O.E.C.D.NO.1240

TRACTOR OPERATION MANUAL

Preface

Taishan Series Tractors of medium and small size have developed into 4 series of products. The series described in the manual includes 7 models, such as basic agricultural model, four—wheel driving model, etc. These products are featured by their advanced design, compact construction, easy operation, convenient repair and maintenance, economical oil consumption, high interchangeability of their parts and components, and many other advantages. Equipped with many agricultural implements, the tractors can be used for plowing, harrowing, seeding and planting, harvesting and many other field operations, in upland or in paddy field. They can also serve as facilities for transportation or as stationary power sources for power generation, irrigation and drainage, etc.

In order to raise the working efficiency and prolong the service life of the tractors, the operators must seriously observe the stipulations specified in the operation manual for carrying out operation, repair and maintenance.

With the development of science and technology, and varying in requirements of customers, the tractors are subject to improvement and perfection in their construction, which will be written about in next editions of the manual. Therefore, users of the tractors are requested to pay attention to where the manual differs from the actual tractors.

SHANTUO AGRICULTURAL MACHINERY EQUIOMENT CO.,LTD

PRECAUTIONS

1 . Drivers should read the Operation Manual carefully and be familiar with the performance , operation and maintenance of the tractor.

2. Never fill the fuel tank with unfiltered or undeposited fuel.

3 . New tractor must undergo running —in according to the regulations before it is put into service.

4. It is prohibited to turn sharply with one—side braking while tractor runs at high speed so as to prevent overturning or parts damage.

5. Bolts or nuts of wheel disks and of other important parts should be checked regularly and tighten them if loose.

6. During transferring the tractor with a mounted implement , it is not allowed to drive the tractor at high speed so as to avoid damaging hydraulic control and hitch system.

7. Traction devices are used only for pulling agricultural implements or a trailer with the implement control lever in the " lowering" position , but when implements are to be mounted , traction devices must be detached.

CONTENTS

Chapter i Technical Data of the Tractors

Model	TS-180	TS-184	TS-25A	TS-25K	TS2-5Y	TS-300A	TS-300B	TS-254	TS-304	ATS-25-1	TS-25-2	TS-254-1	TS-254-2	TS-300A-1	TS-300A-2	TS-304A-1	TS-304A-2
general specification																	
Type	4×2 Wheeled	4×2 Wheeled	4×2 wheeled					4×4 wheeled		4×2 wheeled		4×4 wheeled		4×2 wheeled		4×4 wheeled	
Rated traction force kN	3.92	4.9	5.88			6.37	5.88	7.35	7.84	5.88		7.35		6.37		7.84	
P.T.Opower kN	12.1		16.2			20.5		16.2	20.5	16.2				20.5			
Weight kg																	
Constructional weight	900	1050	1210			1240	1220	1400	1450	1200	1225	1410	1415	1250	1255	1460	1465
Min.weight	1010	1170	1340			1370	1350	1530	1580	1350	1355	1540	1545	1380	1385	1590	1595
Weight distribution kg																	
Front axle	400	190	580			587	858	755	770	585	587	760	763	593	595	775	777
Rear axle	610	680	760			783	765	775	810	765	768	780	782	787	790	815	818
Wheel tread mm																	
Front wheel	960	960	1100 adjustable		1100	1100 adjustable	1100 adjustable	1215	1215	1100 adjustable		1215		1100 adjustable		1215	
Rearwheel	990	990	1100 adjustable		1100 adjustable	1150 adjustable	1100 adjustable	1100 adjustable	1150 adjustable	1100 adjustable		1100 adjustable		1150 adjustable		1150 adjustable	
Wheel base mm	1450	1450	1700		1700	1700	1700	1740		1700		1740		1700		1740	
Turning radius m																	
Without braking	2.7±0.2		3.1±0.2			3.2±0.2	3.1±0.2	3.8±0.2		3.1±0.2		3.8±0.2		3.2±0.2		3.8±0.2	
With one–side braking	2.4±0.2		2.8±0.2			2.9±0.2	2.8±0.2	3.0±0.2		2.8±0.2		3.0±0.2		2.9±0.2		3.0±0.2	
Ground clearance mm																	
Under front axle	270	260	475			787	475	340	350	475		340		487		350	
Under transmission box	350	350	430			440	430	430	440	430		430		440		440	
Overall dimensions mm																	
Length	2662		3090		2754	3090	3090	3090	3090	3090				3090			
Width (without ballasts)	1200		1340		1340	1450	1340	1340	1450	1340				1450			
Height (to muffler)	1630		1940		1940	1960	1940	1940	1960	1940				1960			

Model	TS-180	TS-184	TS-25A	Ts-25K	TS-25Y	TS-300A	TS-300b	TS-254	TS-304A	TS-25-1	TS-25-2		TS-254-1	TS-254-2		TS-300A-1	TS-300A-2		TS-304A-1	TS-304A-2	
General specification																					
Nominalspeed km/h												creeper			creeper			creeper			creeper
Gear lst	1.95		1.66	1.97		2.23	2.17	1.97	1.89	2.13	2.13	0.40	2.13	2.13	0.40	2.42	2.42	0.47	2.05	2.05	0.38
2nd	2.46		2.09	2.48		2.81	2.73	2.48	2.38	2.48	2.48	0.46	2.48	2.48	0.46	2.81	2.81	0.52	2.38	2.38	0.44
3rd	4.00		3.40	4.03		4.58	4.43	4.03	3.90	4.03	4.03	0.75	4.03	4.03	0.75	4.58	4.58	0.85	3.90	3.90	0.72
4th	6.31		5.40	6.40		7.26	7.04	6.40	6.11	6.40	6.40	1.19	6.40	6.40	1.19	7.26	7.26	1.35	6.11	6.11	1.14
5th	7.64		6.49	7.69		8.74	8.46	7.69	7.38	7.69	7.69	1.42	7.69	7.69	1.42	8.74	8.74	1.62	7.38	7.38	1.37
6th	9.64		8.20	9.71		11.03	10.68	9.71	9.30	9.71	9.71	1.80	9.71	9.71	1.80	11.03	11.03	2.05	9.30	9.30	1.73
7th	17.93		13.34	15.80		17.96	17.37	18.80	15.12	15.80	15.80	2.93	15.80	15.80	2.93	17.96	17.96	3.34	15.12	15.12	2.81
8th	24.91		21.20	25.11		28.47	27.62	25.11	24.04	25.11	25.11	4.66	25.11	25.11	4.66	28.47	28.47	5.29	24.02	24.04	4.47
1st reverse	1.83		1.55	1.84		2.08	2.02	1.84	1.76	1.84	1.84	0.34	1.84	1.84	0.34	2.08	2.08	0.39	1.76	1.76	0.33
2nd reverse	7.13		6.06	7.18		8.15	7.90	7.18	6.88	7.18	7.18	1.33	7.18	7.18	1.33	8.15	8.15	1.51	6.88	6.88	1.29
Engine																					
Model	TC287		295T			SD2100		295t	SD2100		295t					SD2100					
Type	2 cylinder in line,4-strokewater-cooled																				
Rated speed r.p.m.	2400		2000			2200		2000	2200		2000					2200					
Bore × stroke mm	89×90		95×115			100×115		95×115	100×115		95×115					100×115					
12–hour power kW	13.2		17.6			22		17.6	22		17.6					22					
Max. torque Nm	⩾60.5		⩾96.9			⩾109.8		⩾96.9	⩾109.8		⩾96.9					⩾109.8					
Speed of max. torque r.p.m.	⩽1680		⩽1400			⩽1650		⩽1400	⩽1650		⩽1400					⩽1650					
Fuel consumption g/kWh	257		258.4			257		258.4	257		258.4					257					
Oil consumption g/kwh	2.1		2.3			2.3		2.3	2.3		2.3					2.3					
Lubricating method	Pressure and splash																				
Cooling method	Water																				
Starting method	Electrical																				
Crankshaft turning direction	Clockwise (facing the fan belt pulley)																				

Model	TS-180	TS-184	TS-25A	TS-25K	/ts-25Y	TS-300A	TS-300B	TS-254	TS-304A	TS-25-1	TS-25-2	TS-254-1	TS-254-2	TS-300A-1	TS-300A-2	TS-304A-1	TS-304A-2
Working devices																	
Hydraulic system type	Half remote					Half remote											
Tilling depth control	Draft and position responsive					Draft and position responsive											
Max. lifting capacity at the point of 610mm frin sysoebdubg shaft backward kN	⩾2.98		⩾3.97			⩾4.96		⩾3.97	⩾4.96	⩾3.97				⩾4.96			
Safety valve release pressure Mpa	13.25		17.65			17.65											
Sensing manner	Through top lind					Through top link											
Hydraulic pump	Model 306 gear pump					Model 306 gear pump											
Distributor	Slide valve regulating					Slide valve regulating											
Hydraulic cylinder																	
Type	Horizontal single-acting cylinder					Horizontal single-acting cylinder											
Bore×stroke mm	63×100		63 (or70) ×100			63 (or70) ×100											
Hydraulic take–off device																	
Type					Half remote												
Hydraulic pump					Model 306 gear pump												
Rate of flow L/min					12												
Safety valve release pressure Mpa					15.7												
Hitch																	
Type	Rear mounted ball socket					Rear mounted ball socket											
Upper lind pin–hole diam. mm	$\varphi 19^{+0.51}_{+0.30}$					$\varphi 19^{+0.51}_{+0.30}$											
Lower link pin–hole diam. mm	$\varphi 22^{+0.73}_{+0.40}$					$\varphi 22^{+0.73}_{+0.40}$											
Power–take–off																	
Type	Non-independent					Non-independent											
Speed																	
Low r.p.m.	610		540			540											
High r.p.m.	1000		1000			1000											
Spline shaft dimension mm	6D-34.79±0.06×28.91±0.05×$8.69^{0}_{-0.16}$					6D-34.79±0.06×28.91±0.05×$8.69^{0}_{-0.16}$											

Model	TS-180	TS-184	TS-25A	TS-25K	TS-25Y	TS-300A	TS-300B	TS-254	TS-304A	TS-25-1	TS-25-2	TS-254-1	TS-254-2	TS-300A-1	TS-300A-2	TS-304A-1	TS-304A-2-
Transmission																	
Clutch	Single disk,dry type constant mesh one-stage or two-stage clutch																
Gear box	Spur gear(4+1)×2 compound shaft																
Maim drive	Spiral bevel gear																
Differential	Closed with 2 planetary bevel gears																
brake	Foot-controlled,mechanical transmission,shoes with linings																
Final drive	Externally meshed spur gear																
Traction devices and steering system																	
Driving wheel	RW	4WD	RW					4WD		RW		4WD		RW		4WD	
Front axle			Telescopic ex–tension type adjustable wheel tread			Telescopic ex–tension type adjustable wheel tread				Telescopic ex–tension type adjustable wheel tread				Telescopic ex–tension type adjustable wheel tread			
Tires																	
Front wheel	4.00-14	6.00-12	4.00-16			5.00-15	4.00-16	6.00-16	6.5-16	4.00-16		6.00-16		5.00-15		6.50-16	
Rear wheel	8.3-20	8.3-20	9.5-24			11.2-24	9.5-24	9.5-24	11.2-24	9.5-24		9.5-24		11.2-24		11.2-24	
Tire inflation pressure Mpa																	
front wheel	0.2~0.35	0.147~ 0.167	0.196~0.245			0.176~ 0.196	0.196~ 0.245	0.147~0.167		0.196~0.245		0.147~0.169		0.196~0.245		0.147~0.245	
Rear wheel	0.1~0.15	0.1~0.15	0.098~0.12			0.098~0.12		0.098~0.12		0.098~0.12		0.098~0.12		0.098~0.12		0.098~0.12	
Front wheel alignment																	
Toe–im	3~11							8~16		3~11		8~16		3~11		8~16	
Camber	2°							3°		2°		3°		2°		3°	
Kingpin toe–in	8°							10°		8°		10°		8°		10°	
Kingpin caster	0°							0°		0°		0°		0		0°	

Model	TS-180	TS-184	TS-24A	TS-25K	TS-25Y	TS-300A	TS-300B	TS-254	TS-304A	TS-25-1	TS-25-2	TS-254-1	TS-254--2	TS-300A-1	TS-300A-2	TS-304A-1	TS-304A-2
Belt pulley																	
Linear speed m/sec																	
High	15		15														
Low	9		8														
Pulley dimension mm																	
Diameter	200																
Width	125																
Electrical equipment																	
System	12V,negative pole connected with ground,single wire circle																
Generator	JF01C 180W		JFCIC 18W or 2JF200 200W														
Starter	QD127B 1.3kW		QD12 1.47kW or QD1247A 12V 1.5W														
Regulator	FT70 or electrical																
Battery	6-Q-75		3-QA-120														
Lighting																	
Front head light	35W×2 12V																
Rear light	35W 12V																
Gauges																	
Oil pressure gauges	12V inductive		YT-102														
Water tenperature gauge	12V inductive		WT-102														
Ammeter	307-C (-30A-0A+30A)																
Timer	12V 0~9999h																
Air–pressure gauge	YT-102																
Main filling capacities L																	
Fuel tank	18		48														
Engine cooling system	6		10														
Engine oil sump	3.1		4.5~6.5														
Injection sump	0.3		0.3														

Model	TS-180	TS-184	TS-25A	TS-25K	TS-25Y	TS-300A	TS-300B	TS-254	TS-304A	TS-25-1	TS-25-2	TS-254-1	TS-254-2	TS-300A-1	TS-300A-2	TS-304A-1	TS-304A-2
Main filling capacities L																	
Oil pan of air cleaner	0.5		0.5														
Transmission box	7~7.8		7~7.8														
Final drive case	1.35×2		1.6×2														
Lifter	5.5~6.5					5.5~6.5											
Hydraulic take-off device					6.8~7.8												
Belt pulley						0.5											
front main drive								1~1.5				1~1.5				1~1.5	
Front side drive								2×2				2×2				2×2	

Note:

1. TS-25A, TS-25K, TS-25-1, TS-25-2, TS-300A, TS300A-1, TS-300B are main types of tractor for farming;
   TS-25Y tractor is for transportation;
   TS-254, TS-254-1, TS-254-2, TS-304A-1, TS-304-2 are 4-wheel drive tractors.
2. There are two kinds of draw-bars, one of them an supply high or low drawing point by turning over the draw-bar.

Chapter Ⅱ Operating the Tractor

1. Fuel and lubricating oil

1)For fuel and lubricating oil for the tractor see Table 2—1.

Table 2—1 Fuel and lubricating oil for the tractor

Component	Season and ambient temperature	Oil specification	Notes
Fuel tank	Summer (ambient temp. above 10 ℃)	No. 0 light diesel fuel GB252—87	
	Winter (ambient temp. below 10 ℃)	—10, —20, —35 GB252—87	
Engine sump Lifter Oil pan of air cleaner injection pump	Ambient temp . below 0℃	No. 20 diesel engine oil GB5323—85	SAE 20 for recommendation
	Ambient temp. at 0～25℃	No. 30 diesel engine oil GB5323—85	SAE 30 for recommendation
	Ambient temp. above 25℃	No. 40 diesel engine oil GB5323—85	SAE 40 for recommendation
Transmission box Final drive Belt pulley	Summer (ambient temp. above 10℃)	No. 40 diesel engine oil GB5323—85	SAE 90 for recommendation
	Winter (ambient temp. below 10℃)	No. 30 diesel engine oil GB5323—85	
Grease nipple Steering gear	Without consideration of season	No . 2 calcium base grease GB491—87	Firmax2, B_2 AA_2, Unedo 2, Cup_2 for recommendation
Bearing 60203 generator and starter	Without consideration of season	No. 2 compound calcium base grease ZBE36003—88	RPM Multimotive, Mobilplex EPOi, 2 for recommendation

2)**Cautions for filling fuel**

Using clear diesel fuel is an important factor to prevent troubles in engine and prolong the engine's service life. The followings should be observed during filling fuel:

A. Fuel must be deposited for over 48 hours before fuel tank is filled with it. Fuel at the bottom should not be poured into the fuel tank.

B. Filter fuel when filling fuel tank with it.

C. Fuel filling devices must be kept clean.

D. Fuel tank and fuel filter should be cleaned regularly, and deposited fuel should be drained out.

2. Water

1)Radiator should be filled with clean soft water so as to eliminate scale in the engine cooling system which will reduce cooling efficiency. Only after being softened can hard water such as well water, spring water, etc. be used. Method for softening hard water is as follows:

A. Boil hard water, then deposit for some time and filter.

B. Put 1.5g of caustic soda into one lit. of hard water. When operating the tractor in cold weather, add cooling water with freeze—proof liquid.

3. Running—in of the unused tractor

The unused or overhauled tractor can not be put into operation unless it has undergone running—in. Otherwise its performance will be affected and service life will be shortened.

1)**Preparations before running—in**

A. Clean the tractor;

B. Inspect outside bolts and nuts, and tighten them if necessary.

C. Check the lubricating oil level, and refill to stipulated level if insufficient.

D. Inject grease into lubricating points.

E. Fill with fuel and cooling water.

F. Check toe—in (3～11mm) and tire inflation pressure, readjust or reinflate if necessary.

G. Inspect the connecting of battery and wires.

2)**Idle running—in of the engine**

After the engine is started in accordance with specified steps, listen carefully and make sure whether there is abnormal sound, check for leakage of water, air and oil, and the readings of the gauges. When it is made sure that the engine is in normal working condition, the next step of running—in can proceed.

The unloaded running—in lasts 15 minutes, the first 5 minutes with minimum throttle, then medium throttle for other 5 minutes and the last 5 minutes with full throttle.

3)**The running—in of PTO and hydraulic system**

A. The running—in of PTO

While the engine runs with medium throttle, shift the PTO control lever to high speed position and then to low speed position for running—in 5 minutes respectively. Then shift the lever to neutral position.

B. The running—in of hydraulic system

Start engine, shift PTO engagement control lever to " engaged position" , then lift and lower control lever for several times to observe whether there are oil leakage, blocking and rejecting in the system. If the system is in normal condition, mount an implement equal in weight to a double—furrow plow to the hitch, and use control lever to lift and lower the implement for 20 times at rate engine speed. After the running—in, shift the PTO engagement control lever to " disengaged position" , so as to make the gear stop operation.

4) **Unloaded and loaded running—in of tractor**

The running-in of the tractor should be done at rated engine speed. The load must be applied from small to large and the speed from low to high in accordance with Table 2—2.

Table 2—2 Unloaded and loaded running-in of the tractor

Gear / Time (hr) / Load	Running-in hrs per gear					Total hrs
	L3	L4	H1	H2	LR	
Unload	1/3	1/2	1/2	1/2	1/6	2
1/4 load	3	4	5	5		17
1/2 load	3	5	5	5		18
3/4 load	3	5	5			13

A. During the unloaded running—in, left and right steering should be made and brake should be properly used. Additionally attention should be paid to the following:

a. Observe carefully the working condition of the engine, the transmission and the traction devices and steering system.

b. Check the function of clutch, brake and gear shift.

c. Check the readings of the gauges and electrical epuipment.

If abnormal phenomena and breakdown are discovered, remove them and then the running-in may proceed.

B. Loaded running—in of the tractor

Time for loaded running—in is 48 hrs. For the arrangement see Table 2—2.

5) Check and maintenance after runnging—in

After the running—in is completed, the tractor must undergo the following maintenance before being put into operation.

A. Drain out the lubricating oil in the transmission box, final drive and lifter housing while it is still warm. Then fill them with diesel fuel of proper quantity and run the tractor in 2nd forward and 1st reverse gears for 2～3 minutes, meanwhile lift and lower the links for several times, and lower the links to the lowest position. As soon as the tractor is stopped, drain out the diesel fuel immediately and then refill with unused lubricating oil to specified level.

