

# OPERATION MANUAL

(40-65)



MADE IN CHINA



## Precautions

1. Operation, maintenance and repair could only be carried out by the persons who are familiar with the machine's feature and with the relevant operating knowledge.
2. The driver should pay special attention to the safe warning on the machine. Once meeting such signs, please note the possible harm, read the contents carefully and then demonstrate it to the other drivers.
3. Prohibit strictly driving after drinking, driving without license or of being overloaded.
4. New tractors should undergo run-in according to run-in regulations before they are put into use.
5. See that whether there is block on the road, whether there is person between the tractor and the tools or trailer when the tractor starts.
6. It is forbidden to get on or off the tractor while it's moving. And no examination and repairing work could be done under the tractor when the motor is running.
7. All the gear levers should be shifted to neutral position before getting off the tractor.
8. Only "low gear" could be used in climbing up or down steeper slope. Slipping down a slope road with neutral gear is forbidden strictly.
9. When transporting, the left and right brake treadles should be linked up, the PTO shaft should be pushed to "neutral gear".
10. The hydraulic control handle should be pushed to the "middle position" when the tractor transferring with mounted implement.
11. No sharp turn with one-side brake is permitted when driving at a high speed in order not to turn the tractor over or damage its parts.
12. Bolts or nuts of wheel disc and of other important parts should be inspected and tightened regularly.
13. It is forbidden to drive the tractor at a high speed during its transferring with mounted implement, so as not to damage the lifting

system or suspension system parts.

14. Examining the oil-line, electric circuit and cooling water before starting. Fuel oil without being deposited or filtered should not be pouring into the tank in any case. Pay attention to the readings on instruments after starting.
15. No travelling in high gear is permitted when operating or transferring in fields with high-lugged tyres. Nor transporting with high-lugged tyres.
16. Only trailers of 3 tons load limit can be attached with.
17. Clean the dirt on the radiation tank so as to ensure its cooling effect when it is too hot. Pouring cool water onto motor or water tank are forbidden in case of breaking the cylinder. It is necessary to reduce the load till the temperature drops. Thus cooling water can be added when the motor is in running. Opening the cock of the water tank at high temperature will result in hurting persons because of steam or hot water's splashing out.
18. The existing breakdown should be told to the successor on duty as shifts change. Lighting equipment must be perfect while operating at night.
19. After operating at an area of below  $0^{\circ}$  C in winter, the water should be drained out at idle gear lest damaging the parts caused by the left water (except anti-freeze fluid).
20. Any decrease of the machine's reliability, damage of the machine or hurt of persons caused by refitting the tractor arbitrarily has nothing to do with the manufactory.
21. In the process of tractor's travelling or operating, the differential lock can be used according to the instructions when one drive wheel is found to slip severely. In addition, using differential lock is prohibited in any other condition so as not to damage the machine and cause other accidents.



## Contents

### Preface

### Precautions

Chapter I. Overall specification.....	1
1. Overall specification.....	1
2. Engine.....	3
3. Transmission system.....	5
4. Running, steering and brake system.....	5
5. Working equipment.....	6
6. Electrical system.....	7
7. Air cushion brake equipment.....	8
8. Oil and water filling capacities.....	8
Chapter II. Run-in of a new tractor.....	10
1. Preparations before taking run-in.....	10
2. Run-in idle gear of engine.....	10
3. Run-in of power take-off shaft.....	10
4. Idle and loaded run-in .....	10
5. Work after run-in.....	11
Chapter III. Operation of the tractor.....	13
1. Operating and driving of a tractor.....	13
2. Operation and use of working equipment.....	17
3. Use and maintenance of electrical system.....	23
4. Fuel oil and lube oil of the tractor.....	26
Chapter IV. Technical maintenance of the tractor.....	27
Chapter V. Adjustment of the tractor.....	30
1. Clutch.....	30
① Dual-acting clutch.....	30



② Single-acting clutch.....	31
2. Adjustment of brake.....	32
3. Configuration and adjustment of rear axle.....	33
4. Configuration and adjustment of final transmission.....	38
5. Front axle.....	40
6. Configuration and adjustment of steering wheel.....	41
7. Adjustment of rear wheel tread.....	44
8. Adjustment of hydraulic suspension system.....	45
9. Configuration and adjustment of front drive axle.....	47
Chapter VI. Main troubles and their disposals.....	51
1. Clutch.....	51
2. Gearbox.....	52
3. Rear axle.....	53
4. Brake.....	54
5. Front axle ( four wheel drive ).....	55
6. Steering gear and running mechanism.....	56
7. Electrical system.....	57
① Motor.....	57
② Accumulator.....	57
③ Silicon rectifier generator.....	57
8. Hydraulic lift system.....	59
1. Lubricating table of tractor.....	62
2. Torque of main bolts and nuts.....	63

**Three-promises warrant of HUANGHAI tractors**

## Chapter I Overall Specification

### 1. Overall specification

Type of tractor		HUANGHAI-400 (11.2-28)	HUANGHAI-450 (12.4-28)	HUANGHAI-404 (11.2-28)	HUANGHAI-454 (12.4-28)
Name of data					
Pattern		4× 2( 2 wheel drive)		4× 4 ( 4 wheel drive)	
Overall Size (mm)	Length	3825	3825	3825	3825
	Width	1830	1830	1625	1625
	Height	2020	2020	2065	2065
Wheel base (mm)		1877.5	1877.5	1943	1943
Front wheel tread (mm)		1250~1550	1250~1550	1300	1300
Back wheel tread (mm)		1300~1600	1300~1600	1300~1600	1300~1600
Min. ground clearance (mm)		370	370	325	325
Agricultural ground clearance (mm)		430	430	375	375
Turning radius (m)					
One side braking		3.4	3.4	3.5	3.5
Without one side braking		4.0	4.0	4.1	4.1
Tractor mass (kg)					
Construction mass		1730	1734	1937	1952
Min.. use mass		1886	1890	2101	2116
Weight distribution (kg)					
Front axle		776	778	949	960
Back axle		1110	1112	1152	1156
Additional weight (kg)					
Front axle		120	120	120	120
Back axle		380	380	280	380
Rated pulling force		8200	9300	10320	11700



Theoretical speed ( normal gear / climbing gear ) km/h			
Theoretical Speed	Tractor type	HUANGHAI JM-400/404	HUANGHAI JM-400/454
Gear			
1 <sup>st</sup> /Climbing 1 <sup>st</sup>		2.092/0.314	2.188/0.328
2 <sup>nd</sup> /Climbing 2 <sup>nd</sup>		3.074/0.46	3.215/0.481
3 <sup>rd</sup> /Climbing 3 <sup>rd</sup>		4.997/0.748	5.227/0.782
4 <sup>th</sup> /Climbing 4 <sup>th</sup>		6.561/0.982	6.863/1.027
5 <sup>th</sup> /Climbing 5 <sup>th</sup>		9.395/1.406	9.827/1.471
6 <sup>th</sup> /Climbing 6 <sup>th</sup>		13.802/2.066	14.437/2.161
7 <sup>th</sup> /Climbing 7 <sup>th</sup>		22.43/3.357	23.462/3.512
8 <sup>th</sup> /Climbing 8 <sup>th</sup>		29.459/4.41	30.815/4.613
Reverse 1 <sup>st</sup> /Climbing 1 <sup>st</sup>		3.104/0.424	3.247/0.444
Reverse 2 <sup>nd</sup> /Climbing 2 <sup>nd</sup>		4.561/0.623	4.771/0.652
Reverse 3 <sup>rd</sup> /Climbing 3 <sup>rd</sup>		7.415/1.012	7.756/1.059
Reverse 4 <sup>th</sup> /Climbing 4 <sup>th</sup>		9.733/1.33	10.181/1.391

Note: The rotational speed of motor is calculated on 2,200r/min.

## 2.Engine

Type of tractor Parts and data		HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Engine type		SL-3105BT	SL3105AB	SL3105BT	SL3105AB
Engine pattern		Vertical water-cooled 4 stroke diesel engine	Vertical water-cooled 4 stroke diesel engine	Vertical water-cooled 4 stroke diesel engine	Vertical water-cooled 4 stroke diesel engine
Rated power and speed		29.4kw 2200r/min	33.1kw 2200r/min	29.4kw 2200r/min	33.1kw 2200r/min
Fuel oil consumption at 12 hours' power (g/kw h)		≤228	≤248	≤248	≤248
Lube oil consumption at 12 hours' power (g/kw h)		≤2.04			
Compression ratio		17	17	17	17
Position total displacement		2.857	3.039	2.857	3.039
Ignition order		1-3-2			
Valve timing	Open of intake valve	12° before t.d.c	12° before t.d.c	12° before t.d.c	12° before t.d.c
	Open of intake valve	44° after l.d.c	12° after b.d.c	12° after b.d.c	12° after b.d.c
	Open of intake valve	52° before b.d.c	52° before b.d.c	52° before b.d.c	52° before b.d.c
	Open of intake valve	12° after l.d.c	12° after b.d.c	12° after b.d.c	12° after b.d.c
Clearance between valve and rocker arm	Intake	0.30-0.35	0.30-0.35	0.30-0.35	0.30-0.35
	Valve exhaust	0.35-0.40	0.35-0.40	0.35-0.40	0.35-0.40
Cooling method		Forced cooling circulation			
Fuel injector Pump type		Series I 2-cylinder plunger	Series I 2-cylinder plunger	Series I 2-cylinder plunger	Series I 2-cylinder plunger
Cylinder specification		8	8	8	8
Governor pattern		Mechanical centrifugal			
Oil pump pattern		Eccentric inner and outer rotor			
Oil pump pressure Mpa		0.196-0.490	0.196-0.490	0.196-0.490	0.196-0.490
Fuel injector injecting pressure Mpa		18.5-19.5	18.5-19.5	18.5-19.5	18.5-19.5



Type of tractor Parts and data	HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Diesel fuel	Paper filter element			
Filter pattern				
Filter fuse model	C0810	C0810	C0810	C0810
Water pump	Centrifugal			
pattern				
Engine type	SL3105BT	SL3105BT	SL3105BT	SL3105BT
Oil filter pattern	Paper filter core			
Filter core model	J0810	J0810	J0810	J0810
Air cleaner type	Paper filter			
Starting pattern	Electrical			
Starter power kw	2.5			
Voltage v	12			
Net weight of engine kg	320 <sup>+10</sup>	320 <sup>+10</sup>	320 <sup>+10</sup>	320 <sup>+10</sup>
Overall size L×W×H mm	764×510×711	764×510×711	764×510×711	764×510×711
Air compressor type	Z-0.04/T or TY29Z0.03/T			
Average displacement	Z-0.04/T: 40; TY29Z0.03/T: 30			
Rated pressure kPa	700			

### 3. Transmission system

Tractor type Name of parts	HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Clutch	10 inch, Single or dual acting, dry friction			
Gearbox	Double shaft, meshed gear $4 \times (2+1)$ combine type			
Central drive	Helical bevel gear pair			
Differential gear	2 planetary gears in bevel gear form			
Differential lock	Plug form			
Final drive	Planetary gear in bevel gear form			
Front axle	Totally enclosed bevel gear form			
Transfer case	Spur gear			



#### 4. Running, steering, brake

Tractor type Parts and Data	HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI M-454
Frame type	Without frame			
Front axle	allance-type inverted U-pipe		Bevel gear reducer triple housing	
Front axle hunting angle	±12°		±12°	
Front wheel toe-in (mm)	4~8		4~11	
Front wheel camber	2°		3°	
King pin inclination	8°		8°	
Front wheel tyre specification	6.00-16	6.00-16	7.5-16	8.3-20
Rear wheel tyre specification	11.2-28	12.4-28	11.2-28	12.4-28
Front wheel tyre pneumatic pressure kpa	195~220		80~120	
Rear wheel tyre kpa	80~120			
Steering gear pattern	Spherical worm rolling or cyclic spherical / circular Sector, ribbon type or hydraulic steering gear			
Brake	Bi-disc oil bathing discal brake			

## 5. Working equipment

Tractor type Parts and date		HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Lifter type		Semi-separated			
Geared pump type		CBN-E310L-X1(left-hand flat mouth joint)(TY395lift pump: right hand spline			
Constant current type		CBT-E306HL062BIR9(right-hand flat mouth joint) (TY395lift pump: right hand spline joint)			
Distributor type		External off-load control			
Cylinder(diameter×stroke)mm		Single-acting $\Phi 85 \times 110$			
System and cylinder s valve pattern afety		Clearance damping brake direct-acting conic valve direct-acting			
Rated pressure of system safety valve Mpa		16	17.5	16	17.5
Open pressure of cylinder		$18 \pm 0.5$ Mpa			
Max. lift force of the 610mm away from b.d.c		6.7	7.5	6.7	7.5kn
Tillage depth control		draft control and floating control			
Hydraulic take-off joint	Specification	M18×1.5			
	Quantity	1			
	Output quantity	18 l/min			
Suspension pattern		Rear-placed three points suspension			
Suspension connecting triangle		$460 \times 718 \pm 15$ (height×width)			
Diameter of joint pin of upper link		$\Phi 19$			
Diameter of joint pin of lower link		$\Phi 22$			
Power take-off shaft		semi-dependent			
Speed r/min		Choose any two of 540,720 or 1000			
Rotation direction		Clockwise ( face to the advancing direction )			
Dimensions of PTO spline shaft		Type I (6-35×28.91×8.69 ) [GB/T 1592-1989]			
Diameter of pulling pin		$\Phi 30$			
Ground clearance mm		620 (midpoint)			
Trailer	Diameter of joint pin	$\Phi 30$ mm			
equipment	Ground clearance of joint pin	620	620	620	620



## 6.Electrical system

Tractor type Tractor type And Data	HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Electrical system	single-line system, negative strap			
Starting engine	QD142 14V 2.5kW		QD142 14V 2.5kW	
Generator	JF131 14V 350W		JF13114V 350W	
Accumutator	3-QA-150 (12V) ( two )			
Back light assembly	160.48.023			
Turning signal	760 small lights 12V			
Rectangle light	160.48.022			
Starting switch	JK290A or JK424			
Horn	DL38-12V			
Flasher	SG122B			
Turning signal switch	JK812-1			
Water thermometer	Type CA-10 12V (40~100° C)			
Oil pressure gauge	Type CA-10 12V ( 90~0.5 MPa )			
Ammeter	307A ( -30~0~+30 A)			
Air pressure gauge	0~1 Mpa			

## 6. Air cushion brake equipment

Capacity of air chamber	12
Rated pressure of air chamber	560
Air cushion brake valve type,	ZDF-001
Working pressure of air cushion brake valve	500

## 8.Main filling capacity

Tractor type Parts and Data	HUANGHAI JM-400	HUANGHAI JM-450	HUANGHAI JM-404	HUANGHAI JM-454
Fuel tank L	35	35	35	35
Engine oil sump L	6	6	6	6
Final drive of Gearbox, Rear axle and Transfer case L	30	30	31	31
Front axle L	---	---	---	---
Steering gear L	0.3-0.8	0.3-0.8	0.3-0.8	0.3-0.8
Hydraulic lifter L	12	12	12	12
Cooling water L	12.5	12.5	12.5	12.5



## Chapter II Run-in of a New Tractor

### I . Preparations before Taking Run-in

1. Outside tighteners should be inspected and screwed down.
2. Lube grease should be filled into every lubrication spots.
3. Inspect oil levels of engine, gearbox, rear axle, transfer case, final transmission, front drive axle, steering gear, lifter and fuel oil box, and replenish it with oil if insufficient.
4. Fill up with fuel oil and cooling water.
5. Inspect pressure of tires.
6. Inspect specific gravity and level of electrolyte in accumulator.
7. Push the transfer case lever to work gear (4-wheel drive)

### II . Idle run-in of engine

Engine runs at low, middle and high-speed for 7, 5, 3 min respectively. In the course of idle run-in, the occurrence of abnormal noise, other phenomena, leakage of water and oil, and abnormal oil pressure should always be inspected. If any abnormal phenomenon is found, the engine should be stopped and inspected. After the breakdown is fixed, run-in should be taken again.

