright corner of the cab and under the left side of the apparatus panel. The capacity (ampere) on the bulb and clamp must be noticed, when the fuses is replaced.

C. Lamps and apparatus

☆ Check the functions of each lamp switch.

Dirt on lamps must be cleaned away

☆ Press the horn button to check the sound.

☆ If the hand of the engine oil pressure meter points out of the normal range (green), check the engine oil level, and check if leakage, pump and filter clogged or debris trapped inside.

When the engine is cold, the meter hand is always beyond the green range, so warm running is necessary to make the hand return to its right position.

3. Steering device

A. Full hydraulic steering unit has been adopted in this loader. When the loader performs correctly, direction can be changed by a slight turning of the steering wheel. When you feel hard to steer, do not turn the steering wheel rudely, while stop the loader for checking. Operation can be resumed after the trouble has been shooted.

Don't force the steering wheel before starting the engine, the steering pump has not begun to work.

When the ground is uneven, the steering wheel should be free to turn with the change of ground conditions. Never handle the steering wheel roughly under this condition.

B. After 2000 hours working, the steering valve should be dismantled for inspection and steering angle be corrected. When internal or external leakage happens to the steering cylinders, inspection is necessary and seals should be replaced.

4. Transmission system

A. After 2000 hours working, the transmission, torque converter, main drive and wheel rim reducers

of the driving axles should be dismantled for inspection and wash. Pay attention to abnormal noises from the transmission system during operation.

B. Transmission pipeline filter

When replacing the filter element, first drain the dirt and debris out, and then take off the cover to change the filter element with a new one. After that, replace the cover.

C. Transmission shaft

Check the fastening of the assembling screws at the connecting part, vibration of the shaft and fastening of the spline.

When dismantling and reassembling the shafts, pay attention to the relative positions of the universal joint yokes at the two ends, and the arrows should be kept in alignment.

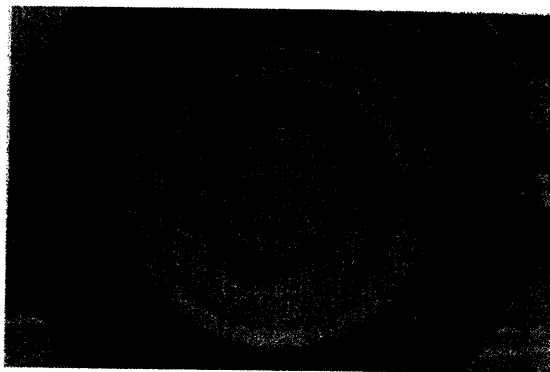
D. Wheels

☆ Check the inflating of the tyres, wear and tear of the surface prinking by metals and fastening of the nuts.

☆ Check the inflating tyres are cold. Normally the inflating must be low when operating in sandlot, high in hard place.

☆ **Check the fastening of the lock ring of the wheels. Special attentions must be paid when inflating.**

☆ After 2000 hours working, check the welding seams and pressured parts. Correct if it is deformed.



5. Working device

After 2000 hours, the natural subsidence of the working device should be checked.

☆ Checking method

The bucket idle load, stop the engine, the descending length of the lift cylinders should not exceed 10mm in minutes.

If the descending is too much (over 20mm), the sealing of the distributing valve and lift cylinders should be checked and system working pressure be measured.

6. Braking system

A. Disc brake

Check the wear of the brake friction plate and deaerate the system periodically.

☆ Checking to the brake friction plates

Screw off the screw pin and remove the cover, take out the friction plate. There are three ditches on the plate, which is the sign of the friction. When ditches disappear off, the plate is to be replaced .

☆ Deaerating

Air trapped into the system will influence the brake effect. After parts replacing or system cleaning, air should be deaerated.

When deaerating, take a piece of transparent hose and slip one end onto a deaerate nozzle while the other end put into an oil container. Release the nozzle and step on the brake pedal continuously until fluid stream comes out without bubbles. Fasten the nozzle and then release the brake pedal.

B. Brake pedal

When traveling, check the brake effect, feel if the brake acting on one side.

Pedal movement after the pedal is stepped, the movement of its front end must be 13 to 23.

C. Booster pump

After 2000 hours, the booster pump should be thoroughly dismantled and maintained.

