KisanKraft®

Warranty Certificate

(KISANKRAFT COPY)

Important: (1) Normal maintenance and adjustments to the product is the responsibility of the customer. (2) Normal wear and tear is not covered under warranty. (3) Rubber/plastic parts and consumables such as blades, clutch and clutch-bell, spark-plugs, nylon line, air-filters, fuel-filters, oil seals etc. are not covered under the warranty.

No Warranty On Electrical Motor / Electrical Parts / Battery Etc.

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Limitation of Liability: This limited warranty is in lieu of all other express warranties, obligations, or liabilities. Any implied warranties, obligations or liabilities, including, but not limited to, any implied warranty of merchantability shall be limited in duration to the applicable warranty period. Any action for breach of any warranty hereunder, including, but not limited to, any implied warranty of merchantability must be brought within the applicable warranty period.

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Jurisdiction: All disputes are subject to Bangalore court's jurisdiction.

Our Products	◆Chainsaws◆Brush Cutters and Accessories◆Harvesters◆ ◆Engines and Water Pumps◆Hand Tools◆Garden Tools ◆ ◆Cultivators and Accessories◆Sprayers and Accessories◆ ◆Transplanter and Post Hole Digger ◆ Milking Machines ◆

This warranty is null & void, if you fail to register the warranty with KisanKraft by sending the KisanKraft Copy with dealer's stamp.

KisanKraft Limited (formerly known as KisanKraft Machine Tools P Ltd)

🌎: www.kisankraft.com ✉: info@kisankraft.com ☎: +91.80.22178200

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Warranty Certificate

(DEALER COPY)

Product	**Power Tiller**	KisanKraft Invoice Date	
Brand	**KisanKraft**	KisanKraft Invoice No.	
Model	☐ **KK-PTDE-16110** ☐ **KK-PTDE-15105**		
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Buyer's Info (Name, Address, Phone, etc.):		Dealer's Stamp (Address, Phone, TIN, etc.):	
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Wide Range of Products for Every Need

For more information give **MISSED CALL: 07676065555**

Many of our products have BIS: ISI certification.

KisanKraft®

Power Tiller

KK- PTDE-16110 / 15105

User Manual/Service Manual/Parts Catalog

KisanKraft Limited

(Formerly known as KisanKraft Machine Tools Pvt. Ltd)

Sri Huchhanna Tower, #4,1st Main,7-A Cross, Maruthi Layout, Dasarahalli,
HAF Post, Hebbal, Bangalore 560024,Karnataka,INDIA

♦ Bangalore (HO) ♦ Ahmedabad ♦ Bhopal ♦ Bhubaneswar ♦ Coimbatore ♦
♦ Guwahati ♦ Patna ♦ Hubli ♦ Hyderabad ♦ Jaipur ♦ Karnal ♦
♦ Kolkata ♦ Lucknow ♦ Nagpur ♦ Pune ♦ Raipur ♦ Shimla ♦

Power Tiller

KK- PTDE-16110 / 15105

PRODUCT RANGE

KisanKraft has a large range of products to serve the farmers. A list of our products is given below:

Brush Cutters and Accessories

- Brush Cutter/Power Weeder
- Backpack Brush Cutter
- Tea Pruner
- Pole pruner with Engine
- Reaper Attachment
- Blades-Circular
- Blades (2 &3 points)
- Baffle
- Nylon Rope
- Tap & Go

Chainsaws

- Petrol Chainsaw
- Electric Chainsaw
- Chain Sharpening Machine

Engines and Water Pumps

- Engine –Diesel-(Horizontal)
- Engine –Diesel(Vertical)
- Engine-Kerosene
- Water Pump with Petrol Engine
- Water Pump with Kerosene Engine
- Water Pump with Diesel Engine

Hand Tools

- Secateurs
- Folding Saw
- Garden Rake
- Garden Shovel
- Hedge Shear
- Lopper
- Telescopic Hedge Shear
- Telescopic Lopping Shear
- Tree Pruner
- Telescopic Steel Pipe & Fruit Picker Bag
- Sheep Shear

Garden Tools

- Electric Pressure Washer
- Hedge Trimmer
- Lawn Mower (Electric, Petrol & Manual)
- Leaf Blower

Cultivators and Accessories

- Petrol and Diesel

Sprayers and Accessories

- Battery Sprayer
- Portable Power Sprayer
- Trolley Sprayer
- Manual Knapsack Sprayer
- Manual Pressure Sprayer
- Rose Cans
- Hose Crimping Machine
- HTP Sprayer
- HTP Delivery Hose
- HTP Hose Reel
- HTP Stand
- HTP Gun / Lance(Brass Rod
- Knapsack Power Sprayer
- Mister / Duster / Granuel Spreader
- HTP Sprayer Set with Diesel Engine
- HTP Sprayer Set with Kerosene Engine
- Fogging Machine

Milking Machine

- Wood Shredder
- Fodder Ensiling Chaff Cutter
- Fodder Grinder Chaff Cutter
- Fodder Mini Chaff Cutter

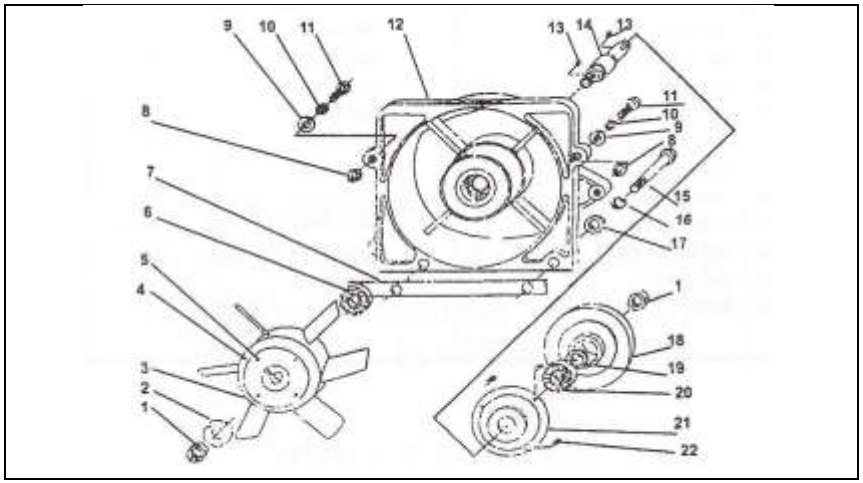
Harvester

- Maize Sheller
- Maize Sheller + Dehusker
- Maize Combine Harvester
- Onion Digger Carlotti Italy
- Tea Leaf Harvester
- Sugarcane Combine Harvester
- Sugarcane Leaf Stripper

Transplanter and Post Hole Digger

- Paddy Transplanter (2 & 8 Rows)
- Transplanter-Vegetable & Tobacco
- Post Hole Digger(4” to 14”Augers)

Fan Assembly



Part No.	Part Name	Part No.	Part Name
E18-1	Nut M12x1.25	E18-12	Fan Cover
E18-2	Washer 12	E18-13	Key 5x10
E18-3	Impeller	E18-14	Fan Shaft
E18-4	Ring	E18-15	Bolt M10x60
E18-5	Rivet 4x12	E18-16	Washer 10
E18-6	Ball Bearing 60201	E18-17	Washer 10
E18-7	Packing	E18-18	Small Belt Pulley
E18-8	Nut M8	E18-19	Adjusting Shim
E18-9	Washer 8	E18-20	Ball Bearing 60202
E18-10	Washer 8	E18-21	End Cover
E18-11	Bolt M8x30	E18-22	Bolt M4x12

CONTENTS

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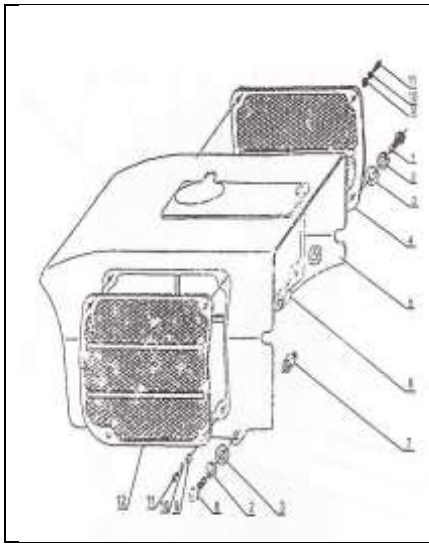
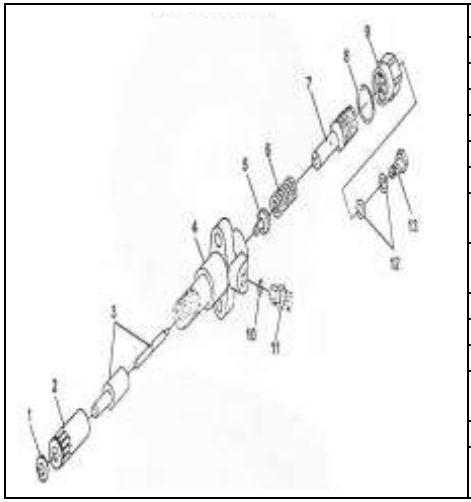
Part No.	Part Name	Part No.	Part Name
E16-1	Big Belt Pulley	E16-9	Bolt M10x80
E16-2	Bolt M6x22	E16-10	Ball Bearing 60202
E16-3	Washer 6	E16-11	Seal Ring
E16-4	Tension Pulley Shaft	E16-12	Circlip 35
E16-5	Tension Pulley Bracket	E16-13	Ring
E16-6	Washer 10	E16-14	Washer 12
E16-7	Washer 10	E16-15	Nut M12
E16-8	Tension Pulley	E16-16	Fan Belt (10x7x1143)

Radiator Shell Assembly



Part No.	Part Name
E17-1	Bolt M8x20
E17-2	Washer 8
E17-3	Washer 8
E17-4	Shutter (1)
E17-5	Radiator Shell
E17-6	Connecting Bolt (B)
E17-7	Connecting Bolt (A)
E17-8	Bolt M8x16
E17-9	Washer 4
E17-10	Washer 4
E17-11	Bolt M4x12
E17-12	Shutter (2)

Fuel Injector

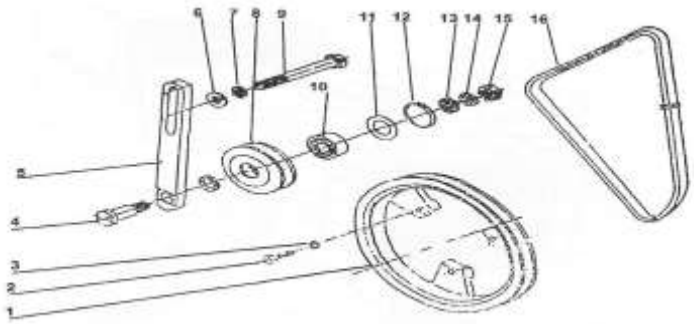


Part No.	Part Name
E14-00	Fuel Injector
E14-1	Washer 19x9.1
E14-2	Cap Nut
E14-3	Nozzle Element
E14-4	Nozzle Holder
E14-5	Needle Valve Spindle
E14-6	Opening Pressure Adjusting Spring
E14-7	Opening Pressure Adjusting Spring
E14-8	Sealing Washer
E14-9	Lock Nut
E14-10	Washer
E14-11	Fuel Inlet Pipe Connecting Screw
E14-12	Washer 11.5x8.5x1
E14-13	Fuel Overflow Pipe Connecting Screw

Alternator & Headlamp Bracket

Part No.	Part Name
E15-2	Headlamp Assembly

Transmission Assembly



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Before Getting Started

Thank you for purchase of our tiller. This operation manual is composed for the purpose of facilitating the users to master the application, adjustment as well as the maintenance of the power tiller and acquainting themselves with the specifications of all the parts and their assembling positions. As this tiller is under uninterrupted improvement and its production technology and style are developed swiftly, therefore this operational manual shall be subject to revision without notice.

In order to prolong the service life of the power tiller, it is essential to run in a new power tiller before putting it into service.

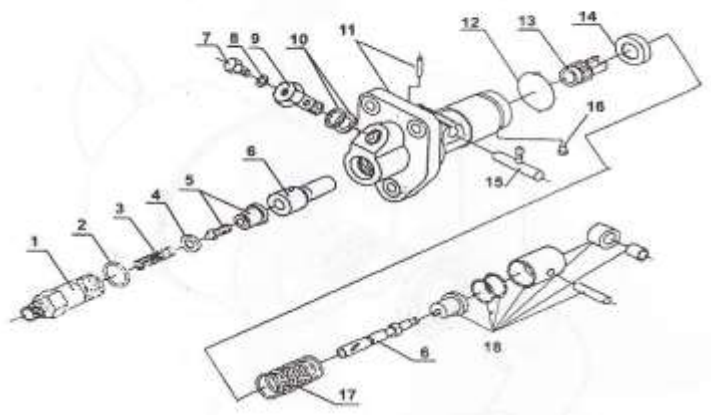
Running-in of the Power Tiller

1. Preparations and inspections to be done before the running-in:
   i. Tighten all the connecting parts of the power tiller
   ii. Fill the relative reservoirs with fuel, lube-oil and water.
   iii. Adjust the V-belt tension if necessary.
   iv. Check the tyre pressure.
2. Running-in schedule:

Item	Gear Nos 1-6						Total (hr.)
	1	2	3	4	5	6	
Running time without load (hr.)	0.5	0.5	0.5	0.5	1	1	4
Working time with ½ load(hr.)	4	4	4	4	0	4	18

Note:
   i. Load means the normal working capacity of the power tiller at the specific gear.
   ii. Running-in at 1st or 2nd gear with a rotavator attached:
   1/2 load means a rototilling depth of 6~8 cm.
   iii. Running-in at 3rd or 4th gear with a double – furrow plow attached:
   1/2 load means a rototilling depth of 8~10 cm.
   iv. Running-in at 5th or 6th gear with a trailer attached:
   1/2 load means carrying load of 500~ 800 kg in the trailer (1st, 2nd, 3rd and 4th gear can also be used for this running-in).
3. Points to be observed in running-in
   i. Running-in to be observed in the sequence from unloaded condition to loaded condition and from bottom gear to top gear.
   ii. Make repeated steering and braking operation to check whether all control handles function well,

Fuel Injection Pump



Part No.	Part Name	Part No.	Part Name
E13-00	Fuel Injection Pump	E13-10	Washer 27x13x1
E13-1	Delivery Valve Holder	E13-11	Pump Body
E13-2	Sealing Ring	E13-12	Circlip
E13-3	Delivery Valve Spring	E13-13	Adjusting Gear
E13-4	Delivery Valve Holder Packing Ring	E13-14	Upper Spring Seat
E13-5	Delivery Valve With Seat	E13-15	Gear Rack
E13-6	Pump Element (Plunger And Barrel)	E13-16	Guide Pin
E13-7	Vent Screw	E13-17	Plunger Spring
E13-8	Washer 10x6.5x1	E13-18	Tappet
E13-9	Fuel Inlet Pipe Connecting Screw		

Intake System

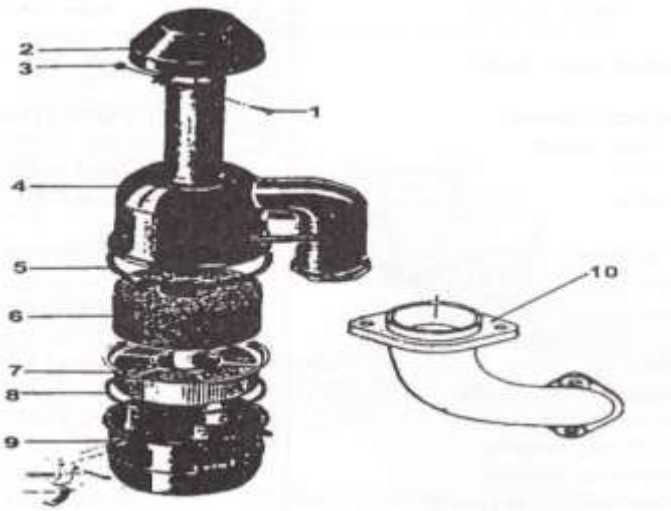
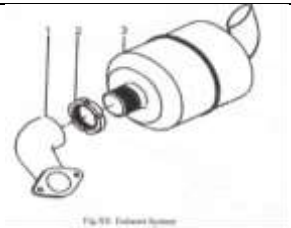


Fig.XI Intake System

Part No.	Part Name	Part No.	Part Name
E11-00	Air Cleaner Assy	E11-6	Filter Cartridge
E11-1	Bottom Head Cap Screw M6x25	E11-7	Filter Element
E11-2	Air Filter Cap	E11-8	Seal Ring-Oil Sump
E11-3	Nut M6	E11-9	Oil Sump
E11-4	Filter Housing	E11-10	Intake Pipe With Its Accessories
E11-5	Rubber Packing		

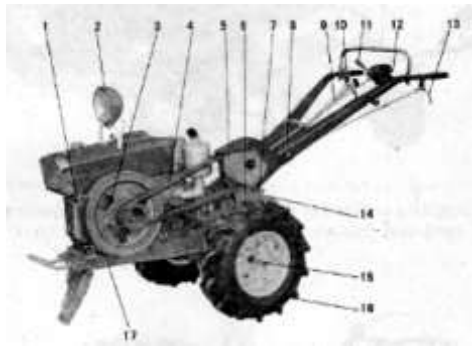
Exhaust System



Part No.	Part Name
E12-1	Exhaust Pipe
E12-2	Lock Nut-Silencer
E12-3	Silencer

iii. After the completion of running-in, the power tiller should undergo a technical maintenance and inspection in accordance with the 1st class technical maintenance. The lubricant in gear boxes should be changed according to the 2nd class technical maintenance.

Overview



1. Engine
2. Head light
3. V- blet
4. AC generator
5. Clutch
6. Transmission box
7. Main drive gearbox
8. Handlebar frame
9. Speed-changing lever
10. Clutch-brake handle
11. Head light switch
12. Throttle control handle
13. Steering hand grip
14. Adapter frame (towing adapter)
15. Final transmission
16. Drive wheel
17. Chassis frame

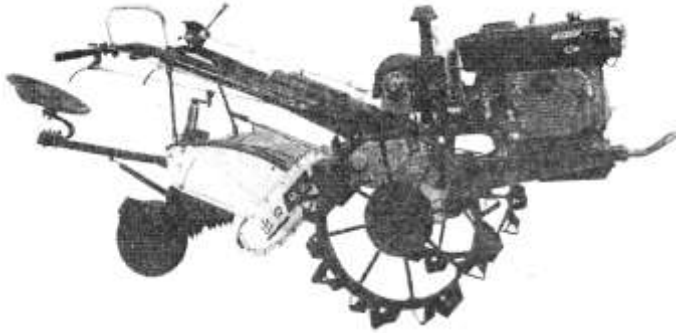
The above picture shows the tiller. It is of dual function type that can be used as a means of traction as well as drive. The power tiller is featured by its simple and compact construction, good reliability, long service life, easy operation, ample output, lightweight and good cross-country ability. This power tiller is very suitable for use in paddy fields, dry fields, vegetable gardens and hilly land with a little inclination. It can be used for ploughing, rototilling and harrowing in paddy fields as well as harvesting, drilling, ditching, transportation etc., if suitable farm implements or accessories are attached in addition, the power tiller can be extensively used as a stationary power source for small scale drainage and irrigation, spraying, grain threshing, cotton ginning, flour milling, fodder cutting and so on.

Furthermore, there is a riding chair provided with the rotary cultivator for comfortable driving in rototilling.