### III. Run-in of output power axle

#### 1. Run-in of output power axle

While the engine runs at middle speed, place the PTO shaft to positions of high speed and low speed to take run-in for 5 min, then slip the handle to neutral position.

#### 2. Run-in of hydraulic system

After farm implements are mounted on suspension mechanism, lift the handle under the highest gear of engine to go up and down for 10 min. at least 20 times. After run-in, set the handle of distributor at drop position.

### IV. Run-in of idle driving and loaded (49.5h)

#### 1. Run-in time at every stage

Gear	1st	2nd	3rd	4th	5th	6th	7th	8th	1st reverse	2nd reverse	3rd reverse	4th reverse
Run-in time at idle driving (h)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Run-in time at light load (h)		2.5	3	3	2.5							
Run-in time at middle load (h)		3	5	5	5							
Run-in time at heavy load (h)		3	4.5	4.5	3							

## 2. Load value at run-in

Types of tractors Run-in pulling load	Huanghai Jinma-400 (11.2-28)	Huanghai Jinma (12.4-28)	Huanghai Jinma (11.2-28)	Huanghai Jinma (12.4-28)
Light load (N)	2050	2325	2580	2925
Middle load (N)	4100	4650	5160	5850
Heavy load (N)	6150	6975	7740	8775

When taking run-in, the gears should be adjusted from low to high ones step by step, load changes from light to heavy ones successively. In the course of idle load and light load run-in, gears of engine is at 1/3 opening, and for other two run-in, at full opening.

Pay attention to the following in the course of run-in.

1. Performance of the engine, transmission system, steering system and readings of instruments.
2. See if the operation of clutch, gear box, transfer case and front drive axle brake are normal.
3. If differential lock can be jointed or separated.

4. Performance of electrical equipments

If abnormal phenomena or obstacle is found in the course of run-in, its cause should be checked and disposed before its taking run-in again.

## V. Operation after run-in



After load run-in ends, the following operations should be done before a tractor is put into utilization.

1. Drain off lubricating oil in the oil sump of the engine while it is hot after engine stops; Then clean the oil sump, filter and strainer, and fill up with fresh lube oil.

2. Drain diesel oil out of the gearbox, back axle, transfer case, final transmission, front drive axle and steering gear while the engine is hot, and the tractor should be operated for 2-3 min. for the second gear and reverse gear respectively, then drain off diesel oil and fill up with fresh lubricating oil.

3. Clean diesel filter (strainer in the fuel box included) and air filter.

4. Drain off cooling water, clean cooling system of the engine with fresh water.

5. Drain off work oil in the hydraulic system while the engine is hot, fill up with fresh work oil after the system is cleaned.

6. Inspect free travel of the front wheels' toe-in, clutch, brake pedal, adjust it if necessary.

7. Inspect and screw down bolts and nuts of main parts.

8. Inspect the clearance between spray nozzle and valve, adjust them if necessary.

9. Inspect electrical system.

10. Fill all oil filling cups with lubricating oil.

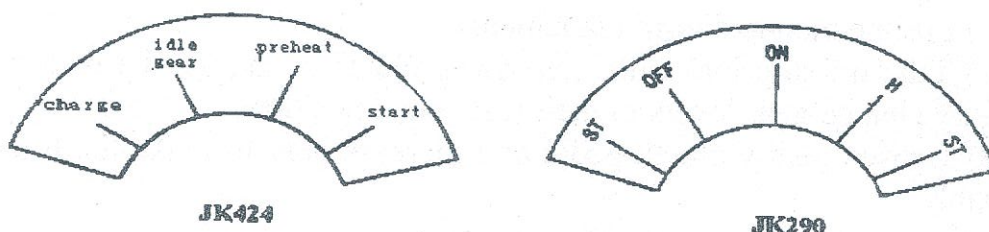
## Chapter III Operation of Tractor

### I. Operation and Driving of Tractor

#### 1. Start of the engine

Inspect fuel oil, lubricating oil, cooling water, and make sure that all parts are all normal, oil lines should be unimpeded without air, change-gear lever should be set at neutral position, engine shutoff link should be pushed to start position, oil sump of hydraulic system should be ensured that oil is sufficient if it is separated.

##### (1) Start at normal temperature (Fig 3-1)



(Fig 3-1)

Step down clutch pedal, set hand throttle at central position, turn start switch to the "on" or "ST" position, and then turn it to ON or CHARGE position promptly after the engine starts to connect the power supply. If the engine can not be started within 10s., it should be started again every 20s.. If start fails for 3 times, start operation should stop and to check the breakdown should be carried out.

##### (2) Start at low temperature

Preheater should be used when start operation is made at low temperature (lower than 5°C). Push the hand throttle to the first gear position, then turn start switch to PREHEAT or "H" position for 15-20s, and then turn it to START or "ST" position, and turn the switch to CHARGE or "ON" position once the engine starts, push the throttle into the second gear position.

##### (3) Start in cold seasons

If the engine can not be started according to the above operation, the following measures should be adopted.

- a. Drain out diesel oil in the oil sump, heat the diesel oil to 80-90°C



and then fill up with it; Stir it evenly from deteriorating.

b. Fill the cooling system with 80-90°C hot water until temperature of drainage water reaches 40°C, then start the engine according to the start procedure like that under low temperature.

Note:

(1) The engine is prohibited from starting if the water tank contains no water and the oil sump lacks oil.

(2) After the engine starts, if the motor rotate swiftly while the throttle turned down, an emergency measure must be taken to stop the engine, wrench out the nut on the high pressure oil pipe from oil injector pump to oil injector nozzle, and pull out oil pipe to cut off oil lines.

## 2. Start of tractor

(1) Lift the mounted farm implements

(2) Take off stop lock unit, step down clutch pedal, set the main and secondary change-gear levers to their respective positions.

(3) Loosen gently clutch pedal and increase gear to make the tractor start stably.

## 3. Choice of gears and speed of tractor

(1) Gears of tractor

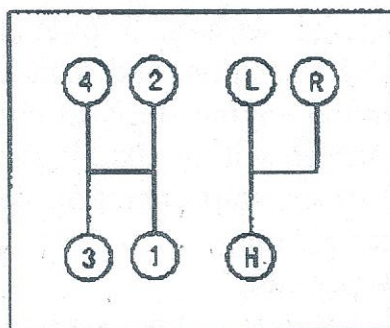


Fig 3-2 Gears

The gearbox with climbing gear has 16 forward gears and 8 reverse gears. When climbing handle is set in high-speed position, keep original 8-gear-box's 8 forward gears and 4 reverse gears on; When climbing gear is set at low-speed, there are 8 low-speed gears and 4 low-speed reverse gears.

The gear box without climbing gear has 8 forward gears and 4

reverse gears.

## (2) Choice of travel speed

If travel speed of the tractor is chosen rightly, the best productivity and economical results will be gained and its life will be prolonged. The tractor should not be overloaded, its actual load should be about 80% of the rated load when it works in the fields.

Basic operation gears while tractor works in fields cultivator are of that: plowing chooses the second, third and fourth gears, roto-cultivating chooses the first and second gears, climbing chooses the sixth, seventh and eighth gears, harrowing land chooses the third, fourth and fifth gears, sowing chooses the third and fourth gears, harvesting chooses the third gear, transport on the fields byways chooses the sixth, seventh and eighth gears, furrowing (when section area of the channel is  $0.4\text{m}^2$ ) chooses the first climbing gear.

## 4. Steering of tractor

When the tractor turns, its throttle should be reduced properly, then swing the steering wheel to change direction. If the tractor is worked on soft soil or muddy ground, one side brake could be taken, that is to step down the relevant side's brake pedal while steering wheel is operating.

## 5. Application of differential lock

When the tractor does not march forward as single-side rear wheels skid, adjust the differential lock as the following:

(1) Step on the clutch pedal to low-speed gear.

(2) Turn up the throttle to the max. point.

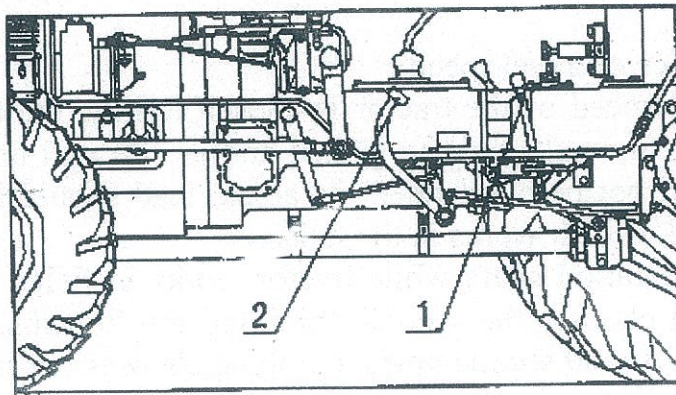
(3) Make the differential lock handle under driver seat to be connected, loosen the clutch pedal gently to make clutch adjoined together, its two driving wheels turn, then it will pass the slipping area.

(4) After the tractor passes the slipping area, the handle of differential lock should be loosened away.

## 6. Application of front drive axle (4-wheel tractor)

When the tractor works in the fields with heavy load or on moist soft soil, 4-wheels drive could be undertaken with the cooperation of front axle to get better adhesive force. Pull back the handle (1) at the left bottom of driver seat (Fig 3-3) to make driving force pass to front drive axle through transfer case (To pull back or push awards the handle could be done only if clutch separates. ).





1. Operation lever      2. Clutch pedal

Fig 3-3 operation of front driving

#### 7. Stop of tractor and engine

If the tractor stops for a while, the engine doesn't have to stop; While it should stop for a longer parking. It stops according to the steps listed below:

- (1) Turn down the throttle and slow down the tractor.
- (2) Step down clutch pedal, push gear lever to the neutral position, then loosen clutch.
- (3) After the tractor stops, the engine should be adjusted to run at low speed for a while to reduce water and lube oil temperature; No stopping the engine at high temperature.
- (4) Pull stop lever to the stop position.
- (5) Turn start switch to "off" position, switch off electricity supply.
- (6) Step down brake pedal and lock the installation with stop lock when it stops.
- (7) Drain off cooling water to prevent cylinder and water tank from freezing and damaging.

#### 8. Pay attention to the following points when you operate the tractor:

- (1) You should often see if the readings on the instruments are normal while you drive the tractor.
- (2) The engine must not work too long if water temperature is less than 70°C; And the engine must stop to inspect when water temperature is more than 95°C.
- (3) Listen to the engine and the tractor carefully, observe performance of outside parts. If there is something wrong, stop it to inspect at once.
- (4) While the tractor is traveling, the driver must not step on the clutch pedal or brake pedal.
- (5) To step down clutch pedal should be done prior to step down

brake pedal for stopping the engine. If emergency occurs, to step down clutch and brake's pedal simultaneously. Stepping down brake pedal only is forbidden.

(6) Place hydraulic lifter lever in neutral position for transportation, pull transmission plate of brake pedal to connection position to make right and left brake locked so as to prevent from turning over.

(7) Before the tractor goes up or down along a slope, one gear should be chosen rightly, while it goes along a slope, don't change gear and slide.

(8) When the tractor goes down a slope during transportation; It is not permitted to step on brake pedal heavily if inertia of trailer is more than that of the tractor or the road is slippery, you can but adjust gear to speed up or the trailer may push the tractor over.

(9) To switch throttle down and change to low gear when the tractor goes on uneven road or passes obstacles; Don't control speed by stepping over clutch pedal and don't pass obstacles with instant connection.

(10) Gear down when the tractor turns, sharp turning is prohibited at high speed or when plough is under the soil.

(11) If the tractor cocks during its operation, step over clutch pedal promptly and remove overload away.

## II. Application and Operation of Working Equipment of Tractor

### 1. Application of PTO shaft

run at a high speed      neutral gear      at a low speed

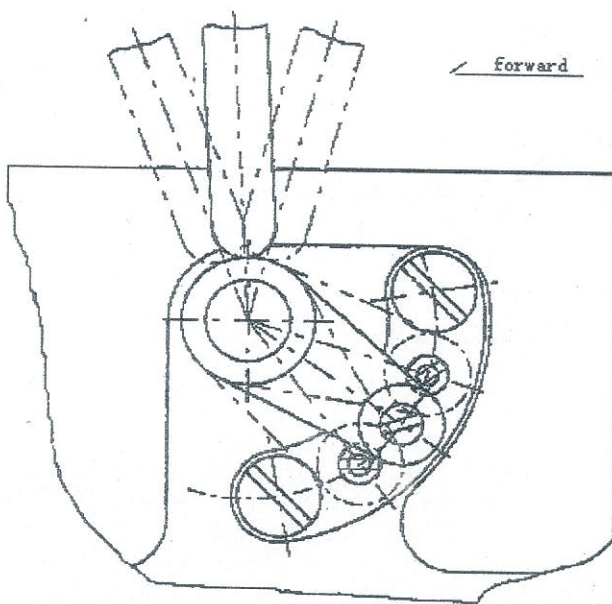


Fig 3-4 Sketch map of the lever of PTO shaft



The PTO shaft has two rotating speeds, high rotating speed is 1000r/min, low rotating speed is 540r/min; Any 2 rotating speeds can be chosen among 540r/min, 720r/min and 1000r/min by users (Note: The rotating speed of PTO shaft is 80-90% of the rated rotating speed of the engine).

The operation of PTO shaft is given as follows:

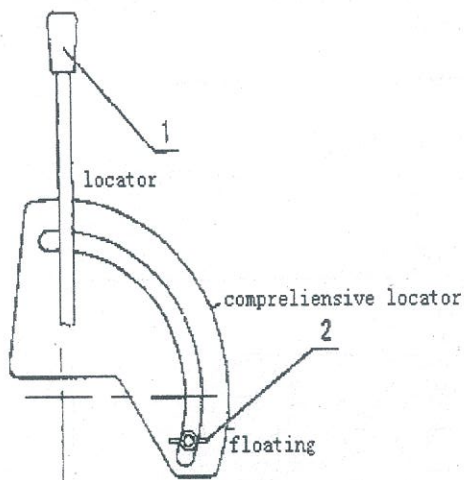
(1) Pull the handle of PTO shaft to neutral, remove protection cover of the PTO shaft, then connect working mechanism to the PTO shaft.

(2) Step on the clutch pedal to the lowest position to separate clutch of PTO shaft, then pull the handle to the proper gear.

(3) Loosen the clutch pedal gently to make machine operate; Observe operation with low gear, then speed up to put into operation normally.

## 2. Application of hydraulic system

Hydraulic suspension system has three kinds of control ways, which are force , position and float control. These controls are available through latter parts like force control spring assembly, right plate lift axle, welding part of middle arm, connection rod, feedback rod.



① Handle ② Butterfly nut of limit block

Fig 3-5

## (1) Application of hydraulic suspension system lever

The operation of the hydraulic suspension system practices through the handle's adjustment.

1) Force and position comprehensive control

When soil resistance rate changes notably for plowing, the force and position comprehensive control will be utilized. Plowing depth gets bigger while the handle pulled down, vice versor. After the handle is adjusted to the proper position, screw down the butterfly nut of the handle limit block.

