

# GRADER PY200H

# Operating Manual

Product name: Grader  
Product specification: PY200H

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## **Foreword**

This operating instructions is compiled for the grader operator, in order to find and avoid the personal injury and machine accident, the machine operator shall be familiar with different rules indicated in this instruction.

The operator shall take the operating instructions when carrying out operation.

The operation, repairs and maintenance shall be conducted by the qualified personnel.

We can supply training on different models of graders for users at all times.

In order to insure the safety of person and machine, the operator shall do the as follows:

- The working environment of grader shall be safe and reliable.
- The operation falling short of rules shall be forbidden.
- Report any abnormal phenomenon to higher level and the higher-level department shall take measures accordingly.
- Refuse unapproved personnel to get on the machine or enter the working site.
- Forbid operating against rules, such as lateral drag, repairing on inclined or uneven road surface and working under lifted heavy, etc.
- Once the operator take notice of possibility of happening dangers to personnel or machine, necessary measures shall be taken to avoid accident.

We reserve the rights to make modification to the operating instructions. In case of minor technical changes, this operating instruction will not be revised and additional pages will be added to this operating instruction.

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## **1. Preamble**

Our corporation has accumulated an abundance of experiences in complete machines manufacture in engineering machinery; the grader manufactured by us has advanced design level and level of technology. If the grader can be used correctly and maintained properly, the service performance, production efficiency and service life of the grader will be more reliable, higher and longer respectively.

The trouble-free operation and service life of the grader is depending on the correct use and maintenance of the grader to a great extent, therefore this manual must be read by operator and the different operating provisions must be complied with before the first operation of the grader strictly.

Make sure that the system to be readjusted and the system performance checked after repair work or replacing parts and components. The above mentioned adjustment and inspection are very important for the brake system and steering system especially.

We will provide technical service for any necessary repairs upon the sales of the grader. The GB/T 14782-93 *technical item of Motor Grader* is complied with by this product.

### **1.1 Warranty clause**

We observe the contact and carry out guarantee of repair; replacement and refund of substandard products and supply mating parts after the sales of engineering machinery.

### **1.2 Spare parts**

Make sure that in all repair work, only original spare parts supplied by our company are used. This gives you the assurance that you will be protected from damage and your machine will be kept in original conditions.

## **2. Sales service department**

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## **3. Accident prevention**

1) When disassembling and assembling the grader, the works shall be done under instruction of special technicians.

2) The person who received the driver's license for the grader and is fully familiar with the operation of the grader can operate the grader.

3) The grader driver must control the grader under good condition.

4) Before driving grader for each day, the driver must check the function of braking and steering devices.

5) The grader driver shall report the abnormal phenomenon found to maintenance and repair men and tell the next shift of person. The machine must be stopped if the abnormal phenomenon brings about unsafe factors to operation.

6) Different control levers of grade can only be controlled in driver's cab.

7) Make sure to insure the stability of grade during the whole operating process.

8) Must engage gear on downhill path.

9) The safe distance must be kept during operating process and working on busy road.

10) The driver must take notice that there is no person near the grader before operating and driving the machine and sound the horn.

11) If cannot see the blade working, the driver shall use flag signal or take measures necessary.

12) This method can only be used for the driver who is familiar with flag signal.

13) When the grader is operating, any person is forbidden to enter the working area.

14) The operating device shall be fallen to the ground or fixed in case of down time or not used.

15) Only when setting the grader to the ground or fixing the grader can the diver leave and set the control device to their original positions.

16) The drive must have the hand brake engaged and all assistant safety devices locked before leaving the driver's cab.

17) After work interrupted or completed, shut down the engine and take off the ignition key as well as switch off the main power switch (if equipped) to avoid accidental starting.

18) The relevant personnel can go out or enter into the driver's cab only when approved by the driver and the grader is parking.

19) It is not allowed for the driver to let the unapproved personnel to enter into the driver's cab.

20) When repairing the grader, you should follow the steps as follows:

a) Shut down the engine and put all work devices on the ground or have them firmly fixed.

b) If you must work under lifting device, the device must be locked or fixed.

c) Because of articulated-steering structure, front and rear frames must be locked.

d) When there is pressure in hydraulic system, don't turn the joints.

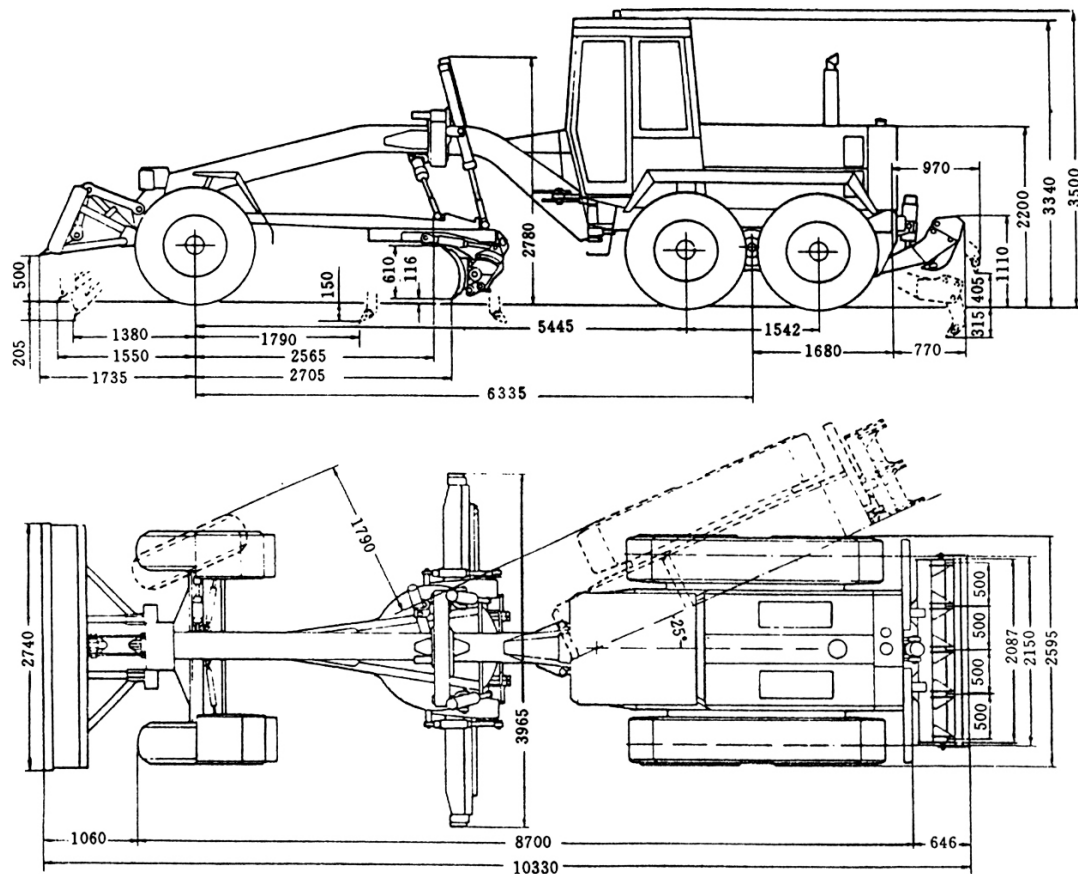
e) After repairing, all safety devices must be returned to original positions (cotter pins, etc).

It is very important for accident prevention to comply with above-mentioned rules.

## 4. Performance parameter of complete machine

### 4.1 Dimensions (Fig.1)

(Tyre 17.5-25)



**Fig.1**

### 4.2 Working weight (Unit: kg)

Complete machine	Front axle	Rear axle
15400	4600	10800

### 4.3 Engine

Type	QSB6.7
Bore×stroke	104×130mm
Total displacement of the pistons	6.7L
Rated power	160kW
Rated speed	2500r/min

Max. torque	888N.m
Max. torque speed	1500r/min
Operations sequence of different cylinders	1-5-3-6-2-4
Generator	24V/70A

#### 4.4 Torque converter –Transmission

Type: ZFW320 torque converter (with free wheeling) is integrated with 6WG200 transmission.

Direction change (power gear shifting): Forward gear –neutral gear – reverse gear

Speed gear (power gear shifting): Forward 6 speeds; Reverse 3 speeds.

#### 4.5 Axle

##### 4.5.1 Driving axle

Type: 3-stage driving axle with “no-spin” differential gear.

##### 4.5.2 Driven axle

Type: Oscillating and steering front axle of box type, oscillating angle  $\pm 15^\circ$ , leaning angle of front wheel  $\pm 17^\circ$ , steering angle  $45^\circ$ .

Ground clearance from center: 630mm

#### 4.6 Tandem box

Type: Oscillating type tandem box, oscillating angle  $\pm 15^\circ$ , heavy-duty roller chains drive.

#### 4.7 Speed

Forward (km/h)						Reverse (km/h)		
1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd
5.23	7.94	11.84	17.85	25	40	5.23	11.84	25

#### 4.8 Brake system

##### 4.8.1 Service brake (foot brake)

Pipe system: Brake system consists of one circuit, hydraulic pump and accumulator.

Brake: Pliers disc brakes are assembled on rear wheels. 4 on two front wheels; 2 on two rear wheels.

##### 4.8.2 Parking brake (hand brake)

Type: Hub brake, mechanically operated and mounted on drive shaft of gear box.

##### 4.8.3 Continuous service brake

The torque converter is designed to conduct continuous service brake.

#### 4.9 Steering system

##### 4.9.1 Front wheel steering

Feature in structure: Hydraulic oil from oil tank is obtained by gear pump to supply hydraulic steering-gear which distributes hydraulic oil to steering cylinder.

Service pressure: 15MPa

Steering angle:  $45^\circ$

Turning radius: Without wheel lean 10.9m

With wheel lean 10.4m



#### 4.9.2 Articulated frame

System: The articulation operation between front and rear frames is driven by double acting hydraulic cylinder.

Articulating angle: Right and left sides 25° respectively.

Min. turning radius with articulating steering: 7.8m over the front wheel.

#### 4.10 Hydraulic working system

System: Hydraulic system of double pumps and double circuits.

Control valve: Two valve blocks, each is composed of 5 control valves.

Working pressure: 16MPa (180MPa while blade rotating and with front scraping plate)

Hydraulic pump: Double-gear pump of high pressure mounted on power output shaft of the gear box.

Cylinder: Double-acting hydraulic cylinders.

#### 4.11 Work devices

System: Hydraulic adjustment of blade/back ripper and front bulldozing plate, ring-gear with rolling plate, scarifier with 6 teeth mounted on blade back.

#### 4.12 Blade turning device

Features in structure: worm gears are driven by hydraulic motor, there are two types of structures, tooth ring or rolling disc.

#### 4.13 Wheels and tyres

Rims: 14.00/1.5-25 (TB)

Standard tyres on all 6 wheels: 17.5-25 PR12

#### 4.14 Front and rear frames

Construction: Front frame – steel beam structure, its section is pressed into U-sleeve, welded like box.

Rear frame – solid beams welded in two sides.

#### 4.15 Driver's cab

Structure: Weld structure of the steel is conformed to the DIN AND ISO standards.

The driver's cab is structure of preventing tipover and sliding down (ROPS/FOPS), two sliding doors.

##### 4.15.1 Driver's seat

Structure: Spring vibration absorbing seats, adjustable in horizontal and vertical position and in back rest inclination.

##### 4.15.2 Air conditioning system

The system is configured according to the user's requirement. The air conditioners are heating and cooling devices designed specially for engineering machinery. Before using air conditioner (for heating or cooling), please read the instruction of air conditioner carefully.

#### 4.16 Electrical system

Working voltage: 24V

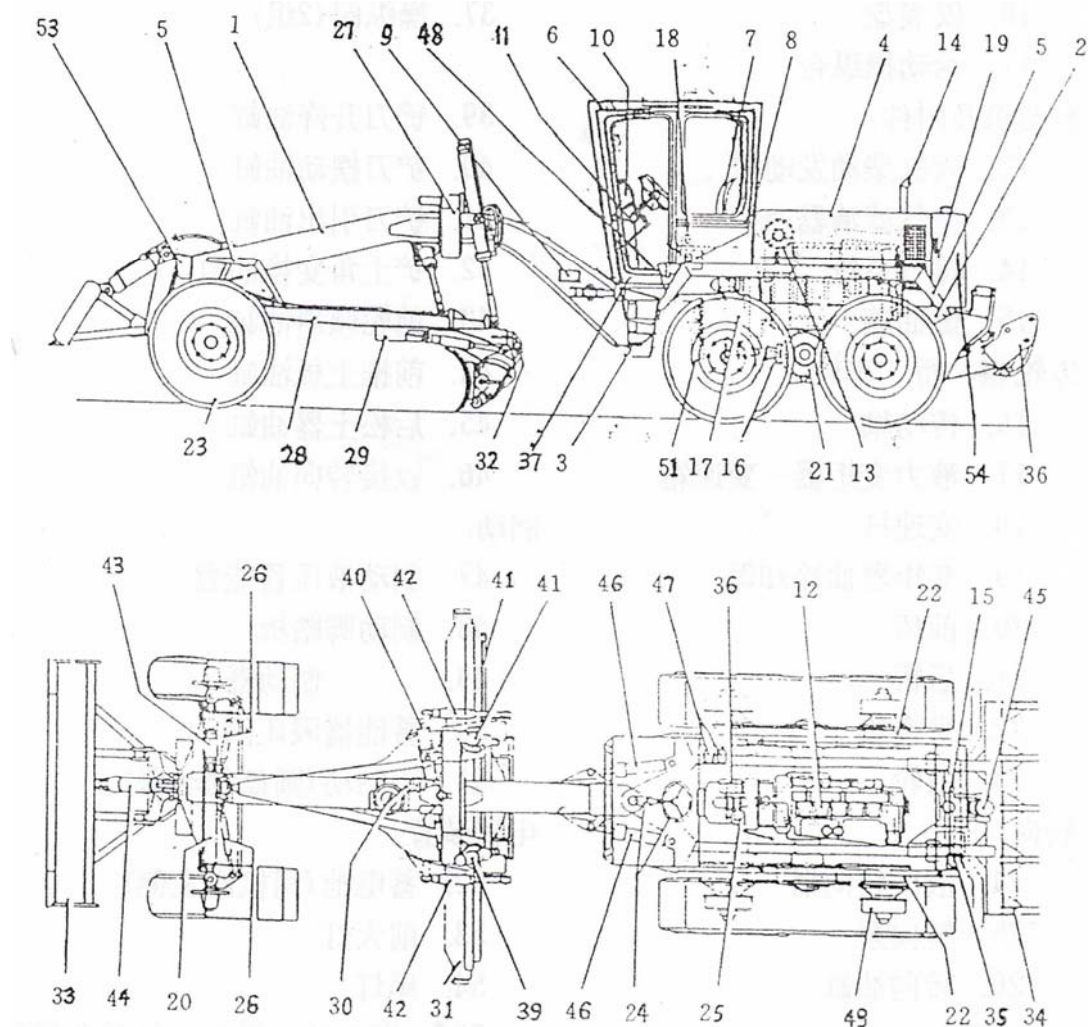
Fuses: 50A, 2; 30A, 1; 5A, 5; 7.5A, 2; 10A, 9; 15A, 1; 20A, 1.

Batteries: every one 12V, DIN165, Ah165 or RTS-4, 2L, 56Ah.

Lights: head lights 2 (far-light, near-light, steering light, working light); steering light 2, tail lights 2 (brake, steering, reverse, working light); working lights 4.

Sound signal: Horn

## 5. Layout and equipments



**Fig. 2**

Frame and accessories:

- 1. Front frame 2. Rear frame 3. Articulation center 4. Engine cover 5. Splash guard
- 6. Driver's cab 7. Driver's seat 8. Air conditioner (optional) 9. Mark plate
- 10. Instrument plate 11. Removable console

Engine and accessories:

- 12. 6-cylinder-diesel engine 13. Air filter 14. Exhaust system 15. Fuel tank

Gear box, axle, wheel:

- 16. Driving shaft 17. Torque converter-transmission 18. Gear change lever
- 19. Torque converter oil cooler 20. Front axle 21. Rear axle 22. Tandem box

23. Front wheel

Steering:

24. Hydraulic steering-gear

25. Steering pump

26. Steering cylinder

Work devices:

27. Swing frame, 6 adjustable positions 28. Traction frame

29. Tooth ring with rolling disc

30. Blade turning hydraulic motor 31. Blade

32. Scarifier

33. Front bulldozing plate (front additional weight)

34. Back scarifier (Rear additional weight)

Hydraulic system:

35. Hydraulic tank

36. Working pump

37. Control valves (2 blocks)

39. Hydraulic cylinder, blade lift

40. Hydraulic cylinder, blade swing

41. Hydraulic cylinder, blade shift

42. Hydraulic cylinder, blade cutting angle 43. Hydraulic cylinder, wheel lean

44. Hydraulic cylinder, front bulldozing plate

45. Hydraulic cylinder, back ripper

46. Hydraulic cylinder, articulation

Brakes:

47. Brake accumulator

48. Brake pedal

49. Brake

50\*. Relief pressure valve of the accumulator 51. Hand brake (disc brake)

Electrical devices:

52\*. Batteries (left side of the engine)

53. Head lights

54. Tail lights

55\*. Indicators, instruments, switches and cables

\* Not shown in figure.

## **6. Description**

### **6.1 Grader**

The engine and transmission are mounted on the rear frame. The work devices are mounted on the front frame. The additional front bulldozing plate can enlarge the scope of application of the grader.

The grader is driven by water-cooling and turbo-charge diesel engine that is composed of 6 cylinders straight line and 4 strokes.

The power produced by engine is transmitted to the rear axle by hydraulic torque converter, transmission and driver shaft, then to the 4 rear wheels via the tandem chain.

The hydraulic steering for front wheel is combined with articulating frame giving the frame a minimum turning radius of 7.8m.

The nouns such as “Left, Right, Front, Rear” describing directions used in this instruction in relation to the forward direction of grader.

### 6.1.1 Engine

All driving devices (Engine-transmission) are fixed on the rear frame by 6 rubber vibration reduction housing.

Viewed from the engine fan, the direction of the crankshaft is clockwise.

The combustion air is drawn through an air filter.

Lubrication of all bearings in the engine as well as cooling of some running engine parts is conducted by forced feed lubrication. The lubrication system is fed by a pump drawing oil from the engine oil sump.

The engine oil is cooled by internally hidden oil cooler mounted in the engine. For details please refer to the operating instruction for diesel engine.

### 6.1.2 Hydrodynamic torque converter-transmission (ZF6WG200)

The ZF6WG200 hydraulic transmission is composed of torque converter and dead-axle and multi-gear transmission of constant shaft, with the speed of 6 forwards and 3 reverses.

The torque converter is simple 3 units construction with no-lock clutch, the circle diameter is  $\Phi 340$ , the torque coefficient  $K_o=2.55$  at the lost speed. The torque converter pump wheel is directed mounted on the engine fly-wheel by means of spring plate. the oil temperature should be  $80\sim 110^{\circ}\text{C}$  when at normal work and it is allowed to reach  $120^{\circ}\text{C}$  at moment.

The transmission has 6 multi disk clutches controlled by hydraulic which can engage and disengage under the load reach the power shift. The transmission gear is a constant engagement drive. Its construction and principal can be seen in the following attached figures The speed ratio of the transmission as follows:

Forward						Reverse		
1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
5.986	3.904	2.594	1.692	1.178	0.768	5.906	2.594	1.178

There are two pumps outside the transmission. They are dived by pump wheel of torque converter. Output shaft of the transmission is combined with driving axle backwards to transmit power to the rear axle. Output shaft is connected to the driving shaft backward and transfers the power to the rear axle. Output shaft is linked to the parking brake forward.

The gear shift of transmission is operated by electro-hydraulic shift (hand control selector) at driver's right side. The gear shift changes can be achieved by each electro-magnetic valve connected to hand selector and then to control hydraulic sliding valve.



**Note! Here the user should notice that the operation should be done gradually and sequentially without humping over any gear.**

Besides, the transmission can achieve reverse control only in 1<sup>st</sup> gear. During

driving and sliding slope, the corresponding gear shall be controlled and the engine speed shall not be lower than 1200r/min to meet the needs of lubrication of each part of the transmission.

The operating pump for supplying oil to torque converter and operating is mounted inside transmission and also controlled by pump wheel. Its flow is 35L/1000r/min, control pressure is 1.6~1.8Mpa (Liuzhou Transmission). Because of the cushion construction inside the controlling valve, so the pressure of lowering and rising should have a regularity. During gear change, in this way the gear change can be smooth and less shock. Besides, because of "Neutral insurance" set in transmission electric circuit, the driver can start the engine when the transmission is in neutral, so this can prevent from mis-controlling.

The diesel lubrication oil L-ECD15W-40 is applied in this transmission. Filling oil of the first time is about 28L. When checking oil level, the engine should be in idle speed and transmission temperature is in normal working condition. At this time, two oil scales indicate the levels 80°C (Upper scale) and 40°C (Lower scale). The oil level will be higher than upper scale if check the engine without starting the engine.