B. Drain out oil in the engine sump while it is still warm. Wash the sump and oil filter with diesel fuel. After the diesel fuel has been drained out, refill the sump with unused lubricating oil to specified level.

C. Drain out cooling water, flush cooling system with clean soft water.

D. Replace the oil in oil pen of air cleaner.

E. Check the tightness of cylinder head nuts, valve clearance and the free travel of the decompression mechanism, the brake and clutch pedals. Adjust them if necessary.

F. Check and tighten all outside nuts and bolts.

G. Inject grease into each lubricating point.

Tractor, after running—in, should be checked, maintained and adjusted again to make it in excellent working condition and then can be put into operation.

4. Controls and instruments

1) Preheating/starting switch 16 (Fig. 2—1)

Insert the key into the switch. Turn the key clockwise, the electrical equipnent

and battery are connected and charged ,then continue to turn it to the " start " position. Withdraw the force imposed on the key ,it will return back to the " working " position automatically.

2)**Triple—throw switch** 5(**Fig.** 2—1)

Pull the switch to the first throw ,small front head lights ,rear direction indicating lights and panel lights will be lightened. Pull the switch to the second throw ,front head lights (lower beam) ,rear direction indicating lights and panel lights will be lightened. Pull the switch to the last throw ,the front head lights (upper beam) ,rear direction indicating lights and panel lights will be lightened.

3)**Tail light switch** 6(**Fig.** 2—1)

Draw the switch out ,the tail lights are turned on and push the switch in ,thd tail lights are turned off.

4)**Hand throttle** 15(**Fig.** 2—1)

Pull the hand throttle backward ,the fuel flow will increase while push it forward , fuel flow will decrease.

5)**Fuel cut—off rod** 3(**Fig.** 2—1)

Pull fuel cut—off rod backward ,the engine will be stopped. Then push it forward to the original posit

6)**Foot throttle** 21(**Fig.** 2—1)

Depress the pedal down ,the fuel flow will increase ;loosen it ,the fuel flow will decrease.

7)Decompressing lever 4(Fig. 2—1)

Turning the lever clockwise is for the decompressing position.

8)**Main and sub—shifting levers** 18,2(**Fig.** 2—1)

The positions of main and sub-shifting levers are as shown in Fig. 2—2. Shift the two levers into different positions respectively ,various forward and reverse speeds can be obtained. The neutral position is in the middle.

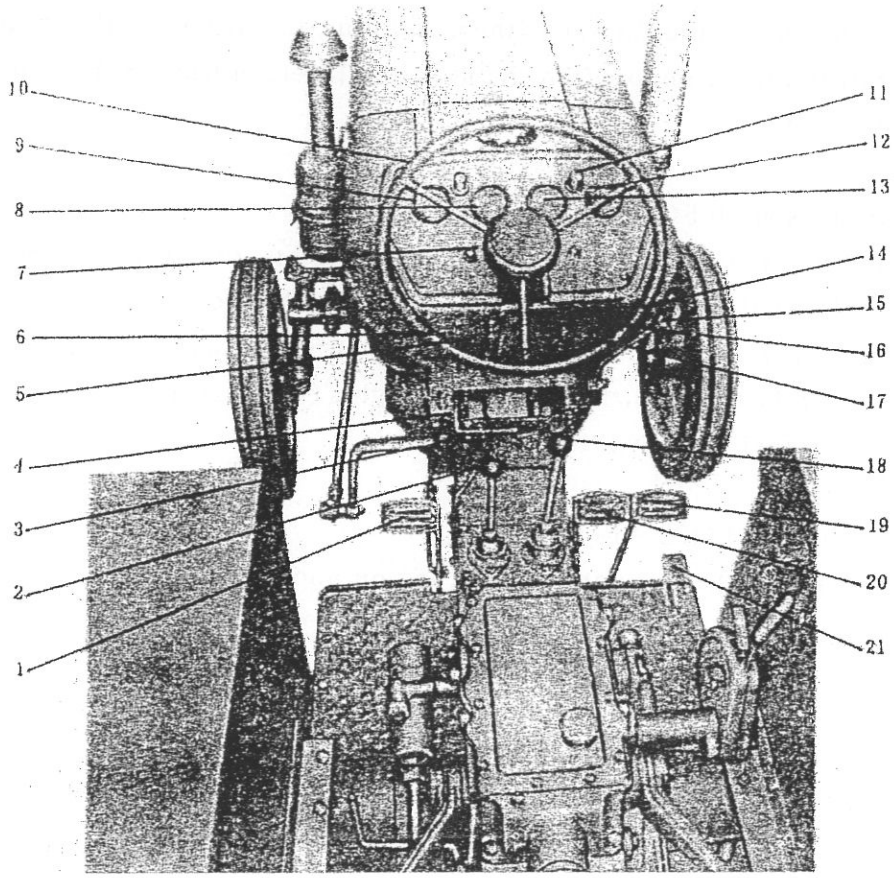


Fig. 2—1

1. Clutch pedal 2. Sub—shifting lever 3. Fuel cut—off rod 4. Decompression lever 5. Triple—throw switch 6. Tail light switch 7. Direction indicating light 8. Water temperature gauge 9. Oil pressure gauge 10. Steering wheel 11. Panel light 12. Ammeter 13. Oil temperature gauge (or air pressure gauge) 14. Horn button 15. Hand throttle 16. Preheating/starting switch 17. Direction indicating light switch 18. Main shifting lever 19. Right brake pedal 20. Left brake pedal 21. Foot throttle

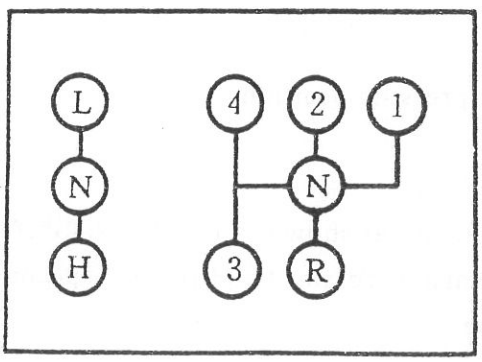


Fig. 2—2 Positions of main and sub—shifting levers

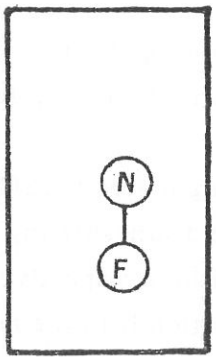


Fig. 2—3

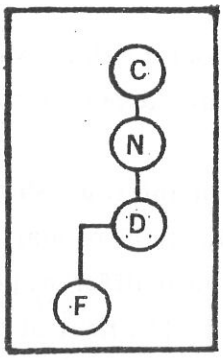


Fig. 2—4

9)Front drive and Creeper lever

The Front drive and Creeper lever is installed on the Mid—connecting housing. Fig. 2—3 shows the positions of the Front lever. The positions of the Front drive and Creeper lever are shown in Fig. 2—4, put the lever in position " N" will cut—off the connection between the engine and transmission system, shift the lever to position " D" if the Creeper or front drive of the tractor is not to be used.

10)**Clutch pedal** 1(**Fig.** 2—1)

Depress the pedal, the release arm will touch stop screw, thus the clutch is disengaged.

11)**Left and right brake pedals** 20, 19(**Fig**, 2—1)

Depress the left brake pedal to brake the left driving wheel, the left turning radius of the tractor can be reduecd. Depress the right brake pedal to brake the right driving wheel, the right turning radius can be reduced.

12)**Ammeter** 12(**Fig.** 2—1)

The ammeter indicates the charging and discharging of the battery. If the pointer deflects to " +" , it means that the battery is being charged. If the pointer deflects to " —" , it means that the battery is being discharged. If there is sufficient electrical engergy in the battery, the pointer remains at " O" or deflects to " +" slightly.

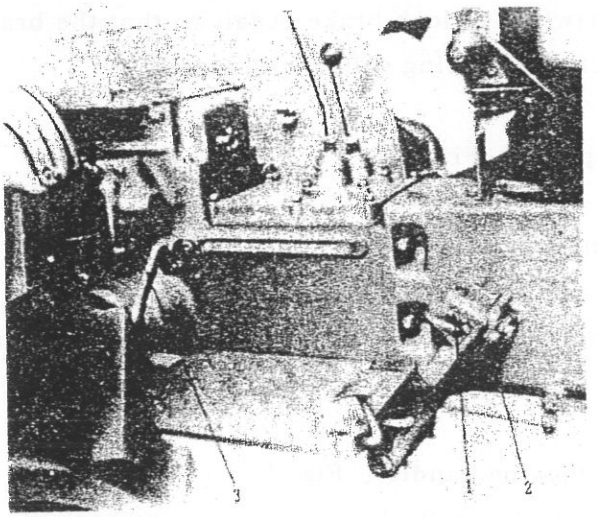


Fig. 2—5

1. Brake lock pawl 2. Brake lock plate 3. Differential lock pedal

13)**Water temperature gauge** 8(**Fig.** 2—1)

The gauge shows the water temperature of the cooling system. The normal water temperature is in the range of 70～90℃。

14)**Oil temperature gauge(or Air pressure gauge)** 13(**Fig.** 2—1)

The gauge shows the temperature of engine lubricating oil. The normal oil temprature is in the range of 75～95℃.

(The gauge shows the air pressure of Brake System. The normal working pressure is 0.78 MPa.)

15)**Oil pressure gauge** 9(**Fig.** 2—1)

The gauge shows the oil pressure in main oil lines of the engine. The normal pressure is 0.2～0.4MPa and should not be lower than 0.05MPa when engine runs idle.

16)**Brake lock plate** 2(**Fig.** 2—5)

The brake lock plate can connect left and right pedals as a whole so that the left and right driving wheels can be braked simultaneously when the pedals are depressed.

17)**Brake lock pawl** 1(**Fig.** 2—5)

The brake lock pawl is used when the tractor is parked on a slope or in storage for a long period. Push the pawl up to lock brake pedals so that the brake can be kept in braking. Pull the pawl back, the braking will be eliminated.

18)**Differential lock pedal** 3(**Fig.** 2—5)

19)**PTO gear—shifting lever** 2(**Fig.** 2—6)

For the engagement of the power—take—off shaft, shift the lever forward or backward for high or low speed repectively. Place the lever in middle position to disengage the shaft.

20)**Hitch mechanism locking handle** 1(**Fig.** 2—6)

Push the handle forward to vertical position, the internal lift arm is locked so that the raised implement is locked and kept in raised position.

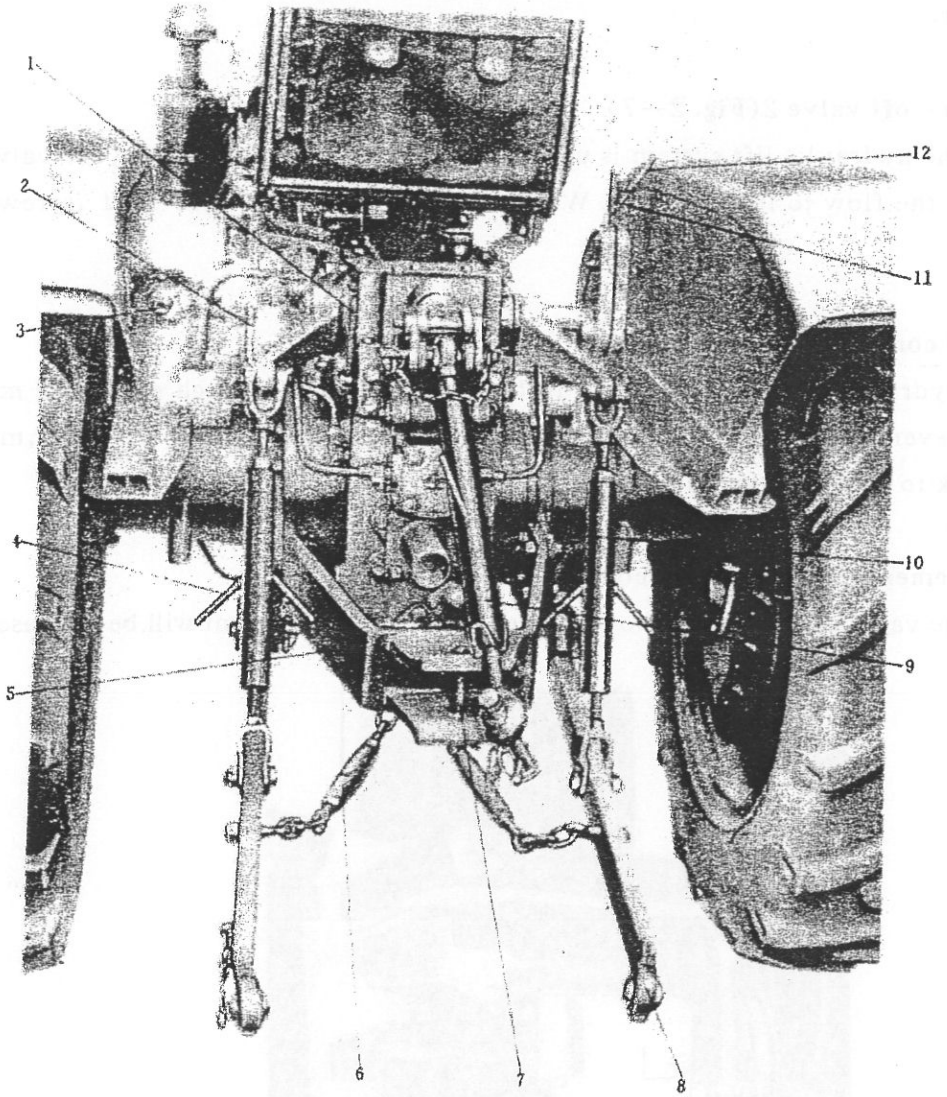


Fig. 2—6

1. Hitch mechanism locking handle 2. PTO gear—shifting lever 3. Electrical connector 4. Lift link length regulating handle 5. Drawbar 6. Check chain 7. Hitch pin 8. Lower link 9. Upper link adjusting tube 10. Connecting plate 11. Position control lever 12. Draft control lever

21) Draft and position control levers 15, 14 **(Fig.** 2—6)

Push any of the two levers forward to " lowering position" , the hitch will be lowered. But when raising the hitch, the two levers must both be in " lifting position " .

22)**Electrical connector** 3(**Fig.** 2—6)

The electrical connector connects the electrical equipment on the tractor with that on the trailer.

23)**Shut—off valve** 2(**Fig.** 2—7)

When the hydraulic lift system is used for hydraulic output,screwing the valve in will shut off the flow to lift cylinder. When the lift cylinder is to be used ,screw the valve out.

24)**PTO control lever** 3(**Fig.** 2—7)

When hydraulic devices or PTO is to be used ,deprss the clutch pedal and move the control lever to " engaged" position. When the operation has been done ,move the lever back to " disengaged" position.

25)**Implement lowering speed control valve** 1(**Fig.** 2—7)

Screw the valve clockwise ,the lowering speed of the implement will be increased.

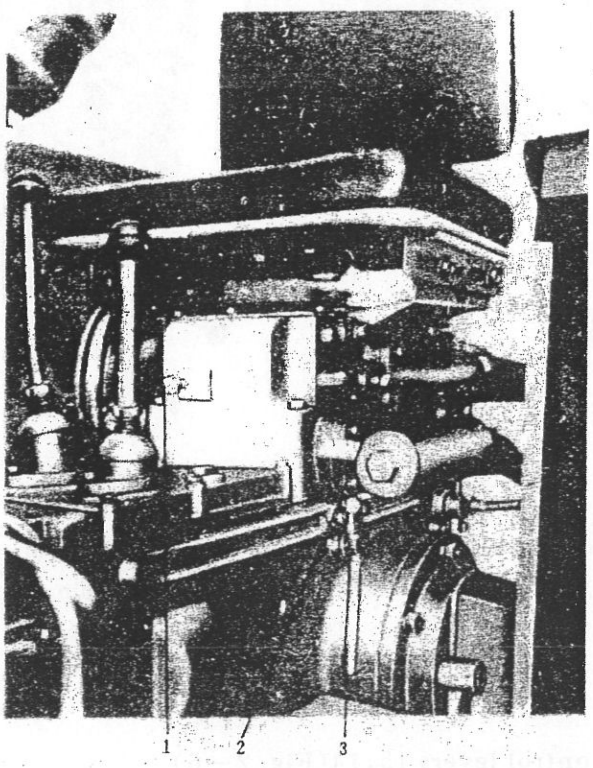


Fig. 2—7

1. Implement lowering speed control valve 2. Shut—off valve 3. PTO control lever

5. Control and operation of the tractor

1)**Starting engine**

A. Before starting the engine, check the oil level of engine sump, injection pump and the fuel level of the tank, and see if the radiator is full of water.

B. Move the switch of sediment lowl to " open" position and drain out the air in fuel line.

C. Insert the key into preheating/starting switch and trun it clockwise to connect electrical circuit.

D. Shift the main shifting lever and PTO control lever to neutral position.

E. Set the hand throttle to throttled—wide position.

F. Starting

Turn clockwise the key inserted in the preheating/starting switch to " start" position, starting motor will drive the engine, thus the engine can be started. By releasing the key the switch can return back automatically to " operating" position. The time of continuous starting of motor must not be more than 10 sec. for each start. If the engine can not be started after a start, only after an interval of 2 minutes can the engine be started again. In case the engine still fails to be started after repeated trial, check the engine for any defect and remove it immediately.

G. If the engine crankshaft speed is too low during starting, move decompression lever to " decompression" position and preheating/starting switch to " start" position. When engine speed is increased, immediately move back the decompression lever, then the engine can be started.

H. When the engine has been started, set the throttle to throttle-down position and inspect the engine. If no abnormal phenomena are found out, full load operation can be done when water temperature is up to 60℃.

1. When ambient temperature is too low and it is difficult to start the engine, the follwing methods can be used:

a. Drain out the engine oil in oil sump and head it to 60～70℃, then refill the oil sump with it.

b. Open water drain cock which is placed in cylinder block, fill the radiator with hot water of 80～90℃, Close the cock when the hot water passes out through the cock.

Note: It is prohibited to heat the oil sump by fire so as to protect the engine body from being damaged.

2)**Starting the tractor**

A. Release the brake lock pawl.

B. Depress clutch pedal and shift the main and sub-shifting levers to their repective positions as required by the selected speed. Do the gear-shifting smoothly and silently. In case the gear —shift levers are found hard to be put in the required positions, try again after releasing and depressing the clutch pedal once more.

C. Depress foot throttle slowly and simultaneously release clutch pedal so as to make tractor start off smoothly.

3)**Operating the tractor**

A. During operation make sure that readings on gauges are normal.

B. It is prohibited for operator to place his foot on clutch pedal so as to protect clutch from being damaged because of semi-engaged condition of clutch.

C. In transportation or running on highway, lock the left and the right brake pedals together with brake lock plate.

D. In field operation, one-side braking can be used to reduce turning radius, but it is prohibited to use one-side braking for sharp turning when the tractor is running at high speed or is used for transportation on highway, so as to prevent overturning and protect components from being damaged.

E. Proper speed should be selected to get best productivity and economy. Talbe 2 —1 shows the speeds for various operations.

Table 2—1 Speeds for different operations

Gear	Operation
1	Rotary cultivation, Transplanting
2	—do—
3	Harvesting
4	Plowing, harrowing and drilling
5	—do—
6	—do—
7	Transportation
8	—do—

4)**Stopping the tractor**

A. Throttle the engine down.

B. Depress the clutch pedal and shift the gear-shifting lever to neutral position.

C. Release the clutch pedal and let engine run idle.

D. Depress the brake pedals to stop the tractor, then lock the pedals with the lock pawl.

Note: In case the tractor has to be stopped suddenly, clutch pedal and brake pedals should be depressed simultaneously. It is prohibited to depress the pedals only, which will damaged the parts.