2) Position control

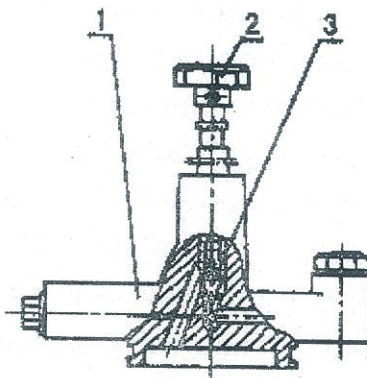
Force control spring does not work when the tractor makes such works like roto-cultivating, weed cutting, harvest and etc. as the suspension lift lever bears pull force; Above comprehensive control only plays a role of position control, the farm implements drops lower while the handle pulled down more within the position control.

3) Float control

When a farm implement with ground wheels is used, the float control should be applied; The lever should be set within the float control limit so that the implement undulates the ground with its land wheels.

(2) Control of fall speed of farm implement

Adjust the control handwheel②of fall speed to make changes (see Fig 3-6 ). A Proper fall speed will avoid damaging the farm implement as fall speed is too fast.



1.cylinder head 2. control handwheel of fall speed 3. control valve of fall speed

Fig 3-6 Application of fall speed control valve



Fall speed handwheel ② directly controls fall speed valve ③ of cylinder head ①, clockwise screw fall speed handwheel ②, then the farm implement fall speed gets slow; On the contrary, fall speed gets fast.

When the tractor goes a long distance with implement, screw fall speed handwheel down ② but not to the dead point.

### (3) Simple hydraulic output

If pressure oil is needed, remove the cock from hydraulic output mouth on the top cylinder head, and connect it with high pressure oil pipe; At the same time, remove the oil recycle cock on the lifter case, connect it with oil recycle pipe to realize hydraulic output. During the operation, the suspension lever should be set at the lowest position; screw the fall handwheel to the dead point, then set the handle in "LIFT" position, so that pressure oil can be transmitted into the relevant hydraulic equipments. Pull down the handle, oil from hydraulic pump returns to an oil pool, oil from the hydraulic installation returns to the oil pool through the oil recycle pipe.

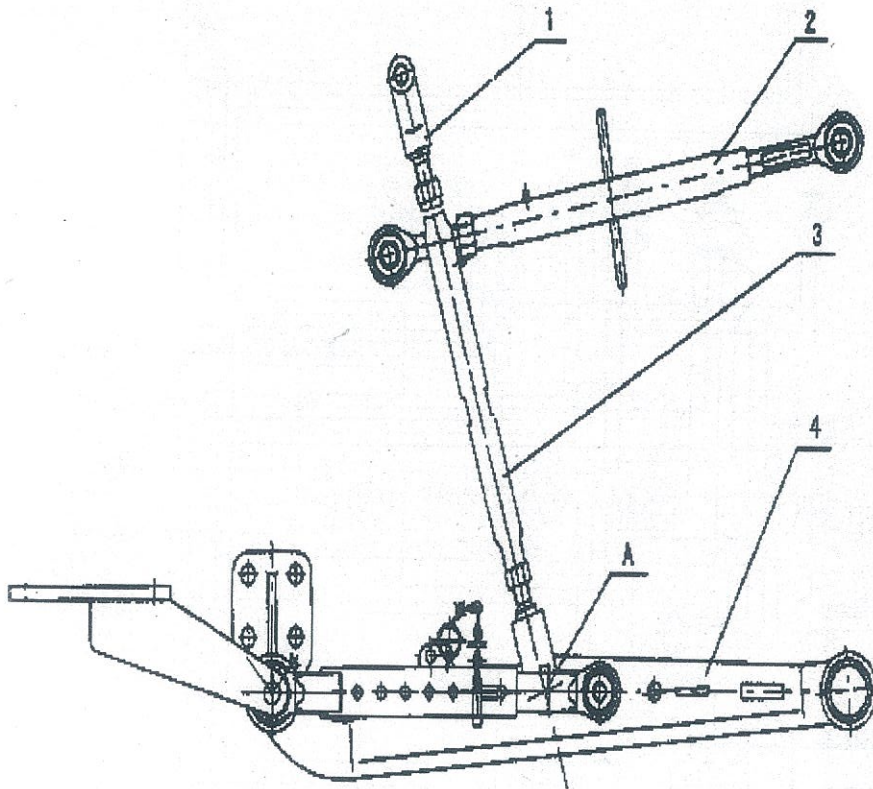
(4) Hydraulic output with hydraulic output valve: Such series of tractors may be attached with one or two groups of hydraulic output valves. Connect output oil pipe with instant changeable connector on oil recycle pipe during hydraulic output; Lifter can not work when hydraulic output is on; Contrary, it works when the valve lies at the neutral position.

### (5) Connection of suspension mechanism and hitched plough.

#### 1) Preparation of suspending plough

Fix the upper lever into the central hole in force adjustment spring sway-arm (Fig3-7), connect upper end of the left lift-rod to the front hole A in the left lower link, lower end of right lift-rod to front hole A in the right lower link. There are 4 joint holes in force control spring sway-arm (or position control stand). When force position comprehensive control works, the upper central hole is usually used; the upper hole is used if load is light, the lower hole is used for 45 horsepower, the central lower hole is used under 35 horsepower 4-wheel drive and 45 horsepower works normally, central upper hole is used for light load. Choice of the holes can

be adjusted according to plowing force.



1. right lift lever    2. upper link    3. left lift lever    4. lower link

Fig 3-7 Suspension mechanism

## 2) Mounting of plough

Slant link connects lower suspension point to hinge point of lower Link through adjustment of spiral pipe of lift rod, joint bolt of upper suspension point of upper link is connected to the upper suspension point of plough with self-adjustment.



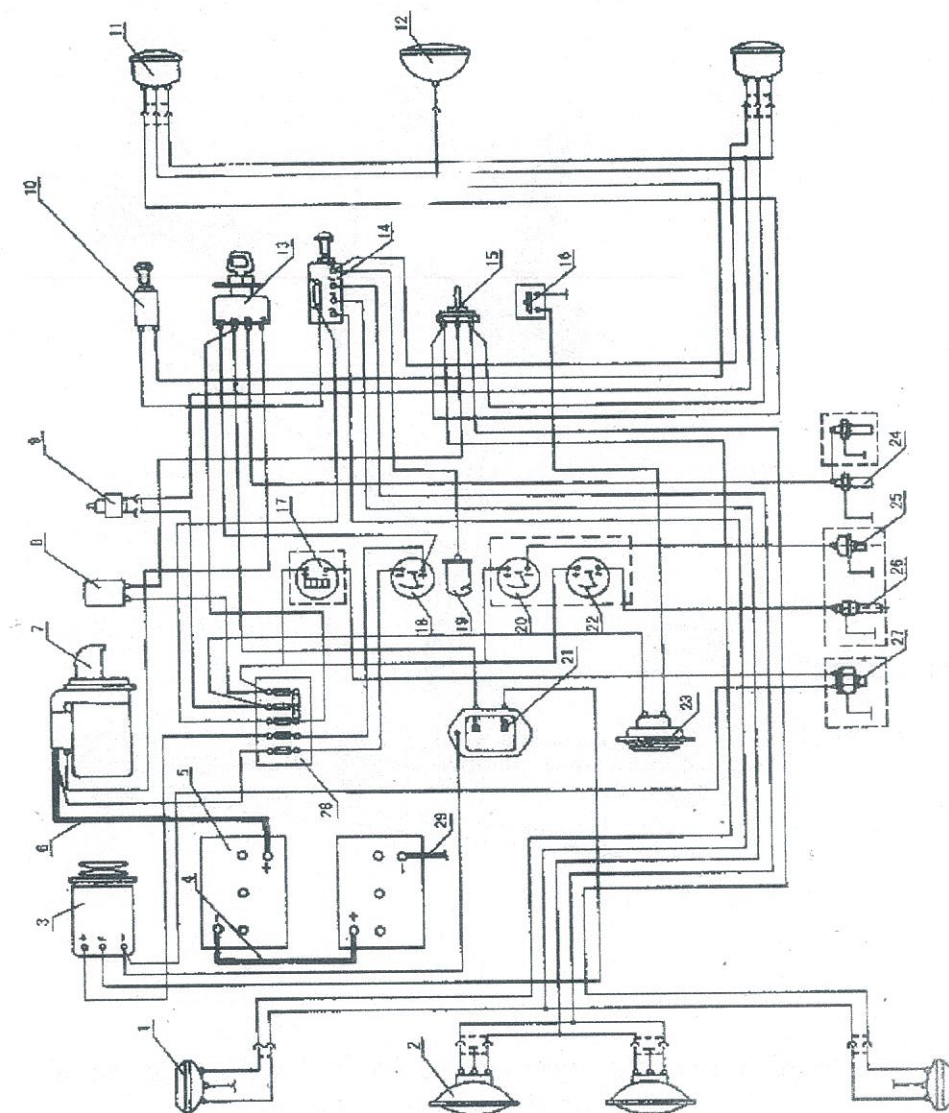


Fig 3-8 Electrical line principle

1. Corner lamp 2. Head lamp 3. A.C generator 4. Accumulator serial cables 5. Accumulator 6. Cable between accumulators and starting motor 7. Starting motor 8. Flasher 9. Switch for brake lamp 10. Single-throw switch 11. Dual-color rectangle lamp 12. Work lamp 13. Start switch for pre-heating 14. Three-throw switch 15. Corner lamp switch 16. Button for loudspeaker 17. Hour meter 18. Ammeter 19. Instrument panel lamp 20. Oil pressure gauge 21. Adjustor 22. Thermometer 23. Horn 24. Pre-heating plug 25. Sensor for oil pressure gauge 26. Thermo sensor 27. Pressure switch 28. Fuse box 29. Cable for accumulators

### 3) Adjustment of plough

a. Right and left horizontal adjustment of plough stand, Adjust length of right and left slant links to reach proper plowing depth, keep plough stand horizontal to get same plowing depth.

b. Front and back longitudinal adjustment: Adjust the upper link on the suspension. When front plowing is too deep or back plough heel departs from furrow bottom, adjust upper link, if back ploughshare is too deep, adjust plough stand to level.

c. Adjustment of plowing width: Plowing width can be adjusted through plough width adjustor, shift its lower suspension point awards, so plough width gets wider, on the contrary, plough width gets narrower, so that re-plowing or missing-plowing will not take place.

### III. Application and maintenance of electrical system

The electrical system of the tractor adopts single line of 12 voltage, the cathode joined iron; And its electrical system principle is exhibited in Fig 3-8.

#### 1) Composition of electrical facilities

The electrical facilities are mainly used to start tractor, supervise performance of diesel engine, lighting and signals etc. Its supervisory meters and steering button are all mounted on the panel in front of drivers. Functions of the electrical facilities fall into the followings.

(1) Power supply: It consists of silicon rectifying A.C generator, voltage regulator and accumulators.

(2) Starting parts: consists of start motor, electrical heating cock etc.

(3) Meter installations: it includes ohmmeter, oil pressure meter, speed meter, oil gauge and water thermometer ( oil gauge and speed meter are chosen to install).

(4) Lighting and signal facilities: front lamp, back work lamp, front corner lamp, back lamp group, flasher and horn, etc.

(5) Accessories: fuse case, socket for suspensor (selective), start button and brake light switch, etc.

#### 2. Application and maintenance of electrical equipments

To guarantee electrical system works normally, it should be maintained regularly. You should inspect to see if electrical parts can work normally, connectors are loosened, insulating layer has been damaged. If there is something wrong, repair them as soon as possible. During the tractor is under operation, the following key parts should be maintained



regularly:

(1) Accumulators: The accumulators with plastic case have a capacitance of 150Ah. The cock of the injection hole should be screwed off before the new accumulator will be filled with electrolyte; Remove seal to keep air hole unblocked. Fill every single hole with electrolyte [specific gravity 1.26, more than 35°C or 1.28, less than 25°C], liquid surface should be higher 10-15mm than protection plate, generally, the liquid surface should lie between the upper and the lower line marked on the case.

After the accumulator is filled with electrolyte for 1 hour, screw cock of injection hole and it can be directly installed to the tractor for emergency. Accumulator should often be kept sufficient, replenish electricity if necessary. If the tractor is idle for a long term, dismantle accumulator, charge electricity once monthly, keep specific gravity of electrolyte and level of liquid surface a constant.

#### (2) Generator

The outside of generator should often be cleaned, joint bolts in particular, wire connection should be kept stable, motor belt should be tension proper, generally its tension is proper if its middle part can be pressed and 10-15mm sag got.

(3) After the start motor works for 1,000h, it is to be maintained once according to the following measures:

①Inspect to see if fixing bolts of start motor are tight, insulating cover is damaged, wire connection is stable.

②After the tractor works for 1,000h, inspect the steering gear and electric brush once. If the steering gear surface is burned and corroded severely, use fine abrasive papers to polish it. Exchange the electric brush if it is worn or broken. Fill axle sleeve with lubricating oil.

③Turning on of start button must not exceed 10s for starting the engine, an interval between starts is not less than 2 min. The engine should be pre-heated in winter if starting is difficult. Don't start if continuous starts fail for 3 times, inspect its trouble and repair it

④After loosening start button, cut off wires between accumulator

and start motor at once if electromagnetic switch of start motor can not turns off electricity supply itself and start motor still operates during starting engine; Inspect it and repair it.

#### (4) Instruments

Diesel oil pressure gauge and water thermometer are mainly used to monitor the engine performance, hour meter is used to record the operation time of the tractor, ohmmeter is used to supervise electric system performance. You should often watch these instruments so as to find troubles in time and fix them.

#### (5) Lighting and signal device

Lighting and signal device is mainly used for the tractor working at night, fix breakdown at once if it is out of order. It is replaced by new same parts but not other parts if it is damaged.

#### (6) Accessory electrical unit

① Fuse box. The fuse box has 5 groups, each has fuses to protect electrical facilities; They should be installed according to the regulated standards. If they are often melted down, find their breakdown and fix it. No changing fuse standards, or the electrical facilities damage easily.

② Start button. The start button is used to turn on electrical circuit of the whole machine, start and preheat the engine. The start buttons fall into JK424 and JK290. Turning JK424 button a division counterclockwise can turn on circuit of the whole machine, turning it to the first division clockwise can turn on preheating unit, turning it to the second division can turn on the start motor clockwise. After the engine starts, turn key back to charging state. Turning JK290 button to the first division counter clockwise can turn on start motor, turning it to the first division clockwise can turn on the whole machine, turning to the second division clockwise can turn on pre-heating unit, turning to the third division clockwise can turn on start motor. After engine starts, turn the key to "ON", and the key is fixed to "ON" or charge state during the tractor works. If the tractor is idle for a long period, the key should be put out to cut off the electrical circuit of the whole machine.



#### IV. Fuel Oil and Lubricating Oil of Tractor (Fig 3-1)

Tab. 3-1 Fuel oil and lubricating oil

Utilization positions of oil	Seasons and environmental temperature	Standards of oil
Fuel oil box	Summer (environmental temperature more than 10°C)	No.10 light diesel oil (GB/T 252-1994)
	Winter (environmental temperature less than 10°C)	No.20 light diesel oil (GB/T 252-1994)
Oil bottom case of engine, lifter, hydraulic steering gear air filter oil plate, oil spray pump	Environmental temperature less than 0°C	No.20 diesel oil (GB/T 5323-1994)
	Environmental temperature 0°C-25°C	No.30 diesel oil (GB/T 5323-1994)
	Environmental temperature more than 25°C	No.40 diesel oil (GB/T 5323-1994)
Transmission box, transfer case, front driving bridge, steering gear	Summer (environmental temperature more than 10°C)	No.40 diesel oil (GB/T 5323-1994)
	Winter (environmental temperature less than 10°C)	No.30 diesel oil (GB/T 5323-1994)
All butter nozzles	Any seasons	ZFG2 compound ca base lubricating oil (SH0370-1992)
Engine, start motor, bearing 6204-LS	Any seasons	ZFG2 compound ca base lubricating oil (SH0370-1992)

#### 2. Notes:

Apply clean fuel oil to prevent the engine from breaking:

(1) Before fuel oil is filled the oil sump let it settle for more than 48 hours and then absorb upper to middle layer fuel oil.