**Note: The transmission oil must be changed after operation of the first 100 hours and later every 1000 hours or at least once a year. The oil filter also should be changed with oil changing. Please notice that the used filter could not be assembled again even no apparent damage found.**



**Note: When the engine is shut down and the main machine is dragged, this transmission requires that the traction distance and speed of grader cannot exceed 10km and 10km/h respectively.**



**Note: When conducting electric welding work on the main frame, the gear selector circuit must be disconnected to avoid damaging its internal circuit by unexpected over-current.**

### 6.1.3 Traveling braking (Foot braking) hydraulic system (As shown in Fig. 9)

The foot brake has a one-circuit system with hydraulic pump and accumulator and operates on four rear wheels of the grader.

When the engine is running, the double pump (2) of the working hydraulic draws oil from the tank (4).

The oil from the pump is transmitted via the pressure limiting valve (9) into two accumulators (11) to increase the pressure below 133 bars and to cut off oil when 150 bars.

Filling oil of the accumulator (11) requires only short time and then oil intaking system makes oil flow into hydraulic circuit (130 bars).

The filling oil of the accumulator (11) has priority and therefore, the pressure oil necessary for the braking system is available as soon as the engine is running.

When the pressure on the brake valve (10) drops below 100 bars, the indicator lamp on the instrument panel lights. This lamp is controlled by controlling the power switch. The pump is switched by brake service switch.

When pressing down the brake valve (10), pressure oil in the accumulator circuit flows to the wheel-side brake (12). At the same time, the brake lights are switched on by the brake light switch.

#### **6.1.4 Hydraulic operating system and hydraulic steering system**

##### **a. Hydraulic operating system**

This hydraulic operating system is composed of double pumps and double circuits (Fig.9). It is made up of closed oil tank (4), a two-gang gear pump (1), two five-gang multi-way reversing valves (Refer to 14, 15), hydraulic cylinders for operating apparatuses, motor and hydraulic lines. Each system has its own hydraulic pump, but the hydraulic oil is supplied from the same oil tank (4). The hydraulic oil from oil tank (4) is pumped by a two-gang pump (1) into two circuits. Among them, oil flows are equal. When multi-way reversing valves (14, 15) are in central position, the hydraulic oil, passing through returning lines and the filter (6), returns to oil tank (4).

When moving one or two operating levers, hydraulic oil pushes one-way valve in reversing valve to flow into hydraulic cylinders and motor. The action of one-way valve prevents the oil in working apparatus from return oil tank (4).

It can insure that hydraulic system in correct working condition. The double direction hydraulic lock (16) mounted on the returning lines for titling and lifting the blade can guard against moving due to their own weight and the load to insure safety running and operating accuracy of the blade.

Because of the supplying oil in the equal flow, double lift cylinders for up and down operation in the simultaneous and same speed to raise operating performance of the grader. System pressure is controlled by the throttle valve in reversing valve (14, 15). The pressure value is 16Mpa and system flow: 65L/min.

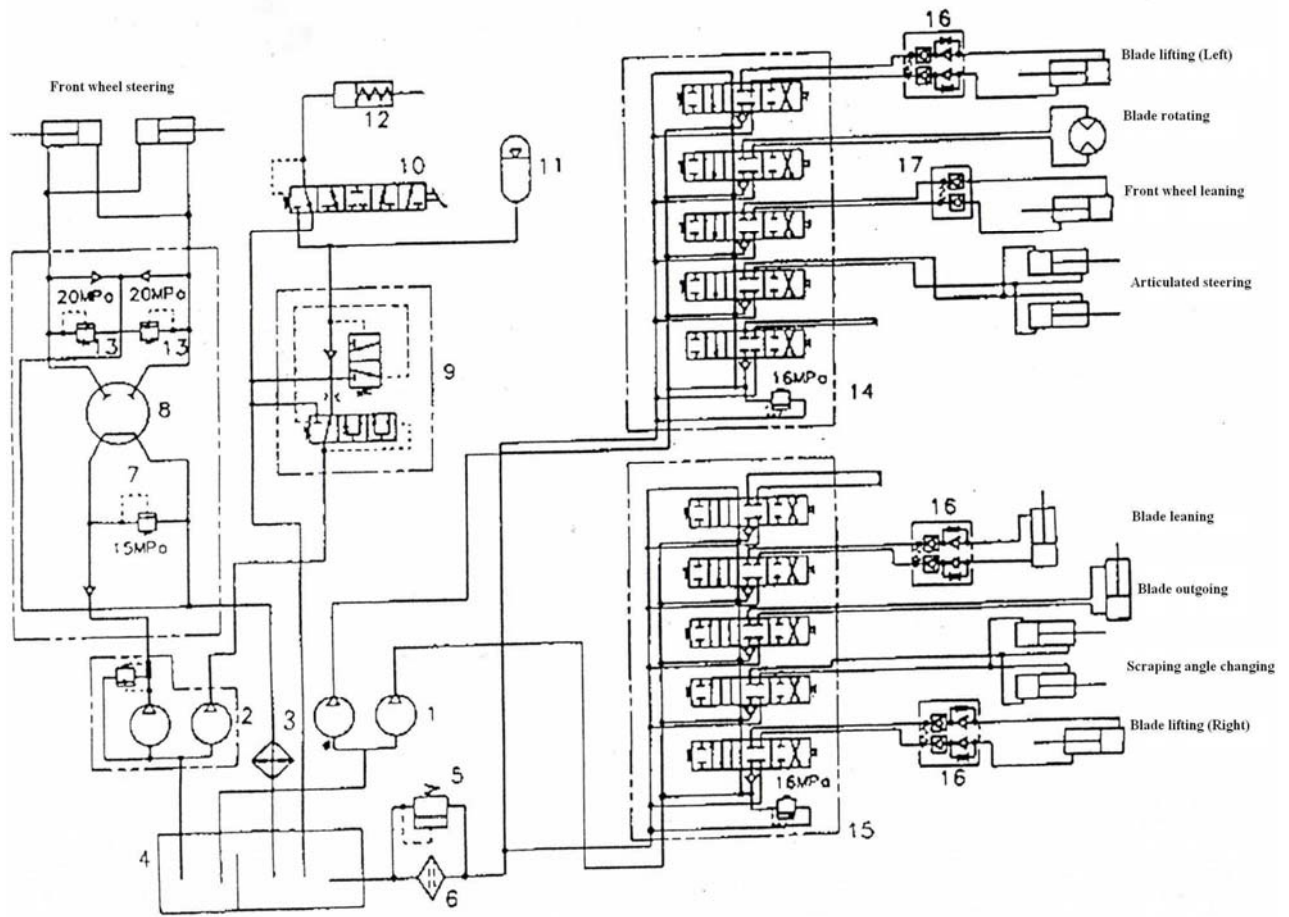
##### **b. Steering system**

When the hydraulic steering-gear (8) needs the oil, the oil from the oil tank (4) is intaken by the steering pump and delivered. When turning the steering wheel, the oil enters into two steering cylinders to make double front wheels steering. Double front wheels are connected by a common pulling lever.

With safety valve (7), the oil pressure of steering system is limited in 150 bars to guard steering system. Double safety valves (13) prevent hydraulic steering system from over pressure. For example, because of the overload caused by road dump, it can be transmitted from front wheels to steering system.

The oil tank (4) is equipped with pre-pressure air filter that can prevent the air with dusts from entering into the oil tank and contaminate the hydraulic system.

If the return filter (6) is blocked and the oil cannot flow, the filter valve (5) allows the oil over the filter from by pass-way and therefore it eliminates the block action of the filter element. The micro-measuring coupler in the system allows gauge to be fitted at various positions in the system to adjust the pressure.



**Fig. 9 Service brake, hydraulic operating and steering systems**

- |  |                                  |
|--|----------------------------------|
| 1. Double-gang operating pump                          | 9. Pressure limiting valve       |
| 2. Double-gang operating pump for steering and braking | 10. Braking valve                |
| 3. Return oil cooler                                   | 11. Accumulator                  |
| 4. Sealed type oil tank                                | 12. Brake                        |
| 5. Filter valve  | 13. Safety valve (20Mpa)         |
| 6. Return oil filter                                   | 14. Operating valve, left        |
| 7. Steering safety valve                               | 15. Operating valve, right       |
| 8. Hydraulic steering gear                             | 16. Bidirectional hydraulic lock |
|  | 17. Hydraulic lock               |

### 6.1.5 Electrical devices

#### 6.1.5.1 Electric wiring diagram

- A. Electric wiring diagram (fig. 5-1)
- B. Electronic Monitor (fig. 5-2), please refer to Operating Instruction of Electronic Monitor for details.

#### 6.1.5.2 Instrument panel (Fig. 5-2)

1. fuse
2. Front-axle drive indicator lamp (Yellow)

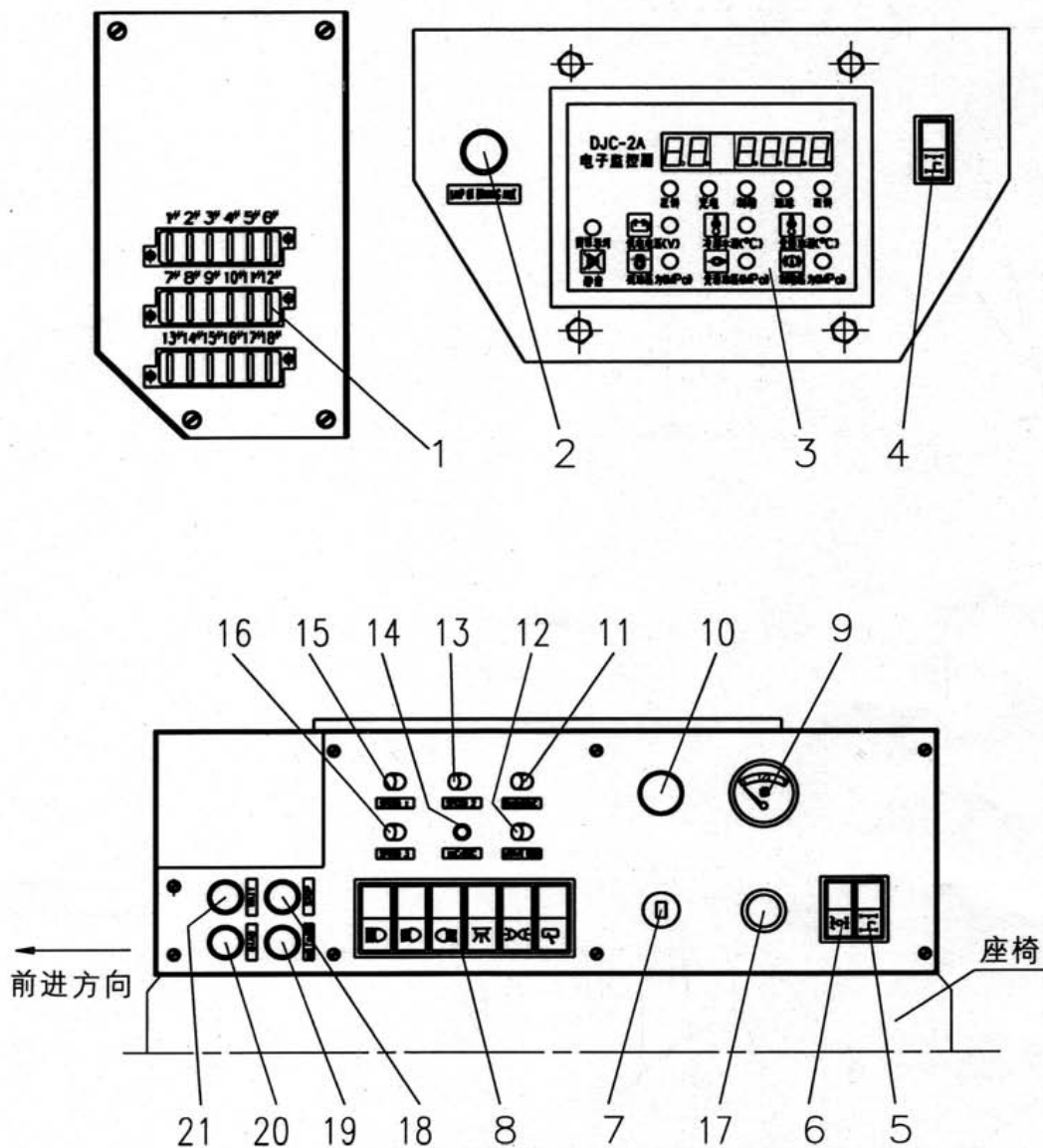
- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| 3. electronic monitor             | 4. Front-axle drive switch 2         |
| 5. Front-axle drive switch 1      | 6. Full-axle driving switch          |
| 7. Driving switch                 | 8. Six-gang switch                   |
| 9. Fuel gauge                     | 10. Emergency stop button            |
| 11. Diagnostics switch            | 12. Double-power switch              |
| 13. Medium speed switch           | 14. Accelerating/decelerating switch |
| 15. Medium speed control switch 1 |                                      |
| 16. Medium speed control switch 3 |                                      |
| 17. Cigarette lighter             | 18. Stopping indicator lamp          |
| 19. Air filter indicator lamp     | 20. Alarm indicator lamp             |
| 21. Waiting indicator lamp        |                                      |

#### 6.1.5.3 Fuse instruction (Fig.5-2)

- 1#. 5A Instrument
- 2#. 5A Starting relay
- 3#. 7.5A Transmission
- 4#. 10A Overhead light, front window wiper and rear window wiper
- 5#. 10A Back light
- 6#. 10A Working light
- 7#. 5A Charging
- 8#. 10A Acoustics and direction indicator lamp
- 9# 7.5A Instrument light, pilot light, reversing light and front drive electromagnetic valve
- 10# 10A Brake light, socket
- 11# 10A head light
- 12# 10A horn
- 13# 15A air conditioner
- 14# 10A Spare
- 15# 10A spare
- 16# 20A Cigarette lighter
- 17# 5A spare
- 18# 5A Key control engine power supply
- 19# (Inside instrument box) 50A instrument box power supply
- 20# (On starting relay) 50A Starter starting
- 21# (On engine wiring harness) 30A Engine power supply



图5-1 电气接线图



**Fig. 5-2**

前进方向: Forward direction    座椅: Seat

#### 6.1.5.4 Starting the machine

Turn on key switch. Gauges and indicators on instrument panel start to work. In case that the vehicle does not move and no alarm is displayed by other parameters, if battery voltage indicated on voltmeter is lower than 21V and charging lights up, it means that battery energy is exhausted. Once engine is started, voltage output of the alternator will be over 26V and charging indicator is off, showing alternator is charging the batteries. Lower engine speed once it is running. Now gauges should display normally and no red indicators should lights up.

## **7. Operation instruction**

### **7.1 Adjust before operating for the first time**

Before unloading the grader, must check whether the machine has been damaged during transportation. If find out damage, shall contact with the transport company or commercial agent. The extent of damage or stolen extent shall be recorded on the freight bill. Contact with the saler and report damage condition to them. They will help you to repair the machine necessarily and handle your claim against Transport Company.

The following inspection shall be conducted and the check result shall be recorded:

- a) Lighting and horn systems;
- b) The oil levels of oil tank, engine, rear axle, rear balancing tank, rotating impeller box of blade are in accordance with requirement;
- c) Fastening condition of nuts;
- d) Whether the tyre pressure is in accordance with regulations and requirement;
- e) Whether the battery (sulfuric acid level) has been charged fully;
- f) Check liquid levels:   Engine  
  Transmission  
  Rear axle  
  Tandem box  
  Blade rotating turbine box  
  Hydraulic oil tank

After starting the engine: The working brake pressure signal lamp cannot light, check the function of the brake and steering systems.

After the machine has worked for more than one week: all grease nipples should be greased according to the lubrication chart and grease shall be filled.

Antifreezing: Antifreezing diesel oil shall be used if necessary.

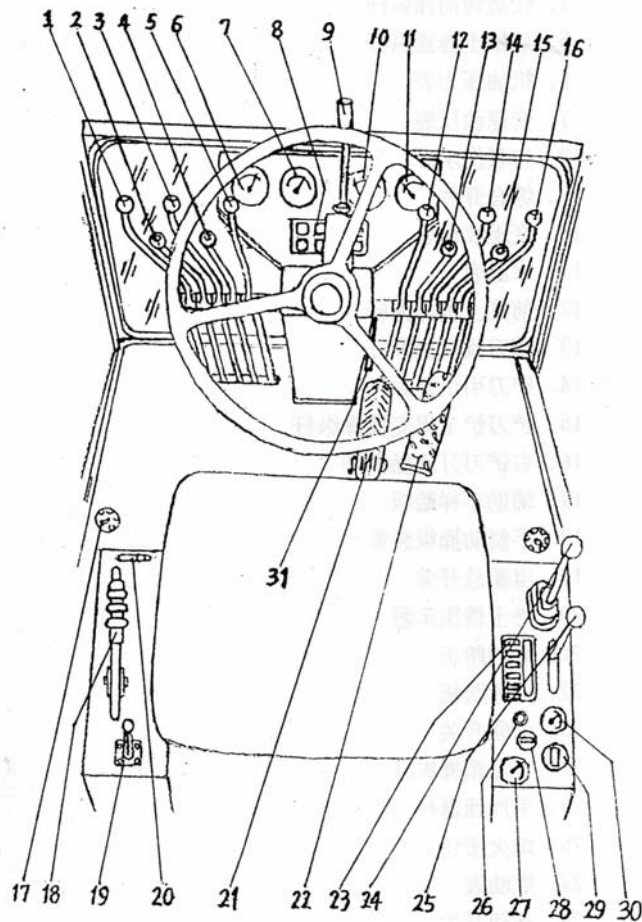
### **7.2 Running-in time**

It is recommended that all moving elements of the grader shall be run in, during this period the grader shall not run under full load.

The grader shall not use full power during the first 50h operating time.

Full power can be used within 50h~100h, while the use time cannot be too long.

### **7.3 Diagrammatic representation of control instrument and operating lever of complete machine**



**Fig. 11**

- |  |   |
|--|---|
| 1. Control lever for lifting left blade      | 16. Control lever for lifting right blade |
| 2. Control lever for rotating blade          | 17. pedal of assistant vehicle ladder     |
| 3. Control lever for front wheel lean        | 18. Control device for hand brake         |
| 4. Control lever for articulated steering    | 19. Main power switch                     |
| 5. Control lever rear scarifier              | 20. Scarifier indicator                   |
| 6. Engine oil pressure gauge                 | 21. Brake pedal                           |
| 7. Gear change oil pressure gauge            | 22. Accelerator pedal                     |
| 8. Four-gang indicator lamp                  | 23. Six-gang switch                       |
| 9. Comprehensive switch                      | 24. Control lever for transmission        |
| 10. Torque converting oil temperature gauge  | 25. Hand accelerator lever                |
| 11. Water temperature gauge                  | 26. Flameout button                       |
| 12. Control lever for front bulldozing plate | 27. Fuel gauge                            |
| 13. Control lever for front wheel lean       | 28. Starting switch                       |
| 14. Blade outgoing control lever             | 29. Timer                                 |
| 15. Control lever for blade to scrape        | 30. Ammeter                               |
|  | 31. Lifting lever                         |

### 7.3.1 Switches

#### 1) Mains power switches

Push the handle (Fig. 11/19) of power switch downwards the mains power will be switched on.

#### 2) Starting switch (See Fig.11/28)

If turn the starting switch by gear I clockwise, all power supplies of instruments will be turned on and turn by gear II the engine will be started. If turn back to gear 0 counterclockwise, the engine will be shut down.

### 7.3.2 Instruments

#### 1) Oil temperature gauge at torque converter outlet (Fig.11/10)

Measuring range: 40 ~ 140°C. Under the normal condition, the temperature shall be ranged from 80 ~ 110°C. Allow instant rise in temperature, the maximum temperature is up to 120°C.

#### 2) Ammeter (Fig. 11/30)

Measuring range: -40A ~ +40A. If pointer points to direction “-”, which means the battery is discharging; If pointer points to direction “+”, which means the battery is charging.

#### 3) Water temperature gauge (Fig. 11/11)

Measuring range: 50 ~ 115°C. Indicates the cooling water temperature of engine. Under normal condition, the water temperature shall be below 90°C.

#### 4) Timer (Fig. 11/29)

Accumulated range: 0~9999.9h. Accumulated operating time of engine.

#### 5) Transmission control pressure gauge (Fig. 11/7)

Measuring range: 0~2.5MPa. When the oil temperature of transmission is 80~90°C, the variation range of oil pressure of transmission: 1.3~1.5 MPa.

The pointer shall always points to above range, if the point is out of this range, the engine shall be shut down to check and repair faults.

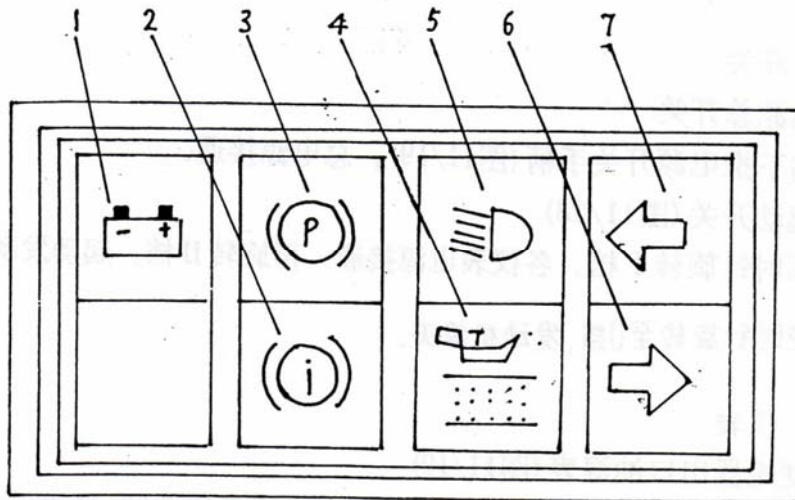
#### 6) Fuel gauge (Fig.11/27)

Measuring range: 0~1. Indicate the oil level in diesel oil tank. Do not start the machine if there is no oil in oil tank; otherwise, the oil pipe will be blocked and air enters into this system.