E. If the tractor is to be parked for quite a while, the engine should be stopped. After the engine has been unloaded, it should run at low speed for some time until the cooling water temperature drops to 70℃ or lower, then pull out fuel cut-off rod to bring the engine to a stop.

Note: It is prohibited to stop the engine at once when its temperature is very high, or to stop the engine with decompression mechanism.

F. Turn the preheating/starting switch to " O" and pull out the key. If the tractor is going to be stored, turn off the fuel tank cock.

G. In case the tractor is stopped when the ambient temperature is below 0℃, screw of the radiator cap and turn on the water—drain cock on the bottom of the radiator and on the cylinder block to drain out water at idle engine speed so as to protect the body from being frozen.

5)**Safety regulation for operation**

Safety regulations are very important for protecting drivers and tractors from hazard. They should be observed strictly in operation.

A. Inspect carefully the working condition of the engine and main components and listen to whether there is abnormal sound or noise. Especially observe the technical state of clutch and brake. Check and tighten the bolts and nuts on main components of the tractor.

B. Make sure that there is no people or obstacle around the tractor and press horn button before starting off the tractor.

C. Don't go up and down the tractor during operation. Never make check or repair under the tractor while the engine is still running.

D. Before the tractor goes up or down a slope, proper speed should be selected and don't coast, turn sharply or shift gears while driving down a slope.

E. In transportation, left and right brake pedals must be locked together. One-side

braking can not be used for sharp turning when the tractor is running at high speed or with full load.

F. If front end of the tractor rises up in operation, throttle down the engine, disengage the clutch and reduce the load to protect the tractor from longitudinal overturning.

G. If the engine runs away, immediately pull out the fuel cut—off rod, move decompressin lever to " decompressing" position or plug up fresh air into the engine instead of disengage clutch.

H. Lightening equipment must work well during operation at night.

I. Control lever should be placed in the neutral position when the four-wheel driving tractor is running idle or being used for transportation.

6. Control and operation of the working devices

1) Control and operation of hydraulic hitch system

A. Coupling, lifting, lowering and transferring an implement

Before coupling mounted implements, set hydraulic hitch system to working condition and move lifting control lever to " lowering" position. Slowly back the tractor to touch the implement and couple left and right lower links, then upper link. Lock them with locking pin.

Lift or lower implement with the control lever.

Note: When the tractor is used for operation in the field with mounted implement, the implement can not be lowered until the tractor has turned at the field end and run straightly.

Implement must be raised up before the tractor makes turning.

During transferring mounted implements in the field, lock the implement at raised position with locking shaft.

B. Control of implement tilling depth

For control of implement filling depth there are two methods, namely, draft control and position control.

a. Draft control

Draft control means that tilling depth is controlled by traction resistance. It utilizes the change of implement's working resistance to control the tilling depth automatically. Draft control is usually used in plowing.

Move draft control lever forward while the tractor is advancing until the working

parts of the implement have been lowered to the desired depth. After the depth is reached, the implement will stop lowering due to the action of control mechanism. The desired tilling depth can be selected during the process of operation. The more the lever is moved forward, the lower the implement will drop and the deeper the tilling depth will be. On the contrary the tilling depth will become shallower.

When the desired tilling depth has been chosen, the draft control lever is limited by a handle stopper at the position so that it can be pushed to the same position every time and the tilling depth can be kept unchanged during the whole process of operation. If the field surface is undulatory or soil draft resistance changes abnormally, the tilling depth can be controlled automatically. When tilling resistance increases, the implement will be lifted slightly thus the tilling depth becomes shallower. If tilling resistance drops down, tilling depth will become normal.

b. Position control

Position control means that the implement is controlled relatively to the position of the tractor. The position control is usually used for operations, such as rotary cultivation. harvesting, sowing and bulldozing, etc. Position control can alse be used for plowing operation in a even field.

When position control is to be used, push position control lever forward, the implement will be lowered. Every position of the lever corresponds to a definite positon of the implement with reference to the tractor. The more the lever is moved forward, the lower the implement will drop. The tilling depth can be chosen during operation. If desired tilling depth has been got, limit the lever with a handle stopper, so that the lever can be pushed to the same position every time, thus lowering range of the implement can be kept unchanged.

Note: Both draft control lever and position control lever can control the lifting or lowering of the implement, therefore only one of the two levers can be used during operation, the other should be set to lifting position and limited by the handle stopper.

C. Selection of hitching point on upper link

There are three hitching points on the rear end of the lifter to be connected with the front end of upper link which are upper, middle and lower holes respectively.

If position control is used to control tilling depth, the front end of the upper link should be fixed in the lower hitching hole. If draft control is used to control the tilling depth, the upper link should be fixed in the upper hitching hole in case of less soil resistance and shallow tilling depth. In case of higher soil resistance or deep tilling depth, middle hitching hole should be used.

D. Adjusting the implement

To turn the middle threaded tube of the upper link can extend or shorten the upper link to fore-and-aft level off the matched implement. To swing the right lifting link length regulating handle can extend or shorten the right link to left—right level off the matched implement. And the length of left lift link can also be adjusted if necessary.

E. Control of the lowering speed of the implement

The lowering speed of the implement should be chosen properly according to the weight, modle of the implement and the field surface hardness in order to protect the implement from being damaged. Turn right the lowering speed adjusting valve, the lowering speed will be reduced; turn left the valve, the lowering speed will be increased.

F. Adjusting check chains

The check chains are used to protect lower links and implement from hiting rear wheels because of the too much crosswise swinging of the lower links and the implement during lifting. The length should be adjusted properly so that it can protect lower links and implement from hiting rear wheels and can not change the implement's limited position of lifting or lowering. The check chains can not be adjusted too tightly, otherwise parts may be damaged.

G. Hydraulic output

If implement or trailer mounted on the tractor needs pressured oil, first connect oil line with hydraulic output coupler tightly, then make the outside lift arms move to the lowest position in order to drain away the hydraulic oil in the lifting cylinder. Screw in the shut-off valve to cut off the oil flow to lifting cylinder, thus the hydraulic output can be used by connecting draft control level or position control lever.

Note: In field operation with mounted implement, screw out the shut-off valve and thus the implement can be lifted or lowered.

2) Control and use of PTO

When the power-take-off shaft of the tractor is to be used, proceed as follow:

A. Shift the PTO control lever to " neutral" position, take off the safety shield and couple the driven machine to the PTO shaft.

B. Depress the clutch pedal and shift PTO control lever to " engaged" position. Then shift PTO control lever to " high speed" or " low speed" according to the requirement of the driven machine used.

C. Release the clutch pedal slowly and the driven machine will run. First let the driven machine run at slightly open throttle for a while to ensure that nothing is wrong with the driven machine. Then make the throttle wide open and put the driven machine into operation.

3)Control and operation of Belt Pulley Assembly

When the belt pulley assembly of the tractor is to be used for stationary working, proceed as follows:

A. Take off the safety guard of P. T. O. and the top-link, left and right lower-link of the suspension system.

B. Install the belt pulley assembly to the PTO shaft.

C. Let the pulley of tractor and the pulley of implement be in same level, then connect them by the belt. Start the tractor forward till the belt in good working tightness. Fix the tractor and the implement.

D. Put the sub-shifting lever in position " N" , then shift the main shifting lever to position " 1" or " 2" for the bearing of Shaft I can be lubricated well.

E. Leave the PTO control lever at needed speed position. First let the driven machine run at slightly open throttle for a while to ensure that nothing is wrong with the driven machine. Then make the throttle wide open and put the driven machine into normal operation.

Note:

a. Must depress the clutch pedal first when engaged or disengaged the PTO shaft if the engine is working.

b. Leave the PTO control lever out of gear when the PTO shaft are not used.

4)Control and use of Hydraulic Take-off Device

(especially for transportation type tractor)

When the trailer mounted with the transportation type tractor needs pressure oil, the hydraulic take-off device can be used, proceed as follows:

A. Connect the trailer's oil line with the oil outlet tube connecter of hydraulic take-off device tightly.

B. Move the shifting handle of control valve to " up" position (means lifting position), hydraulic take off device distributes the pressure oil, the trailer's packing box which loading 2 tons can be push up for dump.

C. Move the shifting handle of control valve to the middle position between " up " and " down" (means neutral position), the trailer's packing box can stay at any

height position.

D. Move the shifting handle of control valve to " down" position (means lower position), the trailer's packing box can be lowered into its regular place.

7. Use of the electrical equipment

The electrical equipment of the tractor is used to start engine, meet the needs of giving indication signals and lighting for operation at night, etc. Therefore it is very important to use the electrical equipment correctly.

1) **Battery**

A. Preparation

a. Clean the surface of a new battery. Screw off the plastic cover and make the air hole on the cover open.

b. The specific gravity of the electrolyte used in the battery is 1.26(15℃) in the tropics, 1.28(15℃) in temperate zone and 1.29(15℃) in frigid zone. Fill the battery with the electrolyte when it is cooled to 25—30℃. After a standstill of 20 minutes the battery can be used.

c. The electrolyte level should be 10—15 mm above the protecting plate.

d. If the battery is stored over a year it should be changed with electric current of 11.5 A for 5 hours.

B. Routine use

a. In routine use the dust and dirt on the battery surface should be cleaned periodically and keep the terminals and all contacts in good connceting condition.

b. Keep the air hole on the plastic cover unimpeded so as to protect the battery from trouble because of too much gas in the battery.

c. Check the height of electrolyte level periodically (Fig. 2—8). The height of electrolyte level is within 10—15mm in the measuring tube. If the electrolyte is below that level, and distilled water. In case electrolyte overflows under unusual conditions, the electrolyte mixed with reference to local temperature can be added.

d. Keep the generator and regulator in good working condition and make the consumed electric power be added in time.

e. Never check the electricity storage by the method of short circuit so as to protect the battery from being damaged.

f. The battery should have enough electric power. When the voltage value of a cell is below 1.7V, the battery should be recharged.

g. In order to prolong the service lift of the battery, the horn should not be used

frequently and starting engine should be carried out according to the regulations.

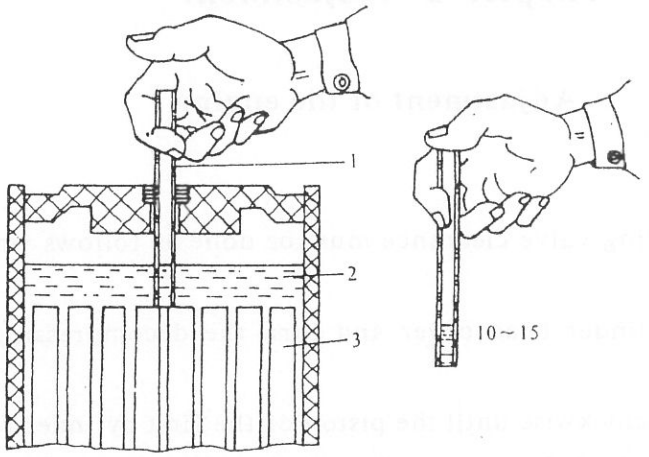


Fig. 2—8 Checking the electrolyte level

1. Glass tube 2. Electrolyte 3. Plate

2)**The generator and regulator**

A. Generator is used with regulator.

B. The generator is connected with ground by negative pole. The generator is connected with the regulator and the battery by negative pole. They can not be connected in wrong way or in counter diretion. Otherwise the generator and regulator may be damaged.

C. Keep the generator clean and contacts between wires in good condition.

D. Check the tension of the generator belt regularly and adjust it if necessary.

E. When the tractor is to be stopped, the key in the preheating/starting switch should be moved to " O" position to disconnect the field coil of the generator and the battery so as to avoid the battery discharging to generator.

Note: Checking the generator by short circuit is seriously prohibited, otherwise the silicon rectifier and the regulator may be damaged.

3) **The starter**

A. Keep the starter clean and the contacts between wires in good condition.

B. The time for each starting should not be over 10 seconds. The shortest interval between two startings must be more than 2 minutes. If the engine can not be started after several startings, the trouble should be found out and removed, then the engine can be restarted.

C. If the engine is started in winter, it should be preheated and then can be started with the starter.

Chapter Ⅲ Adjustment

1. Adjustment of the engine

1) Valve clearance

Checking and adjusting valve clearance must be done as follows when the tractor is in cold state:

a. Dismount the cylinder head cover and turn the decompressing shaft to the decompressing position.

b. Crank the engine clockwise until the piston of the first cylinder reaches the top —dead —center at the end of the compression stroke and the mark on the flywheel matches with the mark on the brim of the inspection window of the flywheel housing.

c. Return the decompressing shaft to its original position and adjust the valve clearance of the first cylinder.

d. Insert feeler gauge between the rocker arm head of intake and exhaust valve and valve stem to measure the clearance. If the clearance needs to be adjusted, loosen the lock nut on the valve clearance adjusting screw, then use a screw driver to adjust the screw until the feeler gauge inserted between the rocker arm head and the valve stem is felt a little snug but still free to move in the gap. And then tighten the lock nut (Fig. 3—1).

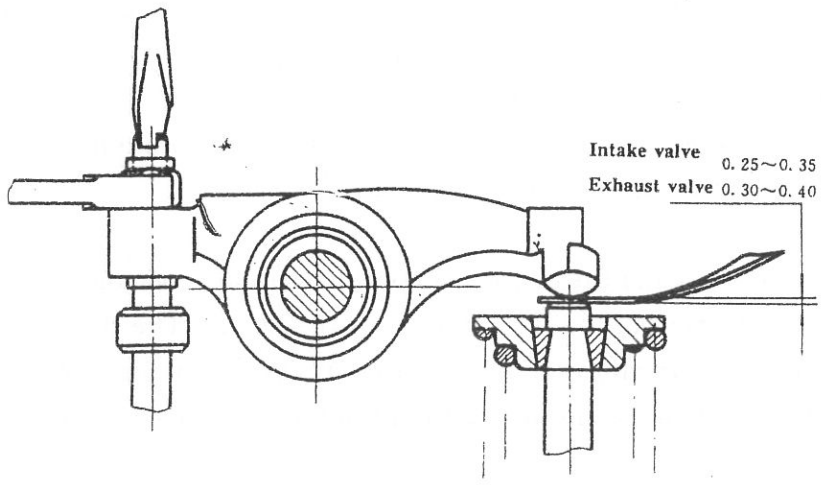


Fig. 3—1

e. Turn crankshaft half a revolution in the rotating direction of the diesel engine and do valve adjustment of the second cylinder in the same way.

After the adjustment of the valves of the two cylinder has been done, check them again.

2) **Fuel delivering advance angle**

a. Dismount the high pressure fuel pipe of the first cylinder and mount a glass capillary tube to the fuel outlet port of the first cylinder (Fig. 3—2).

b. Place the hand throttle to the position for maximum engine speed, exhaust the air in fuel system until there is no air bubble in the glass capillary tube when turning flywheel.

c. Crank the engine slowly while observing attentively the fuel level in the glass capillary tube. Stop cranking as soon as the fuel level in the tube begins to rise and see through the inspection window on the flywheel housing whether the fuel delivery indicating mark on the flywheel alings with the indicating mark on the flywheel housing. If the fuel delivering advance angle does not correspond to the range specified by the manual, it should be adjusted as follows.

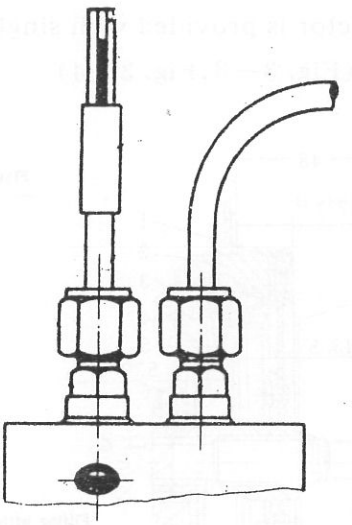


Fig. 3—2

d. Loosen the three fixing screws on the injection pump flange. Turn the pump assembly inward to advance the delivery or turn the pump assembly outward to delay the delivery. When the correct degree has been attained, tighten the three screws.

3) Oil pressure

Adjustment of oil pressure is carried out when the engine has run for a while (oil temperature reaches about 80℃). Loosen the lock nut on side face of oil filter, turn the pressure regulating screw to make oil pressure correspond to the range specified in the manual. After the adjustment has been done, tighten the lock nut.

4) **Injection pump and speed governor**

The fuel injection pump and speed governor have been checked and adjusted well and sealed with lead before shipment of the tractor, therefore the users are advised not to alter the setting. If readjustment is needed it should be done on a special test stand with standard fuel injectors and standard high—pressure fuel pipes, according to the

operation instructions of fuel injection pump and speed governor.

5)**Tighten torques of important stud bolts and nuts of engine(N · m)**

Connecting rod screw ·····98～118

Cylinder head nut ·····118～137

Main bearing cap nut ·····137～157

Flywheel fixing bolt ·····98～118

Main bearing cap stud ·····69～78

2. Adjustment of the transmission

1) Clutch

The tractor is provided with single disk ,dry type constant mesh one-stage or two-stage clutch(Fig. 3—3,Fig. 3—4)

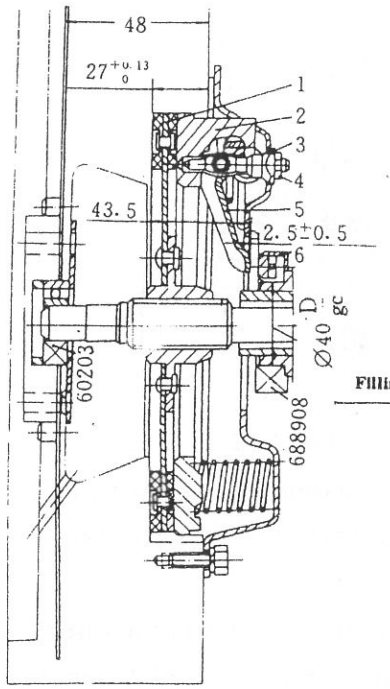


Fig. 3—3 Clutch pressure plate of one-stage clutch

1. Clutch disk sub-assembly 2. Pressure plate
3. Adjusting nut 4. Lock nut 5. Release lever
6. Release bearing

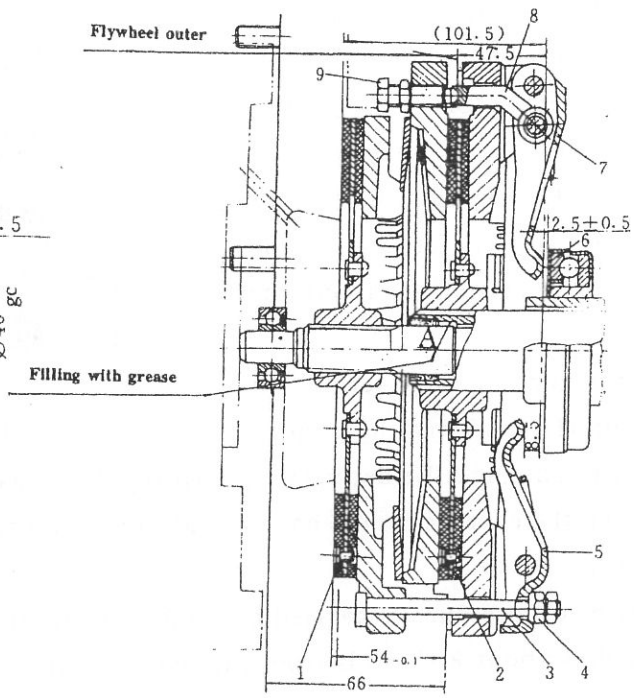


Fig. 3—4 Clutch pressure plate of two-stage clutch

1. Auxiliary clutch driven disk assembly
2. Main clutch driven disk assembly
3. Auxiliary clutch pull rod 4. Ball nut
5. Auxiliary clutch release lever 6. Release bearing
7. Main clutch release lever 8. Push rod
9. Main clutch adjusting screw

The clutch in use is subject to continuous wear and therefore should be timely adjusted and maintained in order to avoid possible slippage or incomplete disengagement brought up by the worn parts.