(2) The fuel oil should be filtered before it is filled into the oil box.

(3) Oil injection tools should be kept clean.

(4) Clean fuel oil box regularly, drain off sediment oil, clean filter.

#### 5. Cooling water of tractor

1) Cooling water should be soft water to prevent the cooling system from producing water stain.

2) Hard water (well water, spring water etc) should be softened before it is used as the following:

① Boil hard water, then let it settle and filter it.

② Add 1.5g caustic soda in every liter of hard water.

Add freezing proof liquid into cooling water when in cold place.

## Chapter IV Technical Maintenance of Tractor

The technical maintenance of tractor could be divided into the following classes according to accumulated working hours:

1. Technical maintenance every shift before or after every shift.
2. Class 1 technical maintenance it should be made every 50 hours.
3. Class 2 technical maintenance it should be made every 250 hours.
4. Class 3 technical maintenance it should be made every 500 hours.
5. Class 4 technical maintenance it should be made every 1,000 hours.

### 1. Technical maintenance of every shift

(1) Remove dust and mud on the tractor and tools and clean air filter under dusty and sandy environment.

(2) Inspect to see if outside main nuts and bolts, nuts on the front and back wheels in particular are loosened, screw them if necessary.

(3) Inspect liquid level in the engine bottom case, water tank and hydraulic lifter, fill up if necessary. When inspect liquid level in the oil bottom case it should be made at least 15 min after the engine stops.

(4) Inspect to see if any air, oil and water leak out of the tractors, fix them if necessary.

(5) Inspect pressure of tires, fill up with air if necessary.

(6) When the tractor operates in the paddy fields, fill up all oil cups with lubricating oil ( fill up every two shifts in the dry fields).

### 2. Class 1 technical maintenance

(1) Finish items of technical maintenance every shift.

(2) Inspect tension of fan belt, adjust it if necessary.

(3) Fill up bearing of fan pump with lubricating oil.

(4) Inspect oil levels in oil boxes of gear box, back bridge, transfer case, and front driving bridge (4- wheel drive), steering gear and hydraulic oil box, replenish if necessary.

(5) Inspect free travels of clutch pedal, left and right brake pedals, adjust them if necessary.



(6) Inspect electrolyte of accumulator, electrolyte level should higher 10-15mm than its plate ,fill up with distilled water if insufficient. Fill up with electrolyte (specific gravity 1.28) to the regulated level.

(7) Maintain diesel oil filter, clean filter element with diesel.

(8) Open air cork of oil fuel filter and oil cork to remove away water and impurities.

(9) Clean oil filter of hydraulic system with diesel oil.

### 3. The second class technical maintenance

(1) Finish items of the first technical maintenance.

(2) Change diesel oil in bottom case of the engine and clean oil button case and filter web.

(3) Change filter element of diesel oil filter and clean filter case

(4) Clean element of fuel oil filter, remove air in oil lines after installation.

(5) Clean element of air filter and change diesel oil.

### 4. The third class maintenance

(1) Finish items of the second class maintenance.

(2) Inspect and adjust throttle clearance, spray nozzle pressure and atomization, adjust it if necessary.

(3) Change element of fuel oil filter.

(4) Change element of air filter according to the work environment.

(5) Change diesel oil in the oil pump case.

(6) Change diesel oil in the gear box, back bridge, transfer case and front driving bridge, hydraulic lifter, steering gear.

(7) Inspect and adjust front bundle of front wheel.

(8) Adjust free travel of steering wheel.

(9) Wash accumulators with boiled water, and inspect specific gravity of electrolyte in accumulator, the specific gravity should be not less than 1.24. If the accumulator charge or discharge of the accumulator is abnormal, it should be repaired and charged again by electrified wire netting.

#### 4. The fourth class technical maintenance

(1) Finish items of the third class maintenance.

(2) Clean and remove dust on radiator of water tank, and clean the cooling system of the engine.

(3) Determine if cylinder cover is dismantled, and repaired and other parts are maintained according to utilization of the engine.

(4) Screw bolts on the cylinder cover successfully according to the regulated torsion moment.

(5) Clean fuel oil box

(6) Determine if hydraulic suspension system is maintained according to its application.

(7) Once dismantled and repair the electric generator

(8) Determine if starting motor is dismantled and repaired according to its application.

(9) After the maintenance is over, install the machine and make a trial run for a while, then inspect and adjust relevant parts.

#### 6. Maintenance for long-term idle tractor

(1) The tractor had better be put in a dry storehouse if it is long-term idle and suspend it with stand to make both front and back wheels hang in the air.

(2) Clean the outside of the tractor and fill lubricant points with lubricating oil before it comes into the storehouse.

(3) Drain off cooling water from the engine and cover the mouth of exhaust pipe.

(4) Start the engine once every 3 months during it is idle, and operate it for 20min at different speeds to inspect if there is something wrong with it.

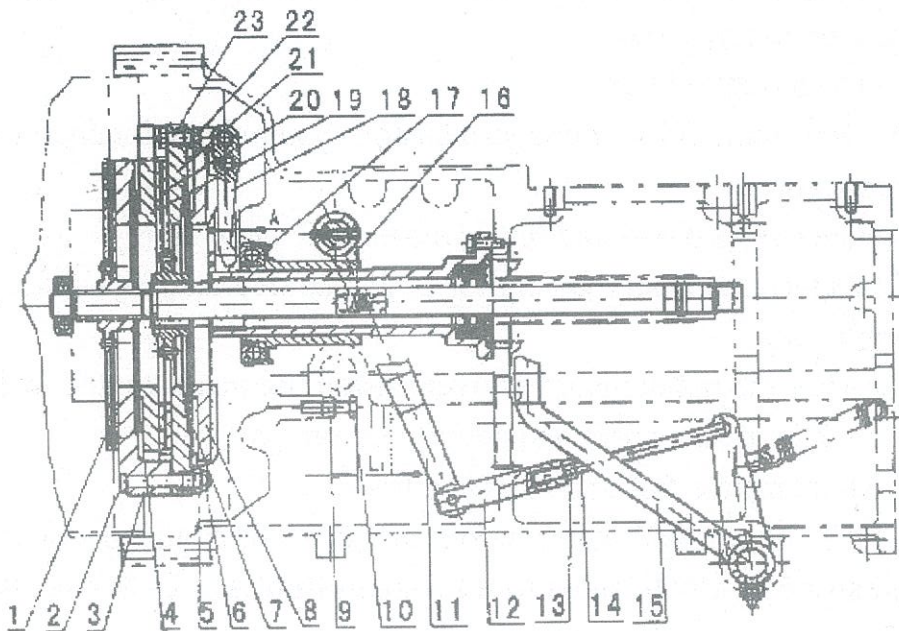


## Chapter V Adjustment of Tractor

### I. Clutch

#### (I) Dual-acting clutch

Adjusting dual-acting clutch:



1.assistant clutch driven plate 2.link 3.assistant clutch pressure plate 4.butterfly spring 5.adjusting nut 6.nut 7.butterfly spring 8.clutch cover 9.nut 10.adjusting bolt 11.release rocker 12.release fork 13.nut 14.release fork rod 15.clutch pedal pad 16.clutch shift fork 17.release bearing 18.release lever 19.fixed pressure plate 20.main clutch driven plate 21.main clutch pressure plate 22.nut 23.adjusting bolt

Figure 5-1 dual-acting clutch

The coupled controlling dual-acting clutch is shown as in the figure 5-1. It is mainly consisted of three parts: driving part, driven part and operating part. The driving part rotates together with engine flywheel. The driven part rotates with the engine only when the clutch is joined.

Adjust the dual-acting clutch on the assembling holder. The adjusting

steps are as the followings. Adjust the length of bolt (10), and make the distance between three release levers (18) and the assistant clutch pressure plate (3) be 100.2mm. The distance error between the three release levers and the pressure plate's top side is less than 0.1mm. After adjustment, tighten M10X1 nut. Through adjusting nut (5), ensure the clearance between the main clutch pressure plate (21) and the adjusting nut (5) to be within 1-1.2.

For adjusting clutch pedal pad's free stroke (see Figure 5-1), firstly adjust the length of the clutch push-rod so as to ensure the gap between the top side of three release levers of the main clutch and the release bearing to be  $2.5 \pm 0.5\text{mm}$  (so as to ensure the idle stroke of the clutch rocker to be  $L_1=5.5\sim 7\text{mm}$ ). After adjustment, tighten the lock nut (9).

Adjust the limit of the clutch pedal pad's working stroke: Loosen nut (9), rotate adjusting bolt (10) to make the clutch release rocker (11)'s lower part's working stroke  $L_2$  of is (23). Then tighten the nut (9).

## **(II) Single-acting clutch**

Adjusting single-acting clutch:

The single plate dry-type single-acting clutch is shown as in the figure 5-2. It is mainly consisted of clutch spring (1), clutch driven plate assembly (2), clutch pressure plate (3), clutch release lever (6), adjusting nut (7), release bearing (9), and its operating mechanism.

Its adjusting method is given as follows:

(1) Adjust the position of release lever:

While assembling the clutch, rotate the adjusting nut (7) to make the distance-B from the working flank of the release lever (6) to the working flank of the pressure plate be 42.5mm. While connecting the clutch, keep the gap-A between the release bearing (9) and the release lever (6) to be 2~3mm. At this time, the working flanks of the three release levers must be within the same surface, the tolerance is 0.25mm.

(2) Adjust the pedal's free stroke:

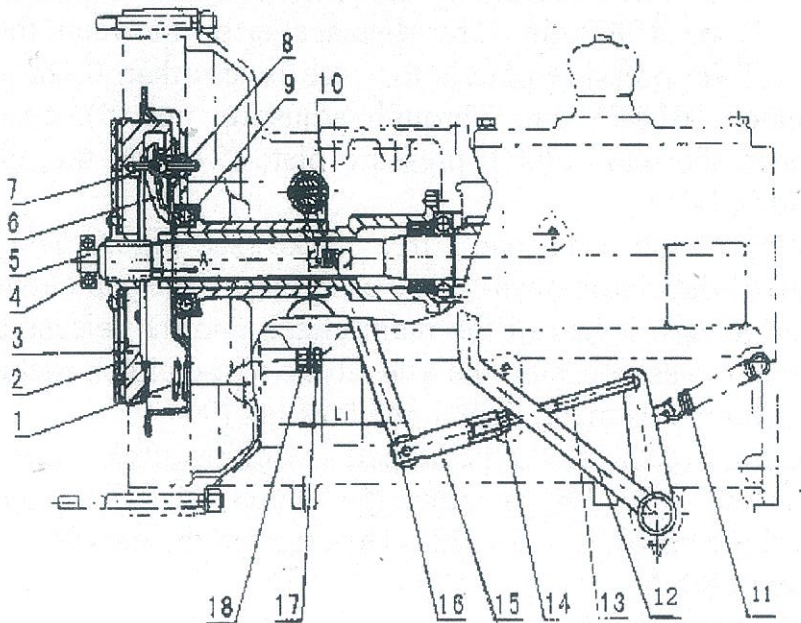
Rotate push-rod adjusting fork (15) to change the valid length of the push-rod (13) till the pedal pad's free stroke reaches  $L=16\sim 32\text{mm}$ . (At this time, the free stroke of the lower part of the release rocker (16) is  $L_1=5.5\sim 7\text{mm}$ .)

(3) Adjust pedal's working stroke limit:

Rotate limit adjusting bolt (17) till the working stroke of the lower part of the release rocker (16) is  $L_2=13\sim 17\text{mm}$ . During operation, often



check to ensure the pedal's free stroke.



1.clutch spring 2.clutch driven plate assembly 3.clutch pressure plate 4.rolling bearing  
5.clutch shaft 6.clutch release lever 7.adjusting nut 8.lock nut 9.release bearing  
10.clutch shift fork 11.pedal pad return spring 12.clutch pedal pad 13.clutch push-rod  
14.lock nut 15.clutch push-rod adjusting fork 16.clutch release rocker 17.limit  
adjusting bolt 18.lock nut

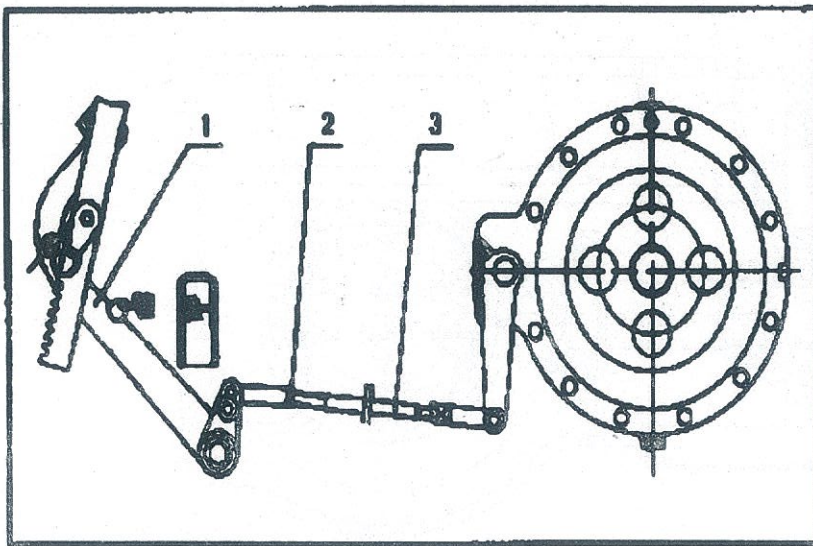
Figure 5-2 single-acting clutch

## II. Adjustment of brake

The free travel of brake's pedal is 70~90mm.

When the brake's friction disc is worn-out, the brake's free pedal travel will increase and bad brake occurrence take place. Therefore, necessary adjustment should be taken.

As shown in Figure 5-3, loosen nut (2), adjust tie (3) to make the brake pedal (1)'s free travel reach 70~90mm, and to make the left and right pedals' free travel almost be the same. Tighten the nut (2) finally.



1.pedal 2.nut 3.link

Figure 5-3 brake

### III. Structure and adjustment of rear axle

The rear axle consists of center drive, differential, differential lock, propeller shaft and other parts.

#### 1.rear axle structure

The center drive is consisted of a pair of spiral bevel gears (Figure 5-4). The rear part of small conical gearing shaft (7) is supported by bearing NUP2210 (6), the front of it is supported by cylindrical roller bearing (8).