#### 7) Engine oil pressure gauge (Fig.11/6)

Measuring range: 0~1Mpa. The minimum pressure shall not be lower than 0.2Mpa.

### 7.3.3 Four-gang indicator lamp (Fig. 12)



**Fig. 12**

**1) Charge indicator lamp, red (Fig.12/1)**

The indicator lamp lights when the engine is running, which means that the charging line or alternator is at fault or the belt is loosened. The battery is not charged, stop the engine and carry on troubleshoot.

**2) Indicator lamp for brake service pressure, red (Fig.12/2)**

The indicator lamp lights when the engine is running; which means there are some troubles in the brake system. Stop the grader and engine immediately and carry out troubleshooting.

**3) Indicator lamp for brake, red (Fig.12/11)**

The indicator lamp lights in case of service brake.

**4) Indicator lamp for hydraulic oil filter, red (Fig.12/4)**

The indicator lamp lights when the engine is running; which means that the oil filters are blocked. Clean or replace the filter element.

**5) Indicator lamp for far light, blue (Fig.12/5)**

The indicator lamp lights when the front light is switched to far light.

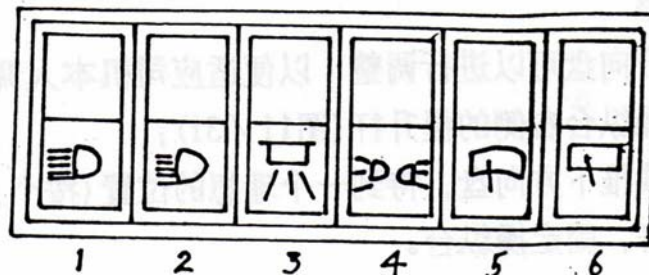
**6) Indicator lamp for right turning, green (Fig.12/6)**

The indicator lamp lights when steering switch is switched to right turning.

**7) Indicator lamp for left turning, green (Fig.12/7)**

The indicator lamp is on when the steering switch is switched to left turning.

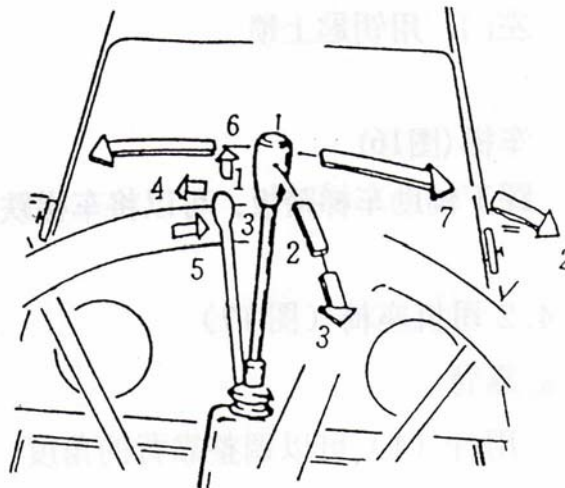
**7.3.4 Six-gang switch (Fig. 13)**



**Fig. 13**

- |  |                                 |
|--|---------------------------------|
| 1. Switch for working light              | 2. Switch for rear light        |
| 3. Overhead light switch in Driver's cab | 4. Switch for pilot light       |
| 5. Wiper switch for front window         | 6. Wiper switch for rear window |

### **7.3.5 Comprehensive switch (Fig. 14)**



**Fig. 14**

Control lever position:

- 1= Switch off
- 2= Big head of head lamp
- 3= Switch off
- 4= Left turning
- 5= Right turning
- 6= Horn
- 7= Small head of head lamp

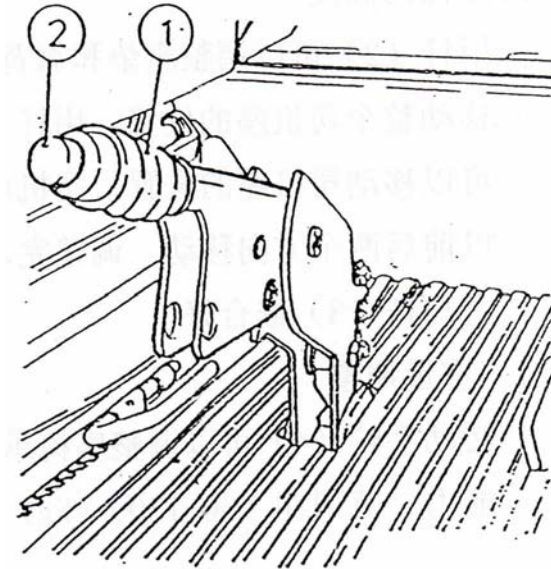
### **7.3.6 Accelerating pedal (Fig. 11/21)**

This pedal can be used to control the engine speed.

### **7.3.7 Brake pedal (Fig. 11/22 )**

This pedal applies the wheel brake on the 4 rear wheels through the hydraulic system. Brake pressure depends on the pressure applied to the brake pedal.

### 7.3.8 Control device for hand brake (Fig. 15)



**Fig. 15**

Pulling up the brake handle (Fig.15/1) to apply parking brake. To release the brake handle, pull it straightly up, press the knob (Fig.15/2) and push it down completely.

### 7.3.9 Adjustment of steering wheel

The position of the steering wheel in the Driver's cab is adjustable; the driver can operate the steering wheel comfortably in proper position:

- a) Pull up the lifting lever (Fig.11/31) on the right side of moving console slowly;
- b) Move the steering wheel up and down to get a proper position (Adjust according to individual conditions).
- c) Release the lifting lever and fix the operating console.

## 7.4 Driver's cab

### 7.4.1 Driver's cab door

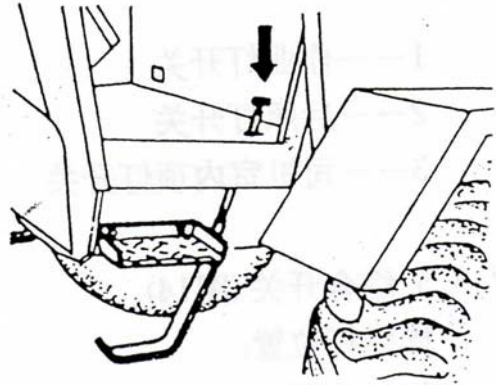
Pull the door backwards to open and close the door completely to lock.

Right door: Lock upwards from driver's cab ;

Left door: Lock with key;

Vehicle ladder (Fig.16): Press the assistant ladder pedal, the ladder can be folded.





**Fig.16**

#### **7.4.2 Driver's seat (Fig.17)**

##### **a) Backrest**

The angle of the backrest can be adjusted by the use of lever (1), the backrest shall be set with the lever (1) after adjustment.

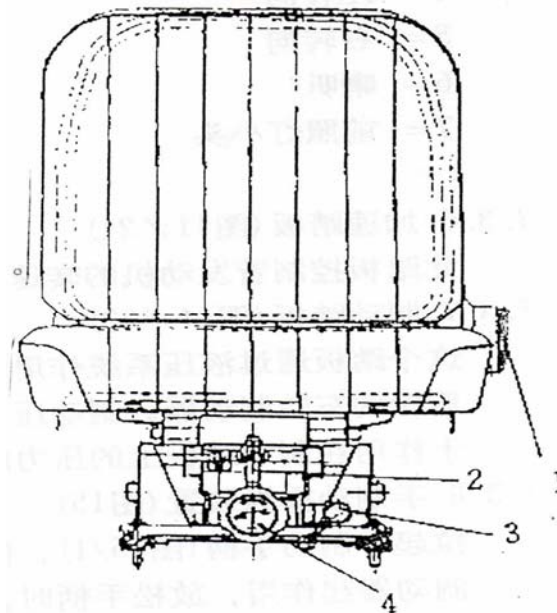
##### **b) Seat height adjustment**

The lever (2) can be used to adjust the height of seat cushion and backrest.

c) The lever (3) can be used to move the position of entire driver's seat frontward and backwards. The driver's seat shall be set with the lever (3) after adjustment.

##### **d) Weight adjustment**

The carrying capacity of seat can be adjusted by the use of hand wheel (4); the adjusting range: 60~ 130Kgf.



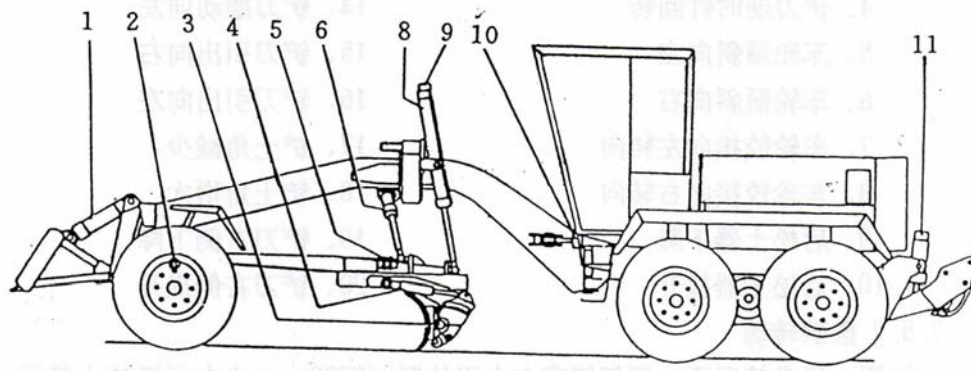
**Fig. 17**

#### **7.5 Operation of operating device**

In driver's cab , the adjustment and determination of all operating devices can be

controlled, of which control methods are hydraulic driving (Except for teeth of scarifier).

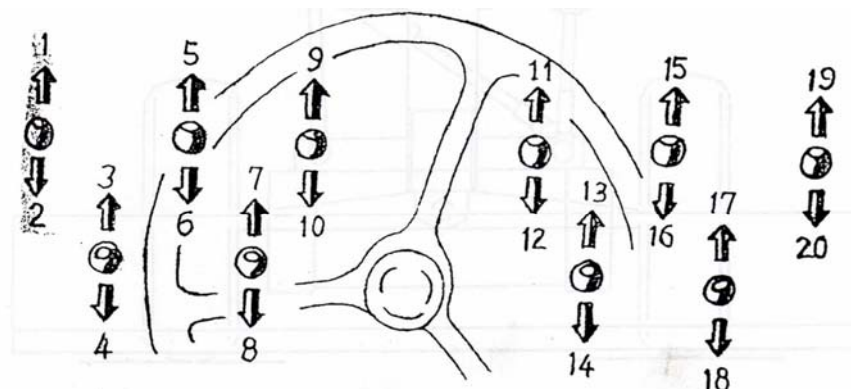
The different hydraulic devices can be driven by the following hydraulic cylinders and hydraulic motors.



**Fig.18**

1. Hydraulic cylinder for front bulldozing plate ;
2. Hydraulic cylinder for front wheel lean;
3. Hydraulic cylinder for blade shift;
4. Hydraulic cylinder for cutting angle adjustment;
5. Hydraulic motor for rotary gear ring
6. Hydraulic cylinder for blade swing;
8. Hydraulic cylinder for blade lift/lower, left;
9. Hydraulic cylinder for blade lift/lower, right;
10. Hydraulic cylinder for frame articulation;
11. Hydraulic cylinder for back ripper lift/lower.

### 7.5.1 Control device



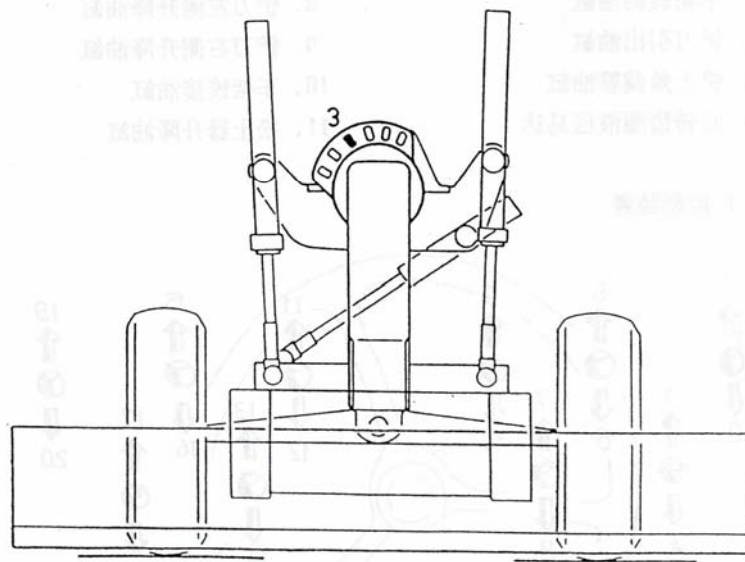
**Fig. 19**

- |                              |                                      |
|------------------------------|--------------------------------------|
| 1. Blade lower, left;        | 2. Blade lift, right;                |
| 3. Blade turning, clockwise; | 4. Blade turning, counter clockwise; |

- |                               |   |
|-------------------------------|---|
| 5. Wheel lean, left;          | 6. Wheel lean, right;                             |
| 7. Articulation, left;        | 8. Articulation, right;                           |
| 9. Back ripper, lower;        | 10. Back ripper, lift (Back ripper is unequipped) |
| 11. Bulldozing plate , lower; | 12. Bulldozing plate , lift;                      |
| 13. Blade swing, right;       | 14. Blade swing, left;                            |
| 15. Blade shift, right;       | 16. Blade shift, left;                            |
| 17. Reducing cutting angle;   | 18. Increasing cutting angle;                     |
| 19. Blade lower, right;       | 20. Blade lift, left.                             |

### 7.5.2 Rotation of swing frame

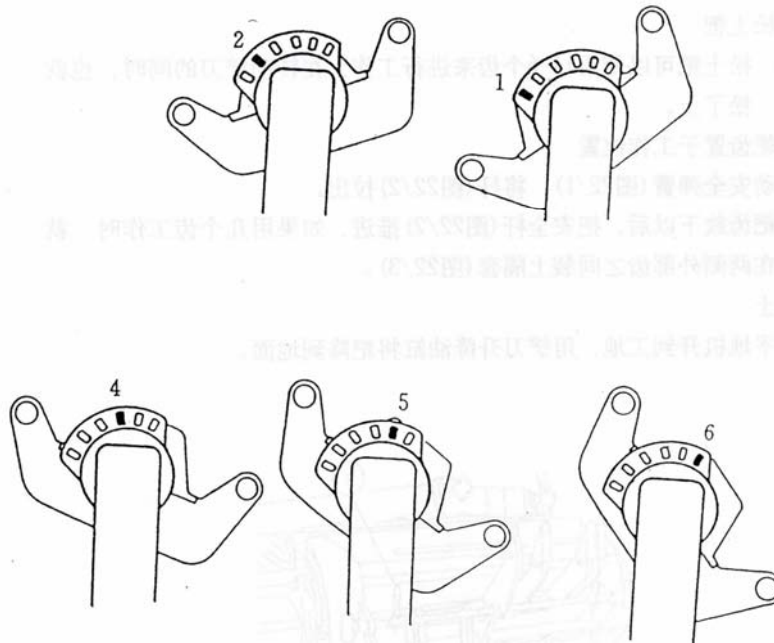
**Note:** Under general conditions, the swing frame is locked at the horizontal position 3 (Fig.20), of which position can be seen when seating on the driver' seat.



**Fig.20**

The following steps can be used to fix the swing frame on positions 1, 2, 3, 4, 5 and 6 shown in Fig. 21:

- If turn from horizontal position 3 to 1 or 2, operate according to the directions 2, 14 and 19 shown in Fig. 19 to retract swing cylinders completely;
- If turn from horizontal position 3 to 4 or 6, operate according to the directions 1, 13 and 20 shown in Fig. 19 to extend swing cylinders completely;
- After the operations mentioned above, use left and right lift cylinders to put the blade to Ground. (No load in the hydraulic system);
- Pull out all lock pin from swing frame;
- Operate lift cylinders and swing cylinder again to turn swing frame to desired position;
- At last lock swing frame with lock pin.



**Fig. 21**

### 7.5.3 Blade adjustment

By use of the swing hydraulic cylinders the blade with the scarifier can be positioned to suit all working conditions. The blade can be taken in and out to the left or right, and set at any angle. It can also be turned through 360°.

**Note:** Make sure not to damage the vehicle frame ladder, hand wheel and echelon pull rod when moving blade.

### 7.5.4 Adjustment of blade cutting angle

The grader is equipped with hydraulic angulator. When operating the control lever in driver's cab, the cutting angle can be adjusted to suit all working conditions.

### 7.5.5 Scarifier

**Note:** The scarifier can work by the use of 1~6 teeth, the earth can be scarified while rotating the blade.

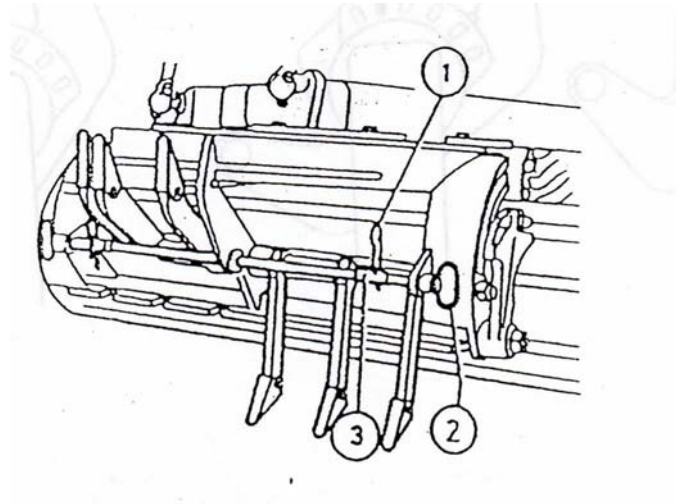
a. Set the scarifier teeth at working position.

1. Move the safety spring (Fig. 22/1) and pull out the lever (Fig. 22/2).

2. Push the safety lever (Fig.22/2) into after setting down the scarifier teeth; the distance sleeve shall be installed between external teeth outside on both sides if work with few teeth.

b. Scarifying

1. Drive the grade to level ground, lower the scarifier onto the ground by the use of blade lift cylinder.



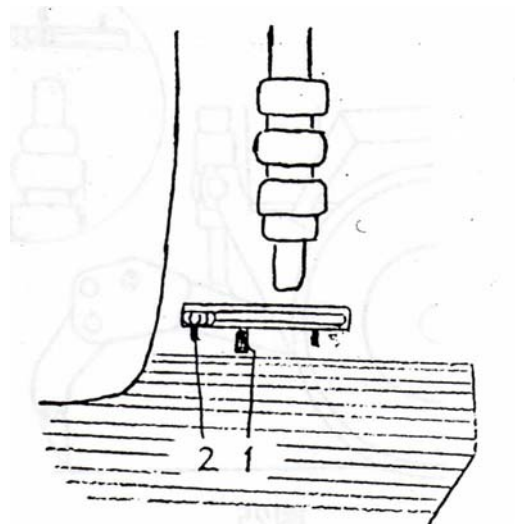
**Fig. 22**

### **7.5.6 Back scarifier**

**Note:** The back scarifier has 5 teeth. Generally, 3 teeth are used to work on hard ground. Different teeth shall be used symmetrically, for example: use 1 tooth on the middle or 2 teeth outside or 3 teeth are used together.

#### **a. Back scarifying indicator (Fig. 11/20)**

This indicator is mounted on the left side of driver's seat, the pointer (2) indicates the height of teeth on measuring scale (1).



**Fig. 23**

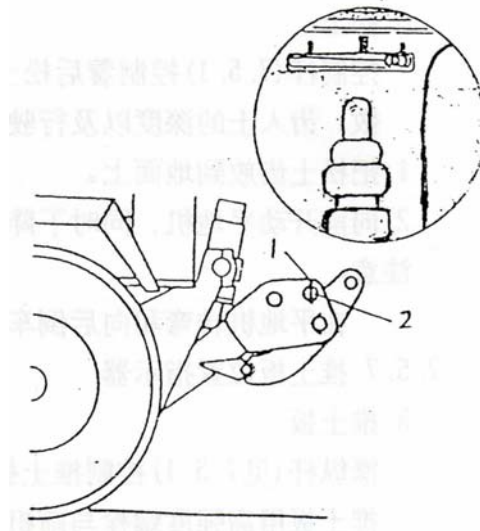
#### **b. Tooth adjustment**

The tooth can have two positions as shown in the figure below:

1. Take off spring pin (Fig.24/1).
2. Pull out the pin shaft (Fig.24/2) , each tooth can be placed on the predetermined position, and then drive the pin shaft in and insert spring pin.

#### **c. Adjustment of back scarifier**

1. Running position (Fig.24), swing the teeth in and lift the scarifier completely;
2. Scarifying position (Fig.25), in the figure the grade is in horizontal condition. The teeth are out and resting on the ground. The pointer of the indicator is in the middle position;
3. Deep ripper (Fig.26), press the ripper completely by use of oil cylinder.