Tractor with main implements and accessories attached:

1. Rototilling set (power tiller, with riding chair) for dry field:

2. Rototilling set (power tiller, with riding chair) for slushy paddy field (anti-skid iron wheels are used instead of rubber tyres):



3. Ploughing set for dry field:

Part No.	Part Name	Part No.	Part Name
E10-1	Gear Casing	E10-23	Speed Control Lever
E10-2	Oil Seal Ring	E10-24	Bolt M8x40
E10-3		E10-25	Speed Control Lever Shaft
E10-4		E10-26	Crankcase Ventilator
E10-5		E10-27	Bottom Head Cap Screw M6x12
E10-6		E10-28	Bottom Head Cap Screw M6x18
E10-7	Fuel Corrector	E10-29	Shim For Injection Pump
E10-8		E10-30	Fuel Injection Pump Mounting Bolt
E10-9	Washer 6	E10-31	Governor Gear Bushing
E10-10	Washer 6	E10-32	Governor Gear
E10-11		E10-33	Governor Ball Spacer
E10-12	Name Plate	E10-34	Steel Ball-Governor Ball Spacer
E10-13	Speed Control Lever Knob	E10-35	Governor Ball Race
E10-14		E10-36	Single Direction Thrust Ball Bearing
E10-15	Speed Indicating Panel	E10-37	Governor Fork
E10-16	Governor Fork Shaft	E10-38	Taper Pin
E10-17	Governor Arm	E10-39	Flat Key-Starting Gear
E10-18	Spring Washer 8	E10-40	Starting Gear
E10-19		E10-41	Starting Gear Shaft
E10-20	Governor Spring	E10-42	Starting Gear Shaft Bushing(B)
E10-21	Adjusting Screw-Speed Control Lever	E10-43	Adjusting Washer
E10-22	Hexagon Nut M6	E10-44	Packing For Governor Ball Race

Part No.	Part Name	Part No.	Part Name
E8-1	Washer	E8-9	Inner Rotor
E8-2	Pipe Connecting Bolt-Oil Pipe	E8-10	Oil Pump Shaft
E8-3	Oil Pipe	E8-11	Oil Pump Cover
E8-4	Cylinder Pin	E8-12	Washer
E8-5	Lubricating Oil Pump Body	E8-13	Pipe Connecting Bolt-Oil Strainer Body
E8-6	Locating Pin-Oil Pump Body	E8-14	Oil strainer Body With Suction Pipe
E8-7	Lubricating Oil Pump Packing Shim	E8-15	Oil strainer Screen
E8-8	Outer Rotor	E8-16	Circlip

Camshaft Assembly

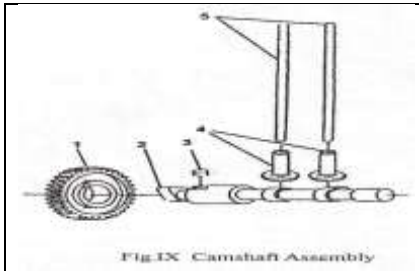


Fig.IX Camshaft Assembly

Part No.	Part Name
E9-1	Camshaft Gear
E9-2	Camshaft
E9-3	Key
E9-4	Valve Tappet
E9-5	Valve Push Rod

Gear Casing Assembly)

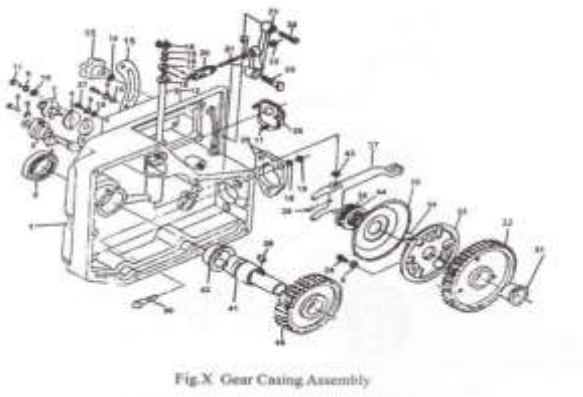
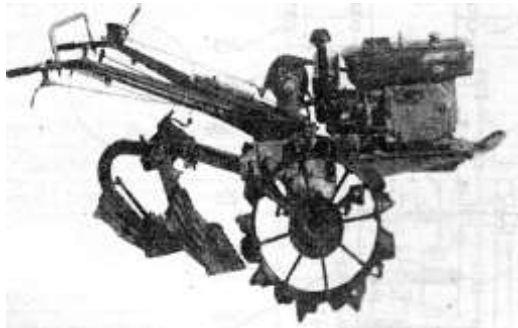


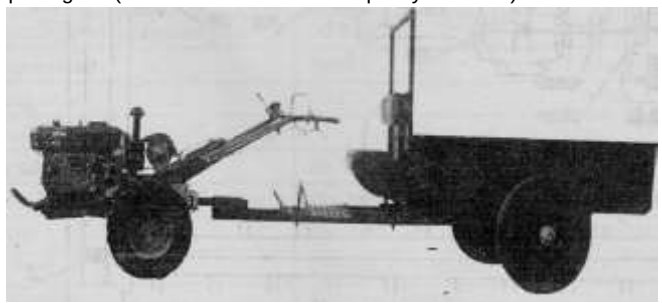
Fig.X Gear Casing Assembly

4. Rototilling set (power tiller, without riding chair) for dry field:

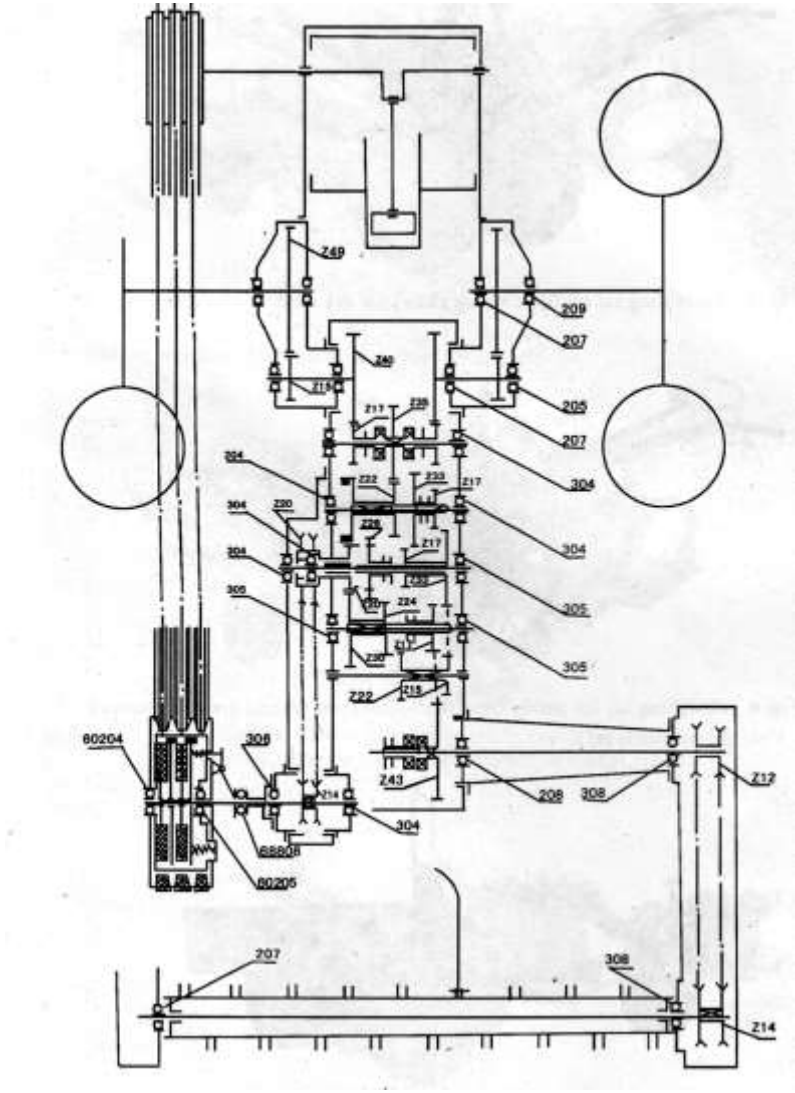
5. Ploughing set for paddy field (anti-skid steel wheels are used instead of rubber tyres):



6. Transporting set (with a trailer of one ton capacity attached):



Schematic diagram of drive system:



Part No.	Part Name	Part No.	Part Name
E7-1	Fuel Filter Cover	E7-19	Washer
E7-2	Washer	E7-20	Fuel Leak Off Pipe Connecting
E7-3	Pipe Connection Bolt	E7-21	Pipe Connecting Bolt-Fuel Pipe-Tank to Filter
E7-4	Holding Nut	E7-22	Fuel Tank
E7-5	Seal Ring	E7-23	Washer
E7-6	Seal Ring	E7-24	Packing
E7-7	Fuel Filter Holder	E7-25	Fuel Outlet Pipe
E7-8	Seal Ring-Fuel Filter Holder	E7-26/27	Fuel Cock with pipe
E7-9	Washer	E7-28	Primary Fuel Filter
E7-10	Spring	E7-29	Fuel Cock Connecting Flange
E7-11	Fuel Filter Body	E7-30	Washer 6
E7-12	Seal Ring-Fuel Filter Holder	E7-31	Bolt M6x16
E7-13	Fine Fuel Filter Paper Element	E7-32	Fuel Tank Cap
E7-14	Washer	E7-33	Fuel Filling Screen
E7-15	Screw	E7-34	Fuel Pipe-Filter to Injector
E7-16	Spring	E7-35	High Pressure Fuel Pipe And Its Accessories
E7-17	Steel Ball-Fuel Filter	E7-36	Pipe Clip
E7-18	One Way Valve Seat		

Lubrication System

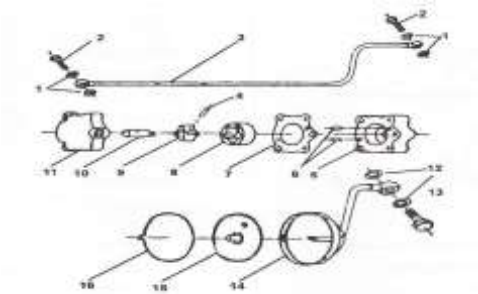
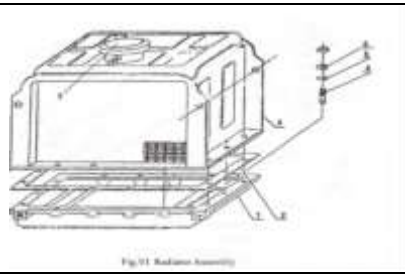


Fig.VIII Lubrication System

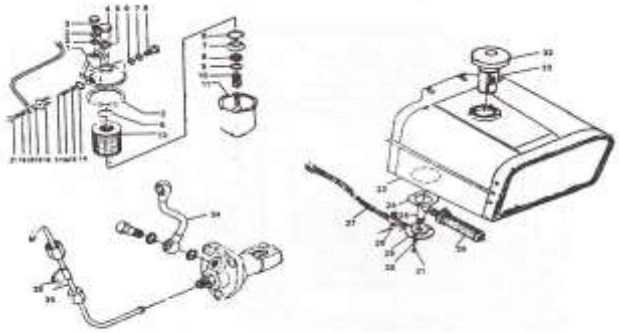
Part No.	Part Name	Part No.	Part Name
E5-1	Bolt M10x35	E5-11	Crankshaft Timing Gear
E5-2	Washer 10	E5-12	Circlip
E5-3	V-Belt Pulley	E5-13	Upper Balancing Shaft
E5-4	Flywheel Nut	E5-14	Flat Key-Balancing Shaft Gear
E5-5	Lock Washer	E5-15	Balancing Shaft Ger
E5-6	Flywheel	E5-16	Washer
E5-7	Flat Key-Fly wheel	E5-17	Washer 8
E5-8	Crankshaft Screw Plug	E5-18	Bolt M8x18
E5-9	Crankshaft	E5-19	Lower Balancing Shaft
E5-10	Flat Key-Crankshaft Timing Gear	E3-32	Hexagon Bolt M8x30

Radiator Assembly



Part No.	Part Name
E6-1	Bottom Tank
E6-2	Radiator Core Pad
E6-3	Radiator
E6-4	Stud M6x20
E6-5	Washer 6
E6-6	Washer 6
E6-7	Radiator Cap

Fuel System



Technical Specifications

Model		KK-PTDE-16110 /15105		
Type		Single axle, dual-purpose for both traction and drive		
Overall dimensions (LXWXH) (mm)		2680 X 960 X 1250		
Wheel track (mm)		800		
Minimum ground clearance (mm)		185 (from ground to the bottom of the final transmission housing)		
Minimum turning radius (mm)		900 (with rotavator removed)		
Calculated speed of every gear	Forward (km/h)	5.83	10.34	16.83
	Reverse (km/h)	4.18		
Diesel engine type		Single cylinder, 4- stroke, water cooled		
Rated speed (RPM)		2200		
Max. torque ((Nm)		59		
Max. torque sped (RPM)		1600		
Specific fuel consumption (g/kwh)		≤258		
Lubricating oil consumption (g/kwh)		≤2.04		
Starting method		Hand		
Power from engine to clutch		By V-belt (B type)		
Clutch type		Double friction disc and constant contact		
Gear box		Spur gear and sliding gear in constant mesh, compound transmission type of (3+1) X 2		
Steering gear		Side (dog) clutch		
Brake type		Inner expanding ring, wet type		
Final transmission		Two-step reduction by spur gears		
Drive wheel	Tyre type	6.00-12,6-pky, herringbone		
	Tyre pressure (kPa)	137-196		

Model		KK-PTDE-16110 /15105
	Slushy paddy field wheel	Anti-skid steel wheel, herringbone
Towing device	Opening of adapter frame (mm)	95
	Clearance from ground to adapter frame (mm)	389
	Diameter of connecting pin (mm)	Ø 20(central) Ø16 (both)
Electric installation	Type of generator	Permanent-magnet A.C generator 12v/90W
	Head light	Two-lights of 12v, 28W each
	Switch	JK 106
The filling of oil and water	Water tank	15kg of clean soft (river) water
	Fuel tank	8 kg of light diesel oil
	Oil sump	2.5 kg of machine oil
	Main gearbox	5.1 kg of machine oil

Note: Technical Specifications are subject to change without prior notice.
Engine specifications are given in the operation manual of the diesel engine at the end.

Piston & Connecting Rod Assembly

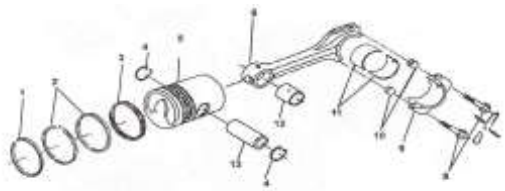


Fig.IV Piston and Connecting Rod Assembly

Part No.	Part Name	Part No.	Part Name
E4-1	Barrel Type Compression Ring (1)	E4-8	Connecting Rod Bolt
E4-2	Taper Face Compression Ring (2,3)	E4-9	Connecting Rod Cap
E4-3	Expander Type Oil Scraper Ring	E4-10	Guide Bushing
E4-4	Circlip For Piston Pin	E4-12	Connecting Rod Bushing
E4-5	Piston	E4-11	Connecting Rod Bearing Shell
E4-6	Connecting Rod(full set 6+8+9+10)	E4-13	Piston Pin
E4-7			

Flywheel Crankshaft & Balancing Mechanism

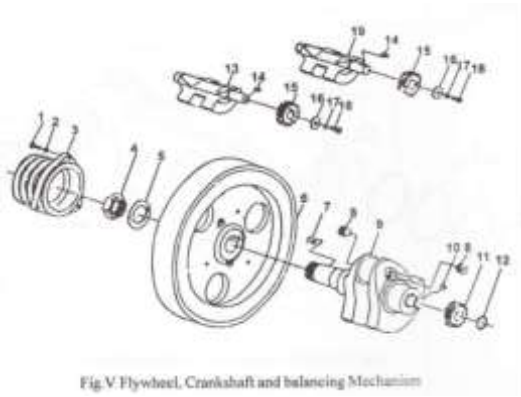


Fig.V Flywheel, Crankshaft and balancing Mechanism

Part No.	Part Name	Part No.	Part Name
E3-1	Hexagon Nut M10	E3-23	Outer Valve Spring
E3-2	Spring Washer 10	E3-24	Inner Valve Spring
E3-3	Plain Washer 10	E3-25	Valve Guide
E3-4	Cylinder Head Cover	E3-26	
E3-5	Decompression Shaft Bushing	E3-27	Hexagon Nut M8
E3-6	Decompression Shaft	E3-28	Spring Washer 8
E3-7	Oil Indicator Piston	E3-29	Exhaust Valve Seat
E3-8	Oil Indicator Spring	E3-30	
E3-9	Oil Indicator Spindle	E3-31	Stud For Injector Clamping Plate
E3-10	hexagon Bolt M8x28	E3-32	hexagon Bolt M8x30
E3-11	Oil Indicator Union	E3-33	Exhaust Pipe Packing
E3-12	Red Float Of Oil Indicator	E3-34	
E3-13	Cap Of Red Float Of Oil Indicator	E3-35	Cylinder Head
E3-14	Cylinder Head Cover Packing	E3-36	
E3-15	Circlip For Rocker Arm Shaft	E3-37	Exhaust Valve
E3-16	Washer For Rocker Arm Shaft	E3-38	Intake Valve
E3-17	Hexagon Nut M8x1	E3-39	Intake Valve Seat
E3-18	Rocker Arm	E3-40	Intake Pipe Packing
E3-19	Rocker Arm Bushing	E3-41	Plug-Cylinder Head
E3-20	Adjusting Screw Rocker	E3-42	Long Stud For Rocker Arm Shaft Support
E3-44	Rocker Arm Shaft	E3-43	Short Stud For Rocker Arm Shaft Support
E3-45	Rocker Arm Shaft Support	E3-46	Decompression Lever Spring
E3-21	Valve Collet	E3-47	Decompression Lever
E3-22	Valve Spring Seat		

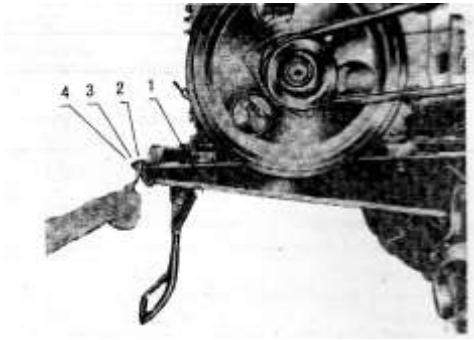
Adjustment

1. Adjustment of V-belt tension:

The tension of V-belt must be properly adjusted, as an excessive slackness or tightness of V-belt will shorten the service life of belt and the machine as well. A severely slack V-belt will cause belt slip, resulting in badly insufficient power transmission from engine to main gearbox.

Method of adjustment:

Loosen the four engine securing nuts (1) under the engine and the round head screw securing the throttle line. Then loosen the locking nut (3), turn the adjusting nut (2) to pull the engine into a proper position, then retighten the nuts and screw.



Adjustment of V-belt tension

1. Engine securing nut
2. Adjusting nut
3. Locking nut
4. Draw-in bolt

The belt tension is just fit when the belts on engine and clutch pulleys can be depressed downward 20-30 mm by four fingers at the middle of the belts.

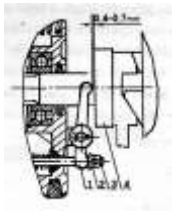
2. Adjustment of clutch throw-out lever

In normal working condition, a clearance of 0.4~0.7 mm should be kept between throw-out bearing (4) and the heads of three throw-out levers (1). The latter should be so adjusted that they are all in the same rotating plane (parallel to the throw-out bearing).

Method of adjustment:

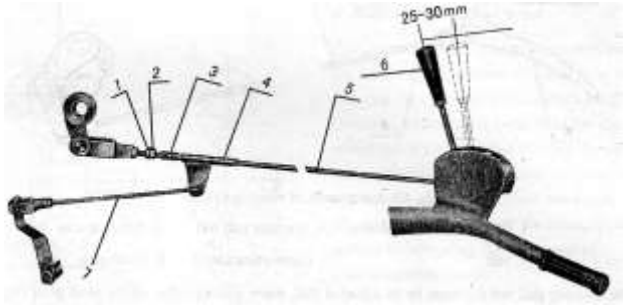
Shift the Clutch-brake handle (6) to “Engage” position.

Loosen the Locking nuts (3) and turn the Adjusting nuts (2) until the correct clearance is obtained.



Adjustment of throw-out lever
1. Throw-out lever
2. Adjusting nut
3. Locking nut
4. Throw-out bearing

3. Adjustment of clutch-brake control system



1. Locking nut
2. Adjusting nut
3. Spring
4. Lug
5. Clutch pull rod
6. Clutch-brake handle
7. Brake pull rod

3.1 Shift the clutch-brake handle (6) to “Engage” position, adjust the clearance between throw-out levers and the throw-out bearing to make it within the range of 0.4 ~ 0.7 mm. Then adjust the length of the clutch pull rod (5) to let the clutch-brake handle (6) have a free running of 25-39 mm, so that an effective “Disengagement” can be obtained after shifting the clutch-brake handle (6) to “Disengage” position.

3.2 Shift the clutch-brake handle to “Disengage” position, adjust the length of brake pull rod (7) and the position of adjusting nut (2) to make the spring (3) come against the lug (4) and further to have the spring compressed for 3-5 mm. then tighten the locking nut (1). Finally, shift the handle to “Brake” position to see whether the braking is reliable. To inspect the reliability of braking, just drive the power tiller onto a slope and pull the clutch-brake handle to “Brake” position, then push the power tiller down the slope. If drive wheels of the power tiller just skid without any rotation, it certifies that the brake system is reliable.