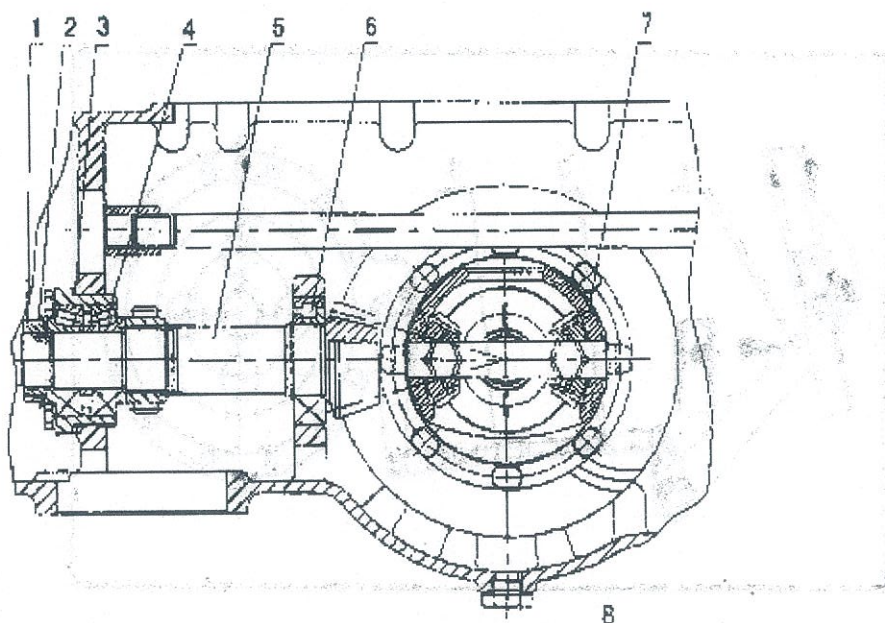


Figure 5-4 center drive

1.round nut 2.lock washer 3.adjusting washer 4.bearing 32209 5.small conical gearing shaft 6.bearing NUP2210 7.differential 8.adjusting nut

## 2.main adjustment of rear axle

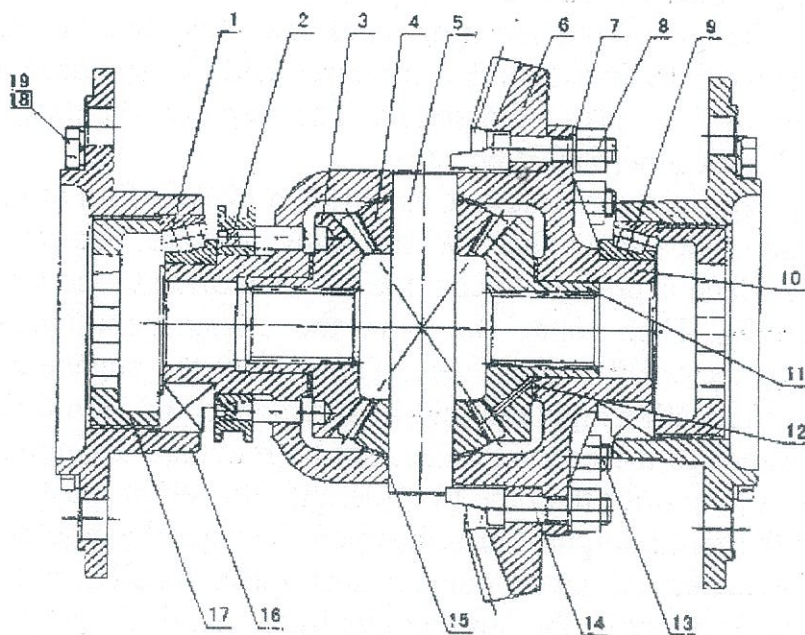
(1) Adjust the small conical gearing shaft (Figure 5-4)

The two bearings 32209 (4) on the small conical gearing shaft (5) are

pre-tightened. The pre-tightened force is about 350N. While the round nut (1) is tightened, the bearing's friction resistance moment should be  $1.5\sim 2.5\text{N}\cdot\text{m}$ . During operation, the abrasion of the bearing causes the small conical gearing shaft to produce axial slack. And the pre-tightened force will reduce down. Therefore, it is necessary to enforce periodical inspections (every third-grade maintenance) for adjustment.

(2) Adjust differential bearing (Figure 5-5).

The left and right differential bearings (1), and (9) are also pre-tightened. During operation, the abrasion of the bearing causes the large bevel gear to produce axial slack. And the pre-tightened force will reduce down. Therefore, it is necessary to have periodical inspections (every third-grade maintenance) for adjustment. For adjustment, tighten the left and right adjusting nut (8) (Figure 5-4) to keep the bearing's axial pressure be about 350N.



1.bearing 30212 2.differential lock assembly 3.left axle shaft gear 4.planet gear  
5.planet gearing shaft 6.large bevel spiral gear 7.lock disc 8.nut M10 9.bearing 30212  
10.differential casing 11.right axle shaft gear 12.axle shaft gear washer 13.big bevel  
spiral gear set bolt 14.catch bolt 15.planet gear washer 16.differential bearing seat 17.  
Adjusting nut 18.bolt M10x25 19.gasket

Figure 5-5 differential



(3) adjustment of central drive bevel spiral gear's engagement (Figure 5-4)

During operation, the increase of meshing backlash caused by gear's abrasion will not bring any influences to gear's normal operation. If the bearing abrasion causes the bevel gear to leave its original engaged position, generally, if the gear's normal operation is not affected, it can be kept unadjusted during operation. However, the engagement adjustment must be done during overhaul or when the gear cannot operate normally or when changing the bearing (differential bearing and small conical gearing shaft) and bevel gear. (after the bearing pre-tightness is adjusted)

1) Check meshing backlash. Insert lead sheet into the space between large and small conical gearing shaft's non-working flank, and rotate the gear to press the lead sheet. Then, take out of the lead sheet, measure the depth near the gear's large end (i.e. meshing backlash) to be within the scope of 0.15~0.3mm. Measure three points on the full circle of the gear evenly. The change of the meshing backlash must not be larger than 0.1mm. If the meshing backlash doesn't agree with the standard, rotate the adjusting nut (8) to make adjustment. The sum of the left and right adjusting nut's adjustment must be zero.

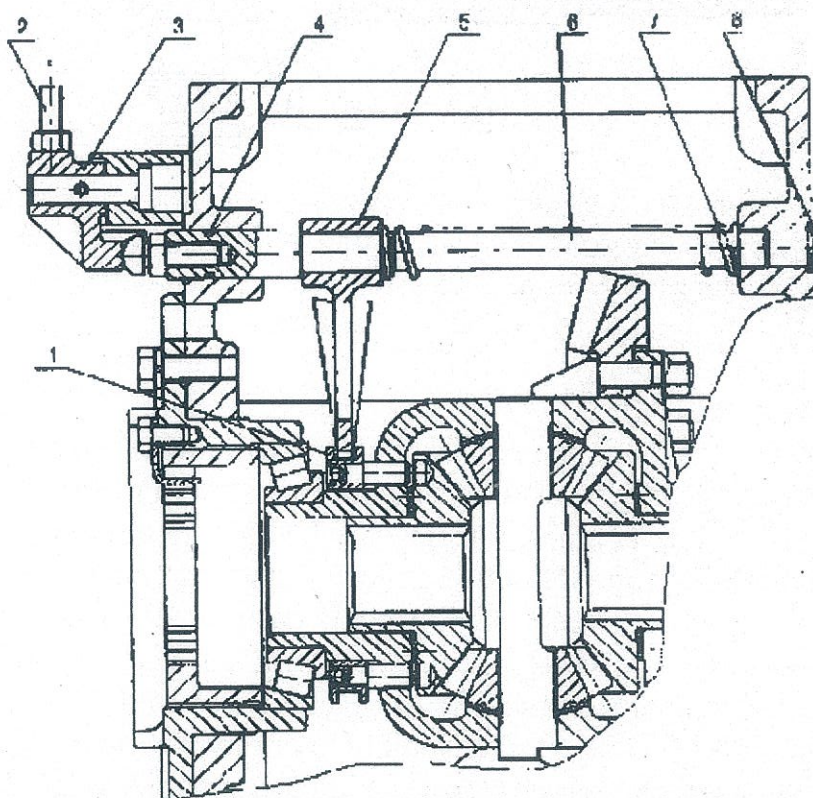
2) Check engagement indent. Coat a thin and even film of red lead oil onto the large conical gear face. While going forward, the small conical gear dished surface is pressed to coat the red lead oil onto the large conical gear's convexity. Then rotate the gear, the engagement indent can be produced onto the small conical gear. The correct the engagement indent must be near the teeth's high and middle pitch cone and lean little to small end. The distance to the end side must not be less than 3~4mm. Its length must not be 60% shorter than the tooth length, its height must not be 50% shorter than the tooth height. For adjustment, change the adjusting washer (3)'s depth to make the small conical gear move axially, and rotate the adjusting nut (8) to make the large conical gearing shaft move axially. In order not to break the differential bearing's pre-tightness, the adjustment sum of the differential's left and right adjusting nuts must be zero. (Figure 5-4)

During adjustment, when the engagement gap is conflicted with engagement indent, (that is, the engagement indent is suitable, but the gap is not suitable,) take the engagement indent as the standard. But the engagement gap must not be less than 0.15mm.



Use six bolts (13) and two planet gearing shaft catch bolts (14) to fix the large bevel gear (6) (Figure 5-5) onto the differential casing (10). There are conical roller bearings (1) and (9) on both ends of the differential casing. Through differential bearing seat (16), use six bolts (18) to install them onto the rear axle casing. There are two planet gears (4) and two axle shaft gears (3) and (11) inside the differential casing. There are washers (12) and (15) between the planet gears and axle shaft gears and the differential casing. The planet gears are rung onto the planet gearing shaft (5). There is nick on one end of the planet gearing shaft. The two ends of the planet gearing shaft are pressed by catch bolts (14) to prevent the planet gearing shaft's rotation and play.

The differential lock control device is on the left of the tractor (Figure 5-6). It is consisted of differential lock assembly (1), differential lock control rod (2), differential lock fork shaft (6), differential lock fork (5), and differential lock spring (7).

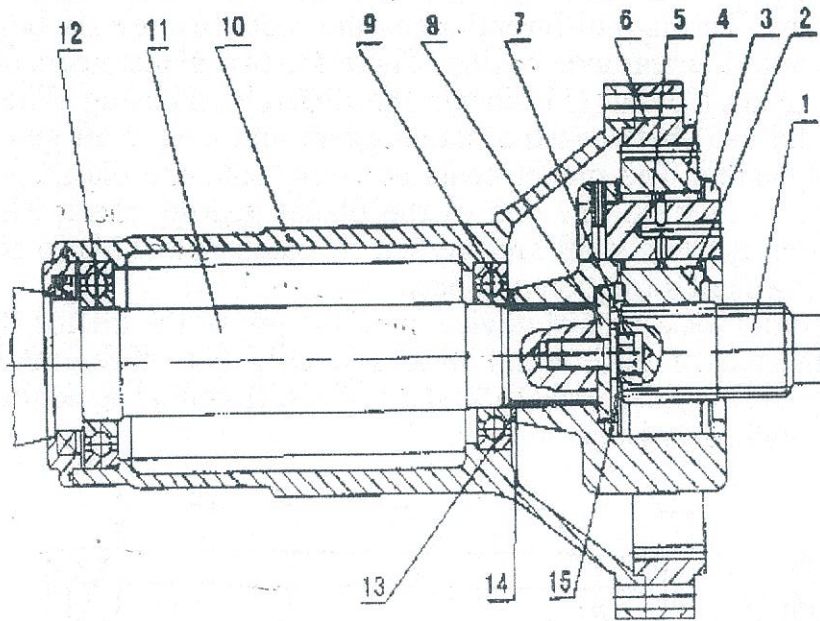


- 1.differential lock assembly 2.differential lock control rod 3.sector hold-down plate  
4.O-shaped rock ring 5.differential lock fork 6. differential lock fork shaft 7.differential  
lock spring 8.blanking disc

Figure 5-6 differential lock control device



#### IV. Final drive's structure and adjustment



1.sun gear 2.planet gear 3.planet carrier 4.needle roller bearing 5.planet gear shaft  
6.ring gear 7.screw 8.set collar 9.rolling bearing 10.driving shaft casing 11.driving  
shaft 12.rolling bearing 13.set collar 14.adjusting washer 15.lock disc

Figure 5-7 final drive

##### 1.Final drive's structure

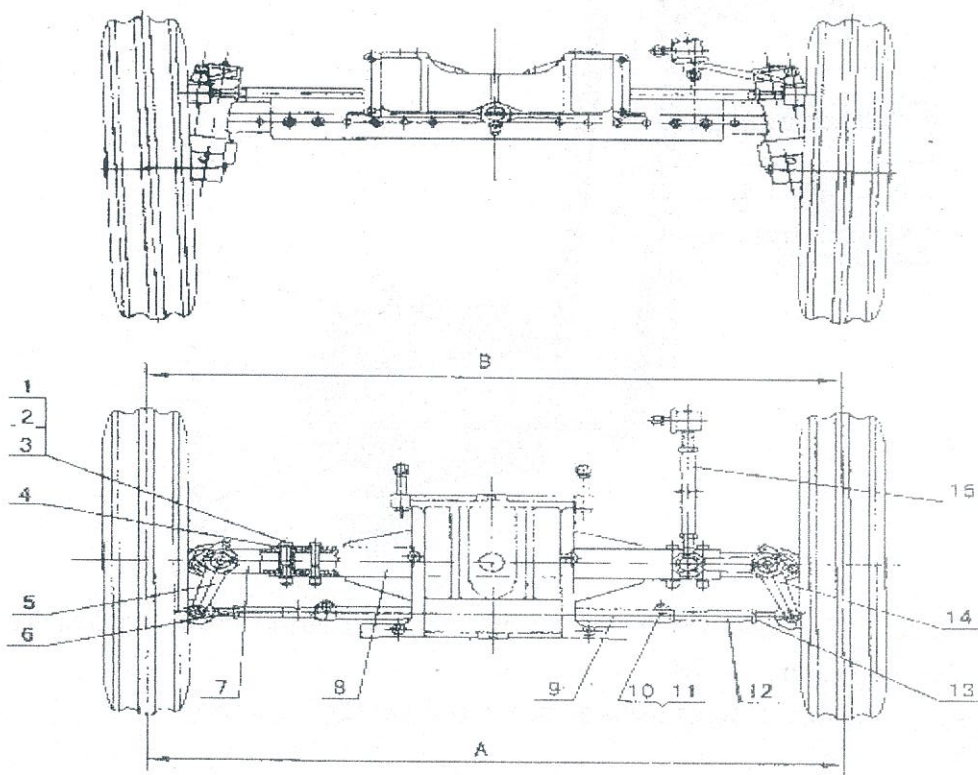
The final drive adopts the planetary gear system (Figure 5-7). The whole planetary gear system consists main sun gear (1), fixed ring gear (6), driven planet carrier (3) and planet gear. The sun gear (1) and axle shaft are close-coupled. Front spline is connected with axle shaft gear. The ring gear (6) is located between driving shaft casing (10) and brake casing. Three planet gears (2) which are meshed with sun gear and ring gear are installed on the planet carrier (3) through needle roller bearing (4) and planet gear shaft (5). The driving shaft (11) are in driving shaft casing (10) and are supported by two centripetal ball bearings (9) (12). The driving shaft (11) is connected with planet carrier (3) through the spline, and is fixed with driving shaft lock screw (7). In order to improve the engagement between the sun gear and the planet gear, load must be even. The sun gear has no fixed supporting. It is floating. There is a flying

height of  $G=0.2\sim0.3\text{mm}$  between the planet carrier (3) and ring gear (13).

## 2. final drive and adjustment

The gap of  $G=0.2\sim0.3\text{mm}$  between the planet carrier (3) and set collar (13) has been adjusted. There is no need of making any adjustment during operation. However, in time of overhaul or in time of changing planet gear system, it is to be adjusted. For adjustment, firstly measure the distance A from the driving shaft (11)'s top cover to the bearing (9), then measure the planet carrier (3)'s spline hole's depth B and set collar (13)'s thickness C. Choose an adjusting washer (14) with the thickness of  $\delta = A - (B + C + 0.2\sim0.3)$  and insert this washer into the place as shown in the figure. Then tighten the driving shaft lock screw (7) and lock with driving shaft lock disc (15).