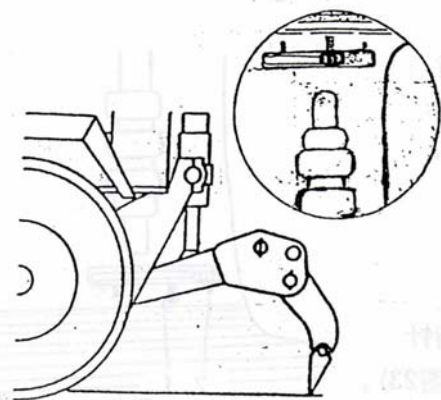


**Fig. 24**

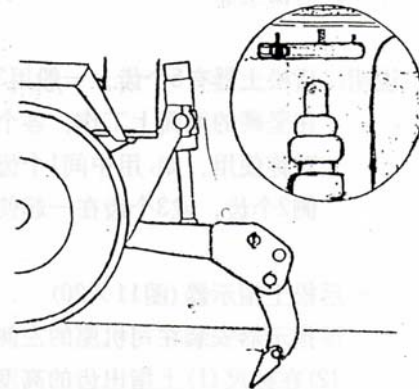
#### **d. Scarifying**

The control lever (See 7.5.1) controls the lifting and lowering of the back scarifier, the number of teeth, depth and driving speed are dependant on the tyre of ground being cut.

1. Drop the ripper until the teeth lower onto the ground;
2. Drive the grader forwards and at the same time lower the ripper further into the ground.



**Fig. 25**



**Fig. 26**



**Note:** Before turning the grader and driving it in reverse, the back scarifier shall be lifted.

### **7.5.7 Bulldozing plate position indicator**

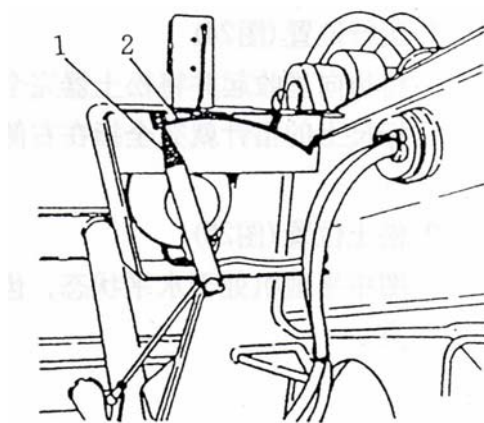
#### **a. Bulldozing plate**

The control lever (See 7.5.1) controls the (lifting and lowering of) bulldozing plate. The bulldozing plate is connected with front frame by high strength bolts to enable the bulldozing plate mount and remove quickly.

**Note:** The connecting elements of the position indicator shall be disconnected firstly before removing bulldozing plate, the bulldozing plate shall not affect the working of blade.

#### **b. Bulldozing plate position indicator**

**Note:** This indicator is mounted on the front-left lamp holder (Fig. 27).



**Fig. 27**

1. The Pointer (1) on indicator (2) indicates the position of bulldozing plate.

Left mark point- The bulldozing plate if lifted completely.

Middle mark point- The bulldozing plate is close to the ground.

Right mark point- Maximum cutting depth of the bulldozing plate.

### **7.5.8 Front wheel lean**

The control of the front wheel lean is carried out by the use of control lever (See 7.5.1), and the use of the front wheel lean can realize:

- A small turning radius, increasing sliding force on the tyre, when grading;
- Good adhesive force even when working on sloping field.

## **7.6 Driving**

### **7.6.1 Preparation work**

- a. Check the oil level and fill up if necessary;
- b. Check the engine level and fill up if necessary (See 8.3.1. a);

- c. Check the engine filter;  
Check the indicator for intaking-resistance in the air filter is in normal condition or not;
- d. Check the oil level indicator of the hydraulic oil tank;  
Carry out this check after lowering the blade, hydraulic cylinder on the ground and cooling hydraulic oil (See 8.3.6.c);
- e. Check the following with the engine running:
  - Steering, when running the steering wheel to the left and to the right. The steering must run easily and the front wheel steering must react;
  - Brake system, the control lamp of service pressure must not light.

After traveling a short distance, check the function of the brake system by stepping down brake pedal.

### 7.6.2 Starting engine

- a. Release the hand brake and gear shift lever to idle (If fail to do this, the engine will not start);
- b. Insert the key into the ignition switch to turn I gear;  
Note: All lamps light and the instrument indicate, this shows all electrical lines are right. Otherwise, they will be checked.
- c. Step down the accelerator pedal (Approximately 1/4 of engine speed);
- d. Turn the starter knob (Second step). Release the starter knob as soon as the engine runs. Do not keep the starter running continuously for more than 15 seconds;  
**Note:** In order to protect the battery, the time interval of 1~2min shall be remained for each starting.
- e. As soon as the engine runs smoothly, the engine speed shall be reduced. At the same time, the gauge is light and the indicator is off;  
**Note:** Pay attention to avoid running at high speed when the engine is at low temperate; the engine oil temperature will rise after short-time traveling on road.
- f. The choice of the lubricating oil depends on the temperature at which the engine is started. You could not take the effect of environment temperature into consideration if use stipulated oil in winter (See 8.2.4);
- g. Pay attention to the good condition of battery. Lowering the limit temperature by 4~5°C is possible by raising the battery temperature to about +20°C. This is done by removing the battery with the engine stopped and storing it in a warm room. When installing the battery, keep contact surface of the terminal clean and bright and endure good contact.

### 7.6.3 Temperature rise in transmission and hydraulic system

If the grader has been idle for long-time, especially at temperature about or below 0°C, the transmission and hydraulic system must be warmed up at medium



engine speed. While the temperature is below 0°C, normal revolutions of 1/2 or 2/3 are not exceeded to prevent starting engine from over-loading, during the first 30 minutes of working.

**a. Temperature rise in transmission**

1. Engage hand brake.
2. Start the engine and let it run at medium speed.
3. Set the transmission rod on the 5<sup>th</sup> or 6<sup>th</sup> gear of “Forward” or “Reverse”, conduct gear shifting for many times until the temperature gauge of torque converter displays about 60°C.

**Note:** The driver shall never leave the can and shall observe the heating temperature during the warming up process.

**b. Warm up the hydraulic working system.**

While warming up the transmission, warm up the hydraulic working system by means of moving the hydraulic cylinder.

**Note:** Do not operate the control lever to the extreme position for warming up operation.

#### **7.6.4 Starting grader**

- a) Set the gear shift at gear I or gear II on “Forward” or on “Reverse”;
- b) After sounding the horn, release hand brake and step on the accelerator pedal, the grader begins to run;

#### **7.6.5 Instrument display during running**

**a. Indicator lamp:**

The indicator lamp for battery charge, red;

The indicator lamp for brake service pressure, red;

The indicator lamp for hydraulic oil filter, red.

Above indicator lamps are off.

**b. The following instruments must be observed:**

**Note:** If one of the indicator lamps mentions above lights and unusual conditions happen in the pressure gauge of the transmission, the oil and water temperature, the engine must be stopped immediately and check the cause of the fault. Especially in brake pressure lamp, before starting you must check if the line is right. When brake pressure lamp is light in running, you must stop the grader and check brake system.

**Note:** When the grader is operating on the ground, the driver must observe the oil temperature gauge of torque converter. The oil temperature would be ranged from 80~110°C. In short-time, it allows to reach 120°C, while cannot exceed 120°C. You should release the oil valve and change the gear immediately if the temperature reaches 120°C and travel at low speed. After the temperature is dropped, make it return original operating speed.

#### **7.6.6 Continuous service brake (Torque converter)**

By selecting the appropriate gear on downgrade, the torque converter can

have a braking effect when the speed of the turbine of torque converter is faster than pump gear linked with the engine.

The traveling speed of the gear II is suitable for plain road or middle slope to travel down. For sharp slope, the gear I can be used for proper speed. With accelerating pedal, you can make the grader using foot brake with in minimum limit.

#### **7.6.7 Steering**

a. Hydraulic steering system of the front wheel:

The steering of the front wheel is controlled by steering wheel;

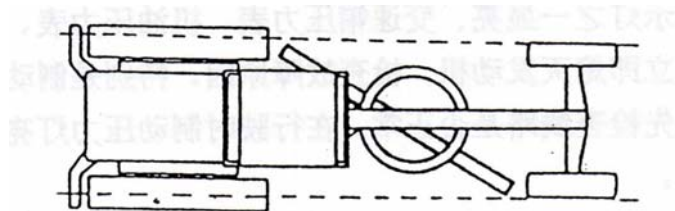
b. Steering of articulated frame:

The articulating frame steering is controlled by a control lever (See 7.5.1). Before steering with the articulation, remove the safety lever (Fig.28) under articulated cylinders firstly.

#### **7.6.8 Preparation before driving**

Before driving on the road, the following instructions shall be followed:

1. Clean the heavy dirt on the grader;
2. Check the brake, steering system, tyres and lights;
3. Set articulated steering. Front and rear wheels must be in line (See Fig.29);
4. Check front wheel lean and set front wheel vertically;
5. Bring the blade in traveling position and lift it as high as possible;
6. Lift the bulldozing plate completely;
7. Take notice that blade and bulldozing plate are not put to lower during running. Lift it again if necessary.



**Fig.29**

#### **7.6.9 Stopping the grader**

- a. Release accelerator;
- b. Put the shift-gear lever in neutral position and stop the grader using the foot brake;
- c. Engage the hand brake tightly.

#### **7.6.10 Stopping the engine**

Press the extinguishing button down until the engine is stopped.

**Note:** The engine cannot be stopped with full load and shall be idle running for 1 ~2min.

### 7.6.11 Parking the grader

- a. Engage the hand brake tightly.
- b. Set the operating devices on ground.
- c. Take off the ignition key and lock the driver's cab door.

**Note:** wheels shall be stopped if parks the grader on sloping field.

### 7.6.12 Drag running

a. If the grader is dragged to run, set the high and low speed control levers at the neutral positions.

If possible, run the engine; in this way, the assistant steering and braking devices still function.

**Note:** If the grader is dragged by the use of wire rope, make sure there is no person staying between tractor and grader.

### 7.6.13 Drag starting

**Note:** Because of torque converter, it is impossible to drag to start the grader, the dragging to start will cause damage to the transmission.

### 7.6.14 Road and railroad transport

a. Extend the articulated frame straight and adjust the front wheel to vertical. Lower the blade and set it on the position where it shall be placed when grader is running, then lower the bulldozing plate.

- b. Stop the wheels and fix the grader firmly.

### 7.6.15 Working slope of the grader

In order to avoid interrupted or insufficient lubrication of engine, the working slope of the grader shall not exceed the following values, because bad lubrication of engine may give rise to danger.

	Transversal slope	Longitudinal slope	
	Left or right	Forward	Backward
Permissible angle	20°	25°	25°

### 7.6.16 Use of grader

It is recommended that the driver accept the instruction of our service technicians so as to develop the application of the grader.

As for the use of the grader, our recommendations are shown as below:

1. Clearing base ground-fine grading-ripping out old road and hard ground-cutting slopes, profiles, mixing, distributing, collecting and compacting materials-clearing snow and ice, etc.

2. The articulation gives the grader a minimum turning radius and when doing the above mentioned work, allows the grader much more maneuverability. It is possible to drive the grader in a "Crab" position. This allows the blade to lengthen out of the rear wheels and so preventing the rear wheels driving over the leveled surface.

The articulation also allows the grader an action of self recovery in different conditions.

3. Further applications of the grader can be realized by installing the following equipment:

- a) Back scarifier;
- b) Front bulldozing plate ;
- c) Towing attachment, rear;
- d) Extra balance weights, front and rear.

4. An important factor for the optimal efficiency of the grader is the choice of correct turning and cutting angle of blade. We recommend a relatively large turning angle is used and thus a high cutting pressure is got in working length of pre cm. Small cutting angle decreases the cutting resistance in cutting operation. Large cutting angle is increases the leveling and mixing effect.

5. The front wheel should be leaned towards the side from which the material is running off. When working on slopes, the front wheel can be set vertically to give better traction with the aid of the wheel lean.

6. By acting the blade side-shift the blade can be moved out during grading without the changing the operating height.

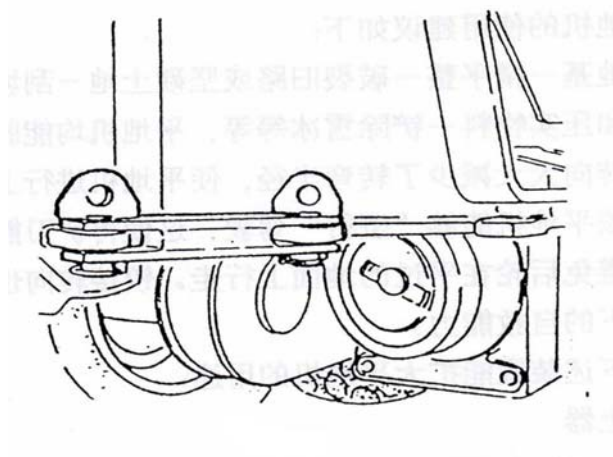
7. The grader should not be used underground or in badly ventilated area because the engine is of the direct injection type and special filtering of the engine exhaust is not enough.

## **8. Care and maintenance**

### **8.1 Safety rules**

#### **Notes:**

- 1. Set the grader on the level and hard ground.
- 2. Set the operating devices (including blade, bulldozing plate, etc) on ground.
- 3. Engage the hand brake tightly.
- 4. Insert the safety lever and fix the articulated steering mechanism of grader(Fig.28).



**Fig.28**

5. Shut down the engine, never ignore this item. Except for the conditions that repairs and inspection cannot be carried out without engine running.
6. If the operating devices must be suspended, they must be supported firmly.
7. Fix the suspenders over the grader.
8. It is strictly forbidden screw on the joints in system in case that there is pressure in hydraulic system.
9. Keep the splash guard clean to avoid slipping and injuries from falls.
10. Reset all fasteners (including cotter pins, elastic collars, etc) after repairs.

## **8. 2 Lubrication chart (fig.30)**

### **8.2.1 Instructions for lubrication**

- a) Service and maintenance work would be carried out carefully and then clean the machine;  
Oil change can only to be carried out with the engine under working temperatures.  
All oil change shall be carried out at the correct intervals, at least once a year.
- b) Clean all grease nipples before greasing;  
Fill up with grease until fresh grease emerges;
- c) Clean all oil nipples and draining plugs before doing oil change. Use a fine mesh for filling oil and clean sealing surface.

### **8.2.2 Description to lubrication chart:**

- \*1. During the first 200 hours of operation, the engine oil level shall be checked twice daily (10h);
- \*2. When greasing driving shaft, only low pressure should be applied. Avoid hard pushing and too much lubrication;
- \*3. In dusty conditions all cooling fins on oil coolers and water tank often should be cleaned more than times stipulated in the lubrication chart,

### A3 润滑图

推土板油缸轴承: Bearing of cylinder of bulldozing plate  
 推土板轴承: Bearing of bulldozing plate  
 推土板油缸轴承: Bearing of cylinder of bulldozing plate  
 前桥轴承: Bearing of front axle  
 前轮倾斜油缸轴承: Bearing of cylinder of front wheel lean  
 前桥轴承: Bearing of front axle  
 前轮倾斜拉杆: Pull rod of front wheel lean  
 前轮转向节: Steering knuckle of front wheel  
 转向油缸: Steering cylinder  
 牵引架轴承: Bearing of traction frame  
 摆动油缸轴承: Bearing of swing cylinder  
 回转圈涡轮箱油位观察玻璃: Inspection glass of oil level of turbine box of turning circle  
 摆架轴承: Bearing of swing frame  
 回转圈: Turning circle  
 油缸轴承: Bearing of cylinder  
 摆架油缸轴承: Bearing of cylinder of swing frame  
 铲刀支承: Blade support  
 油缸轴承: Bearing of cylinder  
 摆架插销: Plug pin of swing frame  
 回转接头: Rotating connection  
 升降油缸轴承: Bearing of lift cylinder  
 铰接油缸轴承: Bearing of articulated cylinder  
 铰接轴承: Articulated bearing  
 变速箱油位: Oil level of transmission  
 变速箱—后桥十字轴: Transmission- centrepiece of rear axle  
 油冷却器—散热片: Oil cooler- radiator fin  
 变速箱及液压系统: Transmission and hydraulic system  
 平衡箱油位观察玻璃: Inspection glass of oil level of tandem box  
 发动机加油滤筒: Filtering cartridge of engine filling  
 后桥油位观察玻璃: Inspection glass of oil level of rear axle  
 发动机油标尺: Engine oil scale  
 发动机加油口: Oil filler of engine  
 发动机油冷却片: Engine oil cooling table  
 液压油箱油位观察玻璃: Inspection glass of oil level of hydraulic tank  
 松土器轴承: Scarifier bearing  
 风扇支承 (3 处) 传动轴十字轴: Centrepiece of transmission shaft of fan support (3 places)  
 油缸轴承: Bearing of cylinder

前轮轴承: Bearing of front wheel  
 回转圈涡轮箱加油口: Oil filler of turbine box of turning circle  
 变速箱吸滤器: Suction filter of transmission  
 变速箱滤芯: Filter element of transmission  
 平衡箱加油器: Oiler of tandem box  
 变矩器变速箱加油口: Oil filler of transmission of torque converter

后桥加油口: Oil filler of rear axle

液压油加油过滤器: Filling strainer of hydraulic oil

液压油箱加油口: Oil filler of hydraulic tank

Symbol description	
●	Oil cup
W	Oil filling and filter
R	Clean
F	Grease
O	Check oil level
S	Bilateral symmetry

**Fig. 30 Lubrication chart of PY200H grader**



### 8.2.3 Firstly filling oil, change and maintenance of filter

Do according to the following regulations:

Working hours	Work to be carried out
After 50h	Change oil for engine Replace engine filter element Tighten tightening screw on engine oil tank Tighten fixing clips of oil suction and drainage conduit on cylinder cap Tighten the loose parts of engine device Check clearance of valve, adjust if necessary
100h First inspection	Change oil for transmission of torque converter Change oil for rear axle Change oil for tandem box Replace filter element of transmission Clean oil suction filter screen of transmission Replace return oil filter element of hydraulic oil
500h	Change oil for hydraulic tank

### 8.2.4 Lubricating oil and grease

Classification	Lubricating grease
Oil cup and oil filling place of lubricating grease	No. 2 extreme pressure lithium based grease
Engine	L-ECD15W-40
Torque converter and transmission	L-ECD15W-40
Rear axle tandem box and turbine box	80W-90
Hydraulic operating system and steering system	N32 wear resistant hydraulic oil

### 8.2.5 Capacity table

**Note:** All capacities given in the following table are approximate values.  
Subject to observing oil scale on inspection glass or control orifice.

Part	Approximate capacity
Fuel tank	228L
First filling oil for hydraulic system	130L
First changing oil for hydraulic system	80L
Change and filtrate oil for engine	22.4L
First filling oil for torque converter, transmission	28L
First changing oil for torque converter, transmission	21L
Rear axle	28L
Tandem box	23L (Each side)
Turbine box	2.5L

### 8.3 Check oil level, change oil and filter

Please refer to items 8.2 and 8.2.3 for instructions to lubrication chart and maintenance time.

#### 8.3.1 Engine

**Note:** If open the machine enclosure on left side of the engine, two oil filters can be seen; if open the machine enclosure on right side of the engine, the oil filler and three engine oil scale (One located on the oil sump and the rest on speed regulator and ejection pump).

##### a. Check engine oil level

**Note:** Generally, the oil consumption of engine oil is very high, so the oil level shall be checked twice daily during running in period (about 200h); check the oil level once after running in period. The engine oil level shall be checked when the grader is on horizontal position.

Draw out oil scale, clean it with soft cloth, then reinsert it to limit position; then draw out the oil scale, here the oil level shall be between the upper and lower marks.

##### b. Change engine oil

**Note:** The engine oil shall be changed at the hot state, at this time, shall take care of not being scalded by draining off hot oil.

Store the old oil into a suitable container.

Refilling with fresh engine oil up to the upper mark.

Intervals of engine oil changing:

Oil designation	Intervals of oil changing (Operating hours)
L-ECD 15W-40	200

Avoid mixing of different oils.

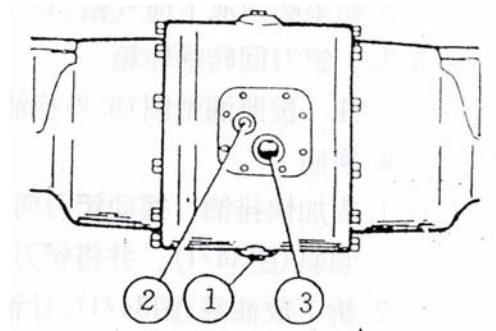
### 8.3.2 Transmission

Please refer to the Item 6.1.2, Hydraulic torque converter-transmission (ZF6WG200)

### 8.3.3 Rear axle

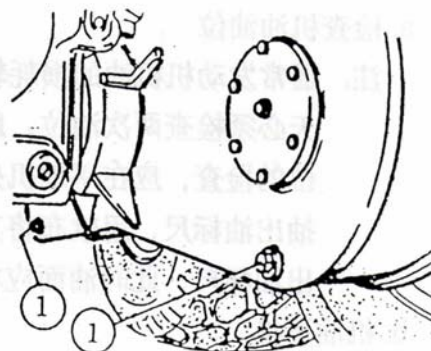
**a. Note:** Check oil level and change oil according to the lubrication chart (8.2).