A. Adjustment of " free travel"

For proper work of the clutch, the clearance between the clutch release bearing and the three release levers' end faces should always maintain 2—3 mm. Depress the clutch pedal untill this clearane is eliminated, the lower end of the clutch release arm will move a distance which is called the " free travel" or " blank travel" (Fig. 3—5). The method for adjustment is as follows: Loosen nut 1, take off connecting pin 3 and turn the clutch push rod adjusting fork 2 to extend or retract the clutch push rod until the free travel distance 4—7 mm is obtained. At this time, the clearance between the end face of release bearing and the end faces of three release levers is about 2—3 mm.

B. Adjustment of " working travel"

Depress the clutch pedal untill the " free travel" is eliminated, then depress the pedal further, the release arm will move forward, along with the axis of the limiting screw 4, until the clutch disengages completely. This distance is called the " working travel" (Fig. 3—5).

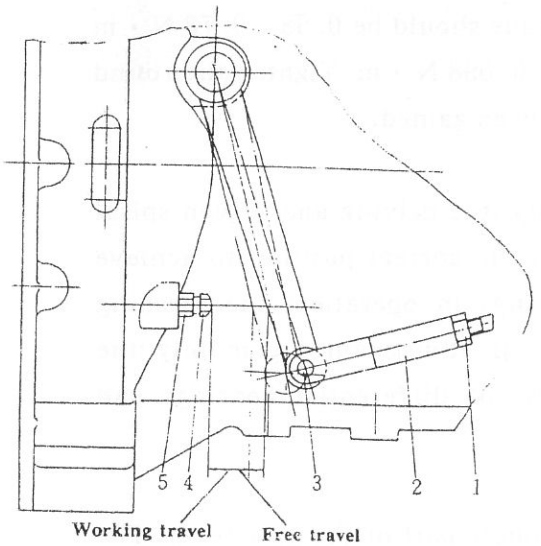


Fig. 3—5 Adjustment of clutch

1. Nut 2. Clutch push rod adjusting fork 3. Pin
4. Limiting screw 5. Lock nut

The method for adjustment is as follows: Loosen the lock nut 5 of limiting screw 4, enlarge or lessen the exposed length of the limiting screw to ensure the working travel of one-stage clutch is 26～36 mm; the working travel of two-stage clutch is 35～45 mm.

After the above adjustments, check the heights of the release levers, the end faces

of the three release levers should be located in a vertical plane perpendicular to the center line of the clutch shaft, the deviation should be no more than 0.15 mm for perfect working of the clutch.

In reassembling the clutch after replacement of friction plate assembly, keep the clutch engaged. For one-stage clutch, the distance between the end faces of release levers and flywheel outer end face should be 26.5 mm. For two-stage clutch, the distance is 47.5 mm and the distance between the main clutch release lever and auxiliary clutch release lever is 8.5 mm.

2) **Transmission box (Fig. 3—6)**

The tractor is provided with a transmission box of compound shaft spur gear (4+1)×2 which has been adjusted properly during assembling and needs no adjustment in its service life.

A. Adjustment of the primary shaft axial clearance

Add or reduce the adjusting shims(2) in the front bearing cap of primary shaft to maintain the axial clearance no more than 0.1 mm.

B. The pre-tightening of the two front bearings(27305) of the output shaft

Turn the round nut(8) to pre—tighten the two front bearings (27305) of the output shaft. The friction torque of pre—tightened output shaft bearings should increase 0.49—0.68 N • m. The generaal friction torque should be 0.58—0.78 N • m with the addition of primary friction torque of about 0.098 N • m. Tighten the round nut with lock nut after the pre-tightness required has been gained.

C. Main drive

In order to ensure that main drive works reliably, the driving and driven spiral bevel gears must be mounted in pairs and moved to the correct position to achieve favourable meshing. Because of wear-out of bearings in operation, the meshing position of gears need to be readjusted. The items of adjustment are mainly the meshing traces of gear teeth and the pre-tightness of differential bearings and occasionally the gear backlash.

a. adjustment of gear meshing traces

The ideal gear meshing traces should be at the middle part of the gear teeth. The meshing traces of small bevel gear teeth should be skewed toward the apex, that is slightly higher than those of big bevel gear teeth. Under the condition of light load, the length of gear meshing traces should be about a half of the tooth length and the traces are near the small end of gears. If the traces are abnormal, adjustment must be carried out.

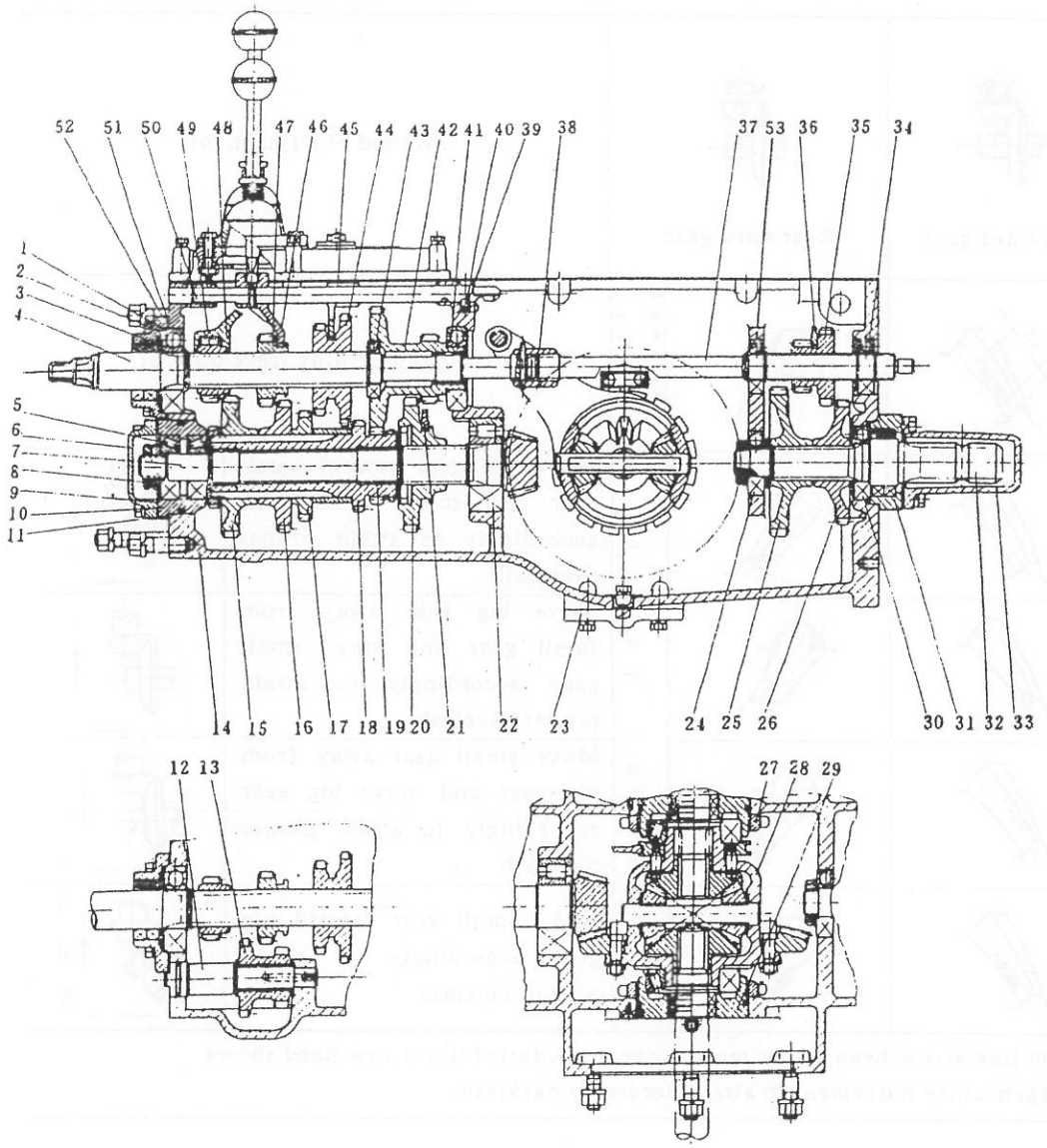
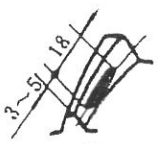
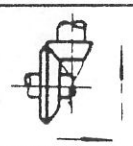
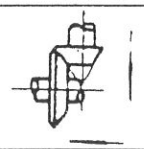
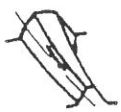
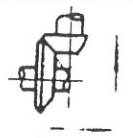
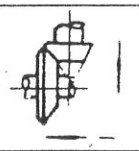


Fig. 3—6 Transmission assembly

1. Bearing 307 2. Primary shaft adjusting shims 3. Oil seal 4. Primary shaft 5. Bearing 27305E 6. Output shaft front bearing cap 7. Output shaft 8. Round nut 9. Output shaft front cover gasket 10. Output shaft front bearing bushing 11. Output shaft adjusting shims 12. Reverse gear shaft 13. Reverse gear 14. Transmission housing 15. 1st speed driven gear 16. 2nd speed driven gear 17. 3rd speed driven gear 18. Output shaft splined sleeve 19. Rolling needle 20. High —low sliding gear 21. High —low shifting fork 22. Bearing 92608 23. Magnet assembly 24. Bearing 305 25. PTO low speed gear 26. PTO high speed gear 27. Differential adjusting nut 28. Differential assembly 29. Differential bearing seat 30. Bearing 50207 31. PTO shaft rear end cover 32. PTO shaft 33. PTO safety shield 34. Bearing 305 35. PTO sliding gear 36. PTO shifting block 37. PTO driving shaft 38. Splined union sleeve 39. Shifting fork lock spring 40. Steel ball 41. Bearing 208 42. High—low twin gear 43. Bearing 106 44. 3rd —4th speed sliding gear 45. 3rd —4th speed shifting fork 46. 2nd —reverse speed shifting fork 47. 2nd —reverse speed sliding gear 48. 1st speed shifting fork 49. 1st speed sliding gear 50. 2nd —reverse speed shifting fork shaft 51. Primary shaft front bearing cap gasket 52. Primary shaft front bearing cap 53. Bearing 305

	Forward gear	Rearword gear		Method of adjustment	
I			Normal trace	Normal meashing trace on gear	
II			Abnormal trace	Move big gear toward small gear and move small gear accordingly to attain proper backlash	
III				Move big gear away from small gear and move small gear accordingly to attain proper backlash	
IV				Move small gear away from big gear and move big gear accordingly to attain proper backlash	
V				Move small gear toward big gear accordingly to attain proper backlash	

Note: Solid line arrow head shows main movement, dotted line arrow head shows compensatory movement to attain necessary backlash.

Fig. 3—7

Adjustment of meshing traces of spiral bevel gears

The adjustment can be done by adding or reducing the adjusting shims (11) at the output shaft front end and turning the adjusting nuts (27) on the both sides of differential to change the relative position of the bevel gears.

The meshing traces of forward speed gears should be in primary consideration and the meshing traces of reverse speed gears should also be considered. Coat the teeth of big bevel gears with red-lead oil and turn the big bevel gear in both directions until distinct contact traces are imprinted on the teeth faces of small bevel gears. If the traces are not ideal, adjust them with reference to Fig. 3—7.

b. Adjustment of differential bearings

Turn adjusting nut (27) to pre-tighten differential bearings. The pre-tightened friction torque increases 0.24—0.34 N • m and is transfered to output shaft with the original friction torque of about 0.098 N • m. The general friction torque of the output shaft, including the pre-tightened torque of the output shaft bearings, should be 0.68—0.98 N • m.

c. Examining the gear backlash

Insert a lead wire of Φ0.5 mm between the teeth of the two unloaded meshing gears and turn the gears. The thickness of the extruded wire can be considered approximately as the gear backlash. It is better to measure three points well-distributed along the circumference of the big gear for accurately measuring the gear backlash. The gear backlash of a new tractor or new gears is in the range of 0.15—0.3mm. The gear backlash of used gears is slightly bigger than the above.

3. Adjustment of traction devices and steering system

1) The steering gear

The construction of the steering gear of Taishan series tractors is divided into spherical worm and roller type (Fig. 3—8), threaded rod and nut circulating ball type (Fig. 3—9) and power steering system (Fig. 3—11).

A. Spherical worm and roller type

a. Pre-tightening worm shaft bearings

Add or reduce adjusting shims (14) between steering gear case (3) and its lower over (15). The worm shaft bearing are pretightened to such a degree that the torque needed to turn the steering wheel without pitman arm shaft assembly mounted is 0.49—0.98 N • m.

b. Adjustment of worm and roller clearance

Take off the pitman arm shaft adjusting nut (7) on the right side and turn the pitman arm adjusting screw (8). Turn it clockwise with a special wrench, the clearance will reduce, while turn it counter-clockwise the clearance will increase. The proper adjustment is that there should be no clearance when the pitman arm shaft roller is in the middle position, which means the pitman arm is in the vertical position. The torque to turn the steering wheel should be in the range of 1.47—2.45 N • m.

B. Threaded rod and nut circulating ball type

The structure of this type steering gear is as shown in Fig. 3—9. Steel balls (5) are mounted in the thread groove between steering threaded rod (6) and steering nut (4). The two ends of the thread groove of the steering nut (4) are connected by the guide

duct(3). The steel balls can circulate in the guide duct. When the threaded rod rotates, the steel balls push the nut axially and the steering nut drives pitman arm shaft(2) and, consequently, pitman arm(1) of steering gear to rotate via the two ball pins(11).

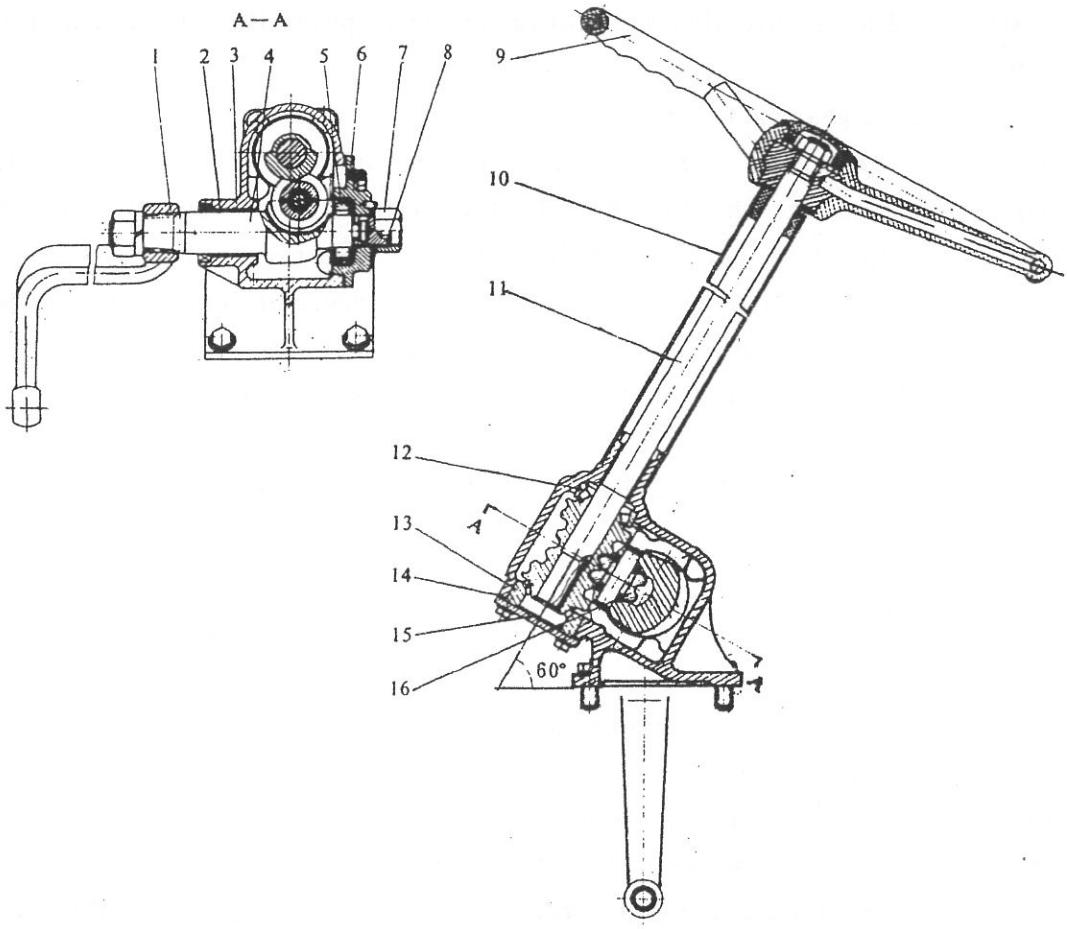


Fig. 3—8 Steering gear assembly

1. Pitman arm 2. Bushing 3. Steering gear case 4. Pitman arm shaft 5. Bearing 922205 6. Steering gear side cover 7. Pitman arm shaft adjusting nut 8. Pitman arm shaft adjusting screw 9. Steering wheel assembly 10. Steering column tube 11. Worm assembly 12. Bearing 977907 13. Bearing 977907k 14. Steering gear bearing adjusting shims 15. Steering gear lower cover 16. Bearing 754701

The clearance between the two ball pins and the steering nut conical hole is adjusted with adjusting shim (12). When the adjustment has been done, tighten the screw M6×15(13)and rivet its head end into the end face slot of the two ball pins to avoid its loosening.

The axial clearance of the threaded rod is adjusted by backing the upper ball socket (10) 1/4—1/6 revolution after it has been tightened.

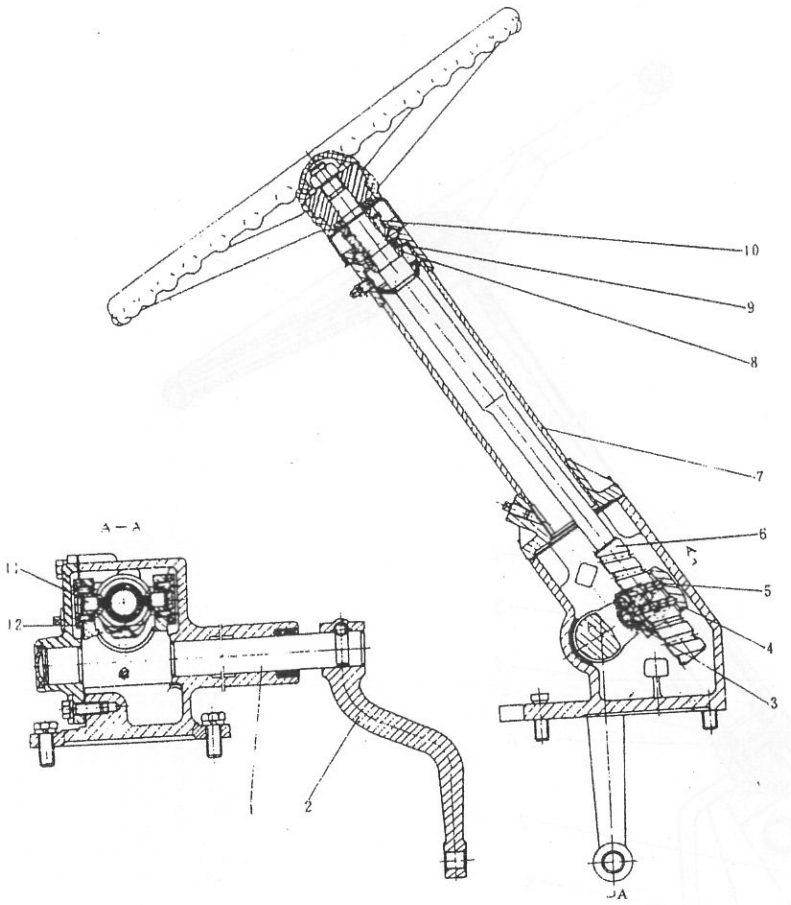


Fig. 3—9

1. Pitman arm shaft 2. Pitman arm 3. Guide duct 4. Nut 5. Steel ball 6. Steering threaded rod 7. Column sleeve assembly 8. Support seat 9. Ball lower seat 10. Ball upper seat 11. Ball pin 12. Adjusting shim

C. Power steering system (Fig. 3—11)

The power steering system is composed of steering gear assembly 4 ,steady and excess flow pump 8 (IILCB D06/06) ,steering cylinder assembly 6 ,and other parts etc. .