Part No.	Part Name	Part No.	Part Name
E2-1	Cylinder Block	E2-17	Locating Pin-Main Bearing housing
E2-2	Packing Of The Rear Cover	E2-18	Washer
E2-3	Rear Cover	E2-19	Plug-Oil Sump
E2-4	Washer 8	E2-20	Main Bearing(Set)-NJ-2211E & 6314C3
E2-5	Washer 8	E2-21	Oil Seal For Crankshaft
E2-6	Bolt M8x25	E2-22	Main Bearing housing
E2-7	Oil Dipstick	E2-23	Main Bearing housing Mounting Shim
E2-8	Oil Hole Plug On The Block	E2-24	Camshaft Rear Cover
E2-9	Bolt M10x20	E2-24.1	Locating Plate For Camshaft
E2-10	Washer 10	E2-25	Packing For Camshaft Cover
E2-11	Washer 10	E2-26	Camshaft Rear Bushing
E2-12	Single Row Self Centering Ball Bearing	E2-27	Water Drain Cock
E2-13	Packing For Balancing Shaft Cover	E2-28	Packing For Oil Sump
E2-14	Balancing Shaft Cover	E2-29	Oil Sump
E2-15	Bolt M8x40	E2-30	Bolt M8x18
E2-16	Packing For Lubricating Oil Pump	E2-31	Rubber Seal Ring

Cylinder Head Assembly

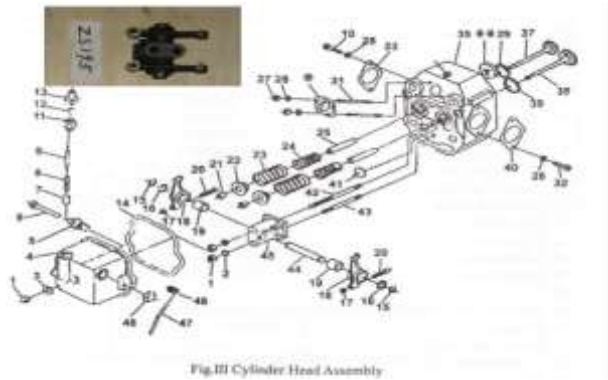


Fig.III Cylinder Head Assembly

Part No.	Part Name	Part No.	Part Name
E1-1	Cylinder Head Nut	E1-16	Washer 8
E1-2	Cylinder Head Gasket	E1-17	Upper Cover Of The Cylinder Block
E1-3	Cylinder Liner	E1-18	Packing Sheet Of Upper Cover
E1-4	Cylinder Liner Water Seal Ring	E1-19	Locating Pin-Gear Casing
E1-5	Cylinder Head Stud	E1-20	Gear Casing Packing
E1-6	Cylinder Block	E1-21	Single Row Self Centering Ball Bearing
E1-7	Hopper Packing	E1-22	Circlip
E1-8	Washer 10	E1-23	Bolt 8x95
E1-9	Bolt 10x25	E1-24	Starting Shaft Bushing (A)
E1-10	Washer	E1-25	Speed Governing Gear Shaft
E1-11	Lifting Stud	E1-26	Camshaft Front Bushing
E1-12	Washer 12	E1-27	Bolt 10x25
E1-13	Lifting Eye Nut	E1-28	Bolt
E1-14	Bolt 8x18	E1-29	Washer 10
E1-15	Washer 8		

Cylinder Block Assembly-2

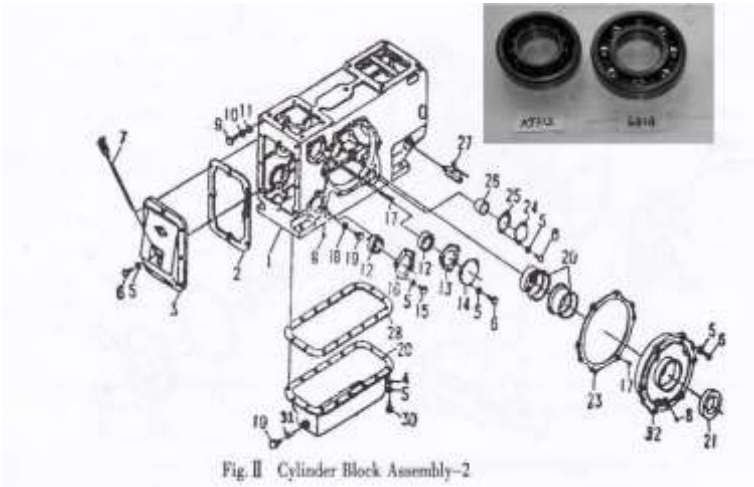
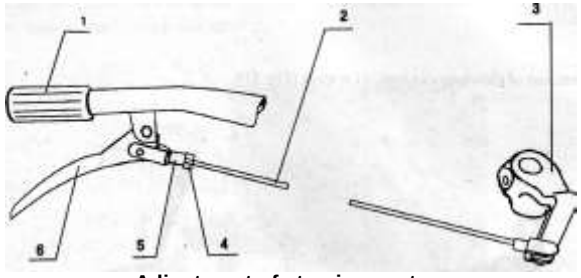


Fig. II Cylinder Block Assembly-2

4. Adjustment of steering system:



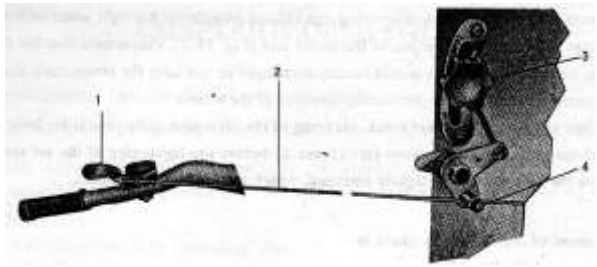
Adjustment of steering system

1. Plastic handlebar sleeve
2. Steering pull rod
3. Steering arm
4. Nut
5. Connecting clevis
6. Hand gri[

The steering rod (2) must be so adjusted that, when griping either of the hand grips (6), the relative jaw clutch in the gearbox is disengaged and reliable steering is realized. If not, the pull rod (2) should be shortened. If there is too big a distance from the plastic handlebar sleeve (1) to the hand grip (6), resulting in inconvenience of steering operation, then the pull rod (2) should be duly extended.

5. Adjustment of throttle control system:

The throttle control system should be so adjusted that the control lever can be operated either to accelerate the engine to the full rated speed or to stop the engine. The adjustment is effected by loosening the round head crew (4), turning the throttle control lever (1) clockwise to the extreme position and shifting the engine speed control knob (3) to the lowest position of the guide quadrant. Then retighten the screw (4).



Adjustment of throttle control system

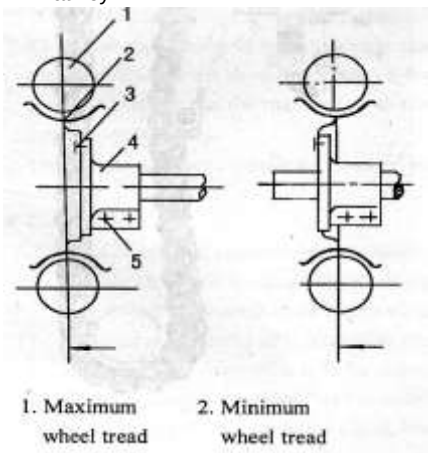
1. Throttle control lever
2. Throttle rod
3. Engine speed control knob
4. Round head screw

6. Adjustment of wheel tread:

Four steps of wheel tread can be obtained by changing the mounting position of wheel hubs or inter-changing the right wheel with the left one. Generally, for rototilling in dry field, the wheel tread of 640 mm is advisable and 800 mm for ploughing and transportation (with trailer attached). If other implement is attached, the wheel tread must be properly adjusted to comply with the actual requirement, such as in cultivating, furrowing etc.

Method of adjustment:

A. Loosen the clamping bolts (5) and the square head set screw, slightly striking the hub to desired position. Firstly turn the square-head set screw into the positioning hole in drive axles with less force but be sure to turn back the set screw by 1 or 2 turns after it is driven to refusal, then fully tighten the clamping bolts, and at last tighten the set screw. Users have to follow the hub fixing procedures, otherwise, the hub shall not be tightened properly, which will result in damage to the hub and the flat key.



Schematic drawing of the wheel tread adjustment

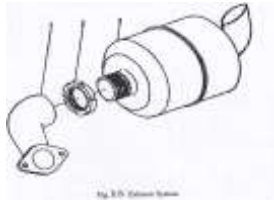
1. Tyre
2. Wheel disc
3. Nut
4. Hub
5. Clamping bolt

B. Or alternatively, remove the four securing nuts (3) and interchange the right wheel with the left, i.e., to change the mounting direction of the wheel disc. Please note that the direction of herring bone pattern of tyres should remain unchanged or just keep the arrow mark shape of tyre pattern coincidental with the forwarding direction of the wheels.

NOTE: **After adjusting the wheel track, securing of the clamping bolts should be done strictly as per the sequence given above (A) before the tightening of the set screw, other-wise the hub will not be tightly clamped, which will lead to bad results.**

Part No.	Part Name	Part No.	Part Name
E13-00	Air Cleaner Assy	E13-6	Intake Pipe And Its Accessories
E13-1	Wing Nut	E13-7	Air Filter Sleeve
E13-2	Washer 6	E13-8	Air Filter Flange
E13-3	Air Filter Cover	E13-9	Air Filter Body
E13-4	Rubber Packing	E13-10	Seal Ring-Air Filter Body
E13-5	Air Filter Cartridge		

Exhaust System (Fig. X IV)



Part No.	Part Name
E14-1	Exhaust Pipe
E14-2	Lock Nut-Silencer
E14-3	Silencer

Parts Diagram & List-Engine (KK-PTDE-15105)

Cylinder Block Assembly-1

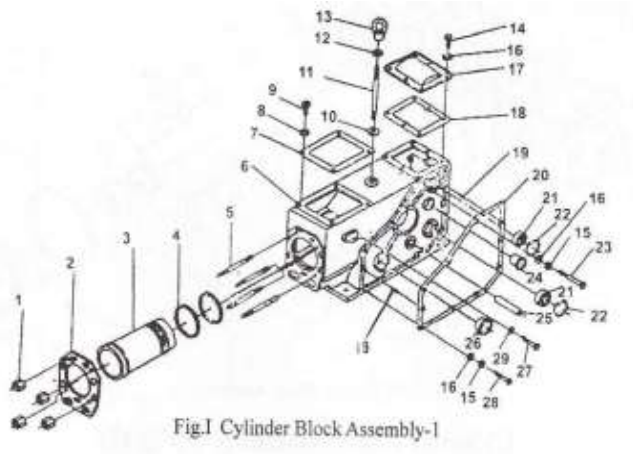


Fig.I Cylinder Block Assembly-1

Fuel Injector Assembly

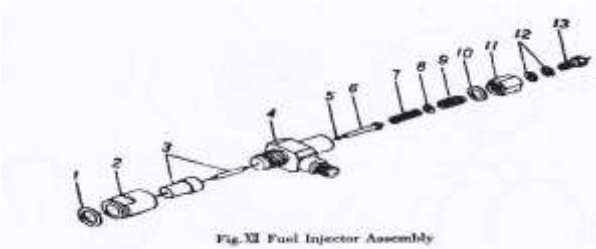
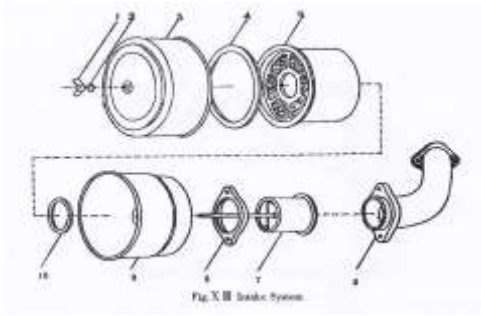


Fig.XII Fuel Injector Assembly

Part No.	Part Name	Part No.	Part Name
E12-00	Fuel Injector	E12-7	Opening Pressure Adjusting Spring
E12-1	Washer	E12-8	Washer
E12-2	Cap Nut	E12-9	Opening Pressure Adjusting Spring
E12-3	Nozzle Body (With Needle Valve)	E12-10	Sealing Washer
E12-4	Nozzle Holder	E12-11	Lock Nut
E12-5	Steel Ball	E12-12	Sealing Washer
E12-6	Needle Valve Spindle	E12-13	Fuel Leak Off Connecting Bolt

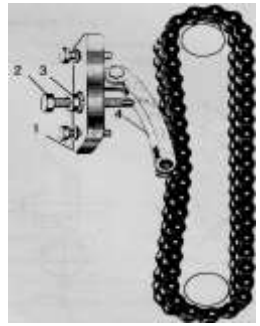
Intake System



Part No.	Part Name	Part No.	Part Name
E12-00	Fuel Injector	E12-7	Opening Pressure Adjusting Spring

Adjustment of tension of the chain in transmission box

When the chain in transmission box gets worn some and becomes slack, tighten the adjusting bolt (2) with hand till the chain obtains proper tension and then tighten the locking nut (3). If the bolt is tightened with a spanner, special attention should be paid to avoiding any overstrain, for which will speed up the damage of the chain.



Chain tension mechanism of the transmission box.
1. Support seat
2. Adjusting bolt
3. Locking nut
4. Tension plate

Operation

1. Preparation before operation and starting of engine:

1.1 Check the lubricating oil, fuel and water and make necessary preparation before starting the engine according to the requirements stipulated in the operation manual of the engine.
1.2 Check the oil level in main gear box and rotary cultivator transmission box.
1.3 Check the tightness of all the connecting bolts.
1.4 Shift the clutch- brake handle to “Disengage” position, the speed-changing levers to “Neutral” and the throttle control lever to “Start” position.
1.5 Place down the supporter Assy (i.e., get the supporter Assy into working position).
1.6 Start the engine by referring to the operation manual of the engine.

2. Driving the tractor away from rest:

2.1 Shift the speed-changing lever to a specific forwarding gear.
2.2 Check the engagement of the left or right steering gear with intermediate reduction gear. (Method for checking: Wobble the handlebar frames leftward and rightward, if the driving wheels do not rotate freely, it certifies that the steering jaw clutches are well engaged, but never operate the steering hand grip while checking).
2.3 Shift the clutch0brake handle to “Engage” position smoothly, thus the tractor is driven away from rest.
2.4 **CAUTION**”
Users of tractor are requested to pay special attention to the correct use of clutch.
a. The clutch should be used only when changing the gear or braking.
b. Users must be aware that the clutch should not be unnecessarily kept in “disengage” status while the engine is running idly, otherwise, the throw out bearing is apt to burn out.

c. Whenever the power tiller is to be stopped for more than one minute, just shift the speed changing lever to “neutral” and release the clutch-brake handle to “engage” position.
d. While engaging the clutch-brake handle should be always be released very gently and smoothly, without any impact.

3. Reversing the tractor:

3.1 Shift the speed changing lever to 1st (or 2nd) reverse gear’. The tractor can be reversed when shifting the clutch-brake handle to “Engage” position smoothly.

3.2 CAUTION :
A sudden raising of the handlebar may occur when reversing of the tractor is made. Therefore, if it is very important to shift the clutch-brake handle to “Engage” position very gently and smoothly. For safety sake, it is advisable to operate the engine under reduced throttle setting while making reversing of the tractor.

4. Steering:

4.1 Steering on flat road is effected by operating the left or right steering grip under the handlebars. If the tail wheel and riding chair are mounted, the pedals on the tail wheel should be applied to turn the tail wheel leftward or rightward as needed in addition to the operation of the hand grips. However, to protect the tractor from turning over, it is very important to speed down the tractor before the steering operation is applied.

4.2 When driving the tractor down a steep slope it is preferable to carry out the steering by pushing the handlebars leftward or rightward. This is because the steering whirl travelling down a slope is in the very reversed way to that on a flat road, i.e., if right turning is intended, gripe the left hand grip, while left turning, just gripe the right hand grip.

5. Braking:

5.1 The braking can be effected by shifting the clutch-brake handle to “brake” position.

5.2 CAUTION:
a. Whenever an emergency braking is necessary, special attention must be paid to the fact that the handlebars of the tractor, owing to inertia, will get a sudden “raise-up” and the tractor wil deviate a certain angle.
b. While driving a transportation set on a road, the driver should try to avoid using the brake of the prime mover (power tiller) but use its clutch and the brake system of the trailer coordinately.
c. Brake should not be unnecessarily applied during cultivation. Slowing down by reducing the throttle and disengage the clutch, the power tiller will automatically come to a halt. Brake should not be always suddenly applied with impact, otherwise the brake ring will br shortly damaged.

6. Stopping:

6.1 Shift the clutch-brake handle to “Disengage” position.
6.2 Shift the speed- changing lever of the tractor and the rotavator to the “Neutral” position.
6.3 Throttle down the engine gradually until the engine comes to stop.
6.4 Then shift the clutch-brake handle back to the “Engage” position.

Part No.	Part Name	Part No.	Part Name
E10-14		E10-36	Single Direction Thrust Ball Bearing
E10-15	Speed Indicating Panel	E10-37	Governor Fork
E10-16	Governor Fork Shaft	E10-38	Taper Pin
E10-17	Governor Arm	E10-39	Flat Key-Starting Gear
E10-18	Spring Washer 8	E10-40	Starting Gear
E10-19		E10-41	Starting Gear Shaft
E10-20	Governor Spring	E10-42	Starting Gear Shaft Bushing(B)
E10-21	Adjusting Screw-Speed Control Lever	E10-43	Adjusting Washer
E10-22	Hexagon Nut M6	E10-44	Packing For Governor Ball Race

Fuel Injection Pump

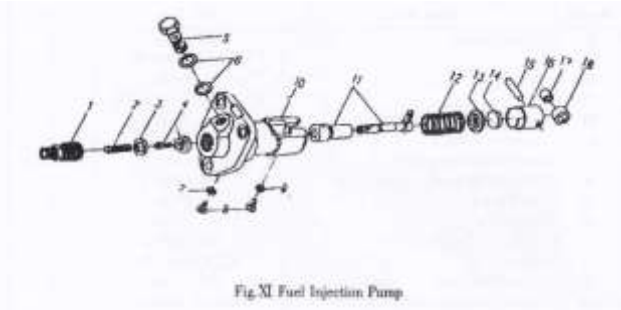


Fig.XI Fuel Injection Pump

Part No.	Part Name	Part No.	Part Name
E11-00	Fuel Injection Pump	E11-10	Pump Body
E11-1	Delivery Valve Holder	E11-11	Pump Element (Plunger And Barrel)
E11-2	Delivery Valve Spring	E11-12	Plunger Spring
E11-3	Delivery Valve Holder Packing Ring	E11-13	Lower Spring Seat
E11-4	Delivery Valve With Seat	E11-14	Adjusting Packing Block
E11-5	Fuel Inlet Pipe Connecting Screw	E11-15	Roller Pin
E11-6	Sealing Washer	E11-16	Tappet
E11-7	Washer 6	E11-17	Roller Bushing
E11-8	Retaining Screw	E11-18	Roller
E11-9	Washer 6		

Gear Casing Assembly

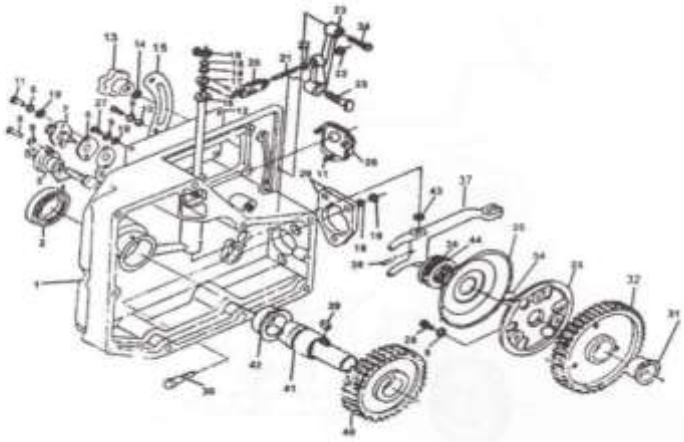


Fig.X Gear Casing Assembly

Part No.	Part Name	Part No.	Part Name
E10-1	Gear Casing	E10-23	Speed Control Lever
E10-2	Oil Seal Ring	E10-24	Bolt M8x40
E10-3		E10-25	Speed Control Lever Shaft
E10-4		E10-26	Crankcase Ventilator
E10-5		E10-27	Bottom Head Cap Screw M6x12
E10-6		E10-28	Bottom Head Cap Screw M6x18
E10-7	Fuel Corrector	E10-29	Shim For Injection Pump
E10-8		E10-30	Fuel Injection Pump Mounting Bolt
E10-9	Washer 6	E10-31	Governor Gear Bushing
E10-10	Washer 6	E10-32	Governor Gear
E10-11		E10-33	Governor Ball Spacer
E10-12	Name Plate	E10-34	Steel Ball-Governor Ball Spacer
E10-13	Speed Control Lever Knob	E10-35	Governor Ball Race

6.5 The brake of the tractor can be used as the parking brake only after the engine is stopped

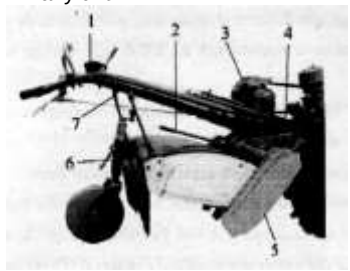
7. Safety Regulations:

7.1 Never operate the clutch-brake handle together with one of the steering hand grips when driving away the tractor from rest.
7.2 Never drive the tractor up or down a slope at high speed. Never slide the tractor down a slope with the speed-changing lever in neutral position, and never operate both the left and right steering hand grips at the same time when driving on a slope.
7.3 Never make a sudden turn at high speed. Never drive the tractor at high speed on a rough road.
7.4 Never make sudden steering when the plough or the tilling blades are still in soil
7.5 Never disengage the clutch when on a steep slope, or drive the tractor across a steep slope.
7.6 If the trailer is attached to the tractor for transportation, the operator must observe the Public Traffic Regulations. It is not allowed to alternate the rated speed at will for transportation. Be sure that the braking systems of both the tractor and the trailer are absolutely reliable. If braking is necessary, use both the braking systems of the tractor and the trailer simultaneously.
7.7 Watch the working condition if the engine according to the description in the operation manual of the engine.