1. Remove the drain plug (Fig.31/1) and drain oil into a container to assist draining, unscrewing the screw thread of oil filler (Fig.31/2). Close it only after oil is drained off;



**Fig. 31**

2. Clean drain plug (Fig.31/1) and use a new sealing ring to refit and retighten;
3. Fill fresh oil at the oil filter (Fig.31/2) into axles until the middle of the oil level indicator (Fig.31/3) is reached;
4. Rescrew on screw plug and tighten. Capacity: Approximate 28L, oil level is required to reach the middle of the oil level indicator.



**Fig. 32**

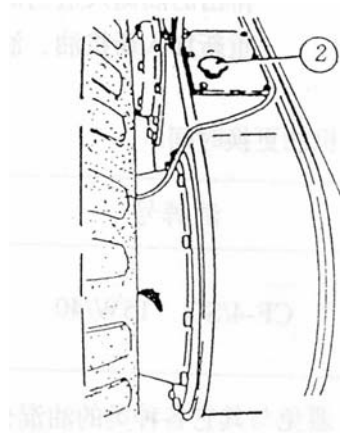
b. Check oil level

1. Oil level must be at the middle of oil level indicator (Fig. 31/3).
2. If necessary, add oil at oil filler (Fig. 31/2)

### 8.3.4 Tandem box

#### a. Change oil

1. Unscrew the screw plug (Fig. 32/1), (Each tandem box has two screw plugs), drain oil into proper container, screw on the screw plug after drainage.
2. Clean the crew plug (Fig. 32/1), replace sealing ring to refit and retighten screw plug.
3. Unscrew the vent cap (Fig. 32-1/2), add new oil to the middle of oil level indicator (Fig. 33/3), namely, the highest oil level.
4. Assemble the vent cap (Fig. 32-1/2) and tighten, capacity: about 23L in each tandem box, it is required to reach the middle of oil level indicator.



**Fig. 32-1**

#### b. Check oil level

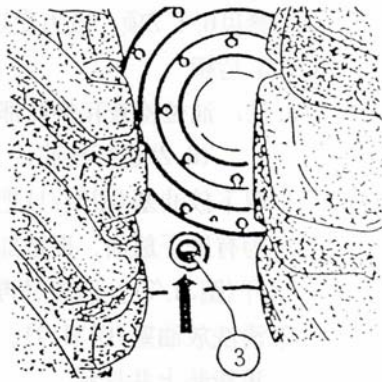
1. The oil level must be at the middle of the oil level indicator, namely, the highest oil level.
2. Remove the vent cap (Fig. 32-1/2), then fill oil if necessary.

### 8.3.5 Turbine box of blade rotating

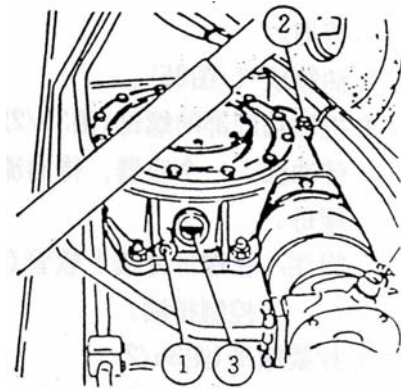
**Note:** Check oil level and change oil according to the lubrication chart (8.2).

#### a. Change oil

1. In order to accelerate the drainage of oil, swing the grader blade. It is inclined towards the oil drain plug (Fig.34/1) and put the blade on the ground.
2. Remove the oil drain plug (Fig.34/1) and drain oil into a proper container. Remove the plug (Fig.8-3/1) for better draining of oil. Close draining plug only after oil has completely drained.
3. Clean oil drain plug, use a new sealing ring, reassemble and tighten the plug.
4. Place the blade exactly horizontal with the lift cylinder.
5. Readd new oil through the filler hole (Fig.34/2) until the oil reaches the middle of the oil level indicator.
6. Clean the plug (34/2), use a new sealing ring and tighten the plug. Capacity: Approx. 25L viewed from the middle of the oil level indicator.



**Fig. 33**

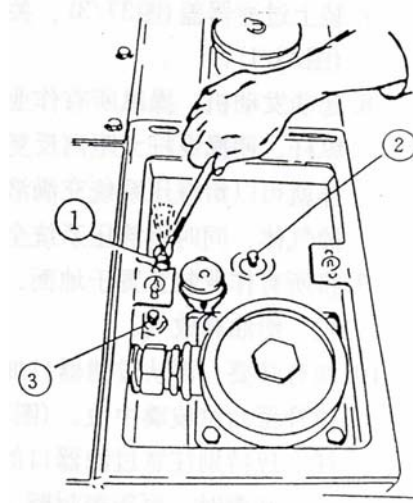


**Fig. 34**

b. Check oil level

1. The turbine box of blade rotating shall be placed horizontally.
2. Oil level (Highest oil level) must be at the middle of inspection hole (Fig. 34/3).
3. Add oil from oil filling hole (Fig. 34/2) if necessary.

### 8.3.6 Hydraulic operating and steering systems



**Fig. 35**

**Note:** The hydraulic tank is located at the left side of the engine cover. Check oil level and change oil and oil filter according to the lubrication chart (Item 8.2).

a. Bleeding of oil tank

**Note:** Before opening the tank (Filling cover or tank valve), air in the tank must be bled.

1. Loosen the fastener and remove the cover;
2. Remove the rubber cap on the exhaust valve (Fig. 35/1);
3. Unscrew the exhaust valve about 1/2 turn;

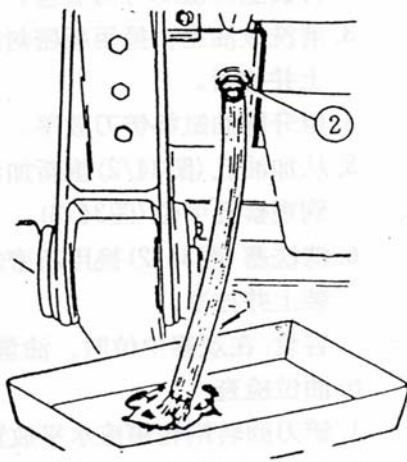
4. When no more air escapes, screw on the exhaust valve and refit the rubber cap.

b. Change hydraulic oil

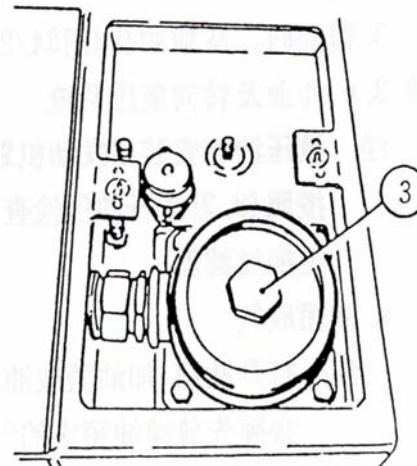
**Note:** The oil should be changed after prescribed operating hours (Item 8.2). In two special conditions, the oil must be changed whenever the oil has become so contaminated that a drop specimen placed on a piece of filter or blotting paper leaves a sharply dark spot after a few hours. Here, if fails to change oil, the hydraulic system will be damaged.

1. Set the blade on the ground and lift the bulldozing plate to top.
2. Shut down the engine and lower bulldozing plate to the ground by operating the control lever.
3. Bleed the oil tank (Fig. 35).
4. Loosen the nut (Fig.36/2) on the bottom of the oil tank by a few turns and let oil drain into a container. Screw the nut if oil is drained off;

**Attached note:** Connect the nut with flexible tube (Fig.36/2) to control draining oil.

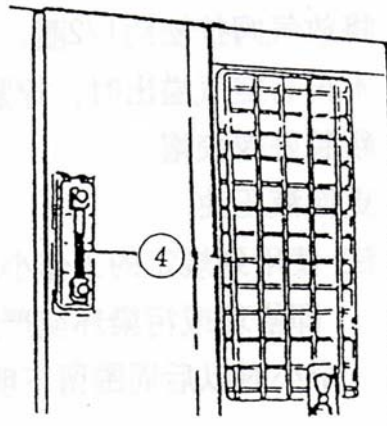


**Fig. 36**



**Fig. 37**

5. Fasten the nut (Fig.36/2);
6. Open the filter (Fig.37/3) and fill up specified hydraulic oil and the oil level shall reach the middle of the observing glass (Fig. 38/4).
7. Refit the filter cover (Fig.37/3) and close the exhaust valve (Fig.35/1).
8. Start the engine and operate the control levers of all operating devices and make the control lever move repeatedly by maximum distance, in this way, the hydraulic system can be filled with hydraulic oil and air in it can be drained;
9. Set all Working Mechanism on the ground, stop the engine and bleed air from hydraulic tank;
10. If necessary, fill up oil to the observing glass through the filter opening. (Fig.38/4).



**Fig. 38**

**Note:** Pay attention to proper sealing of the filter opening. Use new sealing ring, if necessary. Screw in filter cover (Fig.37/3) carefully in order to avoid damaging of the fine thread.

Capacity: Approx.80L viewed from the inspection glass.

c. Check oil level

1. When the engine stopping and operating device falling onto ground, oil level must be at the middle of inspection glass. (Fig. 38/4)

2. Add specified hydraulic oil if necessary.

**Note:** When oil is consumed, check the conditions of leakage, loss and sealing.

d. Replace or repair the operating pump and steering pump

1. Loosen fastener and take off the cover plate;

2. Bleed air from oil tank;

3. Unscrew filter cover;

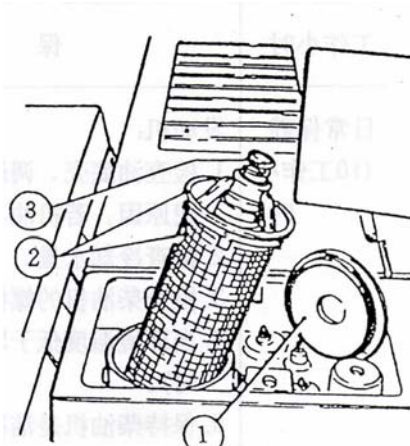
4. Remove complete filter element (Fig.39/2) and pressure cover (Fig.39/3);

5. Pull out the split pin (Fig.40/4) and unscrew the castle nut (Fig.40/5). Remove spring seat (Fig.40/6) and pressure spring (Fig.40/7) and filter element (Fig.40/8) from the base (Fig.40/9).

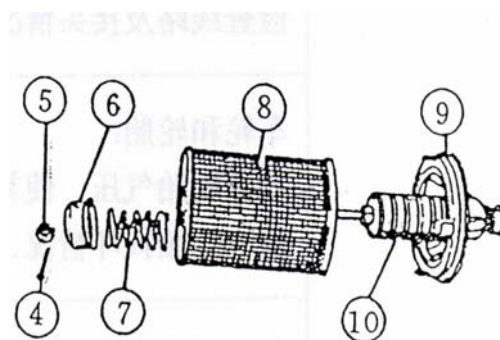
6. Clean magnet (Fig.40/10) and base (Fig.40/9);

7. Reassemble new filter element in reserve order.

**Note:** When assembling, use a new split pin (Fig.40/4).Renew seal ring of the filter holder, if necessary. When securing the new filter element, make sure that it suits flat against the filter holder. When replacing the complete filter into the tank, care must be taken that the seal rein god filter holder is not damaged. Screw in filter cover (Fig.39/1) carefully.



**Fig. 39**



**Fig. 40**

#### 8.4 Maintenance system

The maintenance work must be conducted according to the specified interval.

Operating hours	Maintenance
Daily maintenance (10 operating hours )	Engine: 1. Check lubricating face of oil bath, governor and injecting oil pump. If the oil level is not enough, fill up to the prescribed values;
	2. Check the capacity of cooling water;
	3. Check the bolts of diesel engine and attachments;
	4. When environment temperature is below 5 °C, drain off (Without coolant) the cooling water after parking;
	5. Keep diesel engine clean, washing it is necessary;
	6. Eliminate all break-down occurred and unusual conditions.
Weekly maintenance (50 operating hours)	Hydraulic system: Check for sealing condition (Visual inspection).
	Electrical system: Check the line and joint (Visual inspection).
	Wheel and tyre: Check tyre pressure and make it conform to the requirement of 8.10.2. Check the tyre for damage and remove the foreign body.
	Brake system: Check the function of hand brake.
	Steering system: Check the function of steering system.
	Whole machine: Clean surface and apply grease to polished parts. Check nuts and bolts for loosening and wearing out.
Weekly maintenance (50 operating hours)	Electrical system: Check electrolyte level in the battery.
	Wheel and tyre: Check tyre pressure and wheel nuts; tighten it if necessary (Tightening torque is 450Nm).



Operating hours	Maintenance
First 100 operating hours (First maintenance )	<p>Engine:</p> <ol style="list-style-type: none"> <li>1. Drain the engine oil from engine oil filter and diesel oil from diesel oil filter and clean engine oil filter element and diesel oil filter element.</li> <li>2. Carry out maintenance for air filter, remove the dusts in filter element and dust collector.</li> <li>3. Check the belt tension.</li> <li>4. Clean the outside of engine and engine oil radiator fin and water tank radiator fin.</li> <li>5. Check the suction and exhaust systems, insure the tightened connection of joints. Clean the suction and exhaust ducts if necessary.</li> <li>6. Check the idling speed of engine and adjust, because the disassembled parts and components for maintenance, shall insure their correct positions when reassembling. Then start the engine, check its running condition and eliminate all faults and abnormal phenomenon (This work shall be conducted in the following different stage maintenance).</li> </ol>
	Brake system: Check the hand brake, adjust if necessary.
	Hydraulic operating and steering systems: Check the oil tank, oil pump, oil cylinder, pipe and hose as well as joint for sealing conditions (Visual inspection). Check the operating air pressure.
	Steering system: Check the fastener of steering system for connection condition, including castle nut of steering lever. Tighten it if necessary. Check operating pressure.
	Working Mechanism: Check the guide clearance of blade.
	Wheel and tyre: Tighten wheel nuts (The tightening torque is 45Nm).
	Tandem box: Check chain tension and tighten it if necessary.

Operating hours	Maintenance
After every 250 operating hours	Engine: The following work shall be carried out except for the maintenance items to be conducted after 100h of operation: 1. Change lubricating oil of engine. 2. Adjust valve clearance. 3. Check the fuel injector for injection pressure and injection condition, clean and adjust if necessary. 4. Check the advance angle of fuel supply, adjust if necessary. 5. Replace fuel filter element. 6. Clean filter screen and tube of oil transfer pump of fuel tank. 7. Use compressed air to blow out the dusts accumulated in engine, check whether different parts are under good conditions and process the abnormal parts.
	Hydraulic operating and steering systems: Check the oil tank, oil pump, oil cylinder, pipe and hose as well as joint for sealing conditions (Visual inspection).
	Steering system: Check the fastener of steering system for connection condition, including castle nut of steering lever. Tighten it if necessary. Check operating pressure.
	Brake system: Check the hand brake, adjust it if necessary. Replace the damaged braking pad.
	Working Mechanism : Check the play of blade guide and the play of turning circle guide. Adjust if necessary.
After every 500 operating hours	Engine: Carry out the maintenance items specified by different stage maintenance.
	Torque converter-transmission: Replace the filter element of transmission filter.
	Tandem box: Check chain tension. Tighten it if necessary.
	Transmission shaft: Check the transmission, rear axle and blower for transmission system, and whether the clearance of transmission shaft of universal joint is excessive.
After every 1000 operating hours	Engine: Carry out the maintenance items specified by different-stage maintenance.
After every 2000 operating hours	Engine: Carry out the maintenance items specified by different-stage maintenance.
	Front axle: Change the lubricating grease in axle.
	Rear axle: Check the axial clearance of small gear of main transmission, if it is more than 0.05, must readjust.

Operating hours	Maintenance
After every 3000 operating hours	<p>Engine: The following work shall be carried out except for the maintenance items to be conducted after 100h of operation:</p> <ol style="list-style-type: none"> <li>1. Clean the cooling system.</li> <li>2. Clean the engine oil cooler.</li> <li>3. Check the internal water seal of water pump and fill new lubricating grease.</li> <li>4. Disassemble and check the engine, starter; clean and maintain fill new lubricating grease.</li> <li>5. Determine whether to disassemble cylinder cover and repair inlet valve according to the relevant conditions.</li> <li>6. Determine whether to adjust the injection pump according to the relevant conditions.</li> <li>7. Determine whether to check the oil supply of engine oil pump.</li> <li>8. Replace engine oil filter element.</li> <li>9. Check the axial clearance at main-drive pinion of rear axle, if the axial clearance is more than 0.05, readjustment must be conducted.</li> </ol>

## 8.5 Engine

### 8.5.1 Engine air filter

#### a. Air prefilter

According to the using condition, the air prefilter shall be disassembled to remove dusts with compressed air or water after operating for 100~150 hours, then reassemble after the air prefilter becomes dried completely.

#### b. Air filter

1. When the blocked alarm indicates from green to red, conduct maintenance to main filter element.
2. The filter element must be replaced after cleaning for 5 times.
3. The main filter element and safety filter element shall be replaced at the same time when replacing filter.
4. When conducting maintenance to the filter element, beat the filter element slightly or blow the filter element from inside to outside with compressed air, reassemble the main filter element after clearing dusts and reset the blocked alarm.
5. It is strictly forbidden to clean filter element with oil or water.
6. When conducting maintenance to the filter element, replace the main filter element immediately if find damage. Check the air inlet hose from filter to engine for damage. Take notice of replacing damaged parts.

### 8.5.2 Fuel system

**Note:** When the system is operating, do not contact fuel with open fire and no

smoking and let fuel overflow.

### 8.5.2.1 Fuel, fuel tank

#### a. Fuel

The following fuels are approved to use:

Diesel oil GB252-87      Operating in Winter: No. 0~-35

Operating in Summer: No. 0 or 10

#### b. Fuel tank

The fuel tank is mounted on the right side behind the engine.

##### 1. Fuel scale

The oil level is marked on the fuel scale in oil filling hole (Fig. 48/1).

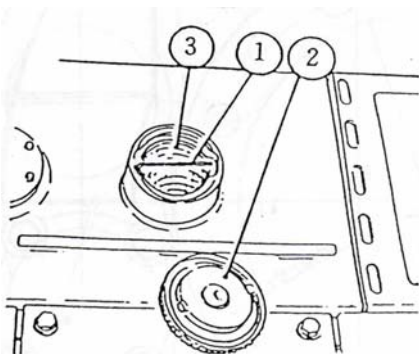
##### 2. Fill up fuel tank

- a. When filling up the tank, do not allow smoke and open fire. The engine would be stopped;
- b. The tank should always be filled completely in order to avoid the condensation of water;
- c. To fill up the tank, open the cab (Fig.48/2) and make sure that the filter screen (Fig.48/3) is in the filling oil hole;
- d. After filling up, close the cap immediately. Always keep tank closed to avoid contamination of the fuel.

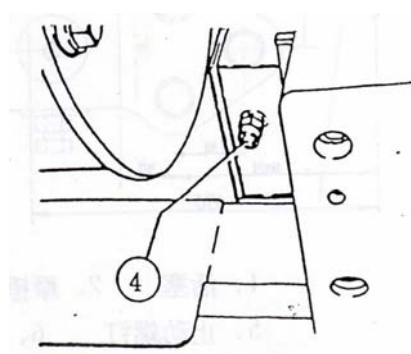
##### 3. Clean the fuel tank

- a. The tank cap (Fig.48/2) and the filter screen (Fig.48/3) should be thoroughly cleaned with kerosene from time to time;
- b. Unscrew the screw cap on the bottom side of the tank for some turns and drain off some litres of fuel into a container, retighten the screw cap. Pay attention to normal seal.

**Note:** Cleaning should be done with the tank only partly full (Approx.1/4). Before cleaning the tank, the grader would remain stationary for some time to collect the contamination accumulated in the tank bottom.



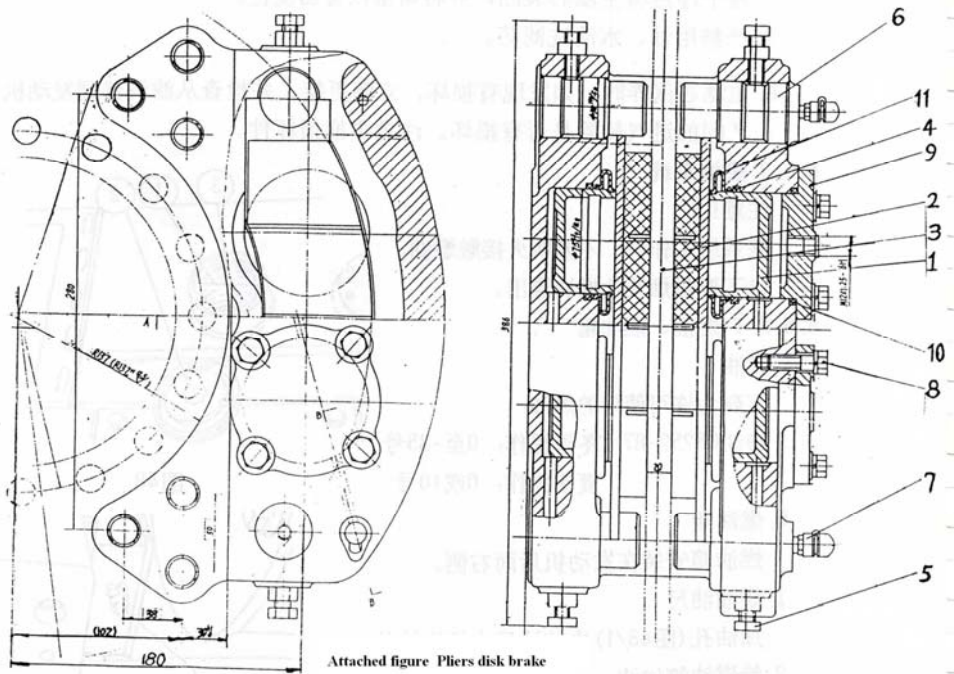
**Fig. 48**



**Fig. 49**

## 8.6 Brake system

### 8.6.1 Pliers disk brake



- |                  |                           |                     |                         |
|------------------|---------------------------|---------------------|-------------------------|
| 1. Piston        | 2. Friction disc assembly | 3. Braking plate    | 4. T-Rectangular gasket |
| 5. Locking screw | 6. Pin                    | 7. Exhaust vent     | 8. Bolt of cylinder cap |
| 9. Cylinder cap  | 10. O-ring                | 11. Dust-proof ring |                         |

#### a. Brake

The pincer-disk brakes are used on the grader. All of them are mounted on four rear wheels. Among them, four brakes are used for two front wheels and two brakes for two rear wheels. Diameter of the brake disk is  $\Phi 450\text{mm}$ . There are many advantages in the brake, such as: hydraulic braking, stable, safe and responsible performance, good radiating-heat, simple structure, convenient maintenance and character of resist-water-fail.