1. Steering gear assembly (Fig. 3—10)

The steering gear assembly is composed of pendulous turn valve type complete hydraulic steering gear (BZZ1 II —80) ,steering sleeve ,steering wheel assembly , steering shaft ,joint flange ,and other parts etc. .

See the structure of the pendulous turn valve type complete hydraulic steering

gear in its operation manual.

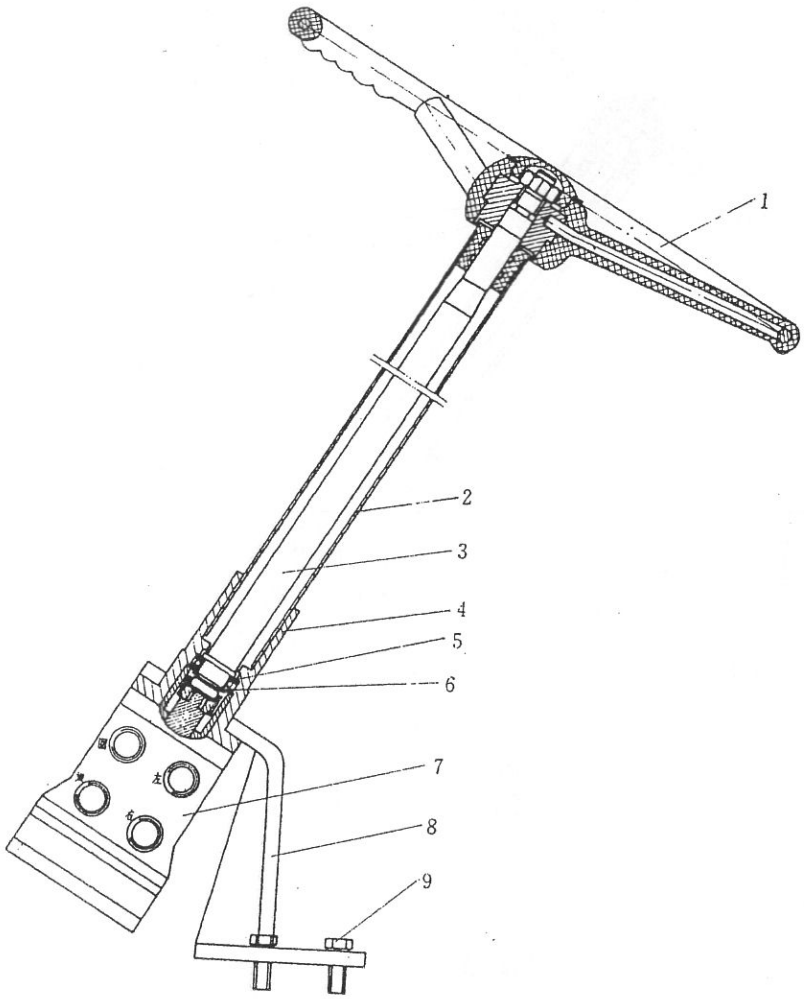


Fig. 3—10

1. Steering wheel assemly 2. Steering sleeve 3. Steering shaft 4. Joint flange 5. Bearing 8104 6. Thrust ring 20 7. Steering gear BZZ1 Ⅱ—80 8. Support plate weldment 9. Bolt

2. Steering cylinder assembly (Fig. 3—12)

This kind of steering cylinder is piston type. One end of the piston rod is connected with the left steering arm of the tractor, the other end is connected with the mounting fixed on the mid connecting housing. The pressure oil from the complete steering gear passes the steering cylinder, then pushes the piston moving backwards and forwards. The piston drives the left or right steering arm and steering horizontal pulling rod for turning left or right.

3. Check and adjustment after the steering system installed

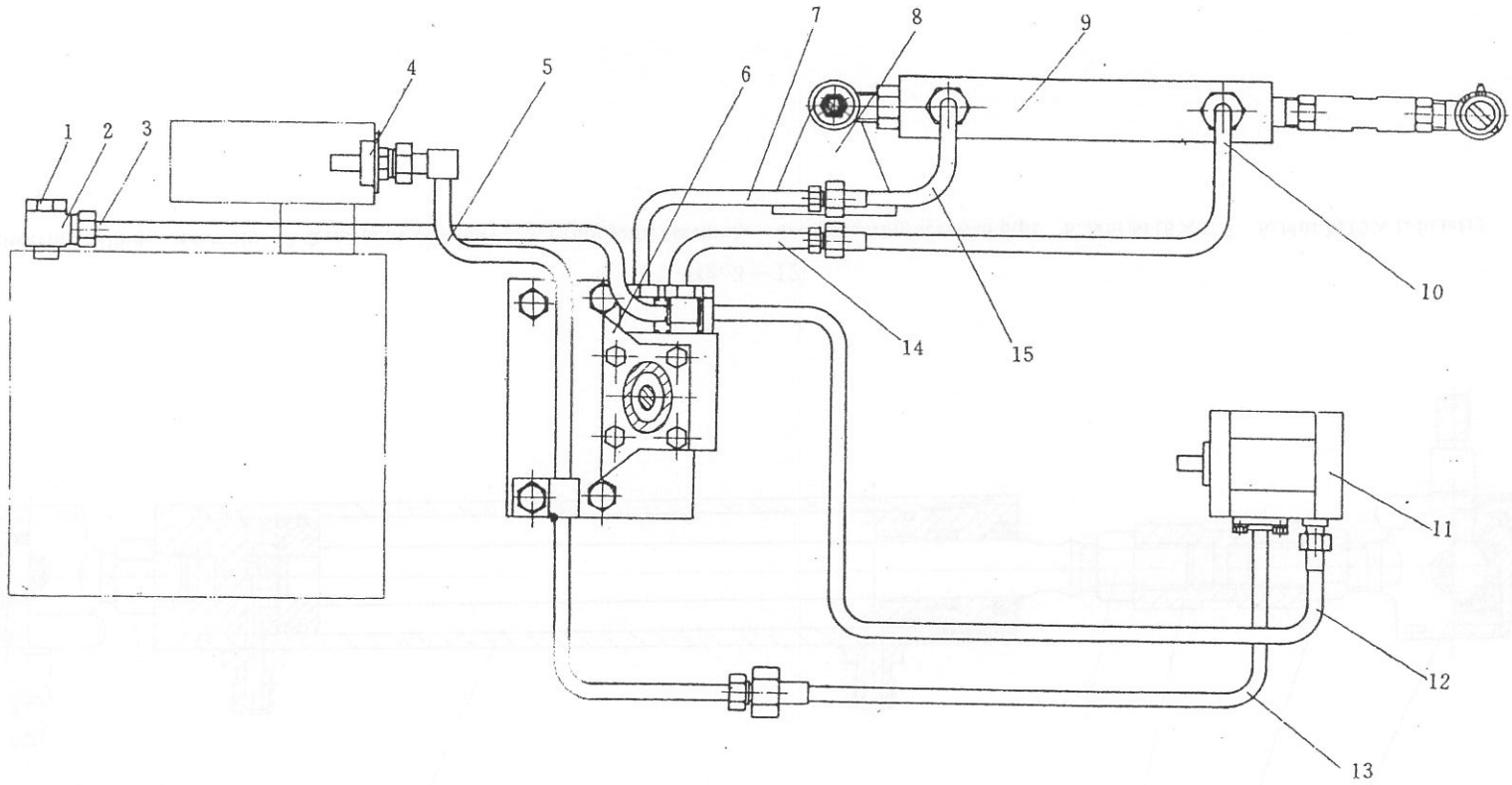


Fig. 3—11

1. Joint bolt 2. Joint body 3. Steering gear oil return tube 4. Filter cover sub—assembly 5. Intake oil tube weldment II 6. Steering gear assembly 7. Cylinder steel pipe sub—assembly (left) 8. Cylinder fix support 9. Steering cylinder assembly 10. Hi—pressure rubber tube (long) 11. Steady and excess flow pump 12. Steering gear intake oil tube 13. Intake oil tube weldment I 14. Cylinder steel pipe sub—assembly (right) 15. Hi—pressure rubber tube (short)

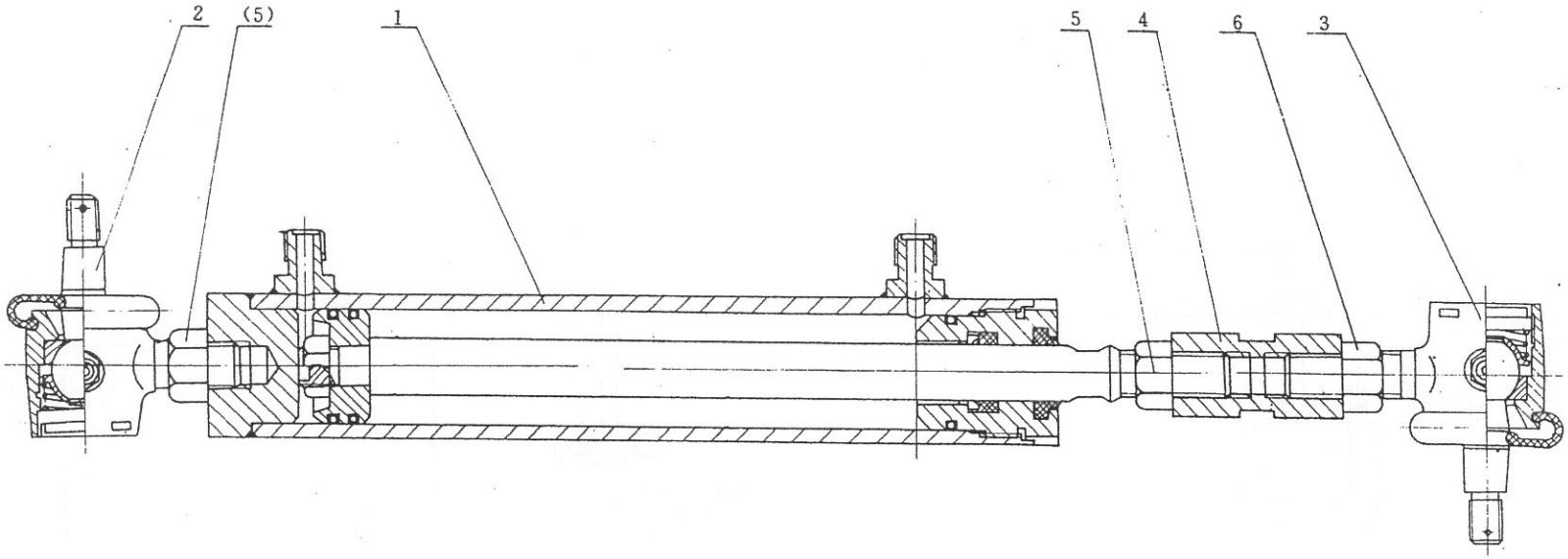


Fig. 3—12

1. Steering cylinder assembly 2. Rear joint assembly 3. Front joint assembly 4. Connecting screwed pipe 5. Nut M16×1.5 6. Nut M16×1.5(left)

a. Turn the steering wheel left or right till it can not be turned any more, see if the exert forces on turning left or right equal or not, and see if the turning steady or not.

b. Check the pipeline of pressure oil, see if the pipes for turning left or right installed conversely or not.

c. Lift the front wheel of the tractor, then turn the steering wheel left and right slowly for several times for removing the air from the oil tubes and cylinder.

d. Adjust the length of steering cyliner assembly by the conneting screwed pipe (Fig. 3—13). Then tighten the Nut M16×1.5 and Nut M16×1.5(left).

2)**The brake**(**Fig.** 3—13)

A. With the wear—out of brake shoe lining in operation, the pedal's free travel will increase or the two driving wheels can not be braked simultaneously and the brake efficiency is affected. Therefore, in consideration of safety, the brake should be adjusted timely. The method for adjustment is:

Take off the pins connecting cam arms(6) with adjusting forks(7). Loosen lock nut(8) and turn adjusting forks(7) to lengthen or shorten brake pull rods(9) so that the left and right brakes can function at the same time and measured at the highest point of the brake pedals, the pedals should each have a free travel of 20—40mm.

B. When brake shoe lining is replaced, brake shoe hinge bolt(19) should be tightened to create a frictional torque of 2.94—4.9N·m on the hinge.

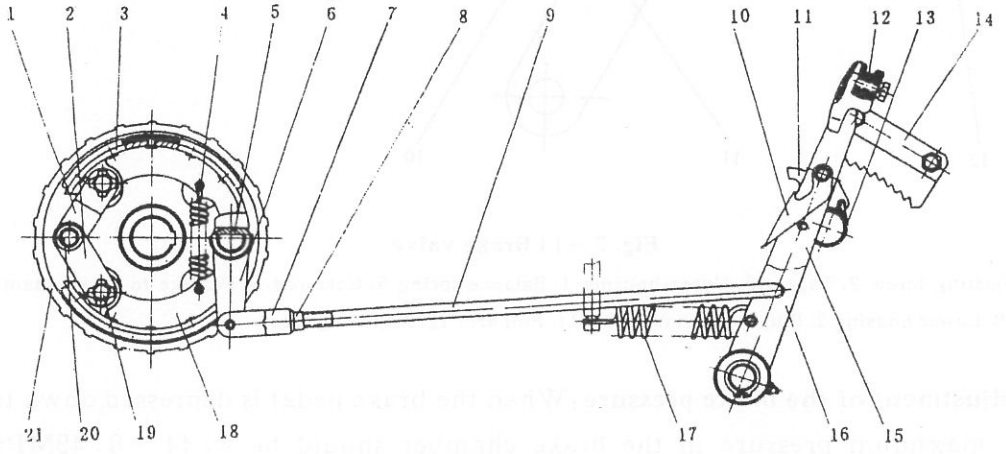


Fig. 3—13 Brake assembly

1. Curved link plate 2. Flat link plate 3. Brake shoe assembly Ⅰ 4. Stretching spring 5. Right cam 6. Cam rocker arm 7. Pull rod adjusting fork 8. Lock nut 9. Pull rod 10. Pawl arm 11. Pawl 12. Brake lock plate 13. Torsional spring 14. Ratchet plate 15. Left brake pedal 16. Right brake pedal 17. Pedal retracting spring 18. Brake shoe assembly Ⅱ 19. Bolt 20. Pin 21. Brake hub

3)Air brake system

The air brake system should do three adjustments:

A. Adjustment of compressor: If the air pressure is too low, should check the sealability of the exhaust. Valve in use; should clean or lap if necessary. If the collecting oil in air tank exceeds 15 milliliters after 24 working hours, should check the piston ring of the compressor, and replace it if necessary.

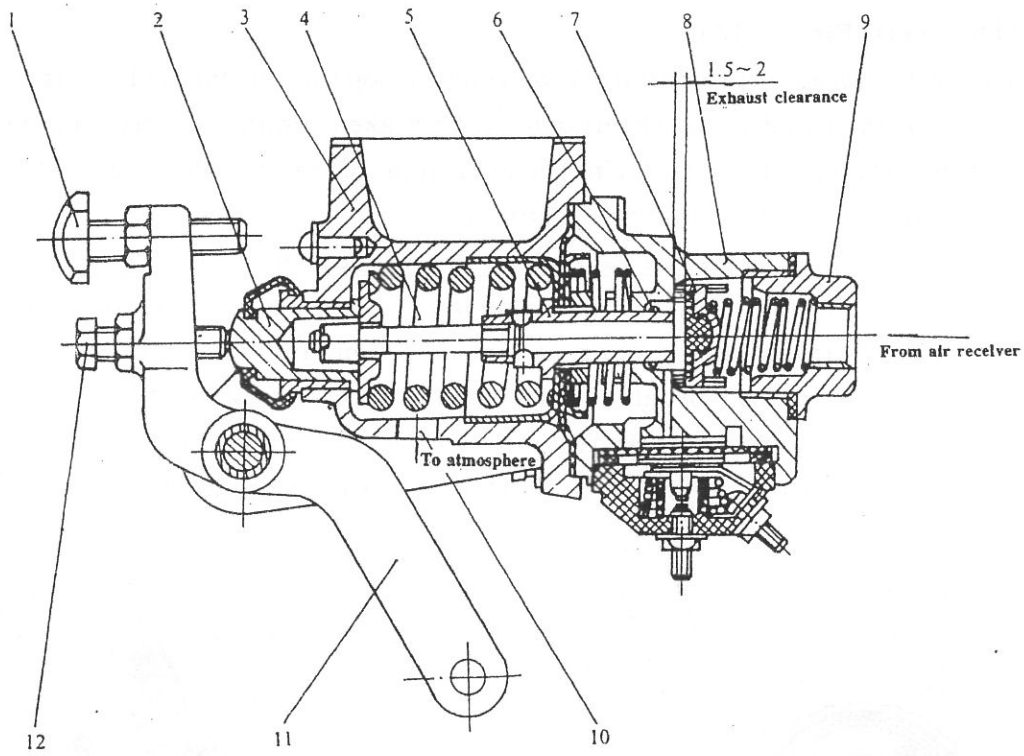


Fig. 3—14 Brake valve

1. Long adjusting screw 2. Tappet 3. Upper housing 4. Balance spring 5. Core rod 6. Passage to brake chamber 7. Valve seat 8. Lower housing 9. Plug 10. Exhaust hole 11. Pull arm 12. Adjusting screw

B. Adjustment of the brake pressure: When the brake pedal is depressed down to the end, the maximum pressure in the brake chamber should be 0.44—0.49MPa. In adjusting, a air pressure gauge is connected to the brake line to the brake chamber, according to the Fig. 3—14 the adjusting screw 12 is screwed to make it touch with a tappet 2; then the brake pedal is depressed down to the end again, if the readings of the gauge is less than 0.44MPa, the adjusting screw is screwed in; if more than 0.49MPa, should be screwed out; when adjusting to a value between 0.44—0.49MPa, lock the nut.

C. Adjustment of brake time of the air brake system: If the brake time is incorrect, should adjust it. If the pull rod of the brake valve becomes shorter, the brake time is advanced; if longer, the brake time will lag. The brake time of the air brake system should be in advance of the brake time of the tractor brake a little.