D. Park brake

Engage the hand brake and check if the loader is under braking. If the braking effect is not good or abnormal appear, perform corresponding checking at once.

7. Miscellaneous

☆ After 2000 hours operation, the whole loader must be visually checked. Pay attention to damages, deforms, cracking, welding peelings and other shortcomings which can hinder normal operation, especially the working device and wheels.

☆ After 2000 hours, check the fastening of each screw and nut on the loader. Fasten it if loosened.

Special attentions should be paid to the rim nuts and screws on the suspending parts.

☆ Check the sealing of each hose connection, engine, radiator and transmission system for oil or water leakage.

If the leakage is hard to be found, stop the engine and clean the be checked, then restart the engine .

Except visual inspection, thick paper contacting method can also be adopted for leakage checking.

Chapter 6 Storage

I . Daily parking

* Park the loader on a place, with its bucket resting on the ground horizontally .Try your best keep the loader inside a dry storage, and moisture must be avoided. If, because of condition limitation, the loader has to be keep outside, a shelter cloth must be used to cover it.

* Turn the ignition switch to “OFF” position, plug out the key and keep it in a careful place.

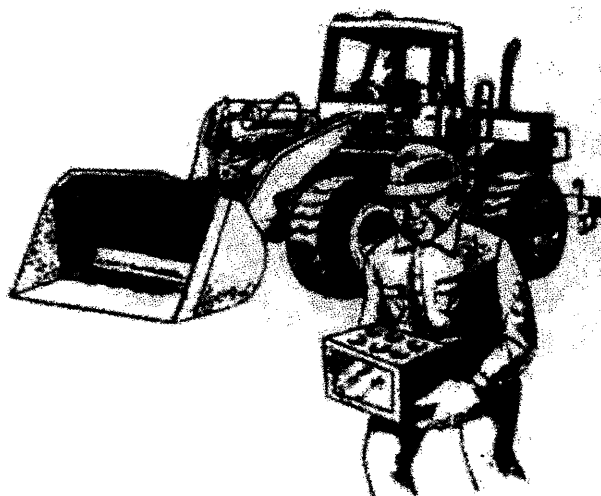
* After the ignition key being plugged out. Operate slowly the control levers of the working device for 2 to 3 times, so as to release the remained pressure inside the cylinders and hoses, and place them at their neutral positions .

* Place the shifting lever at neutral position, and the parking brake must be engaged.

* Lock the front and rear chassis with the lock bar.

* In winter or cold weather (when the environmental temperature below 0℃), anti-freeze must be applied into the cooling water . Cool water must be drained out completely for those loaders without anti-freeze in the cooling system, so that the engine can be protected from being cracked by ice.

II . Long Time Storage



The storage period for this loader can be short-term and long-term. For short-term, the storage period not be over two months, over two months must be take as long-term storage. The parking place for storage should be keep sheltered, ventilated, dry and without any corrodent substances or gas. Before storage, the exposed parts such as cylinder lever and shaft should be greased for anticorrosion. And before long time storage, the surfaces on the loader should also be sprayed with wax to avoid being rusted.

Within one month

Except those mentioned in the “ Daily parking “, the following procedures must be noted:

Start and drive the loader once a week, and operate the working device to be ready for work.

Over one month:

Over one month in “Daily parking”, the following procedures must be noted.

- * Check all the oil levels and lubricating points to see if have enough oil.
- * Considering the raining season, try your best to park the loader on a hard ground of a higher place.
- * The batteries must be disconnected.

Although the loader is indoor stored, if it is too hot or damp, the batteries must be dismantled to be stored in a better place, and charge them once a month.

* Parts which moisture can easily get in, such as ventilation device and air cleaner, should be covered with cloth.

* The inflation of the tyres must be standard. Check the wear and damage of the tyres (new types must be prepared accordingly)



In order to release the heavy load on the tyres, it's better to jack up the loader into a float condition. If the loader cannot be jacked up, the inflation of the tyres must be checked every two weeks to ensure the pressure.

* Recover the loader into ready-work condition each week. Start the engine and let it warm up, and then move the loader back and forth a little bit.

If you think it necessary to activate the working device, before you do it, the grease on the rods must be cleaned away.