#### b. Structure principle

The brake is the type of fixed-clamp. The brake disk is combined with the wheel hub, turning with the wheels. By the transition-plate, the clamp is fixed on shaft-connected plate (See Fig. 9-10). When braking, hydraulic oil is entered into each piston cylinder to make the piston 1 push the friction disk 2 and press brake disk 3 so as to produce braking torque. After releasing hake, by elastic sc were worn, he tolerance increase between friction discs and braking plate. Movement of the piston produces bigger deformation than rectangular gasket. Between the piston and rectangular gasket, it will produce opposite movement to compensate the rear of friction discs. On friction discs, there are three longitudinal slots which are the marks of friction. Before the rear of friction discs reaches the bottom of the slot, replaced by new one. Loose locking screw 5, get the pin 6 out and remove friction discs to replace.

Additionally, if the chains in the tandem box are too slack, adjust the brake after adjustment the chain tension to make the brake always assembled in the positions (Point 3 and point 9) where the exhaust vent is located.

**c. Disassembly (See attached figure)**

- ① Remove the exhaust vent assembly 7, and turn two locking screw 5 off on one end of the clamps. Turn screw M10 to get the pin 6 out and remove friction disc assembly 2.
- ② Remove locking screw 5 on the other end to get the other pin out.
- ③ Record the positions of top and bottom caps. Screw the bolt 8 of cylinder cap off, and get cylinder cap 9 off. Remove O-ring 10 from cylinder cap.
- ④ Push oil piston I out from the hole outside the clamp. Inside the hole remove rectangular gasket 4 and dust-proof ring 11.

**d. Inspection**

- ① Inspect friction discs of ht assembly for wear extent. Replace if the rear limit which is mentioned above has been reached.
- ② Replace if there is any damage on oil seal and dust-proof ring.
- ③ Clean the clamp (Use mineral oil).
- ④ Inspect the piston hole for scratches and corrosions. Replace the clamp if there is any heavy damage.
- ⑤ Inspect the piston for scratches and corrosions. Replace if there is any serious damage.
- ⑥ Replace if the pin is so worn that it cannot guide for friction discs.

**e. Assembly**

- ① When assembling, all of the parts will be cleaned and it is forbidden to use braking liquid;
- ② Screwing torque for cylinder cam is 60N·m.

**f. Inspection of braking performance**

The braking performance is referred to the running safety and efficiency. After repairing, the braking performance also should be inspected. The braking distance can be considered as the constant braking index. On the straight and dry concrete road, when braking speed is  $V=30\text{km/h}$ , the braking distance will be  $S\leq 13.2\text{km/h}$ .

**g. Maintenance**

Cleaning the brake is the key for maintaining.

Inspect the rubber pad for aging phenomenon, replace if necessary.

### **Shoe type brake**

Brake system

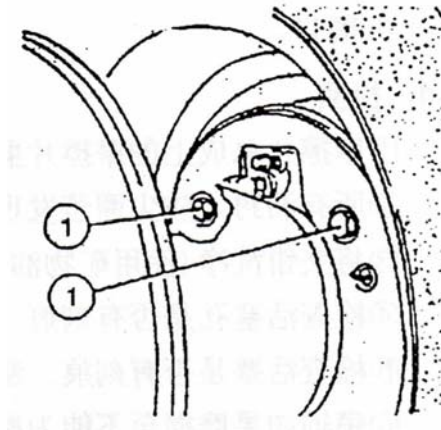
**Note:** Only professional staff can conduct repairs and maintenance.

Check the thickness of brake lining in accordance with maintenance system (8.4); replace brake lining when the remained thickness is less than 3 mm.

Replace brake lining: Only professional staff can conduct repairs and maintenance and inspection of the brake lining.

The replaced brake lining must be run-in and rounded off with brake drum to insure necessary contact area; additionally, in order to avoid unbalanced braking force, the brake lining shall be replaced together with that of opposite wheel.

Adjust foot brake:



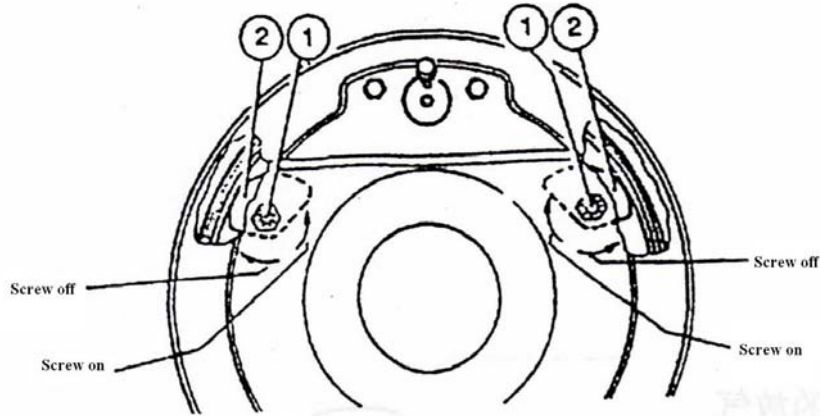
**Fig. 55**

**Note:** When replacing the brake with brake lining, all four wheel of the tandem box shall be adjusted.

Both brake shoes of one brake shall be adjusted together; the adjusting sequence makes no difference.

The adjustment shall be conducted by two people, one shall rotate the wheel and meanwhile the other shall adjust the brake.

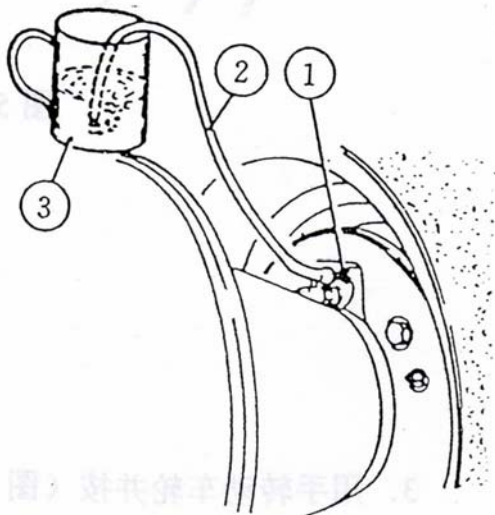
1. Raise one side of grader wheel with blade against the ground till the wheels apart from ground.
2. Support the tandem box, release the hand brake.



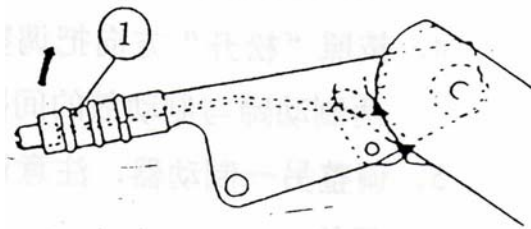
**Fig. 56**

3. Manually rotate the wheels and adjust with 22mm wrench at the shown “Tightening” direction (See Fig. 56) till the wheels have been locked. (Here, both brake shoes contact with brake drum).
4. Unscrew the adjusting bolt (Fig. 56/1) by about 3° at the “Release” direction; in this way, the clearance between both brake shoes and brake drum will be released to about 0.75mm.
5. Adjust the other brake; take notice that the rotating direction of adjusting bolt (Fig. 56/1) is reverse.

#### 8.6.2 Air release of hydraulic brake system



**Fig. 50**



**Fig. 51**

**Note:** After changing oil for hydraulic tank, joints in pipeline become loosened or damaged, the air in hydraulic system must be released. While the engine is running and the hydraulic tank is filled up and bled as prescribed to bleed air in brake system.



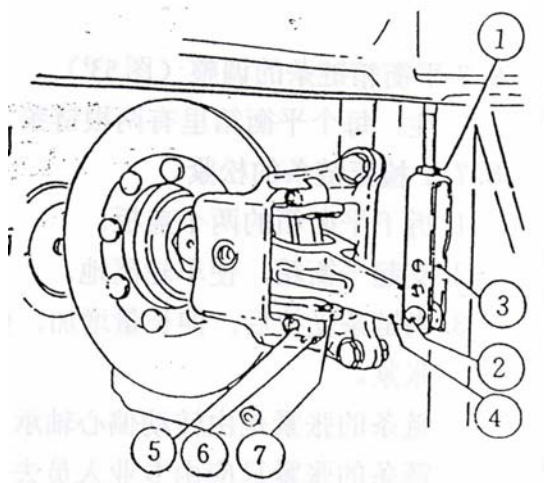
The air bleeding has to be done by 2 personnel from all bleed valves of the wheel brakes.

1. Remove the gum cap of bolt for gas release (Fig. 50/1).
2. Place the hose (Fig.50/2) on bolt for gas release, the other side shall be placed into a clean container (Fig.50/32).
3. Unscrew the bolt for gas release by half turn and step down the brake pedal. Tighten the bolt for gas release and release pedal as soon as oil flows out from deflating valve.

**Note:** Oil flowing out from deflating valve can be completed momentarily, so that the action of gas release must be very concordant.

4. Here, release air for the rest brake wheel cylinders as specified.

### 8.6.3 Hand brake



**Fig. 52**

**Note:** The hand brake is adjusted by pulling the handle upwards to the 4<sup>th</sup> socket of tooth; the full braking force (Fig.51) can be reached. If the handle can be pulled up with normal force over the 6<sup>th</sup> socket of tooth of the detent, the hand brake must be readjusted.

a. Adjust hand brake

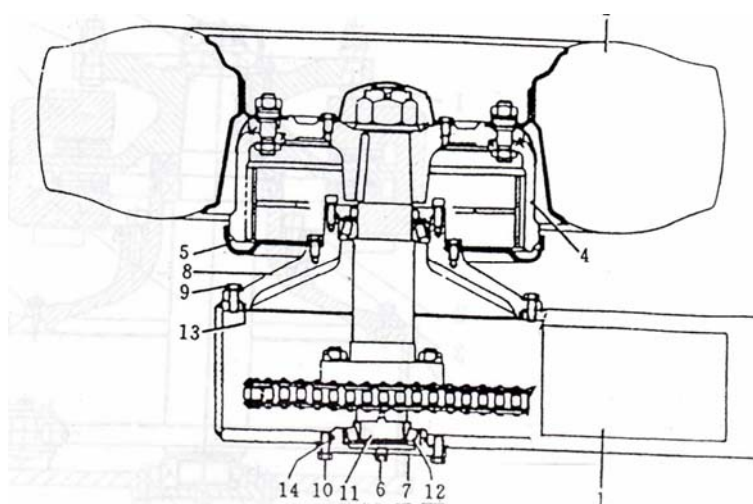
1. Loosen the fastening nut (Fig.52/1) for some turns;
2. Remove pin (Fig.52/2);
3. Disengage the hitch yoke (Fig. 52/3) from claw beam ④ and screw it on by some turns;
4. Put the hitch yoke (Fig. 52/3) on claw beam (Fig. 52/4) and install the pin (Fig.52/2) and tighten fastening nut.

b. Replace hand brake lining

**Note:** When using hand brake, the hand brake lining must be replaced before the claw beam ④ touches the upper baffle. This is very important because, otherwise the

claw beam is stopped before braking force has not been achieved.

1. Loosen the bolt (Fig.52/5) and remove clamping plate (Fig.52/6);
2. Take out the baffle (Fig.52/7) along the direction of the claw beam (Fig.52/4);
3. Replace brake lining (The lining is along the direction of brake disc). Push in the baffle and fix bolt (Fig.52/5) with clamping plate, the anti-loosening glue must be applied to tighten. The torque is 23Nm~25Nm (2.3kgm~2.5kgm).



**Fig. 53**

### **8.7 Adjustment of the chain of tandem box (Fig. 53)**

**Note:** There are two chains in each tandem box. Always check two chains together.

#### **8.7.1 Inspect tension of chains**

1. Disassemble both cover plates of tandem box;
2. Support the tandem box and make the wheel leave from ground;
3. When the chains are tensioned, they increase in elongation. If the chain touches with tandem box, the chains shall be retightened.

The chain can be tensioned by turning the eccentric bearing cover.

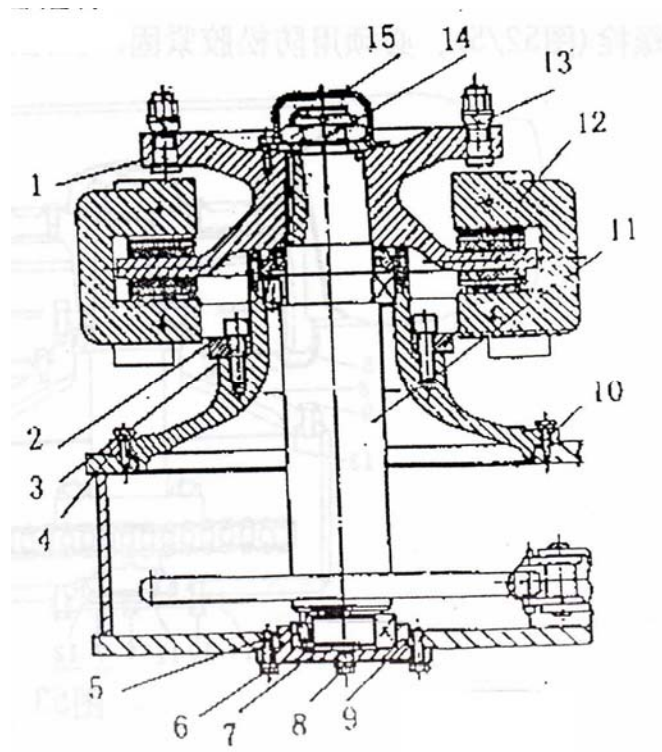
Only professional staff can tension the chain.

##### **a. Retighten the chain**

1. Support the tandem box and make the wheel leave from ground and drain oil off.
2. After removing the wheel, loosen the braking pipes and disassemble the brake (12).
3. Use special tools to disassemble the brake hub (1) and remove the cover (15) and nut (14).
5. Disassemble the screw plug (8) and change the bolt (6) at the original place, and turn several turns in the screw hole of chain wheel shaft (11).
6. Disassemble the bolts (6) on connecting plate (4) and bolts on cap (7).

Take notice that the position of mark “0” of (4) and (7) shall be relatively consistent

**Note:** When turning connecting plate (4) and cap (7), full attention must be drawn to prevent O-ring from damaging.



**Fig. 53**

7. Reassemble the connecting plate (4) and cap (7) by the use of screw (3) and bolts (6), The bolts shall be tightened face to face crosswise.
8. Remove the mounted bolts from cap (7) and replace with screw (8).
9. Mount brake hub, connecting brake pipe with brake.
10. Assemble wheels.
11. Fill oil up for tandem box and reassemble cover plate.
12. Adjust the brake system and drain air for system for use.

### **8.8 Lubrication and adjustment of front wheel bearing**

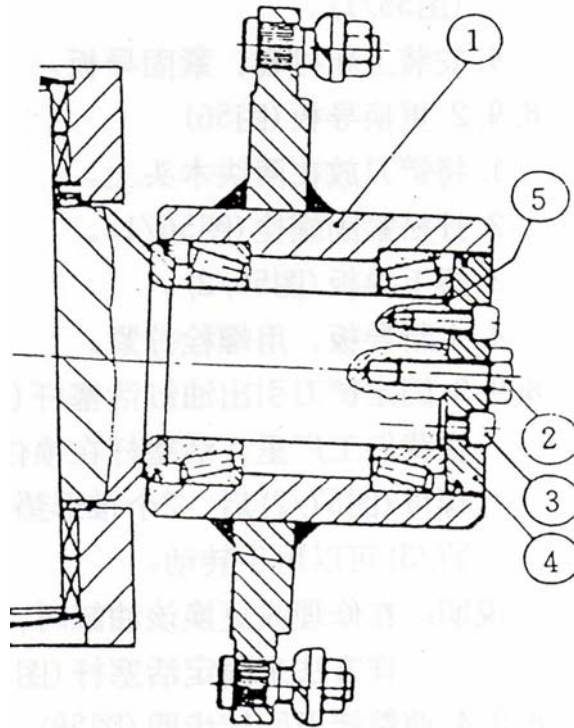
**Note:** The maintenance of the front wheel bearing must be carried out by professional staff.

Lubricating grease consumption: Approx.280g;

Lubricating grease: No.2 Extreme Pressure Lithium Lubricating Grease

1. Jack the front axel up and remove front wheel.
2. Check the interstice of wheel hub (Fig. 54/1).
3. Loosen the hexagon bolt (Fig.54/2) and hexagon socket head cap screw (Fig.54/3).
4. Remove cover (Fig.54/4).
5. Mount the number of the adjusting shim (Fig.54/5).

6. Disassemble the wheel hub (Fig.54/1) by the use of proper drawing tools. Clean wheel hub, front wheel spindle, bearing and cap; if damaged, replace seal ring and bearing to be used on new cap.
7. Fill in new lubricating grease.



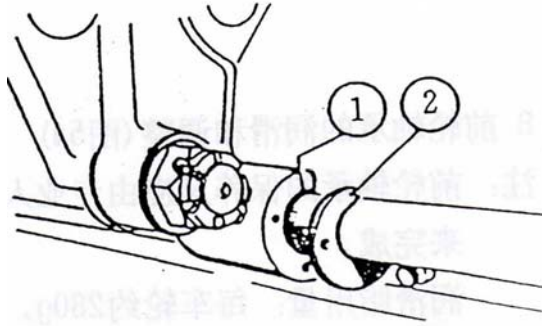
**Fig. 54**

8. Assemble wheel hub.
9. Check the bearing clearance. Take out one of adjusting spacer (Fig. 54/5) if necessary.
10. Use bolt to reassemble cap (Fig.54/4) , screw the hexagon socket head cap screw (Fig.54/3) of 78Nm and hexagon bolt (Fig.54/2) of 250Nm according to specified moment of force. The hexagon socket head cap screw shall be screwed face to face crosswise orderly.
11. The wheel hub (Fig.54/1) shall be turned easily and without jounce. When checking, the wheel hub should not have a screw crosswise.

## **8.9 Work device- Blade**

**Description:** If the action of the wheel blade is too big the guide plate and liner bushing shall be changed in pairs. High wear can be reduced if roughness on the guild rails is removed in time. A file can be used.

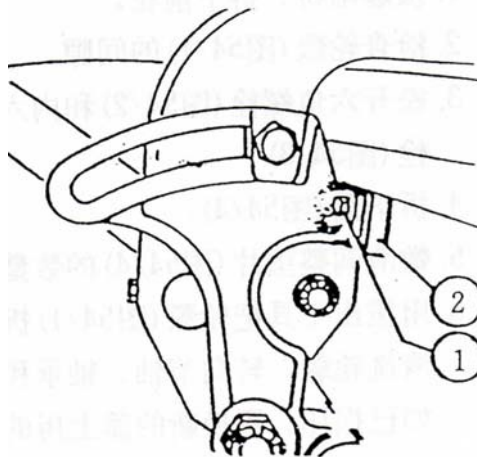
### **8.9.1 Replace liner bushing (Fig.55)**



**Fig. 55**

1. Place the blade on two pieces of wood.
2. Remove the baffle (Fig.55/2).
3. Disassemble the blade by means of sliding and inner bushing (Fig.55/1).
4. Install new inner bushing and fasten the baffle.

#### **8.9.2 Replace guide plate (Fig. 56)**



**Fig. 56**

1. Place the blade on two pieces of wood and loosen the fastening bolt.
2. Unscrew the tightening bolt (Fig.56/1).
3. Disassemble the guide plate (Fig.56/2).
4. Install new guide plate and tighten with fastening bolt.

#### **8.9.3 Fasten the piston rod of the blade shift cylinder (Fig.57)**

In our factory, after the piston rod locks the grooved nut (Fig.57/2), two taper washers (Fig.57/3) can be turned manually.