4) The front axle

A. Adjustment of toe-in (Fig. 3—15)

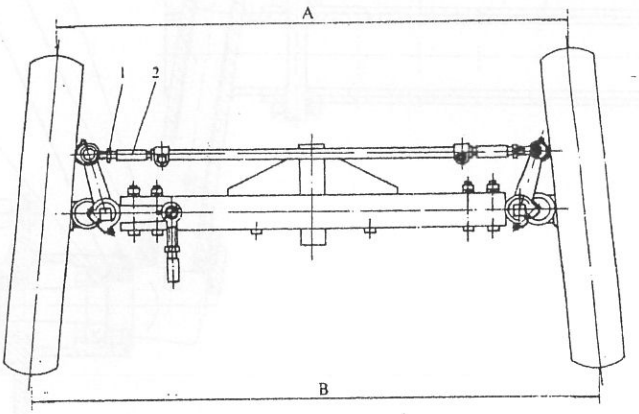


Fig. 3—15 Adjustment of toe-in

1. Lock nut 2. Tie-rod

The toe-in should always be 3—11mm when the tractor runs straightly. Readjust it as follows if it is not in the normal range: Loosen the lock nuts (1) at both ends of the tie-rod and turn the tie-rod (2) to change its length to such a degree that in the horizontal plane through the front wheels circumferences, the distance of the forefront of front wheels is 3—11mm shorter than that of rearmost end, or B—A = 3 ~11mm. Choose four points on the front wheel and measure out the value of each point. The mean value of the four points is the toe-in of the tractor. If the adjustment is successful, retighten the lock nuts at both ends of the tie-rod.

B. Adjustment of the front wheel bearing clearance (Fig. 3—16)

In each front wheel hub are mounted two tapered-roller bearings which should be periodically adjusted to eliminate excessive clearance engendered in long service. In doing the adjustment, jack up the front wheels and dismount bearing cap (13) and split pin. Tighten nut (12) till resistance torque of wheels begins to increase distinctively, then screw it back 1/30—1/8 rotation and insert the split pin, tighten the nut. After adjustment the front wheels should be turned freely, without turning resistance and swing.

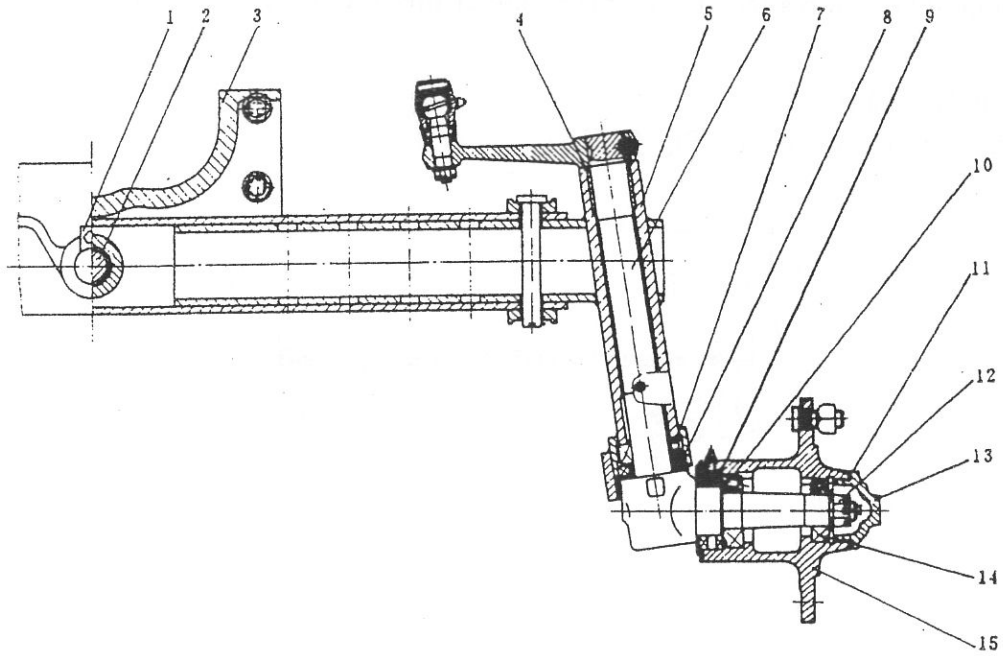


Fig. 3—16 Front axle assembly

1. Limiting plate 2. Pivot shaft 3. Bracket 4. Seal ring 5. Outside axle tube assembly 6. Steering knucle assembly 7. Bearing 8206 8. Oil seal 9. Oil seal 10. Bearing 7506 11. Paper gasket 12. Castellated nut 13. Bearing cap 14. Bearing 7305 15. Front wheel hub

C. The wheel tread (Fig. 3—17)

The treads of Taishan Series Tractors are divided into two kinds: adjustable and unadjustable.

Adjustment of adjustable front wheel tread is achieved by extending or retracting the telescopic axle in the range of 1100—1500mm, the space between steps is 100 mm. The adjustment of rear wheel tread is achieved by alternately inverting the wheel webs and rims. It is also adjusted with each step of 100 mm and has the same range of adjustment.

D. Adjustment of front drive axle

Transmission efficiency and noise are greatly affected by meshing of every step gear in front drive axle. Special attention must be paid to adjustment of every pair of gears when they are being assembled.

The structure of front drive axle is as shown in Fig. 3—18. From front central drive bevel gears(1) to front drive shaft(19) in front drive axle there are three pairs of bevel gears that engage . The meshing contact traces of each pair of gears should be adjusted to the middle of gear tooth faces and slightly nearer to the small end.

Correct meshing contact trace and gear backlash of front central drive gear pair can be attained by adjusting the thickness of adjusting shims(2) of front central drive bevel gears and the thickness of adjusting shims(4) of bearing seat.

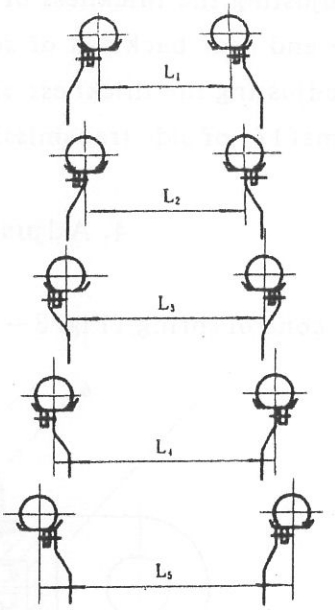


Fig. 3—17 Rear wheel tread adjustment diagram

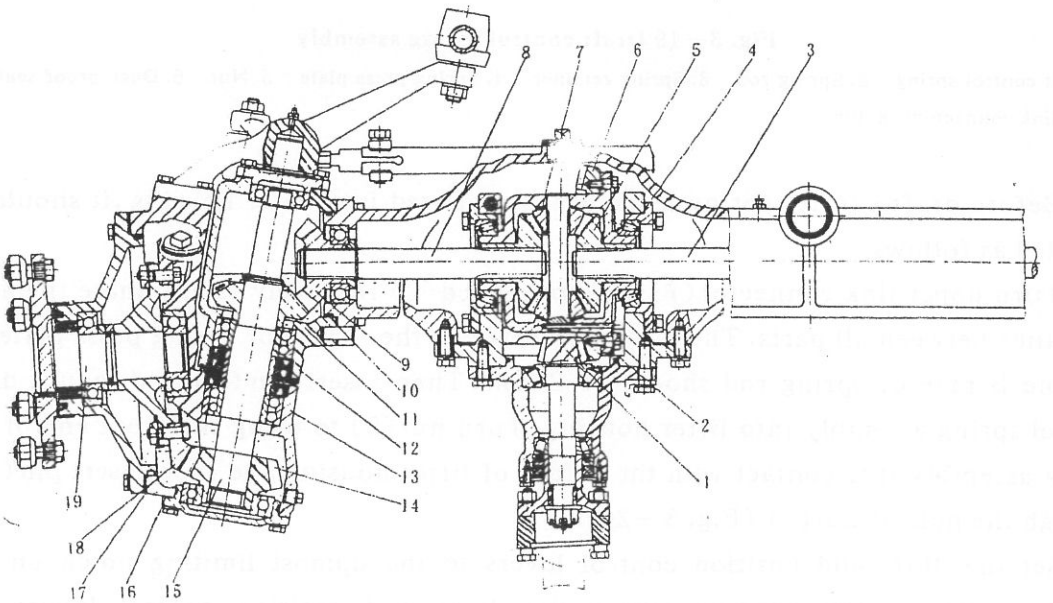


Fig. 3—18

1. Front central drive bevel gear 2. Adjusting shim 3. Long half shaft 4. Adjusting shim 5. Differential half shaft gear 6. Front central driven bevel gear 7. Differential planetary gear 8. Short half shaft 9. First step drive gear 10. Adjusting shim 11. First step driven gear 12. Kingpin housing 13. Side transmission housing 14. Second step drive gear 15. Side vertical transmission shaft 16. Adjusting shim 17. Adjusting shim 18. Second step driven gear 19. Front drive shaft

Correct meshing clearance of first step gear pair of side transmission can be assured by adjusting the thickness of driving telescopic gaskets(10). Correct meshing contact trace and gear backlash of second step gear pair of side transmission can be achieved by adjusting the thickness of lower cover adjusting shims(16) and side cover adjusting shims(17) of side transmission housing.

4. Adjustment of the lifter

A. Draft control spring (Fig. 3—19)

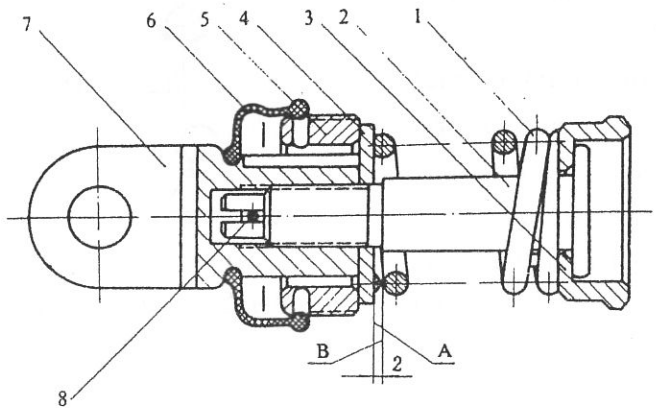


Fig. 3—19 Draft control spring assembly

1. Draft control spring 2. Spring rod 3. Spring retainer 4. Spring press plate 5. Nut 6. Dust-proof seal 7. Upper link connector 8. Pin

Before draft control spring assembly is mounted into lifter housing, it should be adjusted as follows:

Turn upper link connector(7) and spring rod(2) relatively to eliminate the axial clearance between all parts. The clearance between the A face of spring press plate(4) and the B face of spring rod should be 2 mm. Then insert pin(8) and mount draft control spring assembly into lifter housing. Turn nut(5) to bring the front end of the spring assembly into contact with the E face of lifter housing and then insert pin(21) through the hole of nut(5) (Fig. 3—20).

Set the draft and position control levers to the upmost limiting notch on the quadrant plate (the position where the draft and position control levers are perpendicular to the plane of lifter bottom) and the clearance between inner lift arm and rear inner face of lifter housing is 4 mm. At this time the angle between outer lift arm and the bottom plane of the lifter housing is approximately 60°. Then adjust draft control lever and position control cam respectively.

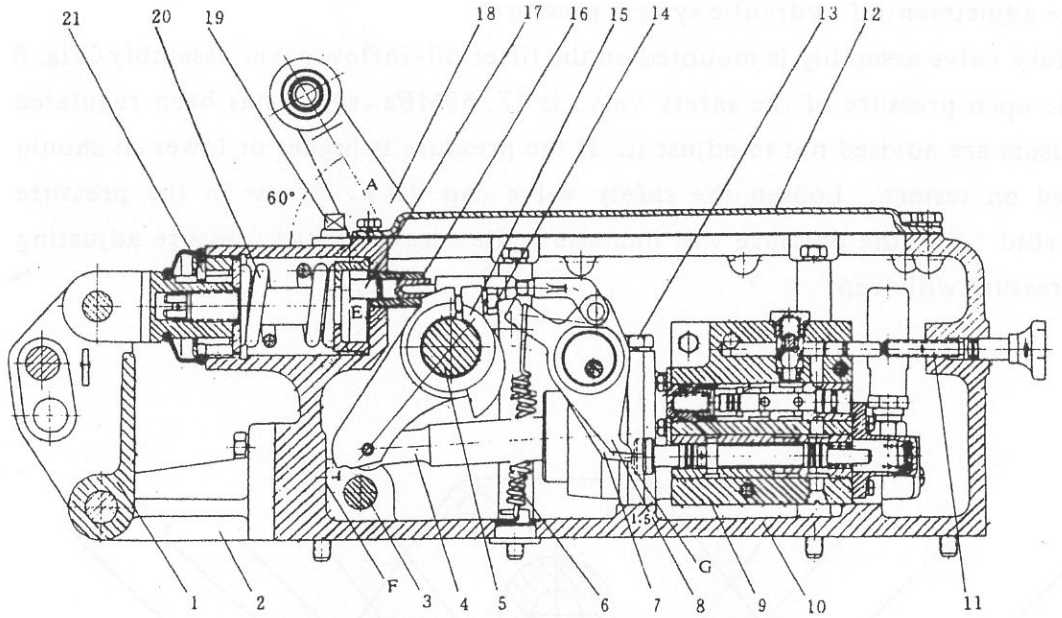


Fig. 3—20 Lifter assembly

1. Upper hitch point rocker arm 2. Upper hitch point rocker arm bracket 3. Lock shaft 4. Inner lift arm and piston ram rod assembly 5. Lift shaft 6. Tension spring 7. Draft control lever assembly 8. Position control lever assembly 9. Cylinder-distributor assembly 10. Lifter housing 11. Lowering valve adjusting lever 12. Lifter upper welded cover assembly 13. Bolt 14. Bolt 15. Position control cam 16. Draft control seal sleeve 17. Push rod sleeve 18. Lift arm 19. Oil dipstick assembly 20. Draft control spring assembly 21. Pin

a. The adjustment of draft control lever

Adjust draft control push rod till the end of push rod sleeve (17) contacts with A face. Then extend or retract the draft control push rod so that the clearance between control end G of draft control lever and the end face of main control valve will be 1.5mm. At this time the main control valve is at the outmost position. Lock with lock nut after adjustment has been done.

b. The adjustment of position control cam

Set the control end of position control lever to contact with the outmost end of main control valve. Turn position control cam (15) to contact with the roller of position control lever assembly (8). Under contacted condition, turn position control cam clockwise until the control end of position control lever pushes main control valve to neutral position, this means that main control valve moves inward 5 mm from outmost position, and meanwhile the distance from the control end of draft control

lever to the end face of main control valve is 6.5 mm. Then fix adjusting cam on lift shaft(5) with bolt(14).

c. The adjustment of hydraulic system pressure

A safety valve assembly is mounted on the lifter oil-inflow cover assembly(Fig. 3-21). The open pressure of the safety valve is 17.65MPa, which has been regulated well and users are advised not to adjust it. If the pressure is higher or lower, it should be adjusted on testers. Loosen the safety valve cap (9). Screw in the pressure adjusting stud (11), the pressure will increase while screw out the pressure adjusting stud the pressure will drop.

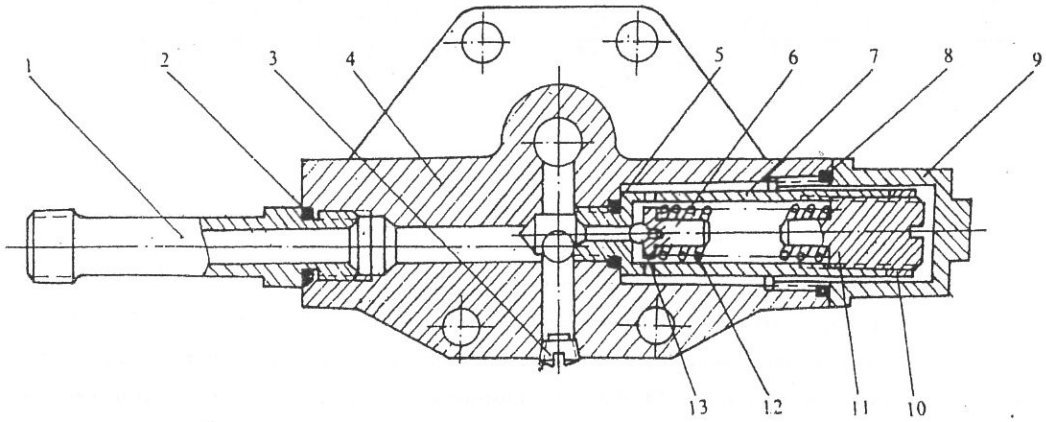


Fig. 3—21 Oil-inflow cover assembly

1. Pressure oil pipe adaptor 2. O ring 3. Taper threaded plug 4. Oil-inflow cover 5. O ring 6. Spring retainer 7. Safety valve body 8. O ring 9. Safety valve cap 10. Lock ring 11. Pressure adjusting stud 12. Spring 13. Steel ball

Chapter Ⅳ Maintenance of the Tractor

Maintenance must be carried out carefully to keep the tractor in excellent working condition, to fully develop its efficiency, reduce operation cost and prolong the service life.

The maintenance is classified into shift maintenance and first class, second class and third class maintenance. The period for them follows:

Shift maintenance	Every 8～10 hours of operation
First class maintenance	Every 100 hours of operation
Second class maintenance	Every 500 hours of operation
Third class maintenance	Every 1000 hours of operation

1. Shift maintenance

1) Clean dirts adhered to the tractor and check and tighten the bolts and nuts of all linking components.

2) Examine the oil level in oil sump, injection pump governor, transmission box, final drive and lifter. Check the diesel fuel in fuel tank and refill if necessary.

3) Examine cooling water and add if necessary.

4) Clean oil deposit and water in fuel sediment bowl and exhaust out the air in the fuel system.

5) Repair where leakage of oil, water or air is found.

6) Examine the tire pressure and inflate if necessary.

7) Check the insulation of the wires and fastness of connectors in electrical system. Examine battery electrolyte level and add distilled water if insufficient.

8) Lubricate the following points with grease gun:

Nine points in the front axle, one point in the steering gear, four points in clutch pedal shaft and brake pedal shaft, four points in suspension linkage and one point in engine water pump.

9) Check and take all of the necessary hand tools.

10) Start the engine and examine the working condition of the electrical equipment and gauges. See if all components of the tractor are in normal condition.

2. First class maintenance

1) Carry out the maintenance items in shift maintenance.

2) Wash air cleaner and change oil therein. This should be done every shift if the tractor works in extremely dusty environment.

3) Examine the colour and cleanliness of the oil in oil sump. Change if it is distinctly turbid or carbonized, but changing may be put off to the next first class maintenance if it is still fresh and clean. Flush oil sump and oil filter when replacing oil. Replace filter element if necessary.

4) Flush fuel tank, fuel inlet strainer and fuel filter. Replace filter element if necessary.

5) Flush oil inflow filter of the lifter.

6) Examine the tension of the fan belt. Depress the belt with thumb, it should drop about 15 mm.

7) Measure the voltage of each cell of the battery and the electrolyte specific gravity (the single cell voltage should be no less than 1.7V and electrolyte specific gravity in the range of 1.27—1.28). Smear the terminals and clips with grease.

8) Turn out the drain plugs on the brakes at the both sides of the transmission box and on the lower end of flywheel case to drain out the oil that may leak out.

3. Second class maintenance

1) Carry out the maintenance items in the first class maintenance.

2) Examine the injection pressure and atomization of the injector and flush and adjust the injector if necessary.

3)Examine the working condition of the fuel pump. Measure valve clearance and the clearance of decompressing mechanism and adjust them if necessary.

4) Check the tightness of the connecting rod bolts.

5) Adjust the free travel of clutch and brake pedals.

6) Examine and adjust the meshing clearance between steering worm and steering roller.

7) Examine and adjust toe-in and front wheel bearing clearance.

8) Check kingpin and its bushing as well as ball pin and its seat for wear out.

9) Change the oil in injection pump, transmission box, final drive and lifter and flush them.

10) Examine the tightness of coupling joint . Tighten the coupling joint if necessary.