## V. front axle (see Figure 5-8 )



1.bolt 2.net 3.washer 4.washer sleeve 5.right steering arm 6.right-handed nut  
7.assistant bushing 8.bushing 9.main tie rod 10.bolt 11.nut 12.assistant tie rod  
13.left-handed nut 14.left steering arm 15.drag link

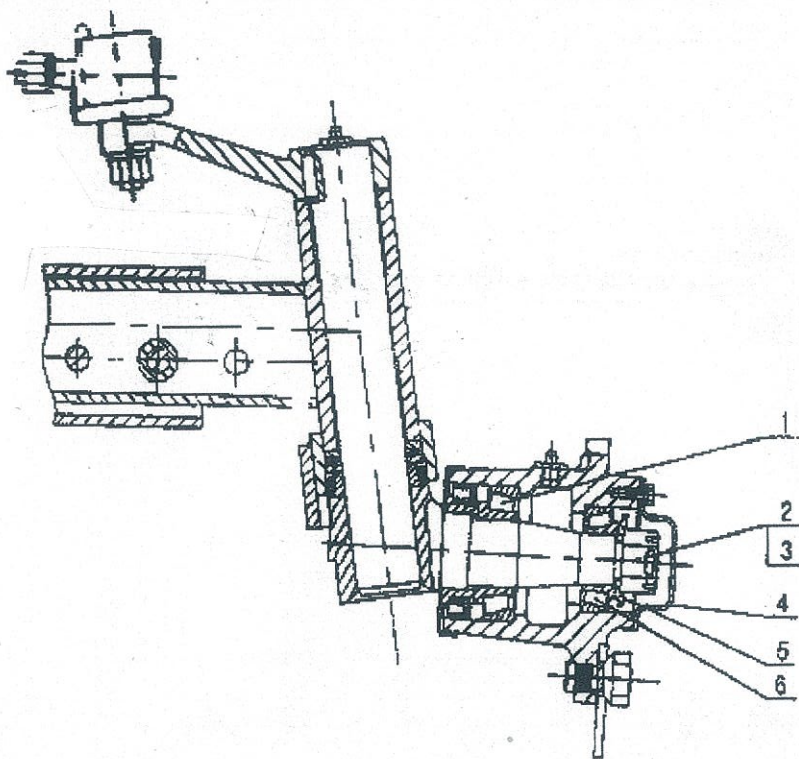
Figure 5-8 front axle



The tractor's front axle is a tubular front axle with adjustable track. It is located in front of the engine. The carrier is connected with the engine with four bolts and two stud bolts. The swing shaft is supported by the carrier's front and rear end. The swing shaft is covered by bushing welding assembly (8). On both sides of the bushing, there are three bolts (1) fixing the left and right assistant bushing assembly (7).

## 2. adjustment

(1) For adjustment of front wheel bearing's end play, see Figure 5-9.



1.bearing 32207 2.groove shape nut 3.split pin 4.bearing cover 5.detachable endless flange 6.bearing 32306

Figure 5-9 adjustment of front wheel bearing's end play

Normal front wheel bearing's end play is 0.05~0.15mm. during operation, when the end play increases to 0.4mm, it must be adjusted. For adjustment, raise and let the front wheel leave the floor, remove away the bearing cover (4), pull out the split pin (3), twist the groove shape nut (2)

to eliminate the end play, then twist back  $1/30 \sim 1/10$  circle, insert into the split pin (3) again and lock it, install bearing cover (4).

(2) For adjustment of front wheel's toe-in, see Figure 5-8.

Every 500h of operation, or when it is found that the front wheel shakes obviously and the front tyre is worn out more frequently, check toe-in. The correct toe-in is 4~8mm. Beyond this scope, adjustment is needed. Adjusting method: Stop the tractor on an even and flat floor, turn the steering wheel to the middle to make the two front wheels stay in straightaway condition. Then loosen the tie rod's left and right nut (6) and (13), rotate the tie rods (9) and (12). And then at the same height of front axle, from the middle of the tyre's width measure the front and rear distance between two wheels. Its difference is  $B-A=4 \sim 8\text{mm}$ . After adjustment, tighten the left and right lock nuts.

(3) For adjustment of front wheel's track, see Figure 5-8.

Adopt inside and outside collars. Use adjustable collars to adjust track. Adjustment scope is 1250~1550mm, with an interval of 100mm each grade. For adjustment, firstly loosen the main and assistant collars' nuts (2), pull out bolts (1) and tie rod's fixed nut (11) and bolts (10), move the assistant collars (7) and assistant tie rod (12) to the desired position, then tighten with bolts and nuts.

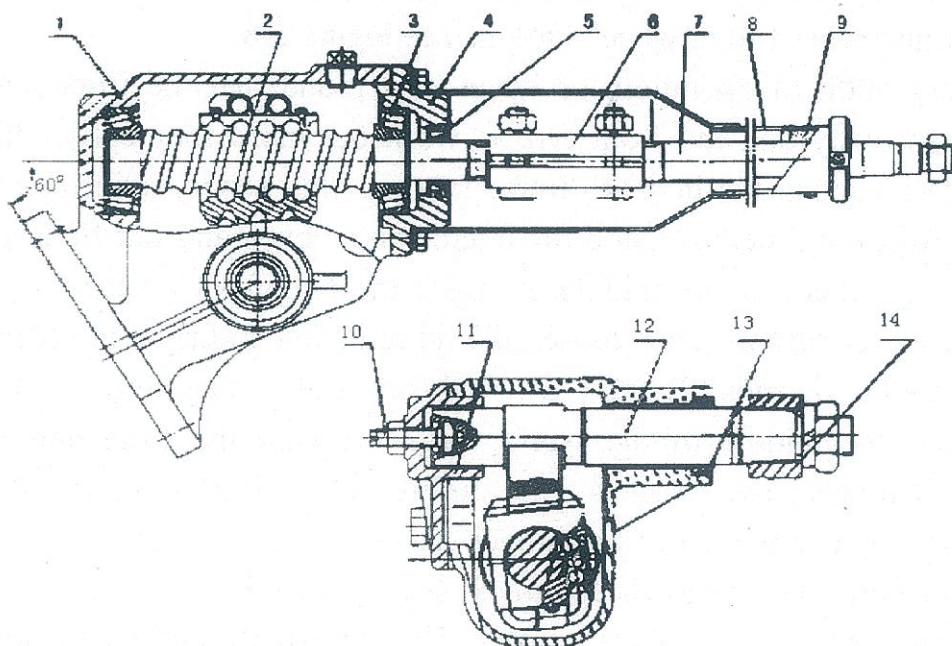
## VI. Steering gear's structure and adjustment

### 1. Recirculating ball type steering gear

#### (1) Structure

The steering gear is recirculating ball type that consists of steering shaft, steering screw, steering nut, steering sector shaft and steering gear housing. (Figure 5-10).





1.steering gear housing 2.screw-nut assembly 3.bearing 7206 4. top cover 5.oil seal 6.connector 7.steering shaft 8.collar 9.contact ring 10.adjusting screw 11.side cover 12.steering sector shaft 13.oil seal 14.pitman arm

Figure 5-10 recirculating ball type steering gear

The screw-nut assembly (2) is installed on the steering gear housing through two 7206 cone bearings (3). While the steering wheel is rotated, the screw-nut assembly can cause the screw (2) to rotate and make the steering nuts move up and down through two rows of steel balls. Rack on the steering nut pushes the sector to rotate, and makes the pitman arm (14) to swing. The steering sector shaft (12) is supported inside the steering gear housing (1). Its axial position is fixed by adjusting screw (10). While installing, let the pitman arm slant  $10^{\circ}$  backward.

There is an oiling port on the steering gear. Fill in lubricating oil to ensure lubrication.

## (2) Adjustment

### 1) Adjusting bearing clearance

In order to make the steering gear work normally, the 7206 cone bearings on both sides of the steering screws must be pre-tightened. When

the bearings are worn out and slack is produced, increase and reduce adjusting washers to remove slacks. Its tightness must be 3~5N on steering wheel.

## 2) Adjustment of engagement backlash between sector and rack

During operation, the abrasion between sector and rack causes its engagement backlash to increase and causes the steering wheel's idle stroke to increase. When the idle stroke exceeds  $20^\circ$ , make adjustment.

For adjustment, loosen the nut at the right side of the steering gear housing. Rotate the adjusting screw (10) clockwise to reduce the engagement slack. Adjust when the steering arm lies in the middle position. Rotate the steering wheel  $45^\circ$  to left and right side. There is no engagement slack between sector and rack. After adjustment, tighten nut to prevent oil leakage.

## 2. Cycloidal hydraulic steering gear's structure and adjustment

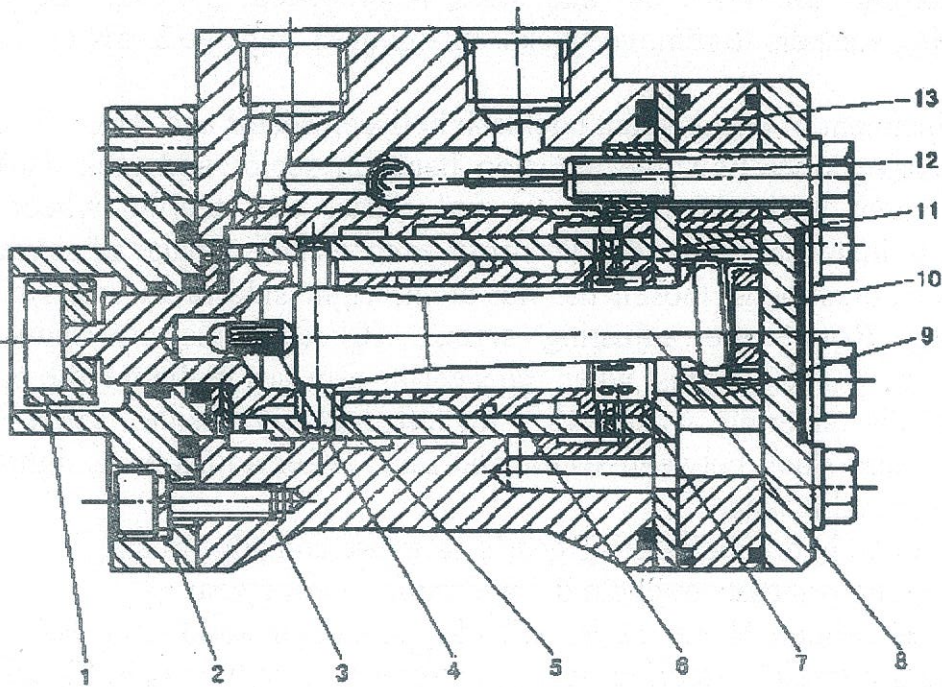
### (1) Working principle of cycloidal hydraulic steering gear

The Golden Horse Series wheel-type tractor adopts the BZZ series cycloidal hydraulic steering gear. Its structure is shown as in Figure 5-11. It is mainly consisted of steering control valve and steering gauging device.

The steering control valve's valve cover (6) and valve core (7) are connected with pin (5), with spring slice (4) centered. The hole for installing pin on the valve core (7) is a little bigger than the hole on valve cover, so both can rotate comparatively. The outside of the valve core is connected with connecting block (1).

The steering gauging device's stator (13) and rear cover (10) are fixed together with the control valve's valve body (3) by bolt. The rotor (9) is connected with the control valve's valve cover (6) through interlocking shaft (8) and pin (5). The rotor (9) and stator (13) are a pair of cycloidal pin wheel engagement pair. The rotor has six prolate cycloidal equidistant curve teeth. The stator has seven circular arc pins. During operation, at the same time of the stator rotates centrally (revolution), it also rotates in the opposite of its axial ray (rotation). Because at the same time of rotor rotating one circle, it can have revolution around stator  $-6/(7-6)=-6$  circles. Every the rotor have one circle of rotation, the oil liquid is jammed out from  $6 \times 7 = 42$  alveoluses. So its displacement of unit volume is large.





1.connecting block 2.front cover 3.valve body 4.spring slice 5.pin 6.valve cover  
7.valve core 8.interlocking shaft 9.rotor 10.rear cover 11.set 12.steel ball 13.stator

Figure 5-11 cycloidal hydraulic steering gear

## (2) Adjust the cycloidal hydraulic steering gear

Since the steering wheel's cylinder number is related with the steering gear's rated output, and since this has been determined in design, if the clearance diametral and end play of the stator and rotor pair is so large as to cause unmanned steering, then the stator and rotor pair must be changed. Otherwise, there is no need to adjust.

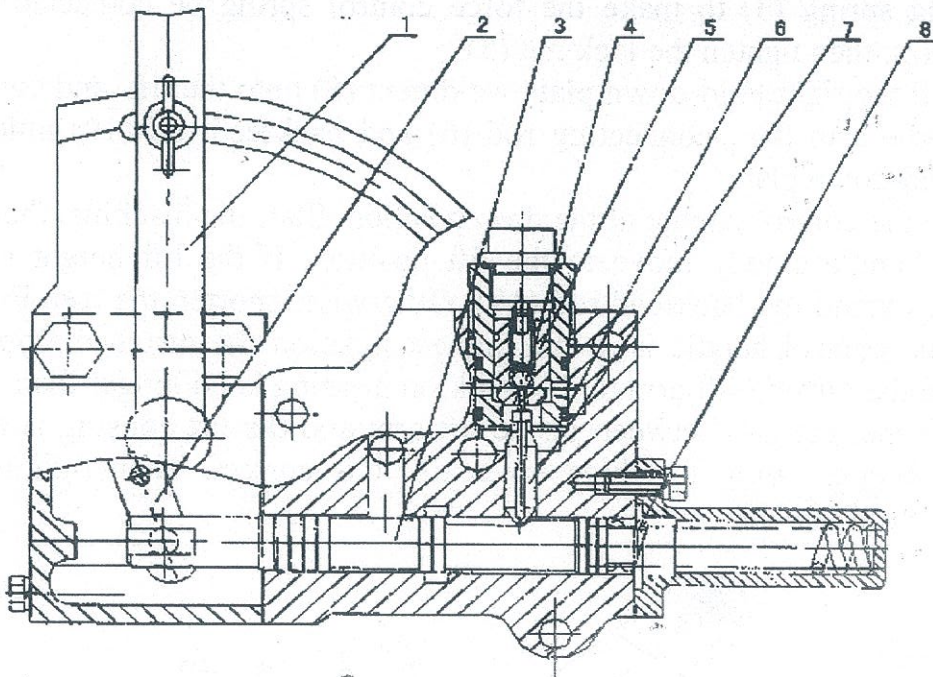
## VII. Adjust rear track

The adjustment of rear track is realized through the different installation position of disc and rim. The adjustment scope is 1200~1600mm, five grades, i.e., 1200, 1300, 1400, 1500, 1600mm.

## VIII. Adjust hydraulic suspension system

After the tractor is used for some time, when the parts in hydraulic system are worn or when the parts are apart for repair, each part must be adjusted.

### 1. Adjust distributor (Figure 5-12)



1. rotating handle 2. swing rod 3. main control valve 4. steel ball 5. drop valve 6. adjusting washer 7. pin 8. main valve spring

Figure 5-12 Adjustment of distributor

### (1) Inspect drop valve's stroke

1) Screw away the drop valve block

2) Place the handle at the highest position (the main control valve in lifting position). Measure the distance  $h_1$  from the ball 4 to the top of drop valve cover.

3) Place the handle at drop position (the main control valve in dropping position). Measure the distance  $h_2$  from the ball 4 to the top of drop valve cover.

4) If  $h_1 - h_2 = 2^{+0.2}$ , then the adjustment is suitable. Otherwise, increase or decrease adjusting washers 6 to reach the dimension.