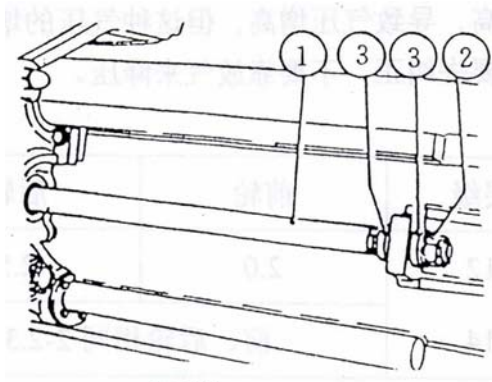
**Note:** When repairing or changing the cylinder, fasten the piston rod in the same way (Fig.57/1).

#### **8.9.4 Adjust blade rotating tooth ring(Fig.58)**

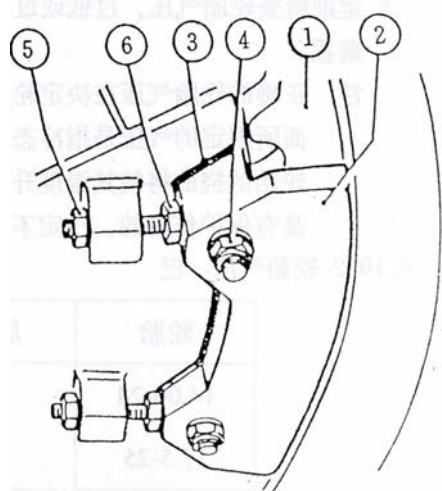
**Note:** The guide plate of turning ring has to be adjusted if radial clearance

exceeds 3mm and axial clearance 2.5mm. In case of gear-ring structure of rolling plate, the mentioned above adjustment is unnecessary.

a. Axial adjustment of guide plate



**Fig. 57**



**Fig. 58**

1. Measure the axial clearance between the tooth ring(Fig.58/1) and 4 guide plates (Fig.58/2) by the use of clearance gauge, guarantee that the clearance is ranged from 0.6mm~0.8mm (Fig.58/3).

2. After unscrewing fastening nuts (Fig.58/4), take out the 4 guide plates (3) to make the clearance conform to the requirement, reassemble the guide plate.

b. Radial adjustment of turning ring

1. Loosen the screw (Fig.58/4) and nut (Fig.58/5) and unscrew bolt (Fig.58/6) to adjust the guide plate.

2. Retighten all nuts. The tightening torque of nut is 590Nm (Fig.58/4).

3. Conduct test, the turning circle must be able to turn by 360°.

## 8.10 Tyres

**Note:** On all 6 wheels, the tyre with the same size shall be mounted.

### 8.10.1 Tyre maintenance

- Check the tyre for incised wound, crack or sharp objects on the surface and immediately all foreign bodies;
- The tyre must be free from fuel oil, oil and grease;
- The gas charging valve must be equipped with valve cap to avoid the dirt getting into the valve;
- The filter element leaking air must be changed;
- The tyre pressure must be checked regularly. Tyre pressure that is too low or too high will lead to excessive or one-side wearing of the tyre.

**Note:** Correct tyre pressure is essential in the aspect of determining efficiency and service life of tyre. The tyre pressure specified below applied to static tyre. When traveling, the flexing of the tyre will cause the rising of the temperature



and leads to raise air pressure. But this increased air pressure is a problem. So, you would not correct it and do not lower air pressure by releasing air.

### 8.10.2 Air pressure of tyre: Bar

Tyre	Layer	Front wheel	Rear wheel
17.5~25	12	$2 \pm 0.3$	$2 \pm 0.3$

## 8.11 Fasten and change wheel

### 8.11.1 Fasten wheel

Wheel nuts should be checked daily for tightness during the first 100 operating hours and should be tightened if necessary. Later, every 50 operating hours.

Tightening torque is 450Nm. Tightening is necessary since bolts and wheel nuts as well as the coat of the lacquer of the rims are settled for a long time. When traveling, if the wheel is loosened and bolt holes are damaged, the wheel will fall off.

For tightening, check proper fitting and retighten the wheel nuts to ensure the specified tightening torque by torque wrench.

### 8.11.2 Change wheel

The hand brake must be pulled tightly before changing the wheel.

Before jacking the grader, loosen the wheel nuts by approx. one turn.

For changing the rear wheel, one side of the grader can be jacked up hydraulically. With this purpose, the blade can be turned in such a manner that the blade tip is located in front of the tandem wheels which have to be lifted. Then jack up the grader with the lift cylinder on the side where the wheel to be changed.

Use bulldozing plate and blade to bear against to support the front wheel.

The grader must be supported firmly before disassembling the wheels.

Unscrew the wheel hub nuts and disassemble the wheels.

**Note:** When disassembling and mounting the wheel, make sure not to damage the screw thread of wheel hub. After mounting the wheel, the wheel nuts must be tightened face to face crosswise.

After mounting the wheel, tighten the wheel nut crosswise. Within 100 operating hours after changing every wheel for the wheel nuts should be retightened daily with specified torque of 450Nm.

### 8.11.3 Direction of wheel treads

When mounting the wheel tyre, pay attention to the direction of the tyre threads. It is recommended that the driving rear wheel mounted so that the tread is in accordance with the illustration (Fig.9-19) to give rise to the greatest tractive power in the forward direction of the traveling (See arrow) to the rear wheels. The non-driven front wheel should be fitted so that the



**Fig. 59**

thread is opposite.

**Note:** As for some special operating conditions, an alternative arrangement of the wheel may be of advantage. However, it is recommended that follow the advice of the tyre manufacturer.

## **8.12 Steering**

Check the steering system for normal function regularly.

a. According to the maintenance system (See item 8.4), sealing conditions of the bump, cylinder, pipes and joints in the steering system shall be checked and the leakage should be eliminated timely.

b. Check the nuts and bolts of the steering ladder-shaped tension rod and steering cylinder for correct assembling and tighten if necessary.

**Note:** In case that the fault occurs in the hydraulic steering system, stop working. The sales service department of the manufacturer or professional staff should be informed to repair.

## **8.13 Hydraulic operating system**

a. According to the maintenance system (See item 8.4), the bump, cylinder, pipes and joints in the steering system shall be checked for leakage.

b. Operating pressure of the hydraulic operating system. All relief valves in the entire hydraulic system are set to the correct operating pressure and these settings are sealed. If find any faults, the operating pressure would be readjusted by our service personnel. If the seals are opened during the guarantee period in the event of damage resulted from excessive pressure settings, the guarantee will be ineffective.

## **8.14 Transmission shaft**

The transmission shaft must be replaced in case that obvious clearance appears between centrepiece of universal joints and hitch yoke sleeve, the mounted balance weight plate shall not be disassembled, the damage of the weight parts will result in unstable running and earlier wear.

## **8.15 Electrical device of grader**

### **8.15.1 Work to be done for electrical device**

When beginning to repair the electrical equipment, take notice that the power supply shall be disconnected firstly and the electrical equipment shall be stopped.

### **8.15.2 Cable**

The cable is an important component part of the electrical system, as a result, must be carefully protected from damage. During the maintenance of electrical system, the wire must be checked for loosening condition, good contact and the insulating material has been damaged or broken.

### **8.15.3 Three-phase alternator**



For the maintenance and notice items of this alternator, please refer to the ***Service manual for Aalternator***. check for correct V-belt tension on driving device of the alternator regularly.

In order to avoid damaging the three-phase alternator, the following must be observed:

1. When starting the engine with aid of foreign source, pay attention to connecting the correct positive and negative poles wit the battery;
2. During fast charging process, ensure firm connection between the battery and the rapid charger;
3. When the grader needs welding, the welding ground shall be connected to the parts to be welded of grader directly;
4. If the charge indicator lamp is not lit, the alternator is charging for the battery. To monitor the charging, replace the damaged charge indicator lamp timely.

#### **8.15.4 Battery**

When disassembling the battery, firstly disconnect the negative cables (-) and then the positive cables (+); when assembling, the positive cable must be connected and then the negative cable.

The battery must be secured on the ground firmly, and correctively connected to the charging circuit of the electrical system. Slightly grease the terminals with acid-free lubricating grease.

Battery shall be kept clean and dry.

#### **8.16 Notes to store the grader**

##### **8.16.1 Place the grader**

1. If the grader is stored for long time, clean and lubricate completely. Grease is coated on finished surface and a thick layer of no-acid grease (Vaseline) is coated on piston levers and packed by a paper bands as far as possible.

2. It is best to put the grader in the canopy or the house to prevent the tyres from sunlight and humidity and after checking air pressure of the tyres. (see item 8.10.1).

3. If the grader is put on open or no-level ground, it is best to support the grader by wooden blocks to reduce load of the tyres. Then, air pressure of tyres is lowered to 50% and cover the tyres to prevent them from direct sunlight radiating.

4. To prevent corrosion, fuel tank should be filled with oil. If possible, rust remover should be filled (10% of total oil amount).

5. It is reasonable to run the grader regularly and start one time in two weeks to warm the machine. If possible, the grader can be traveled for short distance. If the machine is supported on wooden block, driving system of the gears should be run on each shift to warm the machine.

6. If store the grader for more than four weeks, the engine is started to recharge the batteries for one time monthly.

##### **8.16.2 Reput the grader in to operation**

If the grader is not used for about one year, hydraulic oil will be changed in the transmission, driving box of rear axle, tandem box and circle worn gear of the blade at the same time and change engine oil (see item 8.3.1).

1. Clean piston rod completely and fill lubricating oil into all oil cups.
2. Carryout inspection as follows:  
 Check oil levels in the engine, transmission, tandem box of rear axle, turbine box of blade rotating and hydraulic tank.  
 Check the air pressure of the tyres.

## 9. Fault analysis and troubleshooting

As to the maintenance contents listed in the following column of “Troubleshooting”, we suggest that you had better notify the Sales & Service Dept. of the manufacturer when you consider the maintenance, since our maintenance workers are all specially trained, and have special tools to ensure the repairs can be done correct and skilled.

**Note:** Welding of the bearing structural parts on the grader can be only undertaken by our Sales & Service Dept. or done in our factory to ensure the structure strength. It is unallowed to weld on the bridge and strictly forbidden to connect the earth wire of the welding appliance to the bridge.

**Fault symptom, analysis of causes and trouble shooting**

Faults	Possible causes	Remedies
1. Diesel engine 1.1 Diesel engine fails to start	1. Problem in fuel system a. Air in the fuel system  b. Fuel system blocked c. No oil supply or intermittent oil supply d. Abnormal injection of the fuel injector e. Incorrect advance angle of fuel supply	Bleed air in fuel system with fuel delivery pump and check the system for air leakage. Disassemble and clean. Check and repair.  Check the spraying condition of the fuel injector. Check and adjust.
	2. Deficiency in compression pressure a. Piston ring worn out b. Piston ring gumming c. Valve leakage.  d. Too low compression temperature	Replace the piston ring Remove the gumming Valve spring broken, elastic force decreased, improper valve clearance or bad airproof of valve connoid, adopt corresponding solutions. Low ambient temperature, adopt methods like preheating to solve.

	<p>3. Electrical problem</p> <p>a. Deficiency in electrical power of battery</p> <p>b. Poor contact of electrical connection</p> <p>c. Poor contact between starter brush and rectifier</p> <p>d. Deficiency in torsional moment of clutch plate of starter, slipping</p> <p>e. Starter gear can not be embedded in the flying tooth ring of flywheel</p>	<p>Re-charge to reach the regulated requirement. Check if the connection is right or tightened.</p> <p>Repair or replace starter brush and clean rectifier with fine sand paper. Blow off dust, add shims and adjust. Check and repair.</p>
1.2 Unsteady running of diesel engine	<p>1. Air in the fuel system</p> <p>2. Too much water in the fuel</p> <p>3. Fuel lines leakage</p> <p>4. Abnormal work of the speed regulator</p> <p>5. Blow-by of cylinders</p> <p>6. Different oil supply of each cylinder</p> <p>a. Uneven oil supply of each cylinder of oil injection pump</p> <p>b. Poor injection of oil injector or coupling part clipped</p> <p>c. Piston spring of oil injection pump broken</p>	<p>Bleed air. Check water content of fuel. Check and repair. Check and adjust the speed regulator. Check cylinder bolts, if necessary, replace washer of cylinder cap and check height of top surface on bulgy body of the step of cylinder sleeve and height difference. Check and adjust.</p> <p>Check oil injection condition of oil injector, clean or replace coupling part.</p> <p>Replace spring.</p>
1.3 Diesel engine is underpowered or power drops suddenly	<p>1. Air filter is blocked</p> <p>2. Valve spring or valve tappet has been damaged.</p> <p>3. Incorrect valve clearance.</p> <p>4. Compression pressure is insufficient.</p> <p>5. Incorrect advance angle of fuel supply.</p>	<p>Clean or replace filter element. Replace.</p> <p>Adjust. Process according to section 2 of this chapter. Check and adjust.</p>

	<p>6. Air enters into oil supply system or blocked.</p> <p>7. Deficient oil supply.</p> <p>8. Bad atomization of fuel injector.</p> <p>9. Speed regulator malfunctions.</p> <p>10. Engine is overheated.</p> <p>11. Too much carbon deposition in engine.</p> <p>12. Gas exhaust piping is blocked.</p>	<p>Process according to items a and b of Section 1 of this chapter</p> <p>Check injection pump plunger and delivery valve seat</p> <p>Check, clean and adjust pressure</p> <p>Check speed regulator and adjust accordingly.</p> <p>Check cooling system and eliminate scale deposit.</p> <p>Eliminate carbon deposition.</p> <p>Remove stemming.</p>
1.4 Abnormal sound sent by diesel engine when running	<p>1. Gas cylinder sends rhythmical and silvery sound of beating metal because of earlier oil injection.</p> <p>2. Gas cylinder sends grave and non-silvery sound because of too late oil injection.</p> <p>3. Gas cylinder sends impact sound after starting the diesel engine because of too big clearance between piston and gas cylinder, this sound is decreased with diesel engine running warm.</p> <p>4. Sound is low and sharp, it is more obvious especially when idling, as a result of too much clearance between piston pin and pinhole</p> <p>5. Sound of collision of parts of machine can be heard when rotation rate of engine suddenly decreased, heavy and forceful especially at low speed, as a result of too much clearance between main bearing and crank shaft</p> <p>6. Sound of collision when crank shaft moves back and forth can be heard as a result of too much</p>	<p>Adjust advance angle of fuel supply.</p> <p>Adjust advance angle of fuel supply.</p> <p>Replace piston or cylinder sleeve.</p> <p>Replace parts to ensure the specified clearance.</p> <p>Replace parts to ensure the specified clearance.</p> <p>Replace push jack to ensure the specified clearance</p> <p>Replace parts, check and adjust valve clearance.</p>

	<p>axial clearance of crank shaft</p> <p>7. Mussy sound or light rhythmic slap at the cylinder cover can be heard as a result of broken valve spring, bent pushing bar or too much clearance of valve.</p> <p>8. Piston collides with cylinder cover</p> <p>9. Collision can be heard at gear compartment when decreasing rotation speed suddenly, as a result of too much clearance caused by gear abrasion</p>	<p>Check piston and valve for collision and furthermore, check if marks of piston and gas distribution gear are right.</p> <p>Replace gear according to actual condition.</p>
1.5 Too high temperature of the engine oil	<p>1. Overload of engine.</p> <p>2. Too low or too high engine oil</p> <p>3. Serious air leakage</p> <p>4. Oil cooler blocked inside, pressure of bypass valve incorrect, crust blocked by dirt.</p>	<p>Decrease load.</p> <p>Increase or decrease engine oil level as specified.</p> <p>Check piston ring and cylinder sleeve,</p> <p>Check, clean and adjust by-pass valve.</p>
<p>1.6 Abnormal fume drained from the engine</p> <p><b>Note:</b> Fume of diesel engine under normal load is light grey, and only changed to be deep grey even under temporary great load. When the fume drained from the diesel engine is blue, white or black, it is regarded as abnormal. Blue fume indicates burning of engine oil, white fume indicates existence of water or failure of fine droplets of diesel to burn, black fume indicates too</p>	<p>1. Emitting Blue fume</p> <p>a. Too much engine oil, piston ring installed in conversed direction, clipped or worn.</p> <p>b. Oil sealing of valve rod damaged.</p> <p>2. Emitting white fume</p> <p>a. Bad spraying of oil injector, leakage or dripping.</p> <p>b. With water in the cylinder.</p> <p>3. Emitting black fume</p> <p>a. Engine running with overload.</p> <p>b. Too much oil injection.</p> <p>c. Too late oil supply, too much afterburning.</p> <p>d. Incorrect valve clearance, adherence of valve, blow-by caused by bad coordination of valve and seat.</p> <p>e. Blockage of air filter element.</p>	<p>Check and repair.</p> <p>Replace the oil seal.</p> <p>Adjust the pressure of oil injection; check the sealing condition of parts.</p> <p>Adjust to the specified load.</p> <p>Adjust the oil supply.</p> <p>Adjust the angle of advance of oil supply.</p> <p>Check valve clearance, valve spring, and the sealing condition of conical surface and repair.</p> <p>Check and repair.</p>

much oil injection and fail to burn completely.		
1.7 Engine oil is underpressure	<ol style="list-style-type: none"> <li>1. Pressure gauge damaged or oil pipe blocked.</li> <li>2. Too low oil level in oil sump.</li> <li>3. Engine oil is diluted too much.</li> <li>4. Oil pump gear worn out or poorly mounted.</li> <li>5. Filter screen of engine oil or filter is blocked.</li> <li>6. Pressure limiting valve or spring of surge damping valve damaged.</li> <li>7. Oil pipe blockage or leaks.</li> <li>8. Clearance of different parts are excessive.</li> </ol>	<p>Replace the pressure gauge or dredge the oil pipe.</p> <p>Fill in engine oil to the specified oil level.</p> <p>Check the oil designation, whether the engine oil is diluted by the fuel or the temperature of engine oil is too high and repair.</p> <p>Adjust the clearance or replace gear.</p> <p>Clean or replace.</p> <p>Replace.</p> <p>Check and repair.</p> <p>Check and repair.</p>
1.8 Too high temperature of cooling water	<ol style="list-style-type: none"> <li>1. Water temperature gauge or temperature sensing plug does not work.</li> <li>2. Deficiency in water.</li> <li>3. Blockage caused by too much incrustation in engine water passage; Radiating fin of radiator, or copper tube stained.</li> <li>4. Engine overloaded.</li> </ol>	<p>Check and replace.</p> <p>Fill in cooling water, bleed air, adjust belt tension and check the water pump clearance.</p> <p>Check and clean.</p> <p>Decrease the load.</p>
1.9 Oil supply of oil transfer pump is deficient	<ol style="list-style-type: none"> <li>1. Non return spring of oil transfer pump is broken or valve seat is damaged.</li> <li>2. Plunger is worn</li> <li>3. Oil feed screw leaks air or pipeline is blocked.</li> </ol>	<p>Replace spring or repair non return valve.</p> <p>Replace plunger.</p> <p>Replace spacer and tighten, eliminate blockage.</p>
1.10 Fault in injection pump	<ol style="list-style-type: none"> <li>1. Does not supply oil. <ol style="list-style-type: none"> <li>a. Fault in injection pump.</li> <li>b. Filter and pipeline are blocked.</li> <li>c. There existing air in oil</li> </ol> </li> </ol>	<p>Check and eliminate.</p> <p>Clean and replace parts.</p> <p>Drain air.</p>

	<p>supply system.</p> <p>d. Spring of delivery valve is broken.</p> <p>2. Nonuniform output of oil.</p> <p>a. There existing air in oil supply system.</p> <p>b. Spring of delivery valve is broken.</p> <p>c. Sealing surface of delivery valve and external circular face are worn.</p> <p>d. Plunger pair is worn or spring is broken.</p> <p>e. Foreign matters block plunger pair.</p> <p>f. Oil input pressure is too low.</p> <p>3. Oil supply is insufficient</p> <p>a. Delivery valve leaks oil.</p> <p>b. Joint leaks oil.</p> <p>c. Plunger is worn.</p>	<p>Replace spring.</p> <p>Drain air.</p> <p>Replace spring.</p> <p>Replace parts or repair.</p> <p>Replace parts.</p> <p>Clean.</p> <p>Check oil transfer pump or filter.</p> <p>Repair or replace parts.</p> <p>Check and repair.</p> <p>Replace parts.</p>
1.11 Fault in fuel injector	<p>1. Decrease in oil injection or cannot inject oil.</p> <p>a. There existing air in oil circuit.</p> <p>b. Needle valve and valve body are snapped.</p> <p>c. Needle valve and valve body are matched too loosely.</p> <p>d. Oil supply system leaks oil seriously.</p> <p>e. Oil supply of injection pump is irregular.</p> <p>2. Low injection pressure</p> <p>a. Adjusting screw is loose.</p> <p>b. Camber of spring</p> <p>3. High injection pressure</p> <p>a. Needle valve with needle valve.</p> <p>b. Oil hole is blocked.</p> <p>c. Pressure of pressure regulating spring is too high.</p> <p>4. Seriously leaks oil</p> <p>a. Pressure regulating spring is</p>	<p>Drain air.</p> <p>Repair or replace.</p> <p>Replace.</p> <p>Tighten joint or replace parts.</p> <p>Readjust injection pump on test bed.</p> <p>Adjust to specified pressure.</p> <p>Replace spring.</p> <p>Repair.</p> <p>Clean.</p> <p>Readjust.</p> <p>Replace spring.</p> <p>Repair or replace parts.</p>