4. Third class maintenance

1) Carry out the items in second class maintenance.

2) Dismount cylinder head and clean the soot in combustion chambers and on piston heads ,mushroom parts of inlet valves and exhaust valves ,and on valve seats and in ports. Check the seal of the valves and grind the vlaves if necessary.

3) Examine piston ring gap and the wear out of connecting rod bushing ,main bearing shell and thrust ring. Replace them if necessary.

4) Clean out scale in cooling system with following method:

A. Start the engine to run to the normal working temperature. Stop the engine and drain out the water. Take out the thermostat from its cover.

B. Fill the cooling system with 1. 25kg of kerosine.

C. Fill the cooling system with soda water mixed in the proportion of 1 : 5.

D. Start the engine to run at medium idle speed for 5—10 minutes. After 8—10 hours ,start the engine again to run at medium idle speed for 5—10 minutes and then drain out the soda water.

E. Replenish clean water. Run the engine at medium idle speed. Then flush the cooling system again. This should be done for 2 or 3 times.

5) Flush main oil channel. Inspect the working condition of oil pump and the pressure limiting valve on the upper cover of oil filter. Adjust them if necessary.

6) Check the fastness of flywheel bolts.

7) Check clutch friction disk and brake shoe band linings. Flush or replace them if necessary.

8) Replace the grease in front wheel hubs ,steering gear and bearing 60203 of flywheel.

9) Wash and check all parts of A. C. generator and starter. Change the parts if necessary. Replace the grease in their bearings.

10) Check release bearing 688908. If it is lack of lubrication ,wash it clean ,put it into No. 2 calcium-base compound grease and heat it. Then assemble it.

11) Check the oil seals ,water seal and seal rings. Replace them if necessary.

Run the maintained tractor to see if every component is in normal condition.

5. Maintenance for storage of a long period

1) Store the tractor in garage. If storing in the open air, jack it up with wood blocks till the wheels leave ground, dig drains around the tractor and cover the tractor with tarp.

2) Wash the outside surface of the tractor and lubricate each lubrication point with grease before storing the tractor.

3) Drain out the cooling water and dismount the battery.

4) Start the engine to run for 20 minutes every three months to see if the tractor is in normal condition.

Chapter Ⅴ Trouble Shooting

1. Engine

1) Engine hard to start or will not start

Trouble and possible cause	Possible remedy
A. Trouble in fuel system	
a. Fuel tank cock shut off	a. Turn on the cock
b. No fuel	b. Add fuel
c. Air in fuel system	c. Check fuel line connector for leakage and drain the system
d. Clogged fuel filter	d. Dismount and wash
e. Incomplete atomization or no fuel injected	e. Adjust injection pressure or replace needle valve couple
f. Incorrect injection time after replacing fuel pump	f. Recorrect injection time
B. Insufficient compressing pressure	
a. Piston ring worn out	a. Replace piston ring
b. Cylinder sleeve worn out	b. Replace cylinder sleeve
c. Valve leakage	c. Check valve clearance and seal, grind the valve if necessary
d. Cylinder head gasket leakage	d. Check the tightness of cylinder head nuts and replace cylinder head gasket if necessary
C. Low atmosphere temperature	Carry out winter start regulations
D. Trouble in electrical system	
a. Insufficient battery voltage	a. Charge battery
b. Incomplete contact of connecting points	b. Check, clean and fasten con[illegible]

2) Low oil pressure on oil gauge

Trouble and possible cause	Possible remedy
A. Low oil level in oil sump	A. Add to specified level
B. Engine oil too thin	B. Use oil of proper type
C. Clogged oil pipe or oil filter	C. Flush oil pipe or replace filter element
D. Defective oil pressure gauge	D. Replace oil pressure gauge
E. Main bearing shell and connecting rod bearing shell worn out	E. Replace shells, regrind or replace crankshaft
F. Oil filter gasket mounted reversely	F. Remount correctly
G. Oil pump lobed rotor and case worn out and its end face clearance and radial clearance excessive	G. Adjust shims or replace lobed rotor
H. Damaged oil filter pressure adjusting spring or incomplete sealing of valve seat	H. Replace pressure adjusting spring or grind valve seat
I. Oil pump inflow pipe adapter loose and air flows in	I. Tighten inflow pipe adapter

3)High oil temperature

Trouble and possible cause	Possible remedy
A. Engine overloaded and exhausting black smoke	A. Reduce load
B. Excessive or insufficient oil	B. Reduce or add oil
C. Defective engine cooling	C. Check and repair cooling system
D. High surrounding temperature	D. Change work time
E. Defective oil temperature gauge	E. Replace oil temperature gauge

4)High cooling system temperature

Trouble and possible cause	Possible remedy
A. Insufficient cooling water	A. Remove leakage and add cooling water
B. Loose fan belt	B. Adjust fan belt tension or replace fan belt
C. Damaged water pump	C. Repair or replace water pump
D. Thick scale in cooling system	D. Clean out scale
E. Defective thermostat	E. Replace thermostat
F. Defective water temperature gauge	F. Replace water temperature gauge
G. Engine overloaded for a long period of time	G. Reduce load

5)Excessive oil consumption

Trouble and possible cause	Possible remedy
A. Leakage at crankshaft front and rear oil seal or other connecting parts	A. Check and replace damaged parts, remove leakage
B. Oil ring chamfer reverse or heavy oil ring soot	B. Dismount piston to assemble oil ring correctly or clean oil ring soot
C. Excessive clearance between valve and valve guide	C. Replace worn out parts
D. Piston ring or cylinder sleeve worn out excessivly	D. Replace worn out parts
E. Cylinder head oil return obstructed	E. Remove burrs in oil channel

6)Exhaust gas colour abnormal

Trouble and possible cause	Possible remedy
A. Engine emits black smoke	
a. Engine overloaded	a. Reduce load
b. Fuel injection delay	b. Adjust injection advance angle
c. Injector drops oil or defective atomization	c. Check and adjust or replace injector
d. Clogged air inlet and exhaust system	d. Wash air cleaner and clean soot in exhaust pipe and muffler
B. Engine emits white smoke	
a. Engine insufficiently preheated	a. Add load after being heated
b. Water in fuel	b. Replace fuel or drain out water in sediment bowl
C. Engine emits white smoke	
a. High oil level in oil sump	a. Drain out excessive oil
b. Oil inducted in combustion chamber and burnt	b. Find out the cause and remove

7) Engine stops suddenly

Trouble and possible cause	Possible remedy
A. No fuel or fuel line clogged	A. Add fuel or make fuel line flow over
B. Air in fuel system	B. Exhaust air and check fuel line for sealing
C. Air cleaner or fuel filter clogged	C. Wash or replace filter element
D. Engine overheated, piston and cylinder gripped	D. Disassemble engine to check, repair and remove cause of overheating
E. Oil insufficient, shafts gripped with their bearing shells	E. Disassemble engine to check, repair and remove cause of oil insufficient
F. Injector clogged or gripped	F. Repair or replace needle valve couple
G. Injection pump plunger gripped	G. Repair or replace plunger couple
H. Load increasing suddenly	H. Reduce load

8) Lack of engine power

Trouble and possible cause	Possible remedy
A. Air cleaner or inflow port clogged	A. Clean air cleaner and inflow port
B. Exhaust pipe and muffler clogged	B. Clean out the soot in exhaust pipe and muffler
C. Compressing pressure insufficient	C. See B in " Engine hard to start or will not start"
D. Defective injector	D. Check or replace injector
E. Injection fuel supply insufficient or uneven	E. Adjust or replace injection pump
F. Valve clearance incorrect	F. Adjust valve clearance

9) Engine runs with abnormal sound

Trouble and possible cause	Possible remedy
A. Early injection, clear knocking sound in cylinder	A. Adjust injection time
B. Injection delay, indistinct knocking sound in cylinder	B. Adjust injection time
C. Excessive clearance between piston pin and connecting rod (small end) bush, sharp knocking sound in cylinder, especially at idle speed	C. Replace connecting rod (small end) bush
D. Valve spring or plunger spring broken	D. Replace springs
E. Piston hitting valve, thump and rhythmical knocking sound at cylinder head	E. Turn each piston successively to top-dead-center and examine the clearance between piston and valve
F. Excessive main bearing clearance and connecting rod bush clearance, heavy knocking at speed shifting	F. Examine the main bearing clearance and connecting rod bush clearance and replace worn parts if necessary
G. Gears worn out and excessive gear backlash	G. Replace worn out parts
H. Excessive clearance between valve and valve rocker arm, knocking at low engine speed	H. Examine and adjust the clearance

10)Engine runs away

Trouble and possible cause	Possible remedy
A. Ineffective governor	A. Check and repair governor
B. Injection pump gripped at max. fuel supply	B. Check and repair injection pump
C. Excessive oil air cleaner and governor	C. Add oil to specified level

2. Chassis

1)Clutch

Trouble and possible cause	Possible remedy
A. Clutch slips	
a. Friction disk stained with oil	a. Flush friction disk with gasoline and remove oil leakage
b. Pressing spring weakened or broken	b. Replace spring
c. Short or no pedal free travel	c. Readjust pedal free travel according to the specification
d. Driven disk curved, uneven wear-out or excessively worn-out	d. Rectify of replace driven disk
e. Three-release-lever end faces not in the same plane	e. Adjust the release lever end faces
B. Clutch disengaged incompletely, hard to engage or engaged with sound and tractor started off with shake	a. Adjust pedal working travel and free travel
a. Pedal working travel too short and excessive free travel	
b. Driven disk curved excessively	b. Rectify or replace driven disk
c. Three-release-lever end faces not in the same plane	c. Adjust the release lever end faces
d. Friction disk broken	d. Replace friction disk
e. Friction disk spline too tight	e. Repair spline
C. Vibration and noise in clutch	
a. Release lever pressure spring broken	a. Replace spring
b. Rekease bearings lubrication insufficient or damaged	b. Lubricate or replace release bearings
c. Splined hole of driven disk or clutch splined shaft worn out	c. Replace worn out parts
d. Clutch front bearing damaged	d. Replace front bearing

2)Brake

Trouble and possible cause	Possible remedy
A. Ineffective brake	
a. Brake lining stained with oil	a. Flush brake lining with gasoline and remove oil leakage

Trouble and possible cause	Possible remedy
b. Brake lining or brake hub worn out	b. Replace worn out parts
c. Brake cam worn out excessively	c. Replace brake cam
d. Excessive pedal free travel	d. Readjust pedal free travel
B. Two wheels can not be braked simultaneously	
a. Right and left pedal travel different	a. Readjust pedal travel
b. One brake shoe stained with oil	b. Flush the brake shoe and remove oil leakage
C. Brake disengaged incompletely ane overheated	
a. Brake shoe return spring weakened	a. Replace spring
b. Brake pedals will not return	b. Check return spring for damage, shaft for being gripped and remove them
c. Short pedal free travel	c. Readjust pedal free travel

3) Transmission box

Trouble and possible cause	Possible remedy
A. Abnormal sound in transmission box	
a. Transmission box bearing or rolling needle excessively worn out or damaged	a. Check and replace worn out parts
b. Abnormal meshing of main drive gears	b. Examine meshing traces and backlash and adjust them in accordance with regulations
c. Shaft splines and gear splined hole worn out	c. Replace worn out parts
B. Gear engagement out of order	
a. Fork excessively worn out or deformed	a. Replace fork
b. Fork shaft locking spring weakened	b. Replace spring
c. Tooth profile or spline excessively worn out	c. Replace worn out parts
C. Transmission box overheated	
a. Short clearance of bearing or gears	a. Readjust the clearance
b. Insufficient or excessive lubricating oil	b. Add or drain out lubricating oil to specified level
c. Deteriorated lubricating oil	c. Replace lubricating oil

4) Traction devices and steering system

Trouble and possible cause	Possible remedy
A. Front wheels swing	
a. Excessive clearance of front wheel bearing or kingpin sleeve worn out excessively	a. Adjust bearing clearancee and replace kingpin sleeve
b. Wrongly adjusted toe-in	b. Readjust toe-in
c. Ball pin and ball pin seat worn out excessively	c. Replace ball pin or ball pin seat
d. Pitman arm and ball pin fixing nut loose	d. Check and tighten the nut
B. Early worn out of front wheel tires	
a. Wrongly adjusted toe-in	a. Readjust toe-in
b. Front wheel pressure insufficient	b. Inflate tire to specified pressure
C. Excessive steering wheel free travel	
a. Excessive worm bearing clearance	a. Readjust worm bearing clearance
b. Worm and worm gear worn out seriously	b. Readjust clearance or replace worn out parts

5)Hydraulic system

Trouble and possible cause	Possible remedy
A. Lack of lifting force or lifter will not lift	
a. Low oil level or improper type of oil	a. Add proper oil to specified level
b. Clogged oil inflow strainer	b. Flush the strainer
c. Air in hydraulic system	c. Drain system and tighten contactor or replace seal ring
d. Oil pump seriously worn out, leaking serious	d. Replace oil pump seal ring
e. Main control valve or return valve gripped	e. Move lifter control lever several times and shift main control valve with screw driver, if it is still gripped, disassemble to flush
f. Main control valve or return valve worn out seriously	f. Replace worn out parts
g. Ineffective safety valve	g. Readjust or repair safety valve
h. Cylinder leaking seriously	h. Replace seal ring or replace worn out parts if necessary
i. Leakage at distributor seal rings	i. Replace seal rings
B. Implement will not lower	
a. Main control valve or return valve gripped	a. See" Hydraulic system, 'A. e. '"
b. Closed lowering speed regulating valve or shut-off valve	b. Open the valve
C. Implement lifted with shake	
a. Check valve worn out and closed incompletely	a. Repair or replace check valve
b. Leakage at seal rings of the distributor and cylinder	b. Find out the position of leakage and replace worn out seal rings

6)Air brake system

Trouble and possible cause	Possible remedy
A. Air pressure insufficient	
a. Air pump belt loose	a. Adjust the belt tightness or replace it
b. Pipe leakage	b. Check and remove
c. Air pump intake or exhaust valve spring broken	c. Replace springs
d. Piston ring or sleeve worn out	d. Replace the ring or sleeve
e. Air pressure gauge defect	e. Repair or replace the air pressure gauge
f. Safety valve closes insufficient or defect	f. Check or replace the safety valve
B. Control valve can not return	
a. Dust in control valve	a. Wash to remove dust
b. Oil or water in control valve	b. Drain out the oil or water, clean control valve
C. Trailer braked early or delay	c. Adjust the length of control valve pulling rod, let trailer braked with tractor synchronously or earlier
D. Oil drain out excessively or bearing worn out	
a. Air pump oil return tube clogged	a. Repair the oil return tube
b. Piston ring or sleeve worn out damagly	b. Check the piston rings or sleeve, replace if necessary
c. Oil intake tube clogged or leakage	c. Repair the tube, stop leakage

3. Electrical system

1) Battery

Trouble and possible cause	Possible remedy
A. Frequently insufficient electric power	
a. Low electrolytel level	a. Add to specified level
b. Short circuit of plates	b. Clean deposit, change electrolyte and replace spacers or plates
c. Plates sulphurised	c. Charge repeatedly to remove sulphurization
d. Defective generator or governor	d. Repair generator or governor
e. Defective wire contaction	e. Check wire contaction to remove trouble
B. Battery overheated	
a. Short circuit of plates	a. Clean deposit, change electrolyte and replace spacers or plates
b. High charging electric current	b. Adjust regulator
C. Charge capacity of battery distinctively reduces	
a. Plates sulphurized	a. Charge repeatedly to remove sulphurization
b. Sulphuric acid not pure	b. Use proper electrolyte
c. Plate curved, active material peeled off and spacer damaged to cause short circuit	c. Replace plate

2) Generator

Trouble and possible cause	Possible remedy
A. Generator will not work	
a. Rectifying unit damaged	a. Check and replace damaged parts
b. Block brush gripped and no contaction with collector ring	b. Examine block brush size and spring pressure, repair or replace
c. Stator winding or rotator winding broken circuit, short circuit or negative pole and terminals defective insulation	c. Repair or replace
B. Lack of generator power	
a. Loose generator belt	a. Adjust belt tension or replace worn out belt
b. Some rectifying units damaged	b. Replce damaged rectifying units
c. Defective block brushes and collector ring stained with oil	c. Repair them
d. Part of rotator winding or stator winding short circuit	d. Repair or replace rotator winding or stator winding
C. Unsteady generator electric current	
a. Loosened generator belt	a. Adjust belt tension or replace belt
b. Rotator winding or stator winding near short circuit or broken circuit	b. Repair or replace rotator winding or stator winding
c. Low pressure of block brush spring and defective contaction of block brush	c. Repair or replace block brush spring
d. Loose terminals	d. Repair
D. Abnormal sound in generator	
a. Generator wrongly mounted	a. Remount the generator correctly
b. Generator bearings damaged	b. Replace generator bearings
c. Rotator hitting stator or other parts	c. Repair

3)Starter

Trouble and possible cause	Possible remedy
A. Starter will not work	
a. Connecting wire broken or defective contaction of connecting wire and switch contacts	a. Weld or replace connecting wire, clean the oil on contacts and tighten the nuts on contacts
b. Fuse blown	b. Replace ruse
c. Battery no electricity or low battery voltage	c. Charge battery
d. No contaction of block brushes with direction exchangers	d. Check block brush, adjust brush spring pressure
e. Short circuit of starter	e. Remove short circuit
B. Starter can run but cannot start engine	
a. Shaft bushing excessively worn out and rotator frictioning with magnet	a. Replace shaft bushing
b. Defective contaction of block brushes with direction exchangers	b. Flush direction exchanger surface, correct brush contacting surface and adjust spring pressure
c. Direction exchanger surface burnt or stained with oil	c. Grind direction exchanger surface, remove oil on direction exchanger surface
d. Welding of wire connecting armature and direction exchanger broken	d. Reweld
e. Defective contaction of wire	e. Tighten nuts
f. Magnetic switch contacts sintered	f. Repair magnetic switch contacts
g. Battery insufficiently charged	g. Charge battery
h. Low atmosphere temperature	h. Use starting methods at low atmosphere temperature
C. Starter continues running after engine has been started	
a. Magnetic switch contacts sintered	a. Repair magnetic switch contacts
b. Incorrect adjustment of the travel of magnetic switch iron core	b. Readjust the travel
D. Starter begins to run and hits the end face of ring gear before starter gear has been meshed	
Short magnetic switch travel	Readjust magnetic switch travel

Appendix : Check of silicon rectifiers

When checking silicon rectifiers take off the plate connecting generator winding with rectifiers and measure rectifiers one by one with an avometer of high inner resistance in R×1 step(Fig. 5—1)

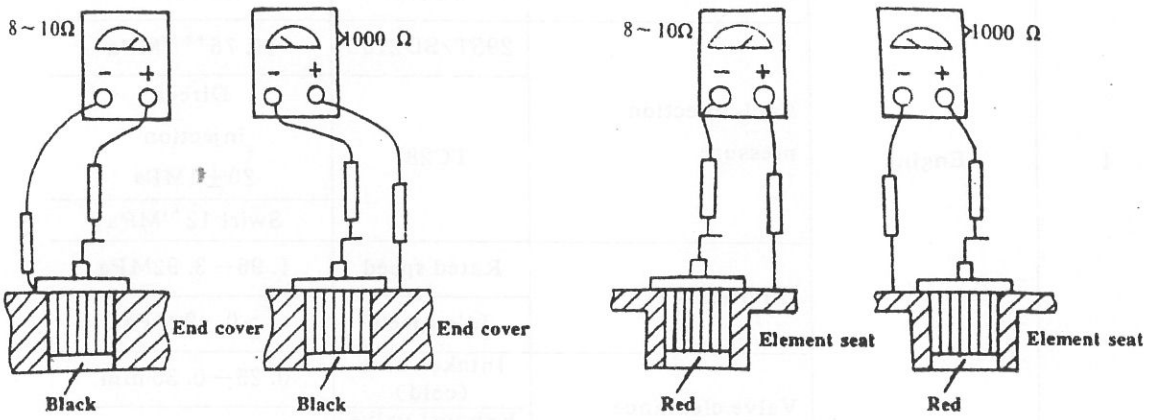


Fig. 5—1 Checking silicon rectifiers

First measure the rectifiers on the rear end cover. Contact " —" measure stick of avometer with end cover, and " +" measure stick with rectifier wire, the reading on the avom[illegible] should be 8—10Ω. The [illegible]ontact " —" measure [illegible] with rectifier wire and " +" measure stick with end cover, the reading on the avometer should be over 10000Ω. The electrode of the three rectifiers on the rectifier panel is opposite to that of the three rectifiers on the end cover. The result of measurement is also opposite. If the positive resistance is below 1Ω, this means the rectifiers are of short circuit. If the negative resistance is hundreds of KΩ, this means the rectifiers are of open circuit.