5) Screw down the drop valve's cock.

(2) Install the adjusted distributor onto the lift.

### 2. Adjust hydraulic lift

(1) Adjust force-position control (Figure 5-13)

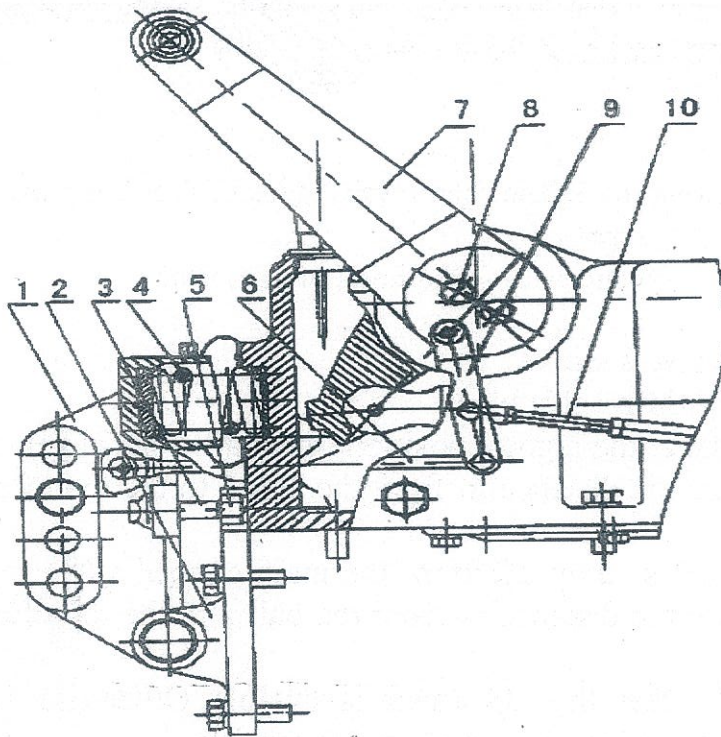
1) Install swing arm (1) bracket (2) force control spring (4), adjust



adjusting spring (3) to make the force control spring be contacted with swing arm, then tighten the lock nut (5).

2) Install the right hold-down plate weldment (8) onto the lift, and connect the middle arm (9), connecting rod (6) and backfeed rod (10) onto the right hold-down plate.

3) Place the control handle at the drop position. Start the machine, then the control handle slowly move to the lift position. If the lift height is not enough, extend the backfeed rod (10). Otherwise, shorten the rod. Ensure when the control handle is at the highest position the distance from the mark on the outside lift arm to the mark on housing is no longer than 3mm (at this time, the gap between inside lift arm and the lift housing is about 5mm). Repeat lifting for three times till it is correct. Then tighten the backfeed rod jam nut.



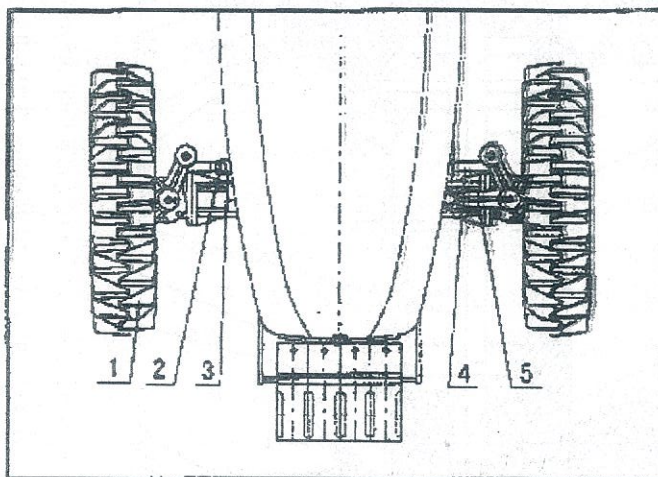
1.swing arm 2.bracket 3.adjusting bolt 4.force control spring 5.lock nut 6.connecting rod 7.outside lift 8.right hold-down plate weldment 9. middle arm 10. backfeed rod

Figure 5-13 Adjust force-position control

## IX. front drive axle's structure and adjustment

### 1. Adjust toe-in (Figure 5-14)

When the front driving wheel is in straight way, the toe-in must be within the scope of 4~11mm. Otherwise, it must be adjusted. Loosen two lock nuts (2) at both sides of tie rod's connecting collar (3), rotate tie rod assembly (4), adjust front driving wheel (1)'s fore and aft distance to make the front distance 4~11mm shorter than rear distance. (While measuring, steering wheel in the middle.) After adjustment use locknut (2) to tighten the tie rod assembly (4).



1.front driving wheel 2.locknut 3.connecting collar 4.tie rod assembly 5.front axle

Figure 5-14 Adjust toe in

### 2. Front drive axle's structure and adjustment (Figure 5-15)

The front drive force is transmitted by distribution cabinet through transmission shaft into front central drive, then under the function of front central drive is transmitted into axle shaft at two sides, then into front final drive to rotate the front driving wheel.

After operation for some time, the axial play of the two bearings (13) and (15) on the front central drive active gear (16) will increase. So it is needed to tighten the small round nut (12) to reduce the bearing's axial play. But it may cause the engagement slack between front central drive's active gear (16) and driven gear (18). Drag out some adjusting washers



(10). If necessary, adjust the adjusting nuts (17) at both sides of the front differential to return to normal slack.

While working fields, especially in paddy field with mal-condition, it is easy for mud to fall onto the top side of the front and rear swing liner plates to cause the top to be worn out to increase the axial play. Adjust the thrust washer (11) to keep the normal axial play.

After long-time operation, the front final small gear and bearing on the kingpin and the cone gear and bearing on the axle shaft will be worn out to cause the engagement slack to be increased. So it must be adjusted. The adjusting method is as the following: loosen the oil drain cock (4) on the right side under the final drive casing (28) to discharge lubricating oil.

(1) upper end of kingpin: Remove the steering arm (23) and kingpin shaft seat (24). According to the gear's engagement slack, grind to shorten the support collar (25) under the cone gear (27). At the same time, drag out the adjusting washers (26). Then install the parts already taken apart.

(2) lower end of kingpin: Use a jack to raise the front axle shaft casing (19) to let the front wheel to be away from the floor. Remove away the front wheel and top cover (32), increase the adjusting washers (1) according to gears engagement slack. Or drag out adjusting washers (30) on the front drive top cover (29) to reduce the gear engagement slack. Then reinstall the disassembled parts.

(3) axle shaft end: Disassemble the whole front final drive assembly, and remove away the spacer ring 85(6). Increase or decrease adjusting washers (5) according to gear engagement slack to reach suitable slack. Then refit the disassembled parts onto the front axle assembly.

After the above-mentioned steps are finished, manually turn the front wheel to see it can rotate freely without any abnormal noises. Then fill into lubricating oil to specified height. Tighten the entrance cock.

Pre-tighten front central drive active cone gear's supporting bearing (Figure 5-16)

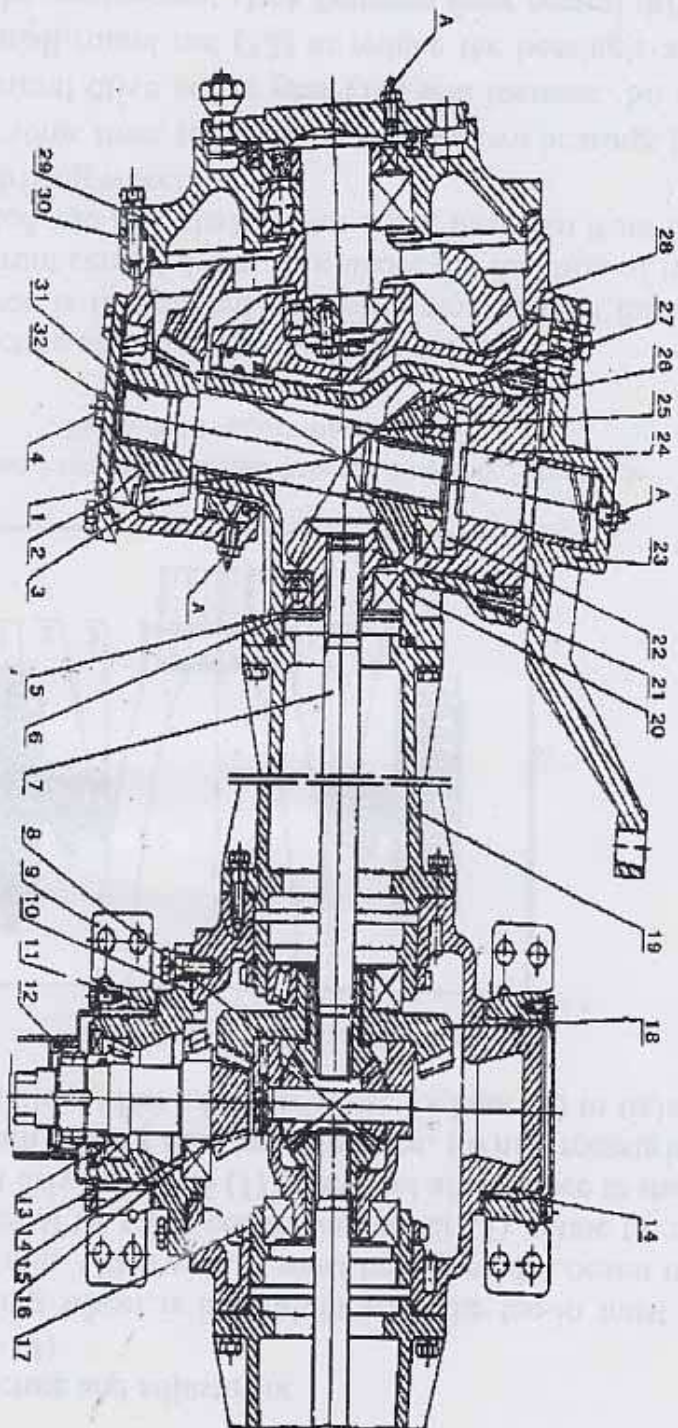
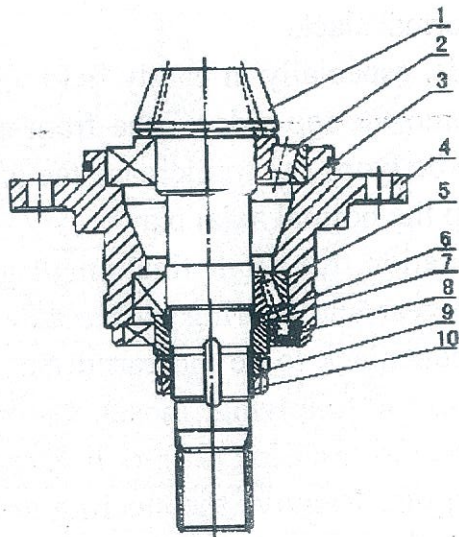


Figure 5-15 Front central drive and final drive

1. adjusting washer 10.2 0.5 1.0 2. bearing 36210 3. front final drive small gear 4. oil drain cock 5. adjusting washer 10.2 0.5 1.0 6. spacer ring 85 7. axle shaft 8. differential assembly 9. swing seat 10. adjusting washer 11. catch washer 12. small round nut 13. bearing 32007 14. swing liner 15. bearing 30208 16. active gear 17. adjusting nut 18. driven gear 19. axle shaft housing 20. bearing 6209 21. cone gear (1) 22. bearing 7208c 23. steering arm 24. kingpin shaft seat 25. support collar 26. adjusting washer 10.2 0.5 1.0 27. cone gear (2) 28. final drive housing 29. front drive top cover 30. adjusting washer 10.2 0.5 1.0 31. king pin 32. lower end cover







1. front active cone gear 2. bearing 30208 3. O-shape ring 4. axle seat 5. bearing 32007  
6. O-shape ring 7. supporting sleeve 8. oil seal FB45 708 9. washer 10. small round nut

Figure 5-16

The sum of end play between bearing 30208(2) and 32007(5) should be adjusted to 0.06~0.10mm. While adjusting, there should be no load on bearing. Tighten the small round nut (10), and then rotate back 1/30~1/50 circle, tighten the washer (9), manually rotate gear (1) to ensure it runs flexibly.

As for the front central drive cone gear engagement space and indent, refer to Figure 5-4 "central drive cone gear's engagement adjustment" in Section 3 of rear axle's construction and adjustment.



## Chapter VI Main Troubles and Their Disposals

### I Clutch

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1.Clutch slipping	① Friction disk contaminated with oil ② Friction disk worn unevenly or broken badly rivet exposed ③ Compression spring weak ④ "Free travel" is too short or release lever touches ⑤ Driven disk deformed	① Wash with gasoline and eliminate the leakage of oil ② Change the friction disk ③ Change spring ④ Re-adjust it according to the requirements ⑤ Change it
2.Disengaging could not be done thoroughly	① Free travel is too large, Working Travel is too short ② Driven disk curled too much ③ Adjusting nuts of three release levers being loosen	① Re-adjust it according to the requirements ② Change it ③ Re-adjust it
3.Tractor vibrates when starting up	① Friction disk and driven disk contaminated with oil ② Friction disk broke ③ Driven disk curled ④ Three release levers being loose	① Wash with gasoline ② Change it ③ Re-adjust it ④ Re-adjust it
4.When clutch pedal is treaded to the bottom, the power take-off shaft can't stop rotating	① Spacing bolts of the pedal placed improperly ② The power take-off shaft and clutch disc separated abnormally	① Re-adjust it ② Re-adjust it according to the requirements

## II. Gearbox

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1.Having noise or knocking sound	① The face of the gear worn badly or case crush, crack appears, or the gear teeth break ② Axle worn too much or damaged ③ Lube oil is not sufficient or can't meet the requirement	① Change the new teeth  ② Change the axle  ③ Oil it sufficiently or change the oil
2.Being difficult in changing gear or engage no gears	① Disengaging could not be done thoroughly ② The teeth of the meshing housing or spline axle worn	① Adjust the clutch  ② Repair or change
3.Disengaging automatically	① Locating slot of fork axle worn ② Lock compression spring weak ③ Meshing housing or spline worn	① Repair or change  ② change lock spring  ③ Change the meshing housing or its slipping gear



### III. Rear Axle

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1. Loud noise increases of central drive	<ul style="list-style-type: none"> <li>① Free gap between the driving helical bevel gear and the axle</li> <li>② The gear meshes abnormally</li> <li>③ The axle of differential gear wears to adhesion</li> <li>④ Planetary gear or pad worn</li> <li>⑤ The axle of differential gear wears or damages</li> </ul>	<ul style="list-style-type: none"> <li>① Adjust the gap</li> <li>② Re-adjust the meshing track and gap according to the manual</li> <li>③ Change it</li> <li>④ Change it</li> <li>⑤ Change it</li> </ul>
2. The axles of driving helical bevel gear and differential gear are too hot	<ul style="list-style-type: none"> <li>① Pre-tightening force of axle is too strong</li> <li>② Faulty lubrication</li> </ul>	<ul style="list-style-type: none"> <li>① Re-adjust it</li> <li>② Examine the lube oil, fill it if necessary</li> </ul>

## VI. Brake

Phenomenon of beakdown	Causes of trouble	Methods of disposal
1.Brake insensitively	① Friction disk worn badly ② The pedals of the brake can't travel the same	① Change it ② Change it
2.Off-tracking when starting up	① The left and right pedals of the brake can't travel the same ② Either friction disk of the brake breaks down ③ Air pressure of the front and back tyres are different	① Adjust it ② Change it ③ Puff the tyre according to the manual
3.Tractor vibrate in starting up	① Free Travel of the brake pedal is too short ②The force of return spring of braking shoe is too weak	① Adjust it ② Change it
Braking could not be released thoroughly and being heated	① Standing brakes fail to loose ② Free Travel of the brake pedal is too short	① Loosen the standing brake ② Adjust it