Rotavator

1. Mounting and dismounting of rotary cultivator:

The rotary cultivator (5) is fixed on a tractor's main gearbox (4) by four studs. For ensuring a correct meshing of gears, two dowel pins are fitted on the coupling surface of the gear box. In case the gear of cultivator is difficult to get into mesh with that relative gear in main drive gear-box when mounting the cultivator, just engage the jaw clutch of the cultivator and turn a little the rototilling shaft or turn a little the clutch pulley of the tractor while the clutch is engaged, then the couple of gears will be accurately meshed. One supporting rod (7) is mounted on either side between each handlebar frame (1) or the cover of cultivator (5). The dismounting of the cultivator is in the order just contrary to the mounting procedure. First remove the two supporting rods (7), then undo the four securing nuts (3). Cover the window of cultivator gearbox after it is dismounted from the tractor so as to avoid the ingress of any dirt.

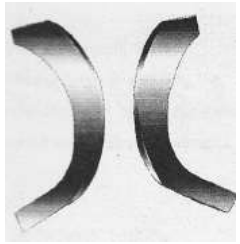


Mounting of rotavator cultivator
1. Handlebar frame
2. Speed changing lever]
3. Nut
4. Main drive gearbox
5. Cultivator
6. Tail wheel Assy
7. Supporting rod

2. Types, selection and mounting of blades:

2.1.1 Left or right twisted blades: They are suitable for rototilling in the field relatively wet or cultivated land that is covered with green manure. This type of blades provides effective performance in soil crushing, soil upturning and gives a perfect tossing of soil. Power consumption is comparatively greater if blades of this type are used.

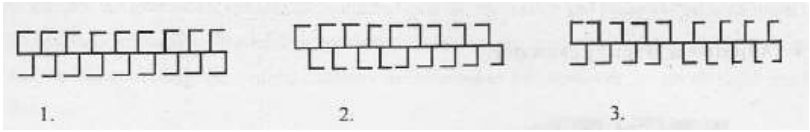
2.1.2 Hook blades (optional): Blades of this type are much suitable for the use in relatively dry and hard land



Left and right twisted blades

2.2 Mounting of blades:

Owing to the specially shaped tips of the twisted blades, the levelling condition of the tilled land will greatly depend on the direction of the blade ends. Therefore, in addition to the mounting direction of the bent of the twisted blades which should be coincident with the rotating direction of the rototilling shaft, the pointing direction of the blade ends must be properly selected to meet different cultivating requirements.



Schematic diagram of the mounting direction of left and right twisted blades.

2.2.1 Opposite mounting of left and right twisted blades (1). The surface of the land tilled is almost level

2.2.2 All the left and right twisted blades are mounted with their tips pointing inward (2). The land tilled will present a slight ridge in the middle of every bout

2.2.3 All the left and right twisted blades are mounted with their tips pointing outward (3): The land tilled will present a slight sunk in the middle of every bout. However, for separating the land tilled from the untilled, the blade at either end of the rototilling shaft is to be mounted with its tip pointing inward.

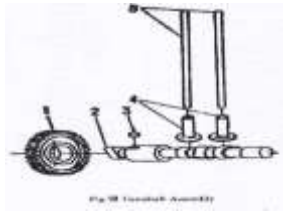
3. Engagement and speed changing of the rotary cultivator:

3.1 The engagement is effected by shifting the on-off control handle the left, while the disengagement by shifting the same handle to the right. For protecting the on-off control handle from deformation, never shift the handle with violent force, but very gently. If the tilling rotor does not rotate when shifting the handle to the left, shift the clutch-brake handle smoothly to engage the clutch of tractor once and then shift the on-off control handle to the left again.

3.2 Speed changing:

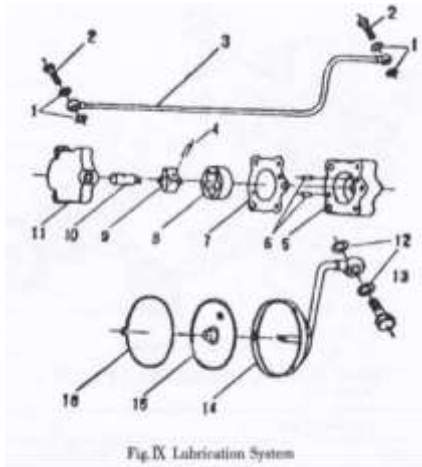
Part No.	Part Name	Part No.	Part Name
E7-13	Fine Fuel Filter Paper Element	E7-32	Fuel Tank Cap
E7-14	Washer	E7-33	Fuel Filling Screen
E7-15	Screw	E7-34	Fuel Pipe-Filter to Injector
E7-16	Spring	E7-35	High Pressure Fuel Pipe And Its Accessories
E7-17	Steel Ball-Fuel Filter	E7-36	Pipe Clip
E7-18	One Way Valve Seat		

Camshaft Assembly



Part No.	Part Name
E8-1	Camshaft Gear
E8-2	Camshaft
E8-3	Key
E8-4	Valve Tappet
E8-5	Valve Push Rod

Lubrication System



Part No.	Part Name
E9-1	Washer
E9-2	Pipe Connecting Bolt-Oil Pipe
E9-3	Oil Pipe
E9-4	Cylinder Pin
E9-5	Lubricating Oil Pump Body
E9-6	Locating Pin-Oil Pump Body
E9-7	Lubricating Oil Pump Packing Shim
E9-8	Outer Rotor
E9-9	Inner Rotor
E9-10	Oil Pump Shaft
E9-11	Oil Pump Cover
E9-12	Washer
E9-13	Pipe Connecting Bolt-Oil Strainer Body
E9-14	Oil Strainer Body With Suction Pipe
E9-15	Oil Strainer Screen
E9-16	Circlip

Radiator Assembly

Part No.	Part Name	Part No.	Part Name
E6-1	Bottom Tank	E6-5	Washer 6
E6-2	Radiator Core Pad	E6-6	Washer 6
E6-3	Radiator	E6-7	Radiator Cap
E6-4	Stud M6x20		

Fuel System

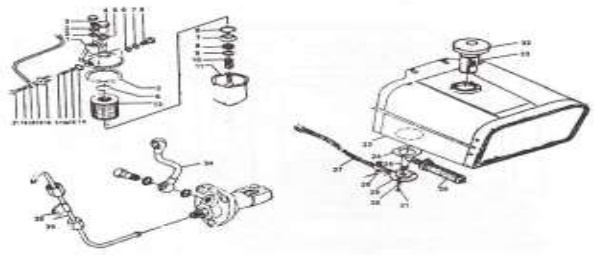


Fig.VII Fuel System

Part No.	Part Name	Part No.	Part Name
E7-1	Fuel Filter Cover	E7-19	Washer
E7-2	Washer	E7-20	Fuel Leak Off Pipe Connecting
E7-3	Pipe Connection Bolt	E7-21	Pipe Connecting Bolt-Fuel Pipe-Tank to Filter
E7-4	Holding Nut	E7-22	Fuel Tank
E7-5	Seal Ring	E7-23	Washer
E7-6	Seal Ring	E7-24	Packing
E7-7	Fuel Filter Holder	E7-25	Fuel Outlet Pipe
E7-8	Seal Ring-Fuel Filter Holder	E7-26/27	Fuel Cock with pipe
E7-9	Washer	E7-28	Primary Fuel Filter
E7-10	Spring	E7-29	Fuel Cock Connecting Flange
E7-11	Fuel Filter Body	E7-30	Washer 6
E7-12	Seal Ring-Fuel Filter Holder	E7-31	Bolt M6x16

Two rotating speeds of the cultivator are available, if the location of two sprockets in cultivator transmission box is interchanged.

3.3 Method of interchanging the sprockets::

3.3.1 Remove the fixing screws on the side cover of cultivator transmission box and take down the cover.

3.3.2 Take out the spring clips at the right ends of the rotor transmission shaft and the rotor shaft with a pair of pliers.

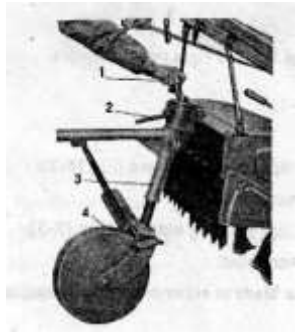
3.3.3 Dismount the leaf spring.

3.3.4 Exchange the upper and lower sprockets.

3.4 For the purpose to carry out smooth direct rototilling in paddy or dry land (i.e., tilling in the land that has not yet been ploughed up), the low gear of rototilling speed should pair up with the low forwarding speed of the tilling set ranging from 1.2-2.5km/h).If the rototilling is for clod crushing only, then the high gear of the rototilling set ranging speed could pair up with the forwarding speed of 2-4 km/h, of course, the forwarding speed should be adjusted as per the hardness of soil and tilling depth.

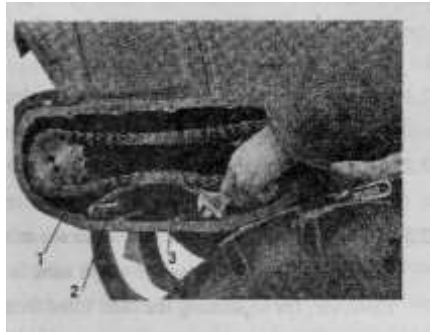
3.5 High gears of forwarding and reverse gears can never be used while the rotavator is running.

4 Adjustment of rotary cultivator:



Adjustment of tilling depth

1. Tail wheel adjusting handle
2. Clamping handle
3. Tail wheel sleeve
4. Tail wheel



Adjustment of the chair tension

1. Chain
2. Spring support rod
3. Leaf spring

4.1 Adjustment of tilling depth:

A small range adjustment of tilling depth can be effected by turning the adjusting handle (1) of the tail wheel. If the desired tilling depth is not available, loosen tail

wheel sleeve clamping handle (2) and adjust the position of the sleeve (3) to increase tilling depth.

4.2 Adjustment of the chain tension:

4.2.1 After the cultivator has been used for a period of time, the chain will wera out dome and become longer. Therefore, it is necessary to adjust the chain tension in time. Otherwise, the chain will be liable to damage.

4.2.2 Method of adjustment:

a) Dismount the side cover of the cultivator transmission box.

b) Turn the spring support rod by an angle to make the leaf spring (3) come closer to the chain (1). If the chain is still too much slack after the above adjustment is made, then turn both the upper and lower spring support rods by an angle simultaneously.

5. **Cautions**:

5.1 In general, the forwarding speeds of 1st and 2nd gear of the tractor and the lower rotating speed of the cultivator are used in the meantime for rototilling in dry field, while 2nd or 3rd gear of the tractor and the higher rotating speed of the cultivator are selected as a combination for rototilling in paddy field.

5.2 In dry-field tilling, the wheel tread of 640mm is preferable, while tilling in paddy field the maximum wheel tread should be selected. Otherwise, the anti-skid wheels cannot be mounted as they will come to impact with the cultivator.

5.3 In rototilling, the protrusion of the tail wheel inner screw sheet from the outer sleeve must not be over 100 mm, and the operator must not ride on the tractor when crossing ridges or ditches, so as to protect the screw sheet from bending.

5.4 In rototilling, a heavy winding of weeds on tilling blades will cause excessive power consumption and wear of parts. The weeds must be wiped out from the blades in time with a hook. When making the cleaning of weeds, reduce the throttle setting, shift the clutch-brake handle to “disengage” position and shift both the speed-changing lever of the tractor and the on-off control handle of the rotary cultivator to “neutral” position.

5.5 In case ingress of mud and water in the cultivator transmission box is found during cultivating, stop operation immediately, remedy the trouble and replace the damaged parts. Otherwise it is liable to quicken the wear, and even to cause breakage of the chain.

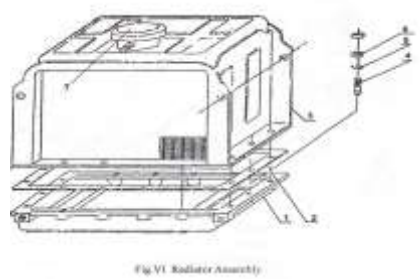
Towing and Ploughing

1. Mounting and use of towing adapter frame:

1.1 Mounting: Dismount the rotary cultivator from the tractor and leave the paper gasket at its original position on main gearbox. Place the adapter frame (towing adapter) onto the four studs on main drive gearbox and fix the frame with nuts.

Part No.	Part Name	Part No.	Part Name
E5-1	Barrel Type Compression Ring (1)	E5-8	Connecting Rod Bolt
E5-2	Taper Face Compression Ring (2,3)	E5-9	Connecting Rod Cap
E5-3	Expander Type Oil Scraper Ring	E5-10	Guide Bushing
E5-4	Circlip For Piston Pin	E5-12	Connecting Rod Bushing
E5-5	Piston	E5-11	Connecting Rod Bearing Shell
E5-6	Connecting Rod	E5-13	Piston Pin

Water Hopper Assembly



Part No.	Part Name	Part No.	Part Name
E6-1	Bolt M8x22	E6-7	Washer
E6-2	Washer 5	E6-8	Hopper
E6-3	Funnel	E6-9	Float
E6-4	Gasket Funnel	E6-10	Float Rod
E6-5	Bolt M8x18	E6-11	Red Indicating Ball
E6-6	Washer 8		

Part No.	Part Name	Part No.	Part Name
E4-12	Red Float Of Oil Indicator	E4-33	Exhaust Pipe Packing
E4-13	Cap Of Red Float Of Oil Indicator	E4-34	
E4-14	Cylinder Head Cover Packing	E4-35	Cylinder Head
E4-15	Circlip For Rocker Arm Shaft	E4-36	Turbulence Combustion Chamber Insert
E4-16	Water For Rocker Arm Shaft	E4-37	Exhaust Valve
E4-17	Hexagon Nut M18x1	E4-38	Intake Valve
E4-18	Rocker Arm	E4-39	Intake Valve Seat
E4-19	Rocker Arm Bushing	E4-40	Intake Pipe Packing
E4-20	Adjusting Screw Rocker	E4-41	Plug-Cylinder Head
E4-44	Rocker Arm Shaft	E4-42	Long Stud For Rocker Arm Shaft Support
E4-45	Rocker Arm Shaft Support	E4-43	Short Stud For Rocker Arm Shaft Support
E3-17	Hexagon Nut M8x1	E4-46	Decompression Lever Spring
E3-20	Adjusting Screw Rocker	E4-47	Decompression Lever
E4-21	Valve Collet	E4-48	Set Nut

Piston & Connecting Rod Assembly

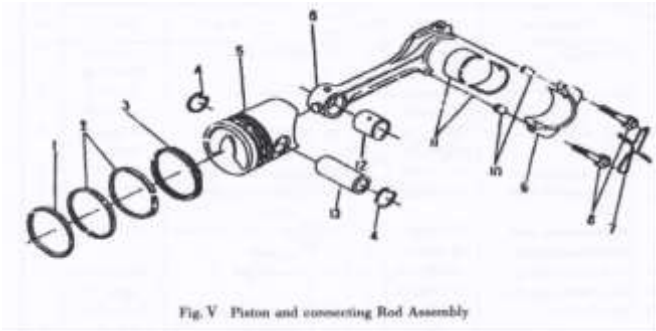


Fig. V Piston and connecting Rod Assembly

1.2 Use: Three pairs of holes in the socket wall of the frame are used for the attachment of plough, trailer and other implements.

2. Ploughing:

The plough is connected to the adapter frame of the tractor with a coupling pin.
In ploughing, the following points must be observed:

2.1 First, make the acquaintance of the operating method of the plough, especially its adjustment (by referring to the operation manual of the plough).

2.2 Adjust the wheel tread according to the requirements of actual ploughing width, in generally, the maximum wheel tread is adopted.

2.3 When turning at the end of every bout, reduce the throttle setting to speed down the tractor and lift up the plough for turning.

2.4 If the tractor deviates automatically to one side in ploughing, the possible caused are:

2.4.1 There is some difference of ploughing depth between the front and rear shares. If the ploughing depth of front share is deeper than of the rear, the tractor will deviate to the right. If it is contrary to the above, the tractor will deviate to the left. Therefore, adjustment of the front share should be made accordingly.

2.4.2 The two adjusting bolts on the coupling of the plough are maladjusted. If leftward deviation occurs, shorten the right screw and lengthen the left one, and the procedure in reverse to the above will be applied for the adjustment of the rightward deviation.

Application of the Optional Accessories

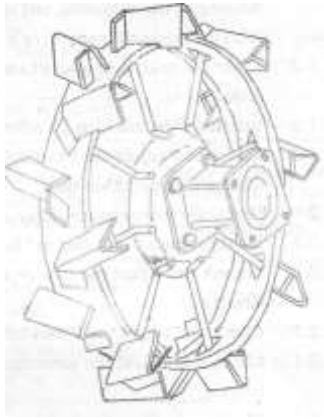
1. Anti-skid wheels (iron wheels):

1.1 For diminishing the slipping and bogging down of the tractor wheels during ploughing or rototilling in slushy paddy field, the rubber wheels should be replaced by the anti-skid wheels.

1.2 Mounting:
First, keep the wheels in suspended position. Remove the securing nuts as well as the rubber wheels. Then put on the (extension if provided and) anti-skid iron wheels and tighten the securing nuts.

1.3 Points to be observed on use:

1.3.1 Note that the left & right steel wheels must not be reversely mounted. The direction of the arrow shape of wheel should be coincident with the forwarding direction of tractor.



1.3.2 Never drive the tractor or ploughing set on a hard road at high gears (3rd or above gears) while the anti-skid wheels are mounted.

1.3.3 Reversing gear is to be avoided while working in paddy field, especially when the iron wheels are bogged down in a boggy field, as the wheels will sink into mud deeper and deeper if reversing is made further.

1.3.4 In rototilling, the anti-skid steel wheels should be mounted with the maximum wheel tread, while in ploughing, the wheel tread should be adjusted according to the requirement of the actual ploughing width.

2. Wheel weight

2.1 Uses of the wheel weight:

When ploughing in soft land or towing a tractor for transportation on road, it is necessary to add the wheel weight of 50kg (2X25) to decrease wheel sliding and so to increase traction force and running stability.

2.2 Method of mounting:

Fix the wheel with four hex. Head bolts of M12 X 120 on the rim of either wheel.

Maintenance

1. Technical maintenance:

1.1 Each-shift maintenance

1.1.1 Check and tighten all the bolts and nuts, especially make regular inspection and tightening of those for fixing the chassis frame with main drive gearbox, tilling blades, drive wheels, rotary cultivator or adapter frame with main drive gearbox, transmission box with right supporting housing of the cultivator, left supporting arm with its housing of the cultivator, handlebar frames with the cover of main drive gearbox and pedals with the tail wheel fork Assy, etc.,

1.1.2 Clear off mud, dust and oil smear from the tractor / power tiller. Check whether there is any oil leakage.

1.1.3 Lubricate the machine by referring to the lubrication chart.

1.1.4 Check and adjust the travelling range of steering hand grips after the tractor has been used for quite a long period of time.

1.2 **First Class maintena**nce (after every 100 working hours):

1.2.1 Do the same as specified in “Regular Maintenance” and the following in addition:

1.2.2 Inspect and adjust the tension of the chains in the transmission box and the cultivator transmission box.

1.2.3 Check and adjust the V-belt tension.

1.2.4 Check and adjust the clearance between the end of clutch throw-out levers and the throw-out bearing.

1.2.5 Check and adjust the braking system to assure its sound performance.

1.2.6 Check and make the tyre pressure equal for both the two drive wheels (when in rototilling, keep the tyre pressure at upper limit, but keep it at lower limit for transportation).