	<p>broken.</p> <p>b. Needle valve and valve seat faces are damaged.</p> <p>c. Needle valve is clipped.</p> <p>d. Pressure map is deformed.</p> <p>e. Joint face of fuel injector is uneven.</p> <p>5. Bad atomization</p> <p>a. Needle valve is deformed or worn.</p> <p>b. Needle valve and valve seat face are worn or burn out.</p> <p>c. Nozzle opening is blocked.</p> <p>d. Needle valve is clipped.</p>	<p>Clean or replace parts.</p> <p>Replace parts.</p> <p>Polish or replace parts.</p> <p>Replace parts.</p> <p>Replace parts.</p> <p>Clean.</p> <p>Repair or replace.</p>
1.12 Fault in speed regulator	<p>1. Unstable speed regulation</p> <p>a. Oil supply of different cylinder is irregular.</p> <p>b. Nozzle hole of fuel injector is blocked or leaks oil.</p> <p>c. Plunger spring of oil pump and delivery valve spring are broken.</p> <p>2. Can not reach idle speed</p> <p>a. Operating arm has not been put to bottom.</p> <p>b. Tooth ring and adjusting toothed bar have been clipped.</p> <p>3. Idle car</p> <p>a. Camber of adjusting spring because of long use.</p> <p>b. Extending and retracting distances of flyball are inconsistent.</p> <p>c. Wearing clearance of floating lever.</p> <p>4. Propeller racing</p> <p>a. Rotating speed is too high.</p> <p>b. Speed regulating spring is broken.</p> <p>c. Adjusting toothed bar and tooth ring are clipped.</p>	<p>Adjust oil supply.</p> <p>Check or replace oil nozzle coupled parts assembly.</p> <p>Replace spring.</p> <p>Check and adjust.</p> <p>Check and process.</p> <p>Replace spring.</p> <p>Check and correct.</p> <p>Check and repair.</p> <p>Check and readjust.</p> <p>Replace spring.</p> <p>Check and repair.</p>
1.13 Diesel engine stops suddenly	<p>1. Crank shaft can not turn after stopping.</p>	



	<p>a. Crank shaft and axle sleeve blocked.</p> <p>b. Piston and cylinder blocked.</p> <p>2. Crank shaft can turn freely.</p> <p>a. Air in fuel system</p> <p>b. Fuel system clogged.</p> <p>c. Air filter element clogged.</p>	<p>Check crank shaft and axle; Repair shaft and replace axle sleeve.</p> <p>Replace the piston or the sleeve.</p> <p>Bleed air. Clean. Maintain the air filter element.</p>
1.14 Faults in the starter	<p>1. The starter can not turn.</p> <p>a. Connecting cable poorly contacted.</p> <p>b. Battery undercharged.</p> <p>c. Poor brush contact.</p> <p>d. Circuit of the starter itself disconnected.</p> <p>2. Idle running of the starter</p> <p>a. Bearing sleeve worn out</p> <p>b. Brush poorly contacted.</p> <p>c. Commutator dirty or burned out.</p> <p>d. Sealing off of cable terminal.</p> <p>e. Poor contact.</p> <p>f. Poor contact of switch</p> <p>g. Battery undercharged or the capacity too small.</p> <p>h. Clutch slipping</p> <p>3. Difficulty in gear return.</p> <p>Switch contact piece fused and firmly adhered.</p>	<p>Clean and tighten the contact point.</p> <p>Charge or replace battery.</p> <p>Clean the surface of commutator.</p> <p>Repair.</p> <p>Change the sleeve.</p> <p>Clean the contact surface of commutator.</p> <p>Remove oil stain and use crocus cloth to polish the surface.</p> <p>Re-weld.</p> <p>Clean and tighten contact points</p> <p>Check the switch.</p> <p>Charge or replace the battery.</p> <p>Adjust the moment of clutch.</p> <p>Repair the switch.</p>
1.15 Faults in engine	<p>1. Not charged completely.</p> <p>2. Undercharged.</p> <p>3. Overcharged.</p> <p>4. Charging voltage is unsteady.</p>	<p>As for these four items, repair according to the characteristics of different engines.</p>
2. Transmission 2.1 Control lever slipping and the valve piston not engaged.	<p>Control lever not correctly adjusted or not connected at all.</p>	<p>Adjust or connect.</p>

2.2 Too low shifting pressure in all gears(See pressure gauge)	Oil level too low.  Faults in operating pump  Faults in gear shifting pressure.	Fill up to the specified pressure. Notify the Sales & Service Dept. of our company. Notify the Sales & Service Dept. of our company.
2.3 Too low shifting pressure in some gear	Sealing parts, piston ring, gear clutch worn or broken.	Notify the Sales & Service Dept. of our company.
2.4. Too high oil temperature (See the thermometer on instrument panel.)	Too low oil level.  Dirty radiating fins of oil cooler. High or low gear used for too long a time.  Faults in safety valve of torque converter.	Fill up to the “Maximum oil level”. Clean radiating fins of oil cooler. Change methods of driving, i.e. selecting a different gear to drive. Notify the Sales & Service Dept. of our company.
3. Brake breakdown	Air in brake system Oil leakage in joints of braking pipes.	Bleeding air in brake system. Tighten joints or replace sealing piece.
4 Hydraulic steering 4.1 Hydraulic steering gear or steering pump damaged.		Notify the Sales & Service Dept. of our company.
4.2 Front wheel wobbled	Steering cylinder or lever bearing worn	Replace bearing or corresponding ball pivot.
5. Working device 5.1 Working device understeers or fails to remain in the selected position.	Too low oil level in oil tank Piston sealing piece in cylinder damaged Regulated pressure by safety valve incorrect Safety valve fails to keep required pressure	Fill up to the specified oil level Change sealing piece (Notify Sales & Service Dept.) Re-regulate (Notify Sales & Service Dept.) Replace spring or valve (Notify Sales & Service Dept.)
5.2 Blade wobbled	Steering clearance too much	Replace, file sleeve of guide plate
5.3 Blade can not rotate	Joints leakage of hydraulic motor Parts of hydraulic motor worn	Replace sealing piece Replace hydraulic motor (Notify Sales & Service Dept.)
5.4 Too less oil supply or too great	Too low oil level in oil tank Hydraulic pump damaged	Fill up to the specified oil level Change hydraulic pump (Notify

working noise in hydraulic pump		Sales & Service Dept.)
5.5 Control leveler can not auto return to middle position	Return spring too soft or broken	Replace return spring (Notify Sales & Service Dept.)
6. Electrical system 6.1 Lamp unlit	Fuse blows Bulb damaged	Replace fuse Replace the bulb
6.2 Electrical appliance does not work	Fuse blows Fault in electrical appliance	Replace the fuse Replace the electrical appliance (Notify Sales & Service Dept.)

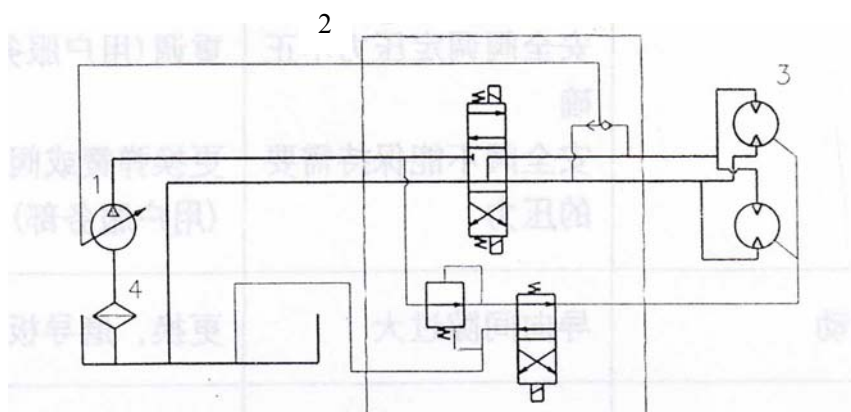
## 10. Front axle drive unit

Compared with the others PY200 series graders, the PY200H grader is only equipped with the front axle drive unit additionally, the others parts are identical with PY200 series graders basically. Introduction to PY200 series graders has been made, here we will not describe. The contents relating to the front axle drive unit are introduced in this chapter.

The front axle drive unit is mainly composed of hydraulic system of front axle drive and front driving axle.

### 10.1 hydraulic system of front axle drive

The drive unit of front axle adopts hydrostatic system as power source (Please refer to schematic diagram for details).



**Fig. 60 Schematic diagram of front axle drive of PY200H grader**

1. Driving pump    2. Control valve assembly    3. Driving motor    4. Oil filter

The drive system is composed of the driving pump 1, control valve assembly 2, driving motor 3. This hydraulic system is open type hydraulic system, the driving pump 1 feeds compressed oil to driving motor 3 through control valve assembly 2. The main role of control valve assembly 2 is to control the forward and reverse of

driving motor 3, meanwhile control the operating state of driving motor 3; namely, driving state and state of free wheel.

The driving pump is mounted on the transmission, the system pressure is controlled by this pump, of which pressure value is 32Mpa. Both driving motors are mounted in the wheel hub of front wheel.

## **10.2 Front driving axle**

This grader not only has rear axle drive, but also has front axle drive. The technical parameters that this grader can reach are identical with that indicated in Section 4.5.2, which can increase towing force by 30%.

## **10.3 Operating instructions**

Here, the section of the front axle drive is introduced in the operating instructions for PY200H grader, for the other sections please refer to chapter 7.

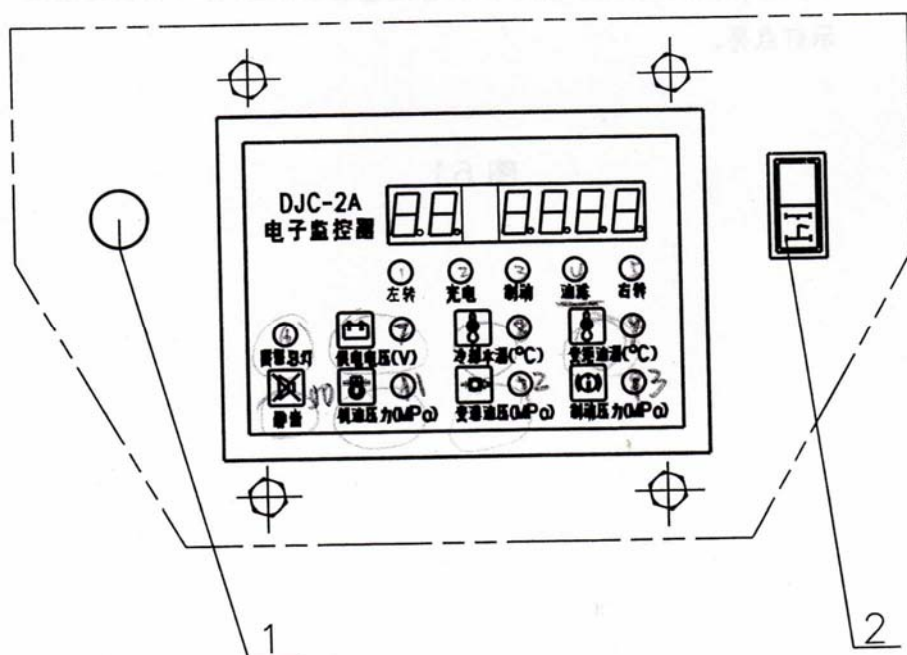
The PY200H grader has three driving types as follows: full axle drive, only rear axle drive and only front axle drive.

The full axle drive means front and rear axles drive at the same time, which can only be used to Gear 1 and 2 of forward, gear 1 and neutral gear of reverse. When the control lever of transmission is at the other gears, even the switch for front axle drive is at open position, the front axle drive will not work.

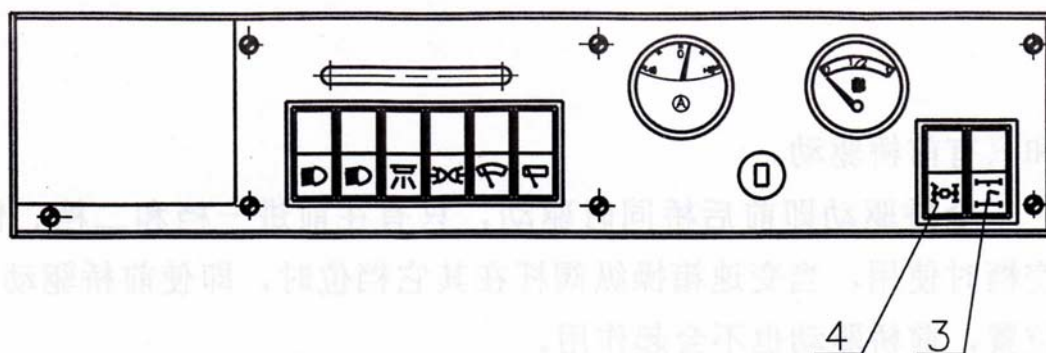
The user of full axle drive can operate according to the operating conditions if it necessary to increase towing force.

In order to reduce the damage of rear axle wheel to leveled road surface in fine leveling operations, the use can engage the control lever of transmission of rear axle on neutral position, while the front axle drive unit can drive whole machine to move to carry out scraping operations.

The control of front axle drive unit of the whole machine as shown in Fig. 61, please see Fig. 62 for details of electrical schematic diagram.



电子监测器 Electronic monitor    左转: Left turning    充电: Charge    制动: Brake  
 油率: oil rate    右转: Right turning    报警总灯: Main alarm lamp  
 供电电压: Supply voltage    冷却水温: Cooling water temperature  
 变矩油温: Torque converter oil temperature    静音: Silencing  
 机油压力: Engine oil pressure    变速油压: Transmission oil pressure  
 制动压力: Brake pressure

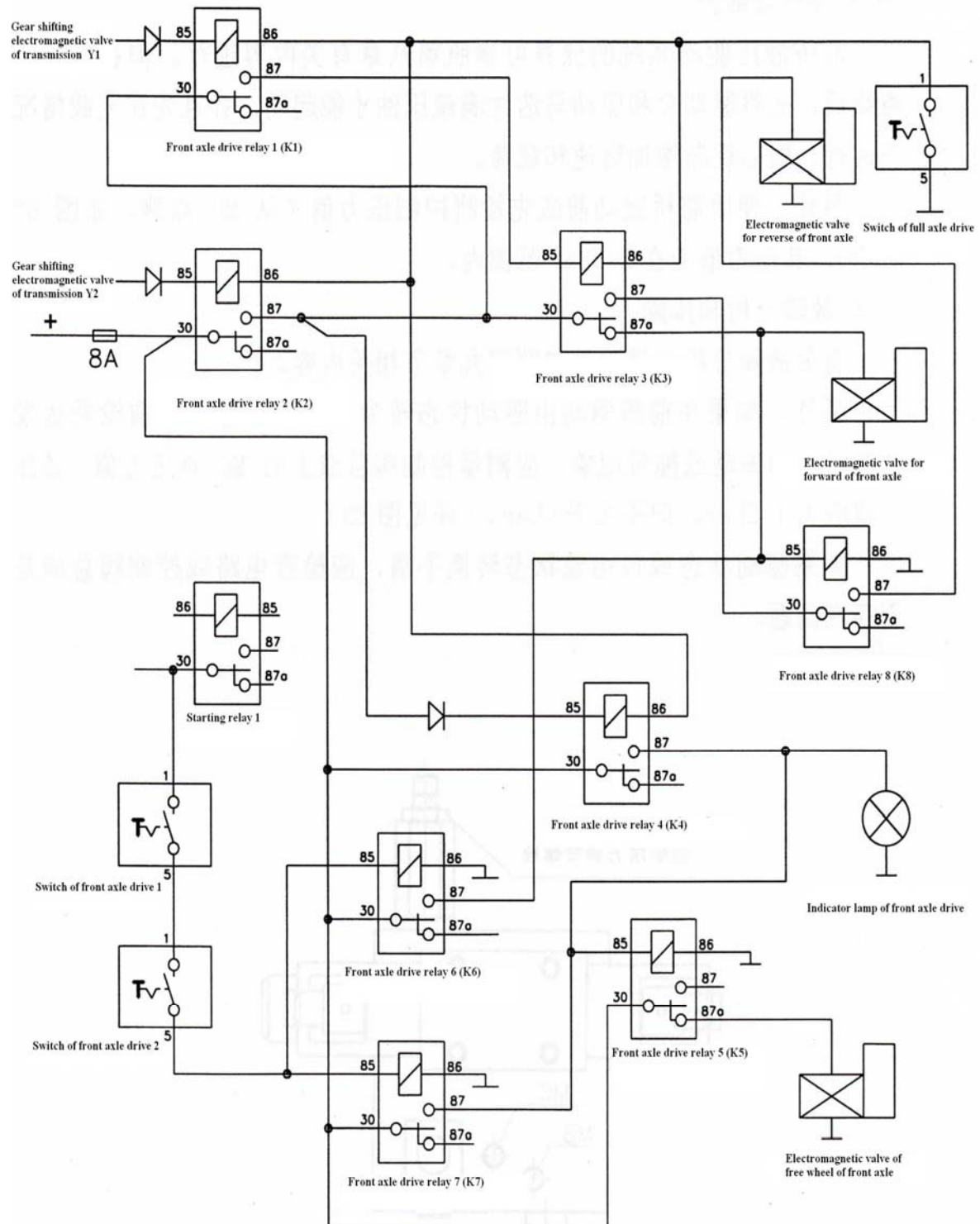


**Fig. 61**

1. Indicator lamp of front axle drive
2. Switch of front axle drive 2
3. Switch of front axle drive 1
4. Switch of full axle drive

**Front axle drive:** After switching off (Pressing) No. 2 switch of front axle drive and No. 3 switch of front axle drive and when the transmission is at neutral gear, the front axle drive will work, the front axle is under driving state; rear axle is under following state, the indicator lamp of No. front axle drive lights.

**Full axle drive:** After switching off (Pressing) No. switch of full axle drive and when the transmission is on gear 1 and 2 of forward and gear 1 of reverse, the front axle drive will work, the front and rear axles are under driving state, the indicator lamp of No. 1 front axle drive lights.



**Fig. 62 Schematic diagram of front axle drive**

## 10.4 Care and maintenance

The care of the hydrostatic driving system of front axle can be conducted with reference to Chapter 8. The driving pump and driving motor can be started after being filled with hydraulic oil after installation and repairs, which shall be carried out under no load and then increase rotating speed and load subsequently.

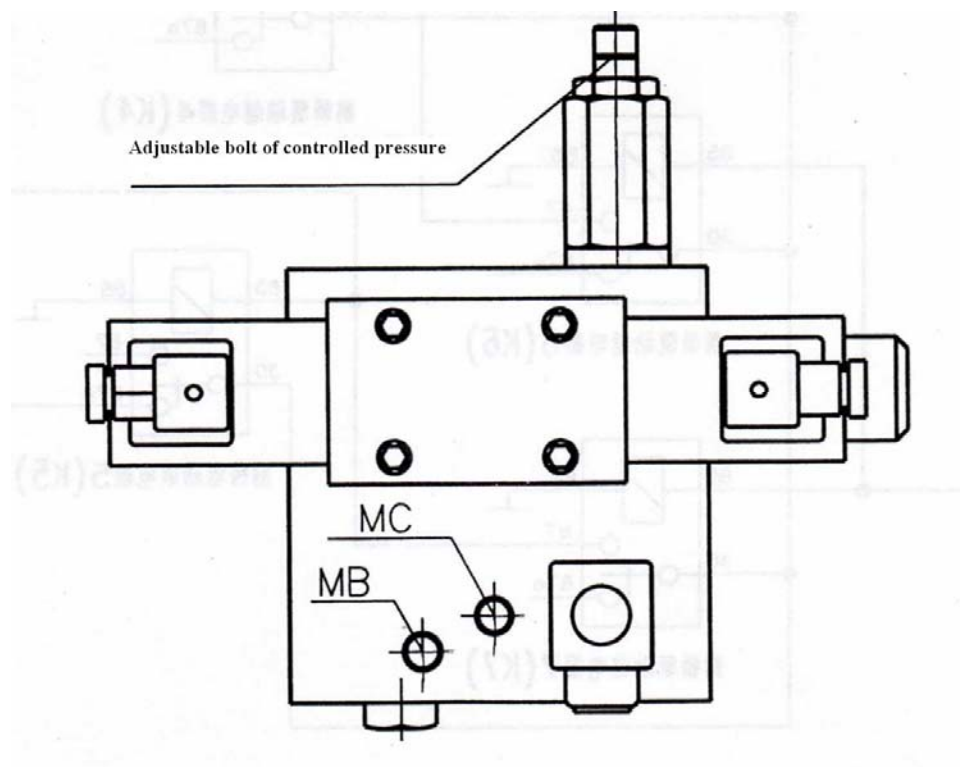
Additionally, the controlled pressure value (from side of MC Point, as shown in Fig. 63) shall be checked prior to using front axle drive, the pressure value shall be within 2~5bars.

## 10.5 Fault analysis and troubleshooting

Please refer to Chapter 9 for fault analysis and troubleshooting.

Additionally, when the front axle drive turns from driving state to free wheel state and long vibration and towing phenomenon happens to front wheel motor, the pressure value at MC point of control valve shall be checked, this pressure value shall be more than 2 bars but less than 5 bars. (See Fig. 63 for details).

If the switch between driving state and free wheel state is unclear, check whether the circuit or control valve assembly have problems.



**Fig. 63 Control valve assembly**