## V. Front driving axle (four-wheel drive)

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1. Front tyre worn badly	<ul style="list-style-type: none"> <li>① Web or rim of front tyre deforms terribly</li> <li>② Toe-in adjusted improperly</li> <li>③ Air pressure of front tyre insufficient caused by long-term transportation or handle of front axle fail to release</li> </ul>	<ul style="list-style-type: none"> <li>① Correct it</li> <li>② Adjust it</li> <li>③ Change it according to the regulations</li> </ul>
2. Vibration of front axle	<ul style="list-style-type: none"> <li>① Front driving axle worn severely</li> <li>② Bushing idler of steering arm worn badly</li> <li>③ Clearance of front and back bearings is too big</li> <li>④ Rim or web of front tyre deforms terribly</li> <li>⑤ Toe-in adjusted improperly</li> <li>⑥ Joint of steering ball worn severely</li> </ul>	<ul style="list-style-type: none"> <li>① Change it</li> <li>② Change it</li> <li>③ Adjust it</li> <li>④ Correct it</li> <li>⑤ Adjust it</li> <li>⑥ Change it</li> </ul>
3. Drive shaft and sheathing glow	<ul style="list-style-type: none"> <li>① Sheathing curled and deformed terribly</li> </ul>	<ul style="list-style-type: none"> <li>① Correct it</li> </ul>
4. Too loud noises	<ul style="list-style-type: none"> <li>① Gear meshing track of central drive is abnormal</li> <li>② Clearance of central driving axle is too large</li> <li>③ Axle of differential gear worn</li> <li>④ Pads of planetary gear or half axle gear worn</li> <li>⑤ Pair mesh of final driving gear is abnormal</li> </ul>	<ul style="list-style-type: none"> <li>① Re-adjust it</li> <li>② Re-adjust it or change it</li> <li>③ Change it</li> <li>④ Change it</li> <li>⑤ Re-adjust it or change it</li> </ul>

## VI. Steering gear and running system

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1.Free Travel of steering gear is too long	1.Thrust bearing worn 2.Screw bolt, nut ball bearing worn 3.Toothed segments and bars worn	1.Change or adjust the bearing 2.Change the worn parts 3.Adjust it
2.Heavy in steering	1.The upper plate of thrust bearing screw tightly 2.Air pressure of front tyre is too low	1.Screw up the upper plate correctly 2.Fill the tyre according to the regulations
3..Front wheel swing	Toe-in adjusted improperly Air pressure in tyre is improper Driving tyre is fixed with the direction of the grain conversed	Adjust it Fill the tyre Fix again
4.Early aging of tyre	Toe-in adjusted improperly Air pressure in tyre is improper Driving tyre is fixed with the direction of the grain conversed	Adjust it Charge the tyre Fix again



## VII. Electrical system

### 1. Motor

Phenomenon of breakdown	Causes of trouble	Methods of disposal
1. Starting machine can't run	<ol style="list-style-type: none"> <li>1. Break of connecting line or poor contact</li> <li>2. Undercharge of battery</li> <li>3. Electric brush and collector in poor contact</li> <li>Short circuit or break in the starting machine</li> </ol>	<ol style="list-style-type: none"> <li>1. Weld or whirl the joint</li> <li>2. Charge the battery or change the battery</li> <li>3. Clear the surface of collector or change the electric brush</li> <li>4. Repair after check</li> </ol>
2. Free running of starting machine without starting force	<ol style="list-style-type: none"> <li>1. Electric brush and collector are in poor contact</li> <li>2. Face of collector burnt or lily soiled</li> <li>3. Joint is in poor contact</li> <li>4. Poor contact of solenoid switch</li> <li>5. Undercharge of battery</li> </ol>	<ol style="list-style-type: none"> <li>1. Clear the connecting face of collector or change the electric brush</li> <li>2. Repair the collector with emery cloth or clear the dirty</li> <li>3. Clear and whirl it tightly</li> <li>4. Examine and repair it</li> <li>5. Charge it after examination</li> </ol>
3. Starting machine begins running and the gears bump before the starting gears get meshing	<ol style="list-style-type: none"> <li>1. Armature travel of the solenoid switch is too short</li> </ol>	<ol style="list-style-type: none"> <li>1. Whirl the connecting bolt of solenoid switch to proper position</li> </ol>

## 2. Accumulator

Phenomenon of breakdown	Caused of trouble	Method of disposal
1. Usually insufficient stored electricity	<ol style="list-style-type: none"> <li>1. Breakdowns of generator or regulators, without charging current.</li> <li>2. Link loose in charging circuit or resistance caused by staining.</li> <li>3. Short circuit of polar plate</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair the generator or regulator</li> <li>2. Examine whether the cluck and link bolt are loose</li> <li>3. Examine and repair it</li> </ol>
2. Self-discharge of battery	<ol style="list-style-type: none"> <li>1. Too much impurity in materials in polar plate or electrolytic liquid</li> </ol>	<ol style="list-style-type: none"> <li>1. Thorough discharging or over-discharging the battery so as to make the impurity into electrolytic liquid. Give out the liquid and clear it with distilled water, then fill in new electrolytic liquid and charge it again</li> </ol>
3. Capacity of battery decreases obviously (low discharging voltage, low density of electrolytic liquid). Polar plate vulcanized	<ol style="list-style-type: none"> <li>1. Frequent undercharged</li> <li>2. Long-term discharge with little current without timely charge</li> <li>3. Level of electrolytic liquid is too low, the upper part of polar plate reveals</li> </ol>	<ol style="list-style-type: none"> <li>1. Adopting long-term charge with little current method or "Thorough charge thorough discharge cycle" method</li> <li>2. Renew the active material or charge with desulfuration</li> <li>3. Add electrolytic liquid</li> </ol>



## VIII. Hydraulic system

Phenomenon of breakdown	Causes of trouble	Method of disposal
1.Fail to be lifted whether with light or heavy load	<p>1.Oil pump can't absorb oil normally</p> <p>(1).Level of oil in gear box (or tank) is too low</p> <p>(2).Screen blocked severely</p> <p>(3).Severe oil leakage or damage of inlet pipe and oil-ring</p> <p>2.Split pin of out end or inner end of draft control handle disengaging</p> <p>3.Swing arm disengaging</p> <p>4.Main control valve clogged in the position of middle or decline, or oil return valve clogged in open position</p>	<p>1.(1).Add the oil to the ruled level</p> <p>(2).Clear or change the screen in time</p> <p>(3).Change the damaged oil ring</p> <p>2. Re-fix the split pin if the outer split pin disengaged, open the distributor and re-fix the split pin if the inner split pin disengaged</p> <p>3.Open the distributor, fix the swing arm</p> <p>4.Knock nearby the oil return valve, it's necessary to take it apart and clear the valves if it is clogged continuously.</p>
2.Implement can only be lifted with empty load, but can not be lifted with load or lifted slowly	<p>1.Oil temperature is too low</p> <p>2.Screen blocked</p> <p>3.Oil rings in oil inlet pipe, high-pressure and oil pump damaged</p> <p>4.Oil pump worn severely</p> <p>5.Leakage in oil return valve, decline valve and safety valve.</p> <p>6.Too much leakage in pump, valve, cylinder to make the temperature too high</p>	<p>1.Continuously running to rise the oil temperature</p> <p>2.Clear the screen</p> <p>3.Change the oil ring</p> <p>4.Repair or change the pump</p> <p>5.Tap the valves of distributor, open the oil return valve, disengaging valve and safety valve, grind them with finishing lapping paste if necessary</p> <p>6.Check it</p>

3.Sharp sound in the pump when the control handle is in lifting position	1.Improper adjustment, makes the inner lifting arm touch the housing of lifter thus the safety valve open	1.Re-adjust it, shorten the control handle or position, force control handle
4.Implement shaking (nodding) after being lifted, fast dropping	<p>1.Check valve of distributor not well sealed</p> <p>2.Descending valve not well sealed</p> <p>3.Safety valve of cylinder not well sealed</p> <p>4.Hydraulic outlet block not well sealed</p> <p>5.Descending speed control valve not well sealed</p> <p>6.Oil rings between distributor, the end of cylinder and oil inlet hole are fired improperly which make them release or damaged.</p> <p>7.Oil ring of piston in cylinder worn</p>	<p>1.Clear the valves, grind them with finishing lapping paste if necessary</p> <p>2.As the above 1</p> <p>3.As the above</p> <p>4.As the above</p> <p>5.Change the oil ring</p> <p>6.Examine and change the oil ring</p> <p>7.Change the oil ring of piston</p>



## Continued

Phenomenon of breakdown	Causes of trouble	Methods of disposal
5..Lifting speed is normal but can't be lifted to the t.d.p	1.Control handle get short/ long (position, force control handle)	1.Elongate or shorten the length of control handle (position, force control handle)
6..Lifted implement couldn't be lowered	1.Descending speed control valve screwed too tightly 2.Main valve clogged 3.Descending valve clogged 4.The push pin get short or the descending valve assembly loose, thus the descending valve can't open	1.Loose the descending speed control valve handle 2.Clear the main valve 3.Clear the descending valve 4.Take out the block, re-adjust the clearance of push pin or screw the descending assembly
7.Oil temperature rises abnormally	1.The position of handle is too high when transporting 2.The highest position of outer lift arm isn't adjusted properly, the safety valve open 3.Descending speed control valve being stopped 4.Too much leakage in the pump, valve and tank so that the efficiency of capacity is too low	1.Fix the handle in "transportation" position 2.Re-adjust it so as to keep certain clearance between the inner lift arm and housing 3.Loose the descending speed control valve 4.Check the sealed parts, change the parts damaged badly if necessary
8. Hard to move the control lever	1.Impure oil gets main valve clogged or the push pin clogged, which make the main valve hard to move	1.Pull down the handle several times, clear the main valve or push pin

### Lubrication table of tractor

Number	Lubrication part	Drops	Sorts of lube oil	Maintainance Schedule	Maintainance work
1	Engine oil sump	1	See Table 2-1 Fuel oil and lube oil of tractor	Each shift Every 50h	Check level, fill enough lubricant, change engine oil
2	Gearbox, rear axle, transfer box	1		Every 50h Every 500h	Check level, fill enough lubricant, change engine oil
3.	Front axle (four-wheel drive)	1		Every 50h Every 500h	Check level, fill enough lubricant, change engine oil
4.	Hydraulic lifter	1		Each shift Every 50h	Check level, fill enough lubricant, change engine oil
5	Steering gear	1		Every 50h Every 500h	Add lubricant
6	Rocker bearing, bearings stand fore and aft axle, knuckle arm, driving wheel axle in front axle ( four-wheel drive)	10		Each shift (every two if dry land	Add lubricant
7	Swinging axle, left and right king pins (two-wheel drive)	3		Each shift	Add lubricant
8	Pedal axle of clutch	1		Each shift	Add lubricant
9	Pedal axle of brake	1		Each shift	Add lubricant
10	Right lift arm	1		Each shift	Add lubricant
11	Engine fan pump bearing	1		Every 50h	Add lubricant



### Torque of the bolts and nuts of tractor's main parts

Joint position	Joint unit	Spec.	Torque N.m
Transmission	Connecting bolt between engine and gap housing	M12	77.7
	between gap bridge-gearbox housing and rear axle	M12	77.7
	Fixing bolt of differential gear axle	M12	77.7
	Fixing bolt of bevel gear	M10	44.5
	Connecting bolt between drive shaft and rear axle housing	M12	77.7
Running & Steering gear	Connecting bolt between drive wheel hub and tread	M14	123.6
	between front drive wheel, front drive wheel hub and tread	M14	123.6
	Connecting bolt between steering gear and gap bridging-gearbox housing	M12	77.7
	Fixing bolt of steering head	M12	77.7
Front axle assembly	Connecting bolt between bracket and engine	M16	192.9
Hydraulic suspension system	Connecting bolt between lifter housing and axle housing	M12	109.3
	Connecting bolt between top of oil tank and lifter housing	M14	173.9
	between pull-rod rocker bearing and rear axle housing	M12	77.7
Front axle	Connecting bolt between front differential assembly driven bevel gear and differential gear	M10	44.5
	Connecting bolt between left and right semi-axle housing	M10	44.5
	Connecting bolt between final drive housing and final drive housing cover	M8	31.6
	Connecting bolt between side reducing housing and side reducing housing lower	M10	62.6
	Connecting bolt between side reducing housing and side reducing housing cover	M10	44.5
	Connecting bolt between combination of steering arm with bush and reducing housing	M12	77.7
	Connecting bolt between bracket and engine	M16	192.9
	Connecting bolt between swinging base assembly and bracket	M13	77.7

Note: Deviation value of the above-given torque are  $\pm 10\%$ .

## **Appendix I : *Regulations on Repair, Exchange and Return of Agricultural Mechanical Products***

**Article 23:** No implementation of three-promises for following situation, but proper pay repair:

- (1) Early wear and break-down caused by improper use, repair and maintainance, such as the damage because of improper load & unload on the way of transportation after purchasing, the use condition exceeding the provided limits in the manual, over-speed & over-loaded use, without run-in, inspection, adjustment and fastening according to the manual, improper match of diesel, use of the oil materials does not conform to the regulations and etc.
- (2) Breakdowns caused by self refit, adjustment, disassembly the parts willfully which are not allowed in the manual.
- (3) The products without three-promises guaranty or effective delivery list, nor be able to prove the products are within the guaranty period of three-promises.
- (4) The specification tag on the delivery list is not in accordance with the one of the object product, or being altered.
- (5) Handling willfully after troubles occur without the agreement of the seller or repairer, which leads to be unable to make technical appraisement for it except the situation of Article 22.
- (6) Breakdowns occurs since the driver has no driving license or operation permit through normal practices.
- (7) Damage caused by force majeure.

## **Appendix II : Names of main parts**

Diesel, cylinder cover, flywheel, housing, gearbox, semi-shaft housing, steering gear housing, differential gear housing, final transmission case, brake hub, pulling plate, lifter housing.



### Three-promises Guaranty of Huanghai Tractor

Name of product		Type of product	Serial no. of product	
Name Of manufacturer	Yancheng Tractor Factory		Address	No.90 South Wenggang Rd.Yancheng Jiangsu
Tel. No.	0515-8260118 (exch.)-8046 (service section)			PC 224002
Engine manufacturer			Address	
Tel.		Post code		Serial no. of engine
Name of repairer			Address	
Tel.		Purchasing date		Invoice no.
Guaranty period	below 18kw	9 month	Guaranty	below 18kw 18 month
	Over 18kw	1 year	period of main parts	Over 18kw 2 year
Repair record (1)				
Trouble				Reporter
Repair time		Return time		Repairman
Repair record				
Exchange or return evidence				
Repair record (2)				
Trouble				Reporter
Repair time		Return time		Repairman
Repair record				
Exchange or return evidence				
Note: Explanation of non-implementing three-promises and main parts in Responsibility Regulation on Repair, Exchange and Return of agricultural mechanical products are attached				

This table is to be kept by user after being filled in.

Yancheng Tractor Factory

### Registration form of Three-promises Guaranty

Seller		User's address	
Name of user		Post code	
User's tel.			
Type of product	Series no.of product	Date of manufacturer	
Purchasing date	Serial number of bill	Date of registration	
Type of engine	Manufactuer of engine	Serial no.of engine	

Post it after being filled in within a month to:Service Section of Users of Yancheng Tractor Factory  
No.90 South Wengang Rd, Yancheng Jiangsu 224002 China