1.2.7 Lubricate the machine by referring to the lubrication chart.

Cylinder Head Assembly

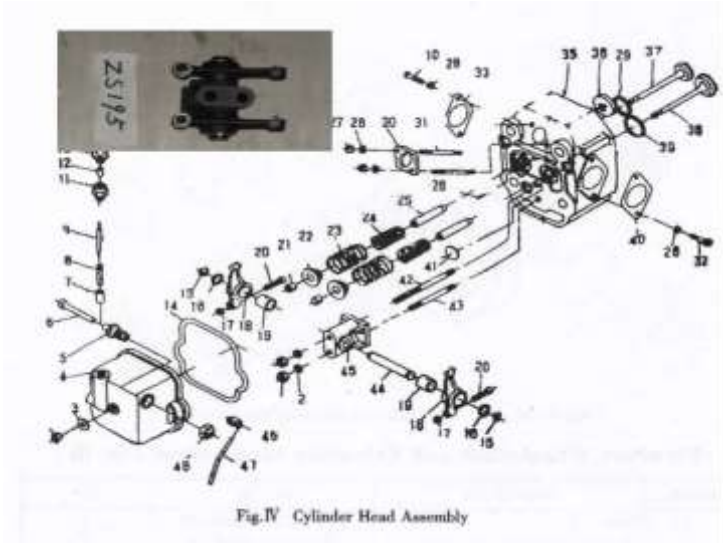


Fig.IV Cylinder Head Assembly

Part No.	Part Name	Part No.	Part Name
E4-1	Hexagon Nut M10	E4-22	Valve Spring Seat
E4-2	Spring Washer 10	E4-23	Outer Valve Spring
E4-3	Plain Washer 10	E4-24	Inner Valve Spring
E4-4	Cylinder Head Cover	E4-25	Valve Guide
E4-5	Decompression Shaft Bushing	E4-26	Locating Pin
E4-6	Decompression Shaft	E4-27	Hexagon Nut M8
E4-7	Oil Indicator Piston	E4-28	Spring Washer 8
E4-8	Oil Indicator Spring	E4-29	Exhaust Valve Seat
E4-9	Oil Indicator Spindle	E4-30	Clamping Plate For Injector
E4-10	hexagon Bolt M8x28	E4-31	Stud For Injector Clamping Plate
E4-11	Oil Indicator Union	E4-32	hexagon Bolt M8x30

Flywheel Crankshaft & Balancing Mechanism

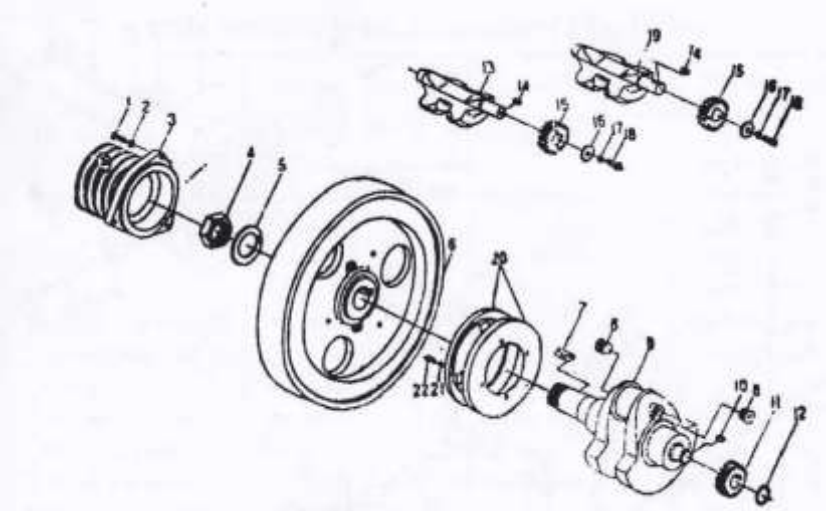


Fig. Ⅲ Flywheel, Crankshaft and Balancing Mechanism

Part No.	Part Name	Part No.	Part Name
E3-1	Bolt M10x35	E3-11	Crankshaft Timing Gear
E3-2	Washer 10	E3-12	Circlip
E3-3	V-Belt Pulley	E3-13	Upper Balancing Shaft
E3-4	Flywheel Nut	E3-14	Flat Key-Balancing Shaft Gear
E3-5	Lock Washer	E3-15	Balancing Shaft Gear
E3-6	Flywheel	E3-16	Washer
E3-7	Flat Key-Fly wheel	E3-17	Washer 8
E3-8	Crankshaft Screw Plug	E3-18	Bolt M8x18
E3-9	Crankshaft	E3-19	Lower Balancing Shaft
E3-10	Flat Key-Crankshaft Timing Gear		

1.3 **Second Class maintenance** (after every 500 working hours):
1.3.1 Do the same as specified in “First Class maintenance” and do the following in addition:
1.3.2 Wash the gearboxes, clean and renew the lubricant.
1.3.3 Lubricate the machine by referring to the lubrication chart.
1.4 Major overhaul (after 1500-2000 working hours):
1.4.1 Dismount and wash clean with diesel oil the gears, chains, bearings, oil seals of the transmission box, main drive gearbox, final transmission, rotavator cultivator, etc.,
1.4.2 Check the wear and tear of gears, chains, bearings and oil seals. Renew them if necessary.
1.4.3 Check the reliability of the springs of gear shifting forks and the steering system. Renew them is necessary.
1.4.4 Check and adjust the accuracy of all the control mechanism.
1.4.5 Check the wear and tear of the V-belts, friction discs of clutch, braking ring, shifting forks, tyres and other parts. Replace them with new ones if excessive wear is found.

2. Lubrication:

2.1 Lubrication chart

Item	Parts	Fig no.	Lubricant	Method	Interval
1.	Field working tail wheel shaft and its bearing	1	Grease	Dismount the shaft and its bearing, grease them after cleaning	Every 100 hours
2.	Clutch throw-out jaw	1	Machine oil	Shift back and forth the clutch-brake handle and lubricate the sliding surface of the jaw	1-2 times per shift
3.	Hinged points of all control links		Machine oil	Apply several drops with oiling can	Every 2 shifts
4.	Main drive gearbox and rotavator transmission box	3 4 5	N46 drive & hydraulic dual-purpose oil	Remove the oil level inspection plug and replenish until the oil overflows from the plug hole.	Replenish in every 30 hours. Drain off, wash clean and refill with new oil once every 500 hours.
5.	Left end bearing on rototilling shaft	6	Grease	Grease it with the bearing cover removed	Every 100 hours

Item	Parts	Fig no.	Lubricant	Method	Interval
6.	Clutch front bearing	7	Grease	Grease it with the bearing cover removed	Every 500 hours
7.	Clutch throw-out bearing		Grease	Dismount the bearing, and wash it clean then put it into grease and heat up for greasing.	Every 500 hours
8.	Tail wheel screw rod		Grease	Take out the screw rod, grease it after cleaning.	Every 500 hours

2.2 Points to be observed during lubrication:

2.2.1The oiling holes as well as the lubricating tools must be kept clean absolutely free from dust, mud and dirt.

2.2.2 For the renewal of gear oil (i.e., the N46 drive and hydraulic dual-purpose oil) in main drive gearbox, left and right final transmission boxes, drain off the oil while it is still hot (right after the engine is stopped). Fill the boxes with some diesel oil and run the tractor under 2nd gear 2-3 minutes for cleaning. Then drain off the diesel oil and fill up the boxes with fresh gear oil.

2.2.3 Lubricants recommended

Engine oil: machine oil T8 (SY1152-60)

Gear oil: N46 & hydraulic dual- purpose oil

Grease: Calcium base grease (SYB1401-60) or other grade of grease suitable for motor car

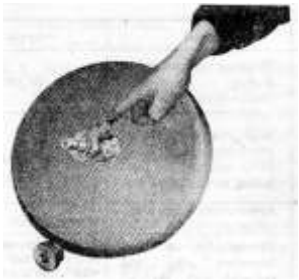


Fig 1. Lubricating the shaft and ball bearing of field working tail wheel

Fig 2. Lubrication of clutch throw-out jaw

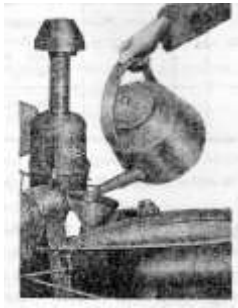


Fig 3 Oil filling point for a main drive gearbox and final transmission boxes

Cylinder Block Assembly-1

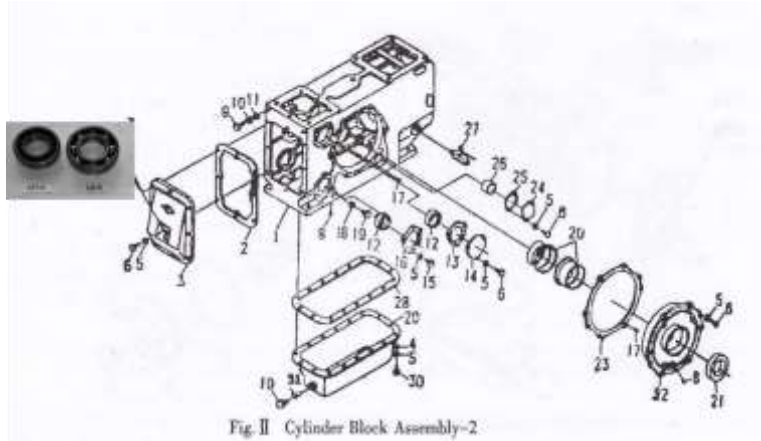


Fig. II Cylinder Block Assembly-2

Part No.	Part Name	Part No.	Part Name
E2-1	Cylinder Block	E2-17	Locating Pin-Main Bearing Housing
E2-2	Packing Of The Rear Cover	E2-18	Washer
E2-3	Rear Cover	E2-19	Plug-Oil Sump
E2-4	Washer 8	E2-20	Main Bearing(Set)-NJ-2211E & 6314C3
E2-5	Washer 8	E2-21	Oil Seal For Crankshaft
E2-6	Bolt M8x25	E2-22	Main Bearing housing
E2-7	Oil Dipstick	E2-23	Main Bearing housing Mounting Shim
E2-8	Oil Hole Plug On The Block	E2-24	Camshaft Rear Cover
E2-9	Bolt M10x20	E2-25	Packing For Camshaft Cover
E2-10	Washer 10	E2-26	Camshaft Rear Bushing
E2-11	Washer	E2-27	Water Drain Cock
E2-12	Single Row Self Centering Ball	E2-28	Packing For Oil Sump
E2-13	Packing For Balancing Shaft Cover	E2-29	Oil Sump
E2-14	Balancing Shaft Cover	E2-30	Bolt
E2-15	Bolt M8x40	E2-31	Rubber Seal Ring
E2-16	Packing For Lubricating Oil Pump		

Parts Diagram & List-Engine (KK-PTDE-16110)

Cylinder Block Assembly-1

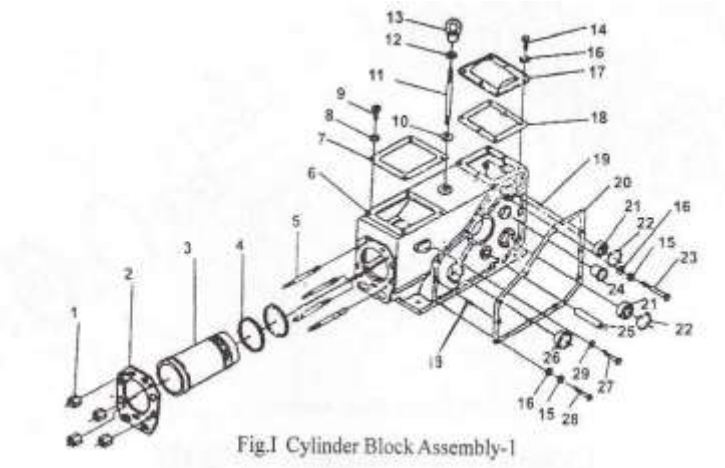


Fig.I Cylinder Block Assembly-1

Part No.	Part Name	Part No.	Part Name
E1-1	Cylinder Head Nut	E1-16	Washer 8
E1-2	Cylinder Head Gasket	E1-17	Upper Cover Of The Cylinder Block
E1-3	Cylinder Liner	E1-18	Packing Sheet Of Upper Cover
E1-4	Cylinder Liner Water Seal Ring	E1-19	Locating Pin-Gear Casing
E1-5	Cylinder Head Stud	E1-20	Gear Casing Packing
E1-6	Cylinder Block	E1-21	Single Row Self Centering Ball Bearing
E1-7	Hopper Packing	E1-22	Circlip
E1-8	Washer 10	E1-23	Bolt 8x95
E1-9	Bolt 10x25	E1-24	Starting Shaft Bushing (A)
E1-10	Washer	E1-25	Speed Governing Gear Shaft
E1-11	Lifting Stud	E1-26	Camshaft Front Bushing
E1-12	Washer 12	E1-27	Bolt 10x25
E1-13	Lifting Eye Nut	E1-28	Bolt
E1-14	Bolt 8x18	E1-29	Washer 10
E1-15	Washer 8		

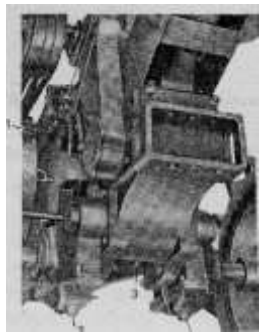


Fig. 4 Plug for oil level inspection and oil drainage on main drive gearbox adna final transmission boxes.
1.Oil level inspection plug:
Fill up the main gearbox until oil overflows from the plug hole while the tractor is in level position
2,4 Oil drainers for left and right final transmission boxes
3. Oil drainer for main drive gearbox.

Fig. 5 Oil filling points and plugs for oil level inspection & oil drainage on rotary cultivator
1.Oil filling points
2. Oil level inspection plug
3.Oil drainer

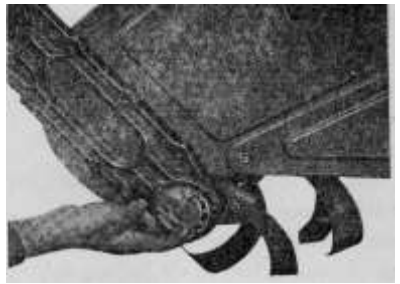


Fig. 6 Lubrication of left side bearing on the tilling rotor shaft

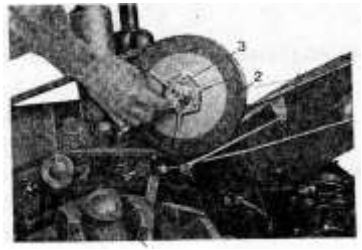


Fig.7 Lubrication of front bearing of the clutch
1. Bearing cover
2. Clutch 3. Bearing

3. Tractor pickling:
   - 3.1 Do the engine pickling according to the instruction in the operation manual of engine.
   - 3.2 Make a thorough cleaning of the tractor.
   - 3.3 Remove the V-belts and store them away.
   - 3.4 Cover up with anti-rust grease the unpainted surfaces of metal parts, such as V-belt pulley, all control handles etc.,

3.5 Shift the clutch-brake handle to “engage” position and the speed- changing lever to “Neutral” position.
3.6 Do not deflate tyres but keep them inflate das usual.

Usage & Maintenance of the Chain Transmission Systems

There are two chains used in the tractor model, for power transmission. One is the transmission box, of short pitch, precise roller chain type of 08B-2 X 50. The correct use and maintenance is the guarantee to prolong the service of the chains.

1. Points To Be Observed In Operation Of The Chain In Transmission Box

1.1 Change all the gear oil (i.e., the N46 drive & hydraulic dual- purpose oil) in the transmission box after it has been used for 500 hours strictly according to the operation manual. After emptying the used gear oil, clean the inside of the housing with clean diesel is the key to decrease wear and tear of the parts such as chain, gears, sprockets and bearings.
1.2 Adjust the chain tension regularly. It is requested to check and adjust once about every 100 working hours. In order to ensure good engagement between chain and sprockets and smooth transmission as well, there must be a certain force of tension at the loose side of the chain. After being used for a period of time, the chain will wear out some and become longer, which tends to cause incorrect engagement. So the chain’s extension must be eliminated in time, otherwise the chain will lap to rub and jostle against the inner surface of the housing, and even cause breakage of the chain or housing.
1.3 Pay a close attention to the wearing condition of the tooth surface of sprockets and the bearings mounted at the ends of the upper and lower shafts while maintaining. If serious, the worn out parts should be repaired or replaced, especially the bearings, so to prevent the shafts from having too much end play.
1.4 If the chain is broken, a thorough check and cleaning of the inside of the housing should be done before replacing the chain, all the broken parts and foreign matter should be taken out, or otherwise the harmful consequences will be resulted.

2. Points To Be Observed In Operation Of The Chain In Transmission Box of Rotary cultivator

2.1 Remove the cover of rotary cultivator transmission box to check the cleanness of the gear oil (i.e. the N46 drive & hydraulic dual-purpose oil) after it has been used for 100 hours. If there is any mud and water in it. The gear oil should be changed at once and the seals at the ends of tilling rotor shaft should undergo a thorough check because mud and water are liable to come inside the housing when the rotary cultivator is working in the slushy paddy field. In case any mud gets into the gear oil, the oil-mud mixture will quicken the wear and tear of the chain and make it become longer. So, preventing mud from coming into the housing to keep the lubricant clean is the key of prolonging the service life of the chain. If the seals on the tilling rotor shaft no longer take any effect or the shaft journal wears out seriously, they must be repaired or replaced right away and should never be overlooked.
2.2 When disassembling and checking the rotary cultivator transmission box, adjust the chain tension mechanism to make the loose side of the chain in proper

Transportation Tail Wheel

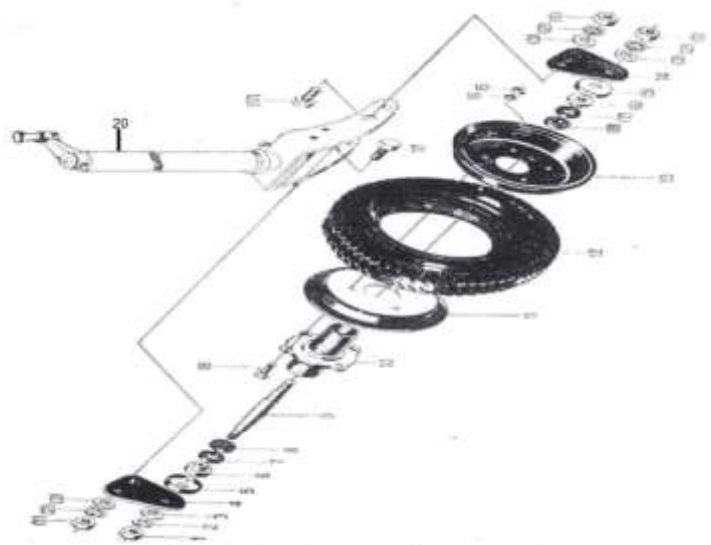
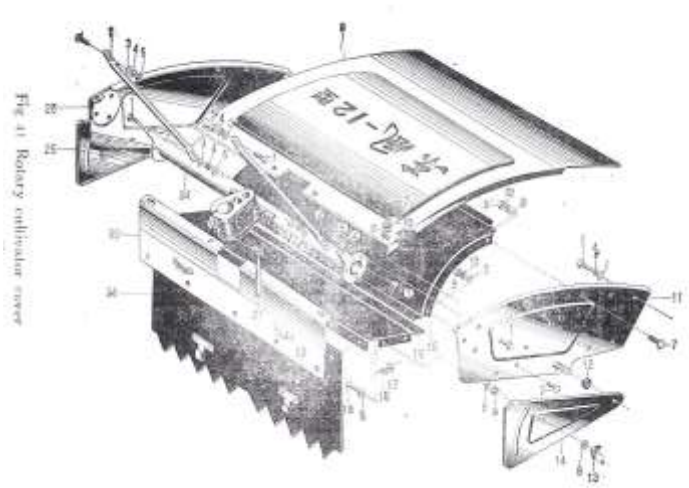


Fig. 42 Transportation tail wheel

Part No.	Part Name	Part No.	Part Name
GB-13- 1	M16 Nut Hex	GB-13- 11	Wheel Disc (B)
GB-13- 2	16 Spring Lock Washer Single Coil	GB-13- 12	Tyre Assy 4.00-8
GB-13- 3	16 Washer Plain	GB-13- 13	Wheel Disc (A)
GB-13- 4	Connecting Plate Assy Right	GB-13- 14	Connecting Plate Assy Left
GB-13- 5	Cover Dust	GB-13- 15	M10 Nut Hex
GB-13- 6	Seat Oil Seal	GB-13- 16	10 Spring Lock Washer Single Coil
GB-13- 7	25x40x5 Oil Seal Rubber	GB-13- 17	M16x40 Bolt Hex Head
GB-13- 8	203 Bearing Ball	GB-13- 18	M10x28 Bolt Hex Head
GB-13- 9	Axle	GB-13- 19	inner tube
GB-13- 10	Hub	GB-13- 20	Fork Assy Transport Tail Wheel

Rotary Cultivator Cover



Part No.	Part Name	Part No.	Part Name
GB-12- 1	M10x25 Bolt Hex Head	GB-12- 14	Side Plate Right
GB-12- 2	Rod Support	GB-12- 15	Cover Lower
GB-12- 3	10 Washer Plain	GB-12- 16	Cover Lower Rear
GB-12- 4	10 Spring Lock Washer Single Coil	GB-12- 17	M6 Nut Hex
GB-12- 5	M10 Nut Hex	GB-12- 18	6 Spring Lock Washer Single Coil
GB-12- 6	Upper Cover Plate Assy	GB-12- 19	M8x32 Bolt Hex Head
GB-12- 7	M8x18 Bolt Hex Head	GB-12- 20	M6x16 Bolt Hex Head
GB-12- 8	8 Washer Plain	GB-12- 21	Clamping Handle Assy
GB-12- 9	M8 Nut Hex	GB-12- 22	Rubber Fender Plate Assy
GB-12- 10	8 Spring Lock Washer Single Coil	GB-12- 23	Rear Fender Plate Assy
GB-12- 11	Side Fender Plate Assy Right	GB-12- 24	Bracket Assy Tail Wheel
GB-12- 12	Washer Rubber	GB-12- 25	Side Plate Left
GB-12- 13	M8 Nut Wing	GB-12- 26	Side Fender Plate Assy Left

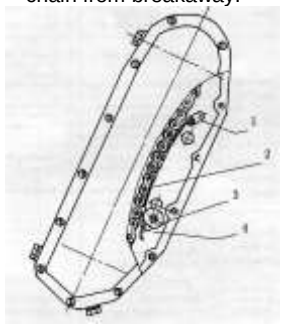
tension so as to prevent the housing from extrusion broken caused by the drop of chain after it wears out and extends longer. We have now improved the tension adjustment mechanism by adopting the spring rod with larger eccentricity and adding a sleeve washer, which will help enlarge the adjustment range and be favorable to prolong the service life of the chain

2.3 Check the parts of every chain link when disassembling for inspection. If some parts as split plates and rollers of the chain are damaged, they should be removed and replaced at once in order to avoid more serious damage, although the chain is not yet broken.