III. After a Long Time Storage

- * Move away all the protection coverings.
- * Clean away the anti-rust grease on the opening parts.
- * Drain out the oil in the case of the engine, torque converter, transmission differential and wheel rim reducer, wash them and refill new oil.
- * Drain out the debris and water inside the hydraulic tank and fuel tank.
- * Dismantle the cylinder cover of the engine, and lubricate the valve and rocker shaft. And

check the movement of each valve.

- * Fill the radiator with the cooling water to the standard level.
- * Charge the batteries again and connect them to the wires.
- * Adjust the inflation of the types in accordance with the manual.
- * Follow the checking procedures before operation.
- * Warm up the engine.

Chapter 7 Normal Trouble and Elimination

I 、 Diesel system

No	Trouble	Causation	Elimination
1	Diesel running but can't traveling	1.Not engage the gear	1.Engage the gear
		2.Transmission oil is low	2.Replenish oil to right position
		3.Transmission pump damaged, oil seal leakage	3.Replace, repair transmission pump
		4.Torque converter trouble	4.Check if the torque converter damaged or leakage
2	Shift oil pressure is low	1. Relief valve pressure isn't correctly	1.set pressure to prescriptive rang.
		2.Clutch oil seal leak	2.replacing new oil seal and oil seal seat
		3.Brake valve lever don't return	3.check the spring and if have sundries in the back cavity
		4. Pipeline leaks	4.Screw down the tie-in
		5.oil pump fail	5.replace the oil pump
		6.filter is blocked	6.clean the filter
3	All or a certain gears isn't engaged	1.shift oil pressure in low	1.refer to the trouble 2
		2.case pipeline is jammed	2.dismantle and clean
		3.clutch oil seal leak	3.refer to the trouble 2
4	Driving force is not enough	1.Transmission system oil lever is not enough or leak	1.Check and supply the new oil
		2.Shift pressure is too low	2.refer to the trouble 2
		3. Brake didn't disengage completely	3. Check and adjust
		4.oil temperature of torque converter is too high.	4.If the temperature over 110℃, should stop working and let it cooling.
		5.Clutch drive and driven plate not joint well	5. Dismantle, clean and replace the damaged plate
		6.Engine speed is insufficient	6. Check and adjust the engine speed
5	Oil temperature of transmission and torque converter is too high	1.the oil lever of transmission is too low	1.fill the oil to standard oil level
		2.the clutch skids	2.repair the clutch, adjust the shift pressure

		3.the working time is too long	3.stop working and let it cooling
6	Don't shift correctly	1.don't engage shift	1.readjust and repair

II 、 Steering system

Trouble	Phenomena	Causation	Obviation
Steering hardly	The slow turning steering wheel is normal, the quick turning steering wheel is heavy	1.The oil supplying is not enough	1.check and repair the oil pump
		2.The pipeline pressure lose too big that between pilot valve and redirector	2.redesign the pipeline, choose rigid pilot valve spring
		3.Pilot valve spool is locked	3.repair the spool or replace the pilot valve
		4.The pipeline system has air, that between pilot valve and redirector	4.turn steering wheel, cylinder at its limited position, open safety valve, vent the air
	When increase the load, the turning become heavy.	1.The safety valve pressure is too low the cylinder working pressure.	1.readjust safety valve pressure
		2.The safety valve spool be blocked or inner leakage is severe	2.repair the spool or replace the pilot valve
	The slow or quick turning steering wheel is heavy, and steering cylinder don't move	Steel ball control valve in redirector abate	If lost steer ball, then pack into the steer ball. If steer ball be blocked, then clean the valve
The steering fail	Some air in the oil, set out the irregular sound, cylinder piston move slowly	There is some air in steering system	Expel the air in the system, and check oil inlet hose
	Steering hardly	The oil tank is unfillable, oil viscosity is too big.	Replenish the new oil to specified position, use the commendatory viscosity oil
	The steering wheel can't automatically return	The spring plate breaks down	Replace the spring plate
	The steering wheel can't be moved	The pin or chord axis joint break down or tansformed	Replace the pin or chord axis
	The steering wheel rotate or right or left waver	The rotor and chord axis exchanged the position	Reassemble

	When turn the steering wheel, the cylinder don't move. (or move slowly)	The double direction over loading valve fails to work	Clean the valve or replace the spring and seal ring.
The steering wheel can't automatically return	When neural position pressure gain, steering wheel stops turning, the redirector does not unload	1.The steering pole is not concentric with the plunger 2.The steering pole ward off the plunger 3.The steering pole steering resistance is too big 4.The spring plate breaks down	Aim to the causation eliminate the trouble
The unmann ed turning	When motive turning, cylinder piston move to extreme position, the driver feel unconspecuous. When manpower turning, the steering wheel turn, cylinder don't move.	Radical and axial tap of rotor is too big	Replace the rotor.