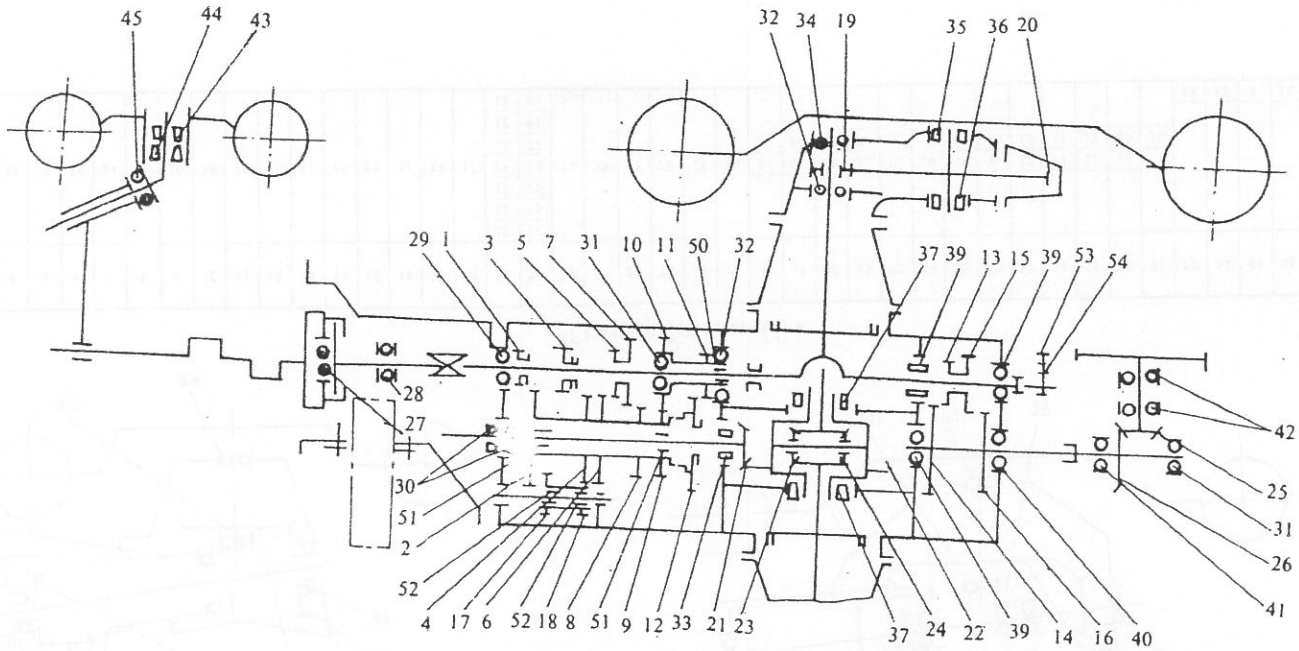
Appendix I Optional Accessories Available on Order

The following accessories are available on users'order:

Item	Accessory	Quantity	Application
1	Ground—grip tire	1 set	.Operation in paddy field
2	Beld pulley	1	Stationary operation

Appendix Ⅱ Adjusting Data of Tractor's Main Parts

No	Mounting location	Adjusting position		Adjusting data
1	Engine	Fuel-feed advance angle (before TDC)	295T	16° ±2
			SD2100	17° ±2
			TC287	14—22°
		Fuel-injection pressure	295T/SD2160	$11.76^{+8.98}$MPa
			TC287	Direct injection 20±1MPa
				Swirl 12^{+1}MPa
		Oil pressure	Rated speed	1.96—3.92MPa
			Idle speed	>0.49 MPa
		Valve clearance	Intake valve (cold)	0.25—0.35 mm
			Exhaust valve (cold)	0.30—0.40 mm
2	Clutch	Free travel of clutch pedal		4—7 mm
		Clearance between release bearing and release lever		2—3 mm
3	Main drive	Meshing backlash of spriral bevel gear pair		0.1—0.3 mm
4	Brake	Free travel of brake pedal		20—40 mm
5	Front axle	Toe-in		3—11 mm

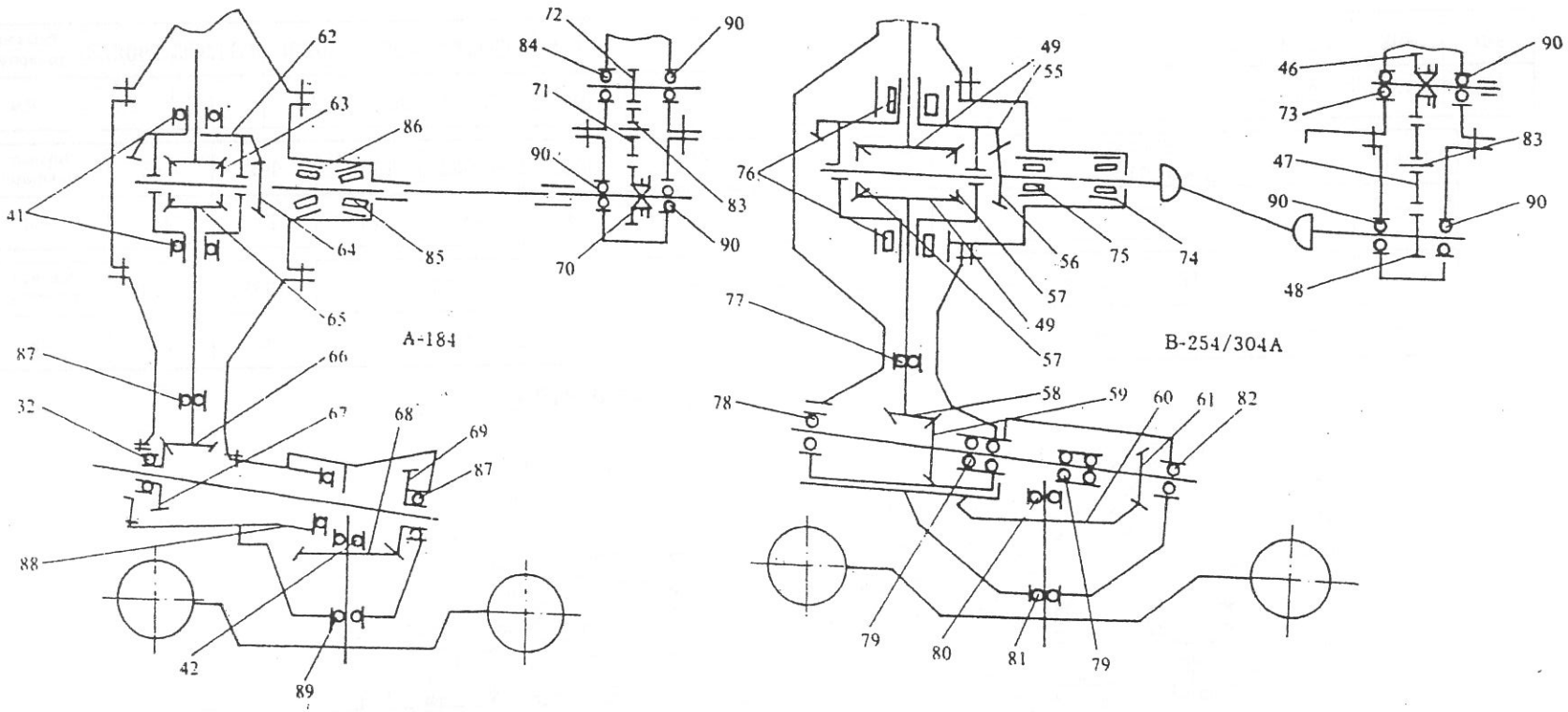


Appendix Ⅲ Transmission (1)

No.	27	28	29	30	31	32	33	34	35	36	37	39	40
Model of bearing	60203	688908	307	27305E	106	208	92608	50208	7212E	7307E	7210E	305	50207

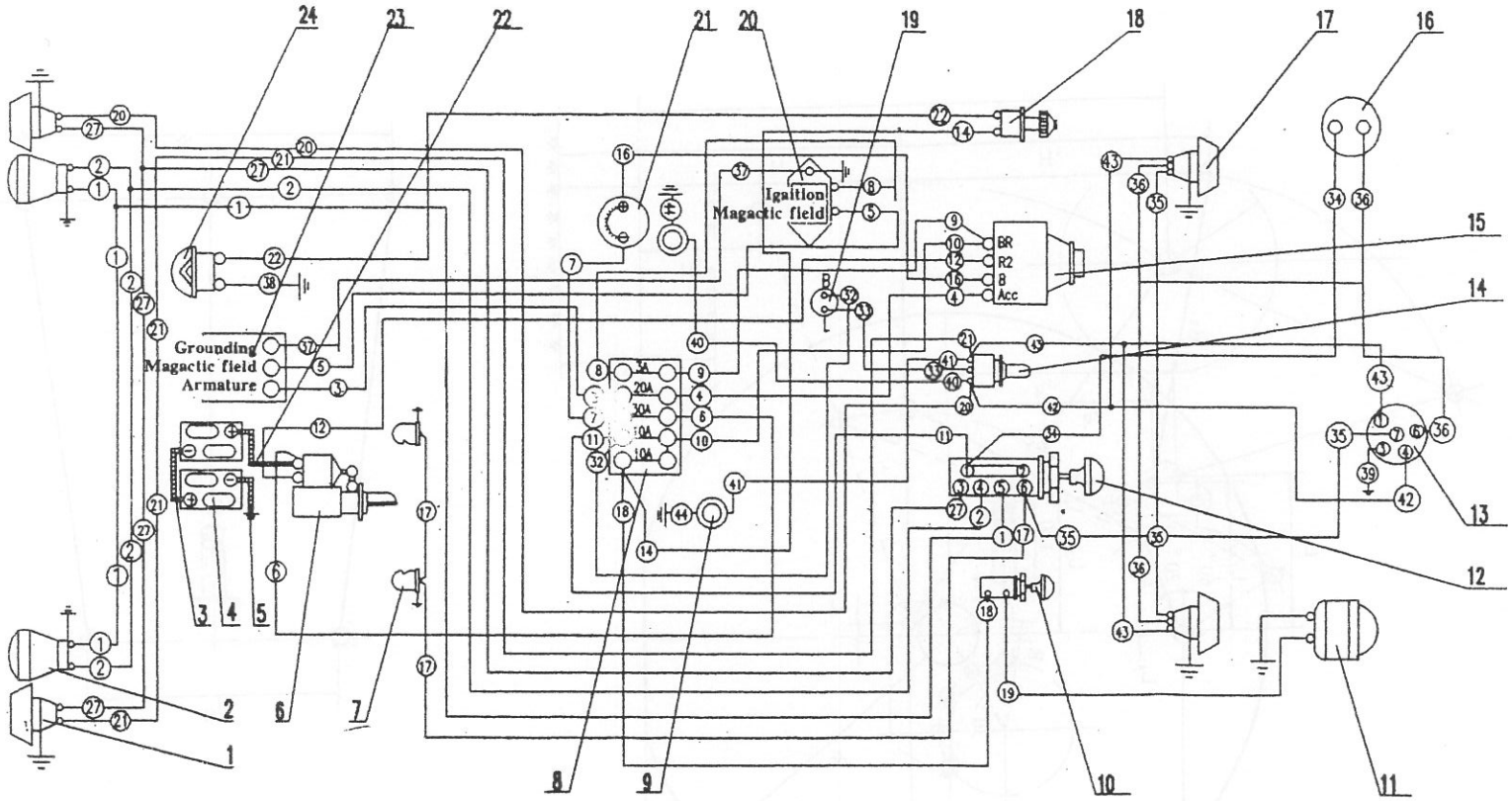
No.	41	42	43	44	45	50	51	52	73	74
Model of bearing	210	306	7506E	7305E	8206	2.5×15.8×34 Needle	3×23.8×36 Needle	2.5×15.8×28 Needle	50204	7205E

No.	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Model of bearing	27306E	2007110E	46207	304	3056207	46307	46209	209	K202515	50205	7206E	27306E	207	B206	308	205



Transmission (2)

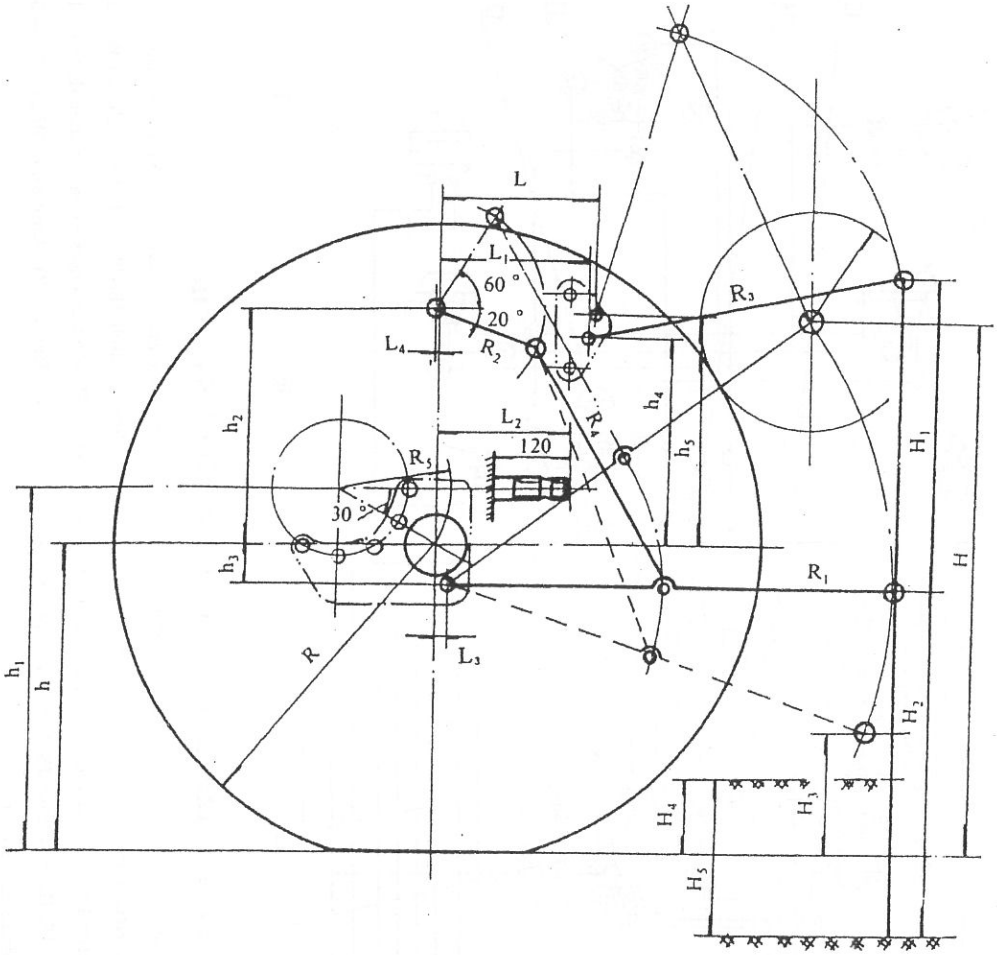
No. / N. of tooth	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	46	47	48	49	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
TS−25A																			13	77																															
TS−25K																			15	75																															
TS−300A																			15	75																															
TS−254	17	44	20	41	27	34	34	27	20	39	19	42	14	47	22	39	23	17	15	75	14	53	12	20	18	26	24	52	20	20	10	10	44	9	12	14	17	40	15											
TS−304A																			13	77							24	52	23	20			44	9	12	14	17	40	15											
TS−180																			12	61																															
TS−184																			12	61																						44	12	9	18	15	16	40	16	24	30	23

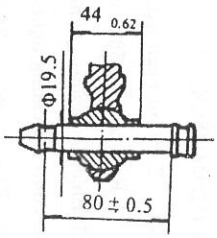


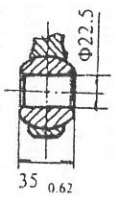
Appendix Ⅳ Wiring Diagram of the Electrical System

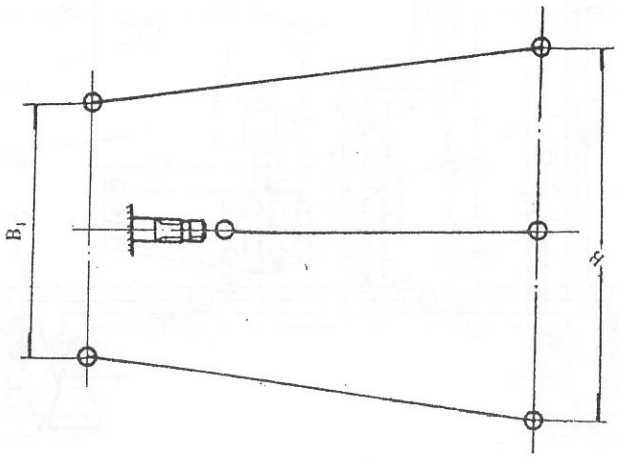
1. Front direction indicating lights 2. Front head light 35W 3. Battery connecting cable 4. Battery 5. Battery ground cable 6. Starting motor 7. Panel light D—Q/JBN—101A 8. Fuse box BX503 9. Direction indicating light XD1—12 10. Single—throw switch JK106 11. Tail light 35 W 12. Triple—throw switch JK108 13. Electric devices connector. 12N 14. Direction indicating light switch JK812 15. Preheating/starting switch JK406 16. Brake light switch 17. Rear direction indicating lights 18. Horn button JK260 19. Blinker SD56—43/12 20. Relay 21. Ammeter 307C(—30—0+30A) 22. Battery—starter cable 23. Generator 24. Horn DL—50—12

Appendix Ⅴ Hitch System Dimensions









Model	TS—180 TS—184	TS—25A TS—25K TS254 TS—25—1 TS—25—2 TS254—1 TS254—2	TS300A TS304A TS300A—1 TS300A—2 TS304A—1 TS304A—2
H	590	865	886
H1	410	510	510
H2	442	550	571
H3	141	200	200
H4	100	125	125
H5	200	250	250
R	447.5	525	552.5
R1	558	725	725
R2	174	174	174
*R3	310	515	515
*R4	495	505	505
R5	147	181	181
L	267.7	243	243
L1	267.7	238	238
L2	236.7	218.75	218.75
L3	53.7	24.25	24.25
L4	—26.7	3	3
h	420.7	493	519
h1	494.2	583.5	609.5
h2	364	381.5	381.5
h3	78.5	61.5	61.5
h4	325	342.5	342.5
h5	325	372.5	372.5
B	500	600	600
B1	321	402	402

* ——adjustable

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