2.4 If the wearing condition of the chain is so serious that necessary tension could not be obtained with the tension adjusting mechanism being adjusted to its maximum position (now the chain must have got more than 20 mm of length extension, the stretch ratio of the chain have reached 2%, and the tight and loose sides of the chain could touch somewhere), just replace the drive sprockets (small one) with a driven sprocket (larger one) for power transmission or remove one of the links and use offset link plate to connect the chain again.

2.5 Pay attention to the wear on the surfaces of sprockets and the bearings while maintaining. If they are seriously worn out, they should be replaced. It is also not allowed that the tilling rotor and cultivator transmission shafts get too much axial shifts (the axial shift must be eliminated if they are found more than 2 mm).

2.6 In rototilling, the cultivator should be lifted up accordingly when crossing ridges and ditches, then lay down gently to avoid shock load and so to protect the chain from breakaway.



Tension mechanism of the chain in rotary cultivator transmission box

1. Spring rod
2. Leaf spring
3. Sleeve washer
4. Spring rod

Troubleshooting

Sl no.	Problem	Possible causes	Remedies
1.	Slipping of V-belt	1. Oil smear on belt or pulley surface 2. Excessive slack of belt 3. Belts excessively worn off.	1. Clean with dry cloth. 2. Move the engine forward 3. Replace with new ones
2.	Clutch slipping	1. Oil smear on friction disc. 2. Friction disc excessively worn away 3. The Throw-out levers come against the bearing. 4. Springs become slackened	1. Dismantle the clutch, wash the disc with petrol and dry it in the air. 2. Replace with a new one 3. Adjust the clearance to 0.4-0.7 mm 4. Replace with new ones
3.	Clutch incompletely disengaged	1. Too large the clearance between throw-out levers and bearing 2. Too much free running of the clutch-brake handle	1. Adjust the clearance 0.4~0.7 mm 2. Re-adjust
4.	Clutch throw-out bearing getting hot.	1. Poor lubrication. 2. Constant contact of throw-out levers & bearing	1. Wash the bearing clean and lubricate with grease 2. Re-adjust
5.	Clutch front & rear bearing getting hot	1. Poor lubrication 2. Bearings seriously worn off	1. Dismount and reapply grease 2. Replace with new ones
6.	Loud noise knocking in gearboxes	1. Burrs on the tooth or ends of gears 2. Gears seriously worn out or gear teeth scaled 3. Bearings seriously worn out 4. Lack of gear oil or not up to requirement 5. Chain excessively worn away	1. Do burring of gears 2. Replace with new ones 3. Replace with new ones 4. Replenish or change the oil 5. Adjust its tension or replace with a new one.
7.	Gear shifting difficult or unable to be engaged	1. Speed-changing lever bent 2. Burrs on chamfered tooth ends of gears	1. Repair and rectify the lever 2. Remove the burrs

Part No.	Part Name	Part No.	Part Name
GB-11- 1	Bracket Shaft Supporting Left	GB-11- 18	End Cover Bearing
GB-11- 2	M16x1.5x18 Fine Pitch Bolt Hex Flange	GB-11- 19	6 Spring Lock Washer Single Coil
GB-11- 3	Washer	GB-11- 20	M6x16 Screw Slotted Pan Head
GB-11- 4	Housing Tilling Rotor transmission	GB-11- 21	M6x12 Screw Slotted Pan Head
GB-11- 5	12A-2x50 Precise Roller Chain Short Pitch	GB-11- 22	Washer
GB-11- 6	Sprocket Drive	GB-11- 23	308 Bearing Ball
GB-11- 7	38 Circlip For Shaft	GB-11- 24	90 Circlip Foe Hole
GB-11- 8	Gasket Soft Wade	GB-11- 25	Sprocket Driven
GB-11- 9	Cover Tilling Rotor Transmission Box	GB-11- 26	Shaft Assy Tilling Rotor
GB-11- 10	2.5x20 Pin Split	GB-11- 27	M10 Nut Hex
GB-11- 11	Washer	GB-11- 28	10 Spring Lock Washer Single Coil
GB-11- 12	Spring Assy Leaf	GB-11- 29	M10x30 Bolt Hex Head
GB-11- 13	Rod Spring Supporting	GB-11- 30	Tilling Blade Left Twisted II T225
GB-11- 14	Washer	GB-11- 31	Tilling Blade Right Twisted II T225
GB-11- 15	SD 50x72x10 Oil Seal Self Tightening	GB-11- 32	207 Bearing Ball
GB-11- 16	W 50x72x5 Oil Seal Rubber	GB-11- 33	35 Circlip For Shaft
GB-11- 17	Gasket Paper	GB-11- 34	Washer

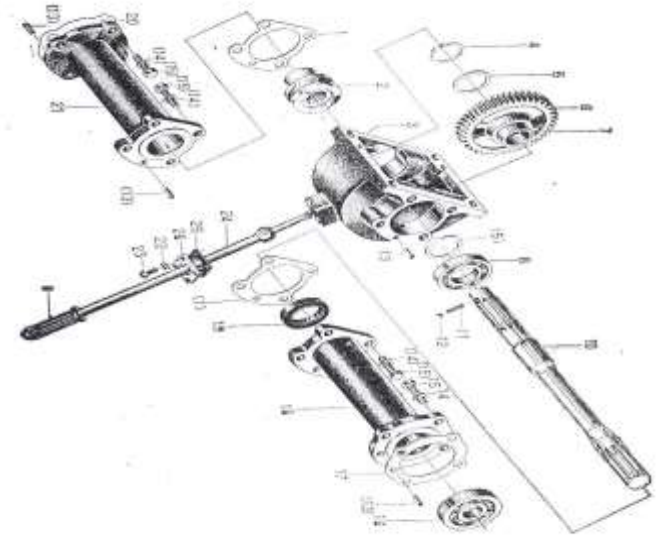
Tilling Rotor Transmission

Fig. 40 Tilling rotor transmission

Sl no.	Problem	Possible causes	Remedies
8.	Gears slip to neutral after engaged (symptom: tractor stops suddenly)	1. The controlling lever is not in suitable position required by the shifting fork 2. Positioning notches of the shifting fork shaft are seriously worn off.	1. Re-adjust. 2. Turn the shifting fork shaft by an angle. 3. Replace with a new spring 4. Replace the worn out parts with new ones.
9.	Gearbox getting hot	1. Lack of gear in (i.e., the N46 drive and hydraulic dual-purpose oil) or not up to requirement. 2. Bearings seriously worn out or damaged.	1. Replenish or replace with the exact N46 dual-purpose oil. 2. Replace with new bearings.
10.	Oil leakage of gearbox	1. Oil seals incorrectly mounted or damaged. 2. Paper gaskets damaged or bearing covers not tightened. 3. Breathing hole in main speed	1. Remount the oil seal or replace with a new paper 2. Replace with new paper gaskets or tighten the covers 3. Clean and make it through
11.	Tractor deviates when travelling on road or operating in field	1. Unequal air pressure of left and right tyres. 2. Uneven wear of left and right tyres. 3. Bearings of the tail wheel seriously worn out. 4. Improper adjustment of the two bolts of the plow against the adapter frame	1. Inflate both tyres up to 1.4~2.0 kg / sq. cm. 2. Replace with new tyres 3. Replace with new bearings 4. Re-adjust (please refer to the instructions in the operation manual of plough).
12.	Ineffective Braking	1. Excessive free running of the clutch-brake control lever. 2. Braking ring excessively worn away.	1. Re-adjust the braking system. 2. Replace with a new one.

Sl no.	Problem	Possible causes	Remedies
13.	Ineffective steering	1. Steering springs slackened. 2. Insufficient distance between the steering hand grip and handlebar. 3. Gear oil becomes thick in winter. 4. Steering fork worn out 5. The fit of intermediate reduction gear and steering shaft becomes loose.	1. Replace with new springs 2. Make adjustment to shorten the pull rod 3. Run the tractor without load for a while in an open court. 4. Replace with new one 5. Repair the gear and shaft or replace with new ones.

Rotary Cultivator Gearbox



Part No.	Part Name	Part No.	Part Name
GB-10- 1	Gasket Paper	GB-10- 14	12 Spring Lock Washer Single Coil
GB-10- 2	Sleeve Splined With Clutch Jaws	GB-10- 15	M12x35 Bolt Hex Head
GB-10- 3	Housing Rotor Transmission	GB-10- 16	308 Bearing Ball
GB-10- 4	38 Circlip For Shaft	GB-10- 17	Gasket Paper
GB-10- 5	Washer	GB-10- 18	Housing Shaft Supporting Arm Right
GB-10- 6	Gear Rotor Transmission	GB-10- 19	40x65x12 Oil Seal Self Tightening
GB-10- 7	Bushing	GB-10- 20	Gasket Paper
GB-10- 8	208 Bearing Ball	GB-10- 21	Housing Shaft Supporting Arm Left
GB-10- 9	Sleeve Control Leaver	GB-10- 22	6 Spring Lock Washer Single Coil
GB-10- 10	Shaft Rotor Transmission	GB-10- 23	M6x16 Bolt Hex Head
GB-10- 11	Spring	GB-10- 24	Handle Assy On Off Control
GB-10- 12	8IV Ball Steel	GB-10- 25	Washer Rubber
GB-10- 13	8x18 Pin Parallel	GB-10- 26	Cover

Part No.	Part Name	Part No.	Part Name
GB-9- 1	Rod Connection	GB-9- 35	Bolt
GB-9- 2	M6x16 Bolt Hex Head	GB-9- 36	A8x28 Pin With Head Clevis
GB-9- 3	Stud	GB-9- 37	Pull Rod Assy Clutch
GB-9- 4	5 Washer Plain	GB-9- 38	Frame Assy Handlebar Left
GB-9- 5	1.5x10 Pin Split	GB-9- 39	Frame Assy Handlebar Right
GB-9- 6	Bolt	GB-9- 40	M6x16 Screw Slotted Pan Head
GB-9- 7	Plate Assy Connecting	GB-9- 41	Frame Gear Shifting Position
GB-9- 8	Spring Torque	GB-9- 42	Cover Tool Box
GB-9- 9	Plate Connecting	GB-9- 43	Pin
GB-9- 10	Support Plate Throttle Line	GB-9- 44	Sleeve Handle Bar
GB-9- 11	Brace Throttle	GB-9- 45	Sleeve
GB-9- 12	M6x65 Screw Slotted Countersunk Flat Head	GB-9- 46	Lug
GB-9- 13	Cover	GB-9- 47	2x15 Pin Split
GB-9- 14	Spring	GB-9- 48	6 Washer Plain
GB-9- 15	Lever Throttle Control	GB-9- 49	Spring
GB-9- 16	Seat Throttle Lever	GB-9- 50	Clevis Connecting
GB-9- 17	M6 Nut Hex	GB-9- 51	Cover Assy
GB-9- 18	M8x32 Bolt Hex Head	GB-9- 52	M14x75 Bolt Hex Head
GB-9- 19	Grip Steering	GB-9- 53	14 Washer Plain
GB-9- 20	8 Washer Plain	GB-9- 54	14 Spring Lock Washer Single Coil
GB-9- 21	8 Spring Lock Washer Single Coil	GB-9- 55	M14x25 Bolt Hex Head
GB-9- 22	M8 Nut Hex	GB-9- 56	M14 Nut Hex
GB-9- 23	M10 Nut Hex	GB-9- 57	M12x25 Bolt Hex Head
GB-9- 24	M6x12 Bolt Hex Head	GB-9- 58	12 Spring Lock Washer Single Coil
GB-9- 25	B8x25 Pin With Head Clevis	GB-9- 59	12 Washer Plain
GB-9- 26	Bar Handle	GB-9- 60	Connecting Rod Brake
GB-9- 27	2.5x20 Pin Split	GB-9- 61	Clevis Connecting
GB-9- 28	Clevis Connecting	GB-9- 62	B5x20 Pin With Hend Clevis
GB-9- 29	Switch Head Light	GB-9- 63	Shaft Brake
GB-9- 30	Pull Rod Steering Left	GB-9- 64	Ring Seal
GB-9- 31	Pull Rod Steering Right	GB-9- 65	Connecting Lever Brake
GB-9- 32	Pull Rod Clutch	GB-9- 66	6 Spring Lock Washer Single Coil
GB-9- 33	Handle Clutch Brake	GB-9- 67	Arm Steering
GB-9- 34	Spring Torque	GB-9- 68	9 Pin Cotter

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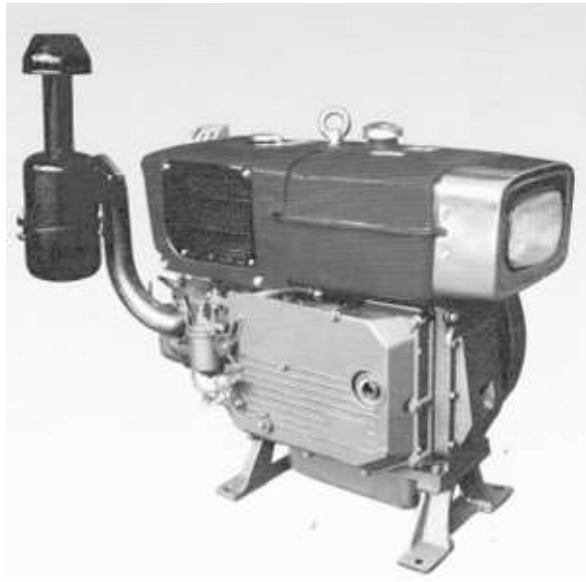
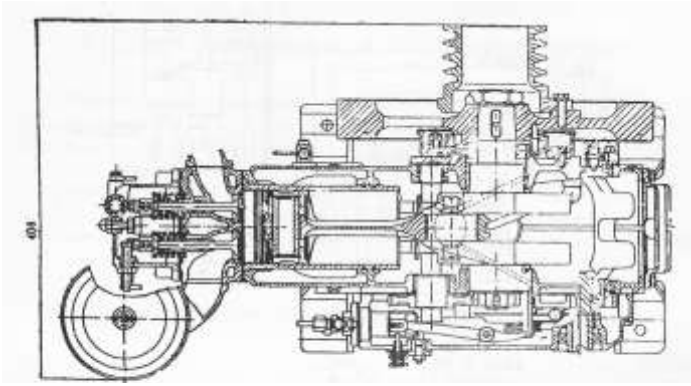
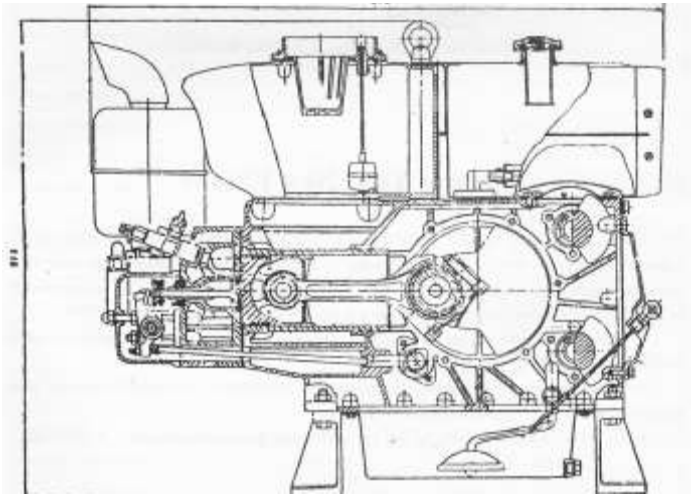
Diesel Engine – User Manual



Mounting Dimensions



Longitudinal section of the diesel engine



Cross Section of the Diesel Engine

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Part No.	Part Name	Part No.	Part Name
GB-8- 1	M8x22 Bolt Hex Head	GB-8- 15	205 Bearing Ball
GB-8- 2	8 Spring Lock Washer Single Coil	GB-8- 16	Shaft Gear
GB-8- 3	Seat Oil Seal	GB-8- 17	AGM12-M12x30 Stud
GB-8- 4	Gasket Paper	GB-8- 18	207 Bearing Ball
GB-8- 5	Key Flat	GB-8- 19	72 Circlip For Hole
GB-8- 6	5H8x10 Pin Parallel	GB-8- 20	Gear Reduction
GB-8- 7	45x70x5 Oil Seal Rubber	GB-8- 21	32 Circlip For Shaft
GB-8- 8	45x70x12 Oil Seal Self Tightening	GB-8- 22	AGM12-M12x40 Stud
GB-8- 9	209 Bearing Ball	GB-8- 23	Washer
GB-8- 10	Axle Drive	GB-8- 24	M16x1.5x18 Fine Pitch Bolt Hex Flange
GB-8- 11	M12 Nut Hex	GB-8- 25	M6x20 Bolt Hex Head
GB-8- 12	12 Spring Lock Washer Single Coil	GB-8- 26	6 Spring Lock Washer Single Coil
GB-8- 13	Housing Final Transmission Left	GB-8- 27	Cover Fine Transmission Box
	Housing Final Transmission Right	GB-8- 28	Gasket Paper
GB-8- 14	Gasket Paper	GB-8- 29	Gear Driving

Throttle, steering, clutch & brake controls of handlebar frame

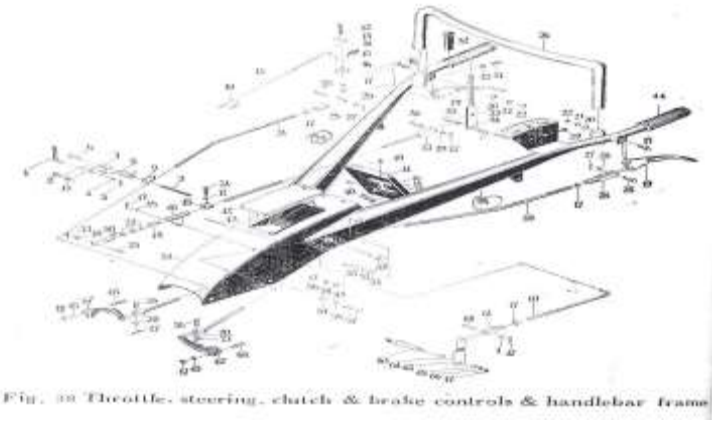

Fig. 10 Throttle, steering, clutch & brake controls & handlebar frame

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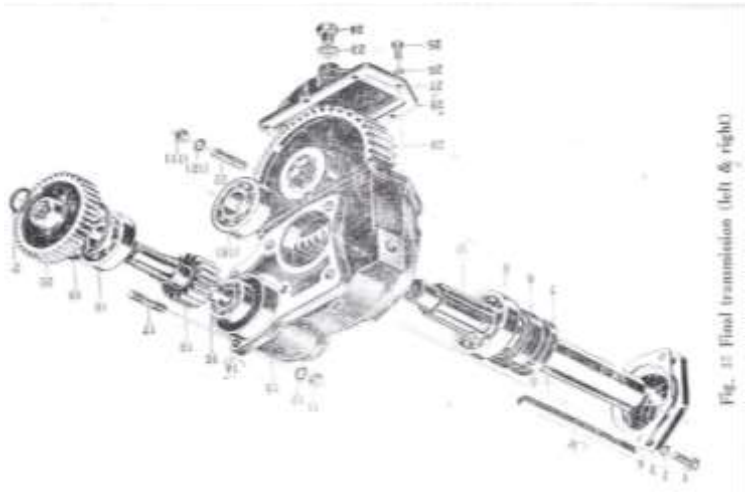
Part No.	Part Name	Part No.	Part Name
GB-7- 1	Lever Assy Speed Changing	GB-7- 15	M10x28 Bolt Hex Head
GB-7- 2	M6x16 Bolt Hex Head	GB-7- 16	10 Spring Lock Washer Single Coil
GB-7- 3	6 Spring Lock Washer Single Coil	GB-7- 17	Handle Assy Speed Changing
GB-7- 4	Cover	GB-7- 18	M16x1.5 Nut Hex
GB-7- 5	Washer Rubber	GB-7- 19	Pull Rod Assy Speed Changing
GB-7- 6	M16x1.5x18 Reduced Shank Bolt Hex Flange	GB-7- 20	A8x50 Pin With Head Clevis
GB-7- 7	Washer	GB-7- 21	8 Washer Plain
GB-7- 8	Joint Sub Transmission Shifting Bar	GB-7- 22	2.5x20 Pin Split
GB-7- 9	9 Pin Cotter	GB-7- 23	Connecting Rod Assy Sub Transmission
GB-7- 10	16x2.4 O Ring Seal	GB-7- 24	B8x28 Pin With Head Clevis
GB-7- 11	Sleeve	GB-7- 25	M6 Nut Hex
GB-7- 12	Cover Main Drive Gearbox	GB-7- 26	6 Washer Plain
GB-7- 13	Gasket Paper	GB-7- 27	Sleeve Seal Rubber
GB-7- 14	Shifting Bar Sub Transmission		

Final Transmission (Left & Right)



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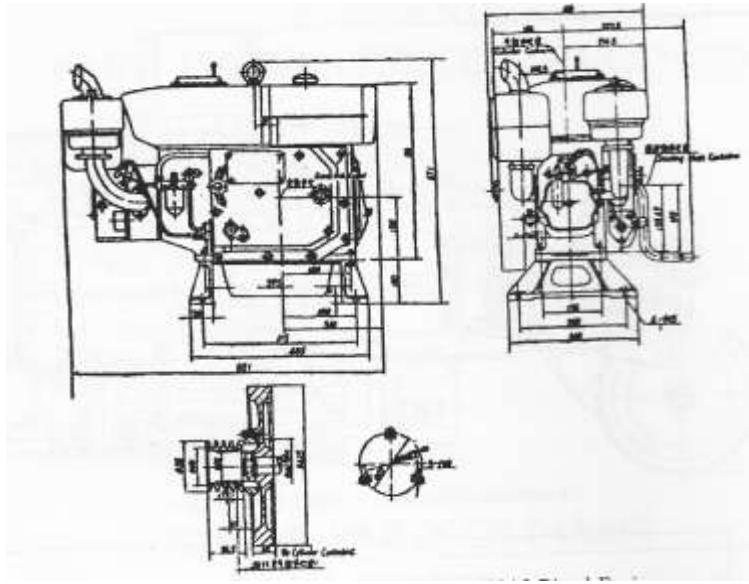

Overall mounting dimensions of the diesel engine

Installation and Driven Machinery

1. Installation of the Engine

The power produced by the engine is taken off to its driven machinery by means of a V-belt pulley of B type with four grooves which is firmly fixed on the fly wheel by three M10 bolts. The distance from the first grooves of the pulley to the cylinder center line is 211 mm and the height of the fly wheel center (i.e. the height of the crankshaft center) 170mm.