III、 Electric system

Trouble	Causation	Eliminate
After start but the motor can't run	1.The start circuit lead is loose	1.Press the lead tightly
	2.Start relay touch badly or the coil were burned out	2.Polish touch point or replace the relay
	3.Electromagnetism switch goes wrong	3.Replace the electromagnetism switch
	4.Shift handle is not at neutral position	4.Put it at neutral position
	5.Fuse is broke	5.Replace the fuse
	6.Coil is damaged	6.Replace or repair
	7.Battery short of electricity	7.Charge battery
Gauge indication is abnormal	1.Connection wire is loose	1.Fasten the wire terminal
	2.Sensor is damaged	2.Replace the sensor
	3.Gauge goes wrong	3.Replace the gauge
Alarm keep on sound	1.Monitor buzzer buzzing	1.Refer to the manual of the monitor
	2.Acoustic back-up signal buzz	2.Replace the back-up relay
	3.Air pressure annunciator is damaged	3.Replace the air pressure annunciator
	4.Buzzer joint wire touches iron	4.Pack lead to isolate
Lamp isn't light	1.Fuse is broke	1.Replace the fuse

The generator doesn't working or charging current is too great or too little	2.Tungsten filament is burn broke	2.Replace the bulb
	3.Joint wire is loose	3.Fasten the wire terminal
	1.Generator touch iron wire is loose	1.Fasten the wire
	2.The belt is loose	2.Adjust the belt
	3.The adjuster and the generator go wrong	3.Replace the integral generator

IV、 Brake system

Trouble	Causation	Eliminate
Foot brake power is insufficient	1.Wet brake leak oil	1.Repair wet brake
	2.There is air in foot brake pipeline	2.Deaerate air
	3.Brake air pressure is low	3.Check the air compressor, segregator units valve, safety valve and air way seal
	4.Booster bowl is wore	4.Replace the bowl
	5.rim leak oil to brake board	5.Check and replace the rim oil seal
	6.Brake plate wore to limit	6.Replace the brake plate
Brake can't disengage normally	1.Brake valve stem at wrong position, piston rod is locked or return spring break down	1.Check or replace the brake valve
	2.The bounce of booster isn't enough	2.Check the booster
	3.The branch pump piston can't return	3. Reseal it
Brake air pressure rise slowly	1. Air way isn't seal well	1. check the air way
	2. Air compressor working abnormally	2.check air compressor working circs
	3. Wing nut of multi-function unload valve is loosen	3.fasten again
Hand brake is insufficient	1. The clearance between brake drum and brake plate is too large	1.adjust it according to standard
	2. There are some oil on brake drum	2.clean the brake plate

V、 Working hydraulic system

Trouble	Causation	Eliminate
Lift or tilt power is insufficient	1.Cylinder seal wore or damaged	1.Replace the oil seal
	2.Distribution valve ware, the clearance between valve rod and valve body over regulated value	2.Keep the clearance reach to standard value to replace the distribution valve
	3.Pipe system leak oil	3.Eliminate the leakage
	4.Working pump inner leak severely	4.Replace the working pump

	5. Adjust the safety valve wrong, system pressure is too low	5. Adjust the system pressure to regulated value
	6. Absorb oil pipe and oil filter is locked	6. Clean the oil filter and replace the oil
When engine running speedily, tilt and lift is slow	1. See (1)	1. See (1)
	2. Dual effect safety valve is locked	2. Dismantle dual effect safety valve and check
Mix working hydraulic oil with transmission oil	Mix working hydraulic oil with transmission oil because working pump seal is aging and broken	Replace seal, clean filter net, check absorb oil pipe