The center to center distance between the four Φ 13 anchor bolt holes at the bottom of the cylinder block is 395×156(mm) and that between the four Φ 15 bolt holes of the base is 415×280(mm). The axial size of the first groove of the pulley of the driven equipment shall equal to the corresponding size of the pulley of the engine to prevent the torsion of the V-belt. The mounting surface of the foundation on or frame on which the engine itself or the base of engine is installed must be smooth and leveled.

2. Determination of the Pulley Size

Since the aped of the pulley is in reverse proportion to its diameter, with the help of the following formula the correct pulley size of the driven equipment can be easily determined

$$D_2 = \frac{D_1 \times n_1}{n_2}$$

Wheel D_1-------The diameter of the engine pulley
(Referring to pitch diameter)
n_1---------the speed of the engine which is not allowed to exceed the
Rated speed, i.e.2000r/min of 2200/r/min
n_2---------The required speed of the drive equipment
The pitch diameter of the pulley for the engine is 125mm

Operation and Adjustment

(1) Operation of the engine

1.1 Diesel fuel, lubricating oil and cooling water

- **Diesel fuel**
  The diesel fuel must be fully settled before use and strictly while it is being poured into the engine fuel tank, use No. 0 light diesel fuel when the ambient temperature is over 5°C, Use No.-10 or No.-20 light diesel fuel when ambient temperature is below 5°C.
- **Lubricating oil**
  The lubricating oil container should be sealed so as to prevent foreign-metal impurities from entering into it, Use No.HC-11(similar to SAE30) when below 5°C.
- **Cooling water**
  Only soft water such as rain water, snow water and river water can be used.
  It is not allowed to use hard water such as well and mineral water.

1.2. Starting the engine

(1)Preparation before starting

1. Carefully check the engine anchor bolts and the engine pulley to make they are securely fixed.

2. Take out the oil dipstick from the rear cover and pour approximately 2.5kg of oil into the oil sump. The oil level should lie between the upper line and the lower one which are marked on the dipstick. And feed air filter with lubricating oil up to the marked line.

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Part No.	Part Name	Part No.	Part Name
GB-6- 8	08B-2x64 Precise Roller Chain Short Pitch	GB-6- 26	10 Spring Lock Washer Single Coil
GB-6- 9	Sprocket Driving	GB-6- 27	8x24 Rivet Round Head
GB-6- 10	Shaft Clutch	GB-6- 28	M10x28 Bolt Hex Head
GB-6- 11	Washer	GB-6- 29	M12 Nut Hex
GB-6- 12	60306 Bearing Ball	GB-6- 30	M12x60 Set Screw With Dog Point Square Head
GB-6- 13	Sleeve Throw Out Jaw	GB-6- 31	Protecting Cover Assy Pulley
GB-6- 14	Seat Hearing	GB-6- 32	M8x18 Bolt Hex Head
GB-6- 15	Throw Out Jaw Clutch	GB-6- 33	8 Washer Plain
GB-6- 16	688808 Throw Out Bearing Clutch	GB-6- 34	M16x1.5x18 Fine Pitch Bolt Hex Flange
GB-6- 17	Cover Bearing	GB-6- 35	Washer
GB-6- 18	Gasket Paper		

Speed changing control & gear box cover

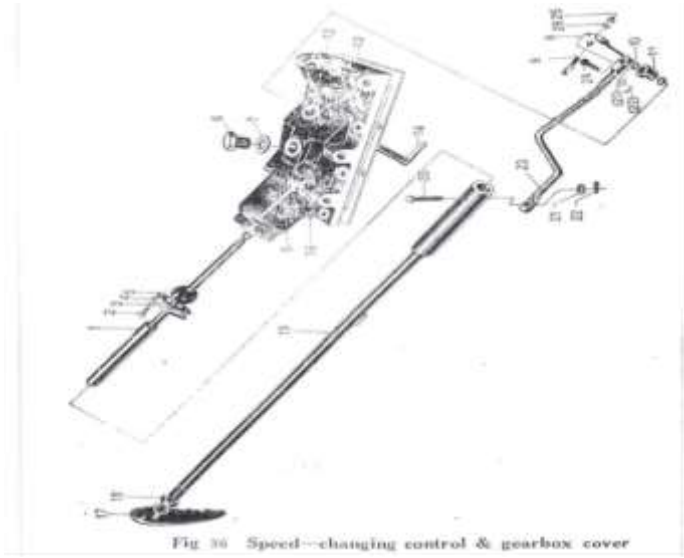

Fig 36 Speed—changing control & gearbox cover

Transmission Box

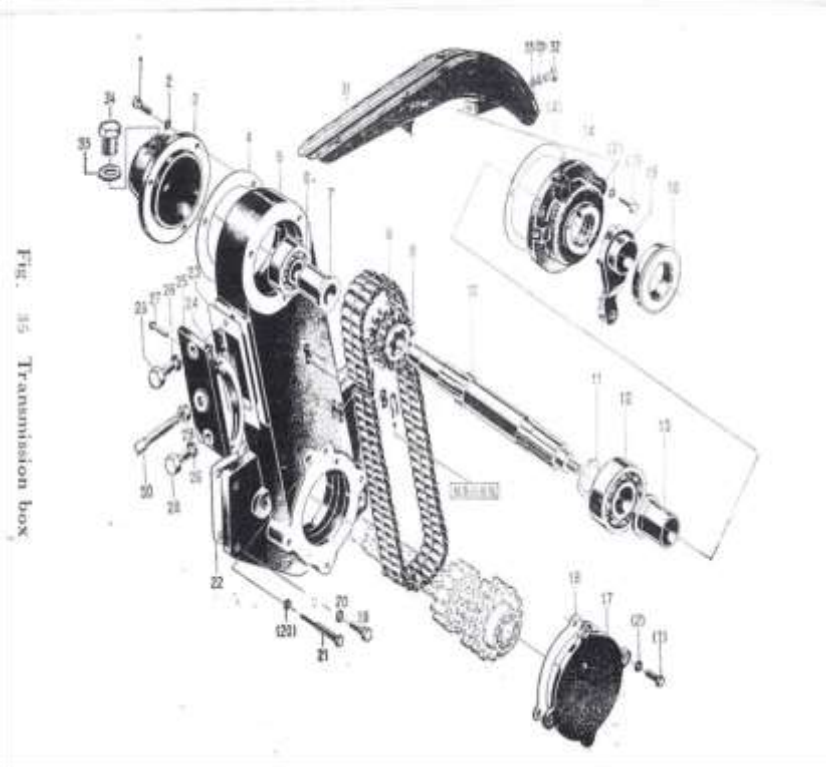

Fig. 15 Transmission box

Part No.	Part Name	Part No.	Part Name
GB-6- 1	M6x16 Bolt Hex Head	GB-6- 19	M8x25 Bolt Hex Head
GB-6- 2	6 Spring Lock Washer Single Coil	GB-6- 20	8 Spring Lock Washer Single Coil
GB-6- 3	Seat Bearing	GB-6- 21	M8x65 Bolt Hex Head
GB-6- 4	Gasket Paper	GB-6- 22	Gasket Paper
GB-6- 5	Housing Transmission Box	GB-6- 23	Gasket Paper
GB-6- 6	304 Bearing Ball	GB-6- 24	Tension Plate
GB-6- 7	Sleeve	GB-6- 25	Seat Support

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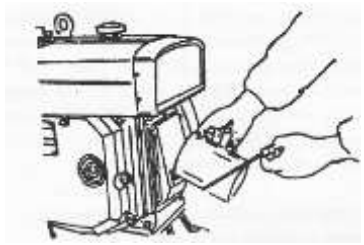
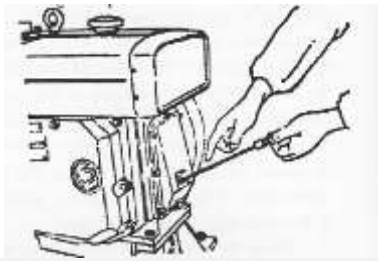


Pouring oil into the crankcase



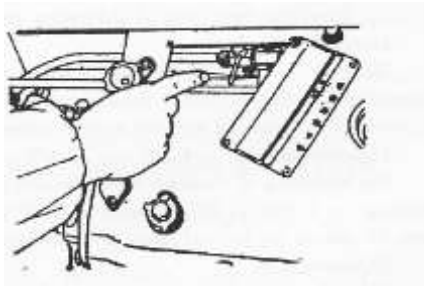
Measuring oil level by means of a dipstick

3. Press down the decompression level clockwise. Crank the engine by means of the starting handle and gradually speed up while cranking, inspect the see whether it rises. The red float's rising indicates that the lubricating oil pump of the engine works normally. Otherwise, check the system carefully until the trouble is located and removed.

4. Turn off the fuel tank cap, pour approximately 12kg of diesel fuel into the tank

5. Turn off the cock of the fuel tank, then the diesel, owing to its gravity, will flow to the fuel injection pump through the primary filter installed at the bottom of the fuel tank, fuel pipe and fuel filter.

Pouring diesel fuel into the fuel tank



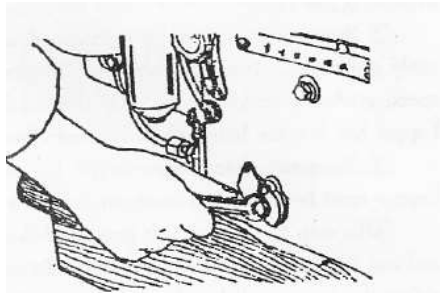
Location of the fuel tank cock

6. Loosen the inlet pipe connection of the fuel filter or that the injection pump to let the flow out freely until it no longer contains air bubbles.

7. Set the speed-governing knob at the middle of the speed indicating panel, loose the union nut which connects the high pressure fuel pipe to the injector. Move the fuel priming

handle to and fro until the flowing out of the fuel is noted. Then tighten the union nut and move again the fuel priming handle until a “chattering” action of the fuel injector noted.

Releasing air bubbles from the fuel supply line



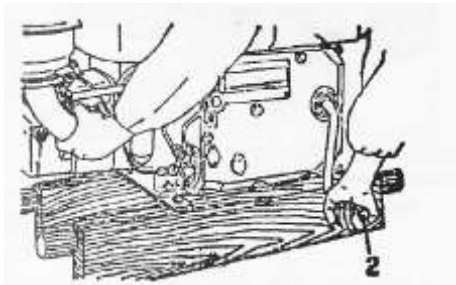
Priming the fuel injection system

8. Pour approximately 18kg of soft into the water hopper and the red indicating ball will rise to its upmost position.

(2) Starting the engine

1. Set the speed-governing knob at the bottom to increase the fuel supply for starting.
2. Press down the decompression lever clockwise with your left hand and hold it. Crank the engine with your right hand by means of the starting handle and speed up gradually. As soon as the cranking speed attains its maximum, suddenly release the decompression lever (it can spring back to its former position automatically). Continue to crank with your full efforts. Then the engine will start up running itself.

Pouring water into the hopper



Cranking the engine with a starting handle
1. Decompression lever
2. Starting handle

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Part No.	Part Name	Part No.	Part Name
GB-5- 1	Shaft Shifting Fork 1St Reverse Gear	GB-5- 33	Gear Intermediate Reduction
GB-5- 2	Shifting Fork 1St Reverse Gear	GB-5- 34	30 Snap Ring For Shaft Round Wire
GB-5- 3	8 IV Ball Steel	GB-5- 35	M16x1.5x18 Bolt Hex Head
GB-5- 4	Spring Shifting Fork	GB-5- 36	Washer
GB-5- 5	Shaft Shifting Fork High Speed	GB-5- 37	8x22 Pin Parallel
GB-5- 6	Shifting Fork High Speed	GB-5- 38	M12 Nut Hex
GB-5- 7	Shaft Shifting Fork Sub Transmission	GB-5- 39	12 Spring Lock Washer Single Coil
GB-5- 8	Shifting Fork Sub Transmission	GB-5- 40	Frame Adapter
GB-5- 9	M8x22 Bolt Hex Head	GB-5- 41	M12x35 Stud
GB-5- 10	8 Spring Lock Washer Single Coil	GB-5- 42	8x18 Pin Parallel
GB-5- 11	Cover Plate Right Side	GB-5- 43	Gasket Paper
GB-5- 12	Gasket Paper	GB-5- 44	Housing Main Drive Gearbox
GB-5- 13	305 Bearing Ball	GB-5- 45	Ring Protect
GB-5- 14	Shaft Idler Gear	GB-5- 46	Cover Steering Gearbox
GB-5- 15	Gear 1st Reverse	GB-5- 47	Gasket Paper
GB-5- 16	Gear Idler	GB-5- 48	Shifting Fork Right Steering
GB-5- 17	28 Snap Ring For Hole Round Wire	GB-5- 49	Shifting Fork Left Steering
GB-5- 18	304 Bearing Ball	GB-5- 50	Gear Main Shaft
GB-5- 19	Shaft Sub Transmission	GB-5- 51	Gear High Speed
GB-5- 20	Gear Sub Transmission	GB-5- 52	Shaft Main
GB-5- 21	Gear Brake	GB-5- 53	Ring Retaining
GB-5- 22	Ring Brake	GB-5- 54	Ring Spacer
GB-5- 23	204 Bearing Ball	GB-5- 55	Sleeve Shaft
GB-5- 24	M6x20 Bolt Hex Head	GB-5- 56	Gear Main Shaft Driving
GB-5- 25	6 Spring Lock Washer Single Coil	GB-5- 57	52 Circlip For Hole
GB-5- 26	Seat Bearing	GB-5- 58	Spacer Outer
GB-5- 27	M10x22 Bolt Hex Head	GB-5- 59	Shaft Reverse Gear
GB-5- 28	Washer	GB-5- 60	Washer
GB-5- 29	Gasket Paper	GB-5- 61	Gear Reverse
GB-5- 30	Spring Steering	GB-5- 62	Sleeve
GB-5- 31	Gear Steering	GB-5- 63	Collar Reverse Gear Shaft
GB-5- 32	Shaft Steering	GB-5- 64	16x30x10 Oil Seal Rubber

Speed Changing Control & Gear Box Cove

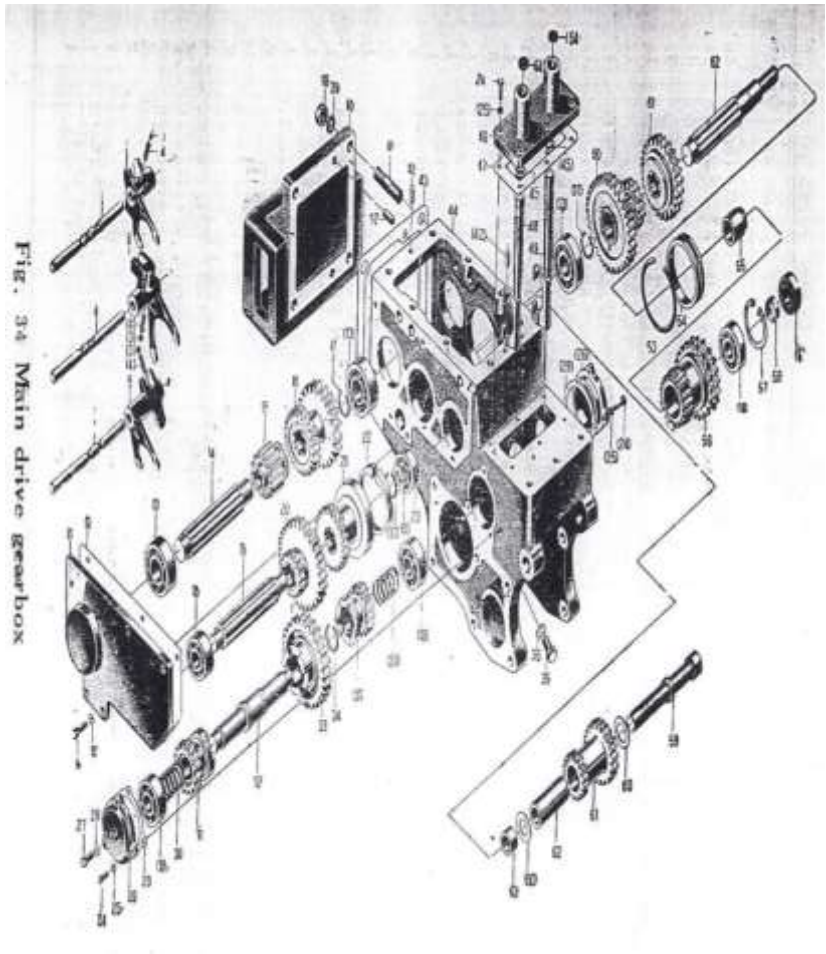

Fig. 34 Main drive gearbox

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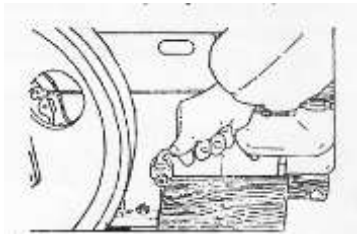
Caution: Once the engine starts up running. The starting handle, thanks to the action of the spiral –jaws on its clutching end, shall disengage and jerk out of itself, and therefore the operator must keep on holding it firmly to prevent any accident

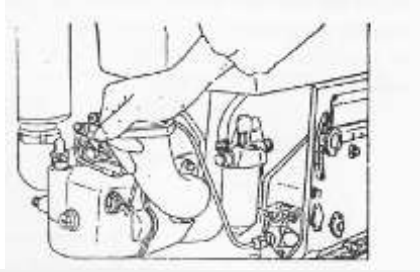
2 .When the ambient temperature is below 5°C, to aid starting , it is advisable to take some measures such as feeding the hopper with hot water, preheating. Lubricating oil and heating intake air.

(3) Running and stopping of the engine

1. After the engine is started, check once again the red float of the oil indicator and see whether it has risen up. Also check the engine for abnormal noises.
2. Running the engine at high speed and with full load immediately after is started is rigorously prohibited. Run the engine idly at low speed for about 5 to 10 minutes and then increase the speed gradually and load it. The engine is allowed to run with load only when the water in the hopper has become boiling hot. But not allowed to operate under black smoke exhaust conditions.
3. Frequent observation should be made on the red indicating ball of the hopper and the hopper must be refilled at once when it goes down to the funnel mouth to the hopper.
4. To stop the engine, it is advisable to unload the engine and decrease the engine gradually and run the engine at idle speed for a few munities, shift the speed –governing knob to the STOP position, the engine will be stopped.
5.In winter or in case the engine is to be put out of service for a long period of time, the cooling water of the engine must be drained out completely from the hopper, so that the engine parts shall be protected from being rusted or cracked due to freezing.
6.When the engine speed gets out of control and emergency stop is required, it is advisable to take off the air filter and block the engine intake pipe with hand , or loosen and of the connections of the high pressure fuel pipe. The engine will then immediately stop. The engine can also be stopped by putting the decompression devise into action.



Draining out cooling water



One method of emergency stop blocking the engine intake pipe

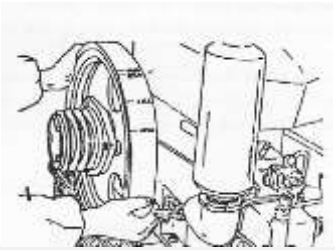
2. Adjustment of the Engine.

2.1 Cold state valve clearance adjustment

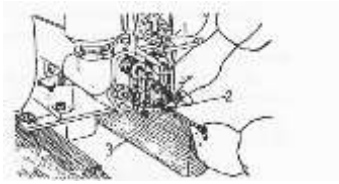
(1) Dismount the cylinder head cover

(2) Turn the flywheel to move the piston to its T.D.C Position. Where both the intake and exhaust valves are shut up.

(3) Slacken the locking nut of the adjusting screw (M8×1). Withdraw the screw by means of a screw-driver. Insert the feeler gauge between the end of the valve stem and the head of the rocker arm. Screw –in the adjusting screw to such an extent that the push rod is just free to turn but not too loose after this is done, tighten the locking nut.



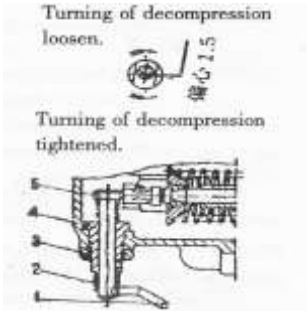
Turning the flywheel to move the Piston to its T.D.C. position



Adjustment of the valve clearance.
1.—Feeler gauge
2.—Locking nut
3.—Adjusting screw

2.2 Decompression device adjustment

Turn the flywheel to shut the intake valve. Press down the decompression lever clockwise and the intake valve shall be pushed open when the hand holding the decompression lever feels pressed. If turning the flywheel after the lever has been released back to its former position does not cause any collision by the decompression shaft with the rocker arm, then it can be concluded that the decompression lever functions properly. Otherwise adjustment should be made according to the following procedures:



Decompression device
1. Decompression lever
2. Decompression lever spring
3. Locking nut
4. Eccentric bushing
5. Decompression shaft

(1) Slacken the set nut (M18×1.5) of the decompression shaft bushing.
(2) Adjust the decompression stroke by turning the decompression shaft bushing to make use of the 1.5mm eccentricity between its Φ 18mm outer cylinder and Φ 9mm hole. Clock-wise turning is made if the decompression stoke is too little, enti – col-clockwise turning is necessary turning is necessary if the decompression stroke is too much.

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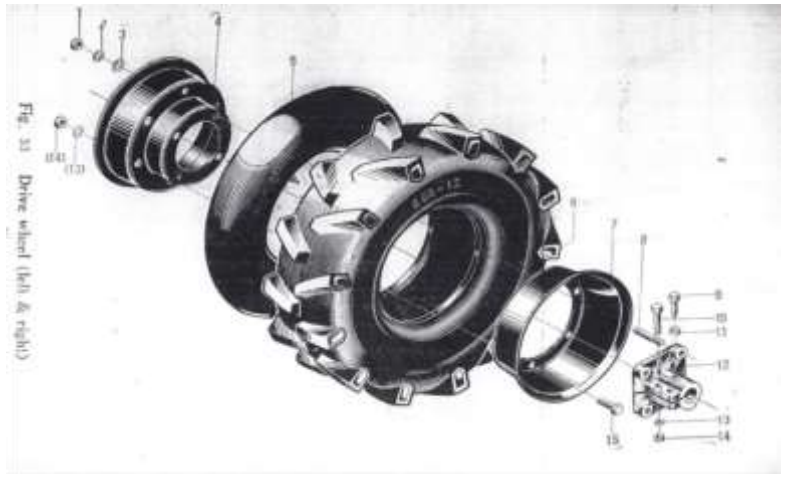
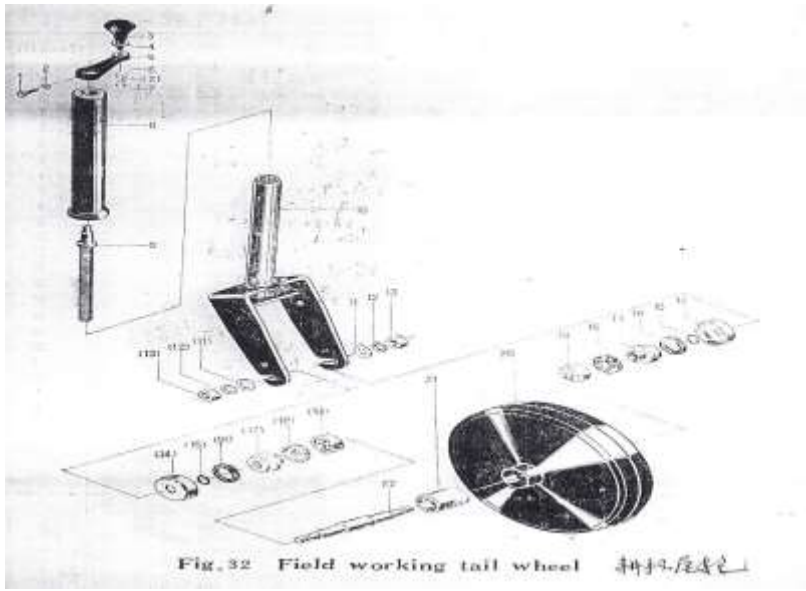
Drive wheel (left & Right)



Part No.	Part Name	Part No.	Part Name
GB-4- 1	M16 Nut Hex	GB-4- 9	M12x35 Set Screw With Dog Point Square Head
GB-4- 2	16 Spring Lock Washer Single Coil	GB-4- 10	M12x70 Bolt Hex Head
GB-4- 3	16 Washer Plain	GB-4- 11	M12 Nut Hex
GB-4- 4	Wheel Disc	GB-4- 12	Wheel Hub
GB-4- 5	Tube 6.00-12	GB-4- 13	12 Spring Lock Washer Single Coil
GB-4- 6	Tyre 6.00-12	GB-4- 14	M12 Nut Hex
GB-4- 7	Wheel Rim	GB-4- 15	M12x35 Bolt Hex Head
GB-4- 8	M16x25 Stud		

Field Working Tail Wheel



Part No.	Part Name	Part No.	Part Name
GB-3- 1	M8x22 Bolt Hex Head	GB-3- 12	16 Spring Lock Washer Single Coil
GB-3- 2	8 Spring Lock Washer Single Coil	GB-3- 13	M16 Nut Hex
GB-3- 3	Handle Assy	GB-3- 14	Cover Dust
GB-3- 4	12 Washer Plain	GB-3- 15	24x2.4 O Ring Seal
GB-3- 5	Arm Adjusting Screw	GB-3- 16	Seal Felt
GB-3- 6	8 Washer Plain	GB-3- 17	Seat Oil Seal
GB-3- 7	M8 Nut Hex	GB-3- 18	26x47x10 Oil Seal Rubber
GB-3- 8	Sleeve Assy	GB-3- 19	204 Bearing Ball
GB-3- 9	Screw Rod Tail Wheel	GB-3- 20	Tail Wheel Assy
GB-3- 10	Fork Assy Tail Wheel	GB-3- 21	Sleeve Positioning
GB-3- 11	16 Washer Plain	GB-3- 22	Axle Tail Wheel

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2.3 Adjustment of injection timing

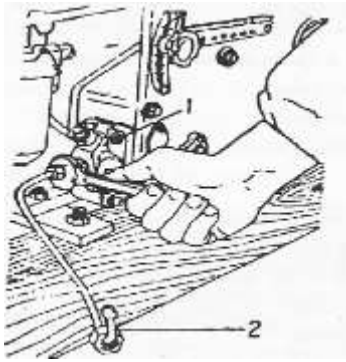
(1) Screw off the M14 nut of the high pressure fuel pipe from the injector. Slacken the M12 nut connecting the pipe to the injection pump. And the turn the pipes around so that the open end of the pipe is upwards. Retighten the M12 nut.

Set the speed –governing knob at the “Middle” position prime the fuel injection pump to fill the fuel pipe with fuel. Turn the flywheel in its working direction and at the same time watch the open and of the pipe carefully, stop turning the flywheel instantly when the fuel surface in the pipe starts to stir. Check whether the INJECTION mark-line on the flywheel periphery coincides with the mark line on the side of the water hopper In case appears a derivation between the two marks greater than ±8mm, then adjustment is needed

Following is the adjusting procedure:

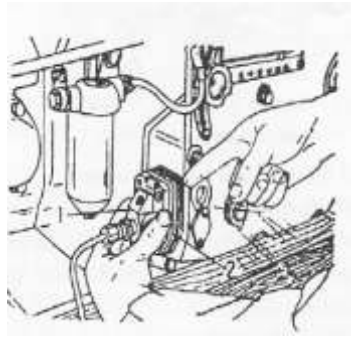
1. Shut off the fuel tank cock and move the speed governing knob to the “ Middle” position
2. Dismantle the fuel inlet pipe from the injection pump, screw off the fixing hexagon nuts and draw out the pump.
3. The injection timing can be adjusted by increasing or decreasing the number of Injection pump shims. When the injection is too early, increase the shims. When the injection is too late, decrease the shims(Adding or reducing 1 piece of shim 0.2mm thick shall affect the injection timing by 1°crank angle)
4. Mount back the injection pump make sure the ball of plunger adjusting arm is engaged with the slot in the speed governing fork. The engagement of the ball with the slot can be check through the inspection hole after the fuel limiter has been dismounted so as to prevent the engine from being out of control. And then tighten the fixing nuts.

Finally, verify the correctness of injection timing adjustment .In case the result is still unsatisfactory, re adjustment ids needed



Turning the high pressure pipe with its open end upwards

- Injection pump
- High pressure fuel pipe



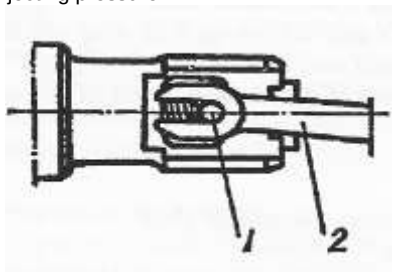
Adjustment of injection timing

- Injection pump
- Shim

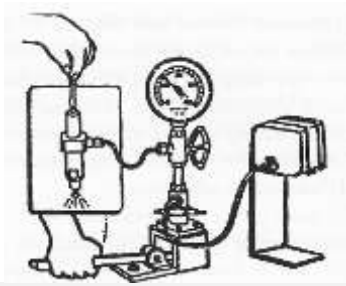
Caution: The injection timing of each engine has been carefully adjusted already before shipment .Therefore it is not advisable that the user should increase or decrease the number of the injection pump shims at random.

Adjustment of the fuel injecting pressure

Securely fix the injector on the fuel injector test bench. Note pointer of the pressure gauge while priming. In case the injecting pressure of the injector fails to reach within 12.75+0.98 Mpa (130+10kg f/cm^2), then screw off the nut on top of the injector and adjust the pressure by turning the adjusting screw with the help of a screw-driven. Drive the screw, the pressure shall be increased. On the contrary, Withdraw the screw, the pressure shall be reduced. After the adjustment is completed and the nut securely tightened, recheck the injecting pressure.



Correct place of the governor fork
1. Ball of the plunger adjusting arm
2. Speed governing fork



Adjustment of the fuel injecting pressure

Dismantling and Reassembly of the Engine

1. Draining the cooling water
2. Dismounting the cylinder head cover and the cylinder head
    - Remove the inlet bolt of the oil indicator and dismount the cylinder head cover.
    - Shut off the fuel tank cock. Detach the injector's fuel leak –off pipe.
    - Remove the air filter, intake and exhaust pipes as well as the muffler assembly.
    - Detach the high pressure fuel pipe.

Caution: While fixing the high pressure fuel pipe to the engine, care must be taken to screw on the two connecting nuts of the pipe simultaneously. However, the nut which connects the pipe to the injection pump should be tightened first. Use the priming handle to prime the fuel injection pump repeatedly until fuel comes out from the other end of the pipe. Then tighten the nut on this end.

- Dismount the fuel injector

Caution: While re-installing the injector the sealing copper washer of 21.5×1.5(mm) should be slipped on to the nozzel before it is put back into place. The two nuts are to be evenly tightened in trun.

- Remove the rocker arm shaft support assembly and draw out the pushing rods.
- Screw off the cylinder head nuts and remove the cylinder head.

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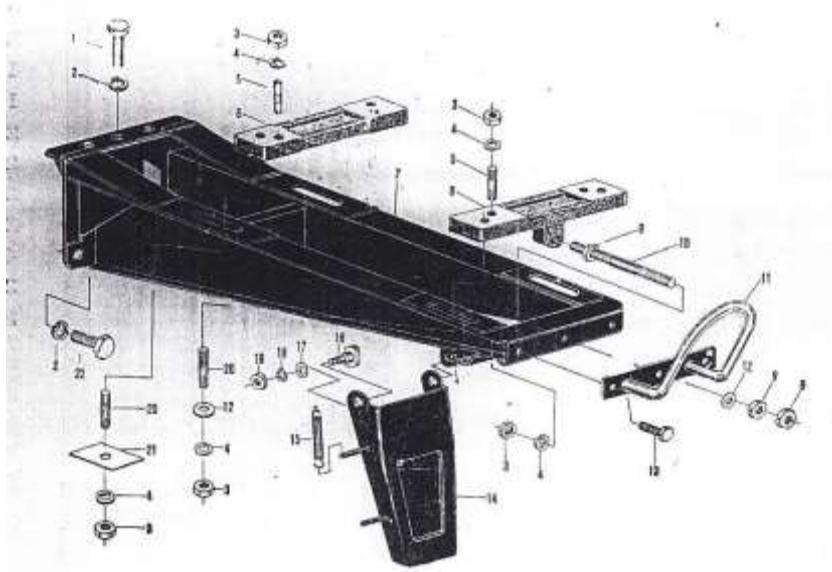
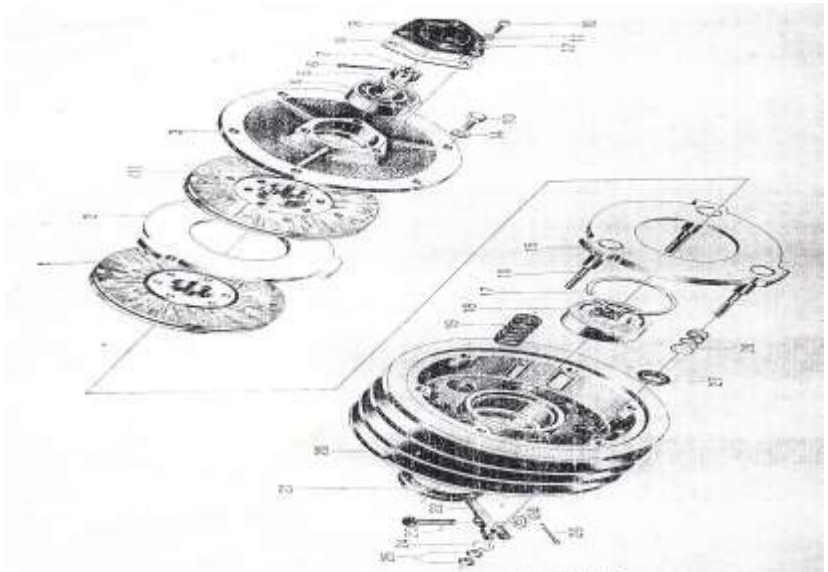
Chassis Frame



Part No.	Part Name	Part No.	Part Name
GB-2- 1	M14x30 Bolt Hex Head	GB-2- 12	12 Washer Plain
GB-2- 2	14 Spring Lock Washer Single Coil	GB-2- 13	M10x30 Bolt Hex Head
GB-2- 3	M12 Nut Hex	GB-2- 14	Supporter Assy
GB-2- 4	12 Spring Lock Washer Single Coil	GB-2- 15	Spring Front Stand
GB-2- 5	M12x30 Stud	GB-2- 16	Clevis Pin With Head
GB-2- 6	Beam Rear	GB-2- 17	10 Washer Plain
GB-2- 7	Chassis Frame Sub Assy	GB-2- 18	10 Spring Lock Washer Single Coil
GB-2- 8	Beam Front	GB-2- 19	M10 Nut Hex
GB-2- 9	M12 Nut Hex	GB-2- 20	M12x25 Stud
GB-2- 10	Bolt Draw In	GB-2- 21	Lining Plate
GB-2- 11	Bumper Assy	GB-2- 22	M14x25 Bolt Hex Head

Parts Diagram & List-Body

Clutch



Part No.	Part Name	Part No.	Part Name
GB-1- 1	Friction Disc Sub-Assy Clutch	GB-1- 15	Pressure Plate Clutch
GB-1- 2	Driving Disc Clutch	GB-1- 16	Bolt Adjusting
GB-1- 3	End Cover Clutch	GB-1- 17	62 Circlip For Hole
GB-1- 4	60204 Bearing Ball	GB-1- 18	60206 Bearing Ball
GB-1- 5	12 Washer Plain	GB-1- 19	Spring Clutch
GB-1- 6	3x25 Pin Split	GB-1- 20	Pulley
GB-1- 7	M12 Nut Hex Thin Castle	GB-1- 21	42x29x5 Seal Felt
GB-1- 8	Gasket Paper	GB-1- 22	Throw Out Lever Clutch
GB-1- 9	Cover Bearing	GB-1- 23	B8x32 Clevis Pin With Head
GB-1- 10	M6x16 Screw Slotted Pan Head	GB-1- 24	8 Washer Plain
GB-1- 11	6 Spring Lock Washer Single Coil	GB-1- 25	M8 Nut Hex
GB-1- 12	6 Washer Plain	GB-1- 26	2.5x20 Pin Split
GB-1- 13	M8x16 Bolt Hex Head	GB-1- 27	Seal Ring Dust
GB-1- 14	8 Spring Lock Washer Single Coil	GB-1- 28	Spring

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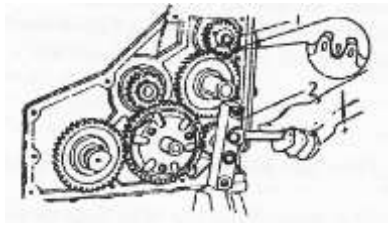
Caution: While re-installing the four M16 cylinder head nuts are to be lighted one in a diagonal order and with a final torque of 235 NM (24-28kgf.m)

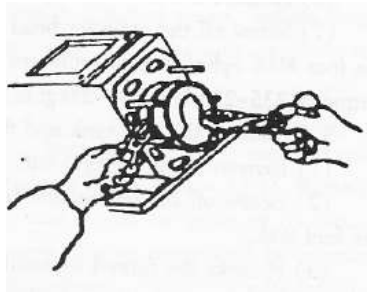
3. Removing the fuel tank and the hopper
   - Remove the lifting key-nut
   - Screw off the connection bolt of the fuel filter inlet pipe: and the three fastening bolts of the fuel tank.
   - Remove the funnel assembly from the hopper, screw off the four bolts inside the hopper, which fix the hopper on the cylinder block.
   - Remove the upper cover of the cylinder block.
4. Dismounting the gear casing
   - Screw of the nine bolts which fix the gear casing to the cylinder block.
   - Draw out one by one the camshaft along with its gear, the starting shaft along with its gear, the speed –governing gear along with sliding ball –race and steel balls.

Caution: While re assembling, it is absolutely necessary that tooth –mesh marks on all the timing gears be respectively lined up with one another.

5. Removing the rear cover of the cylinder block
   - Take out the oil dipstick
   - Screw off the eight bolts which fix the rear cover on the cylinder block.
6. Dismounting the piston connecting rod assembly
   - Turn the flywheel until the connecting rod bolts are in the position nearest to the rear opening of cylinder block.
   - Remove the steel wire which licks the connecting rod bolts
   - Unscrew the M12×1.25 connecting rod bearing shells must be well protected while taking off the cap.
   - Removing all the carbon deposits on the wall of the cylinder. Turn the flywheel until the piston is at it T.D.C position. Detach the big end of the connecting rod from the crankpin, then push slowly the piston –connecting rod assembly out of the cylinder bore by means of a wooden rod against the big end of the connecting rod.

Caution: Any attempt to knock the big end of the connecting rod either with an iron or a hammer to push the piston –connecting rod assembly is strictly prohibited. The crankpin, the cylinder and the piston should be carefully protected from being damaged while re-installing. All the fittings surfaces such as the cylinder liner and the piston rings, the crankpin and the bearing shells should ne smeared with a bit of clean lubricating oil. The inclined parting surface of the big end of the connecting rod must be kept downwards. And the cap must be fitted on in such a way that the matching marks on both the cap and the rod are on the same side. The piston rings are to be soft fitted on to the piston that the gaps are evenly spaced apart from another and are not coincided with the piston pin hole. Made sure the 2nd and 3rd taper face compression rings are installed with their marked ends towards the piston, the direction. Before the spring –backed oil scraper ring is put on the piston, the spring should be fitted into the ring proper. But care must be taken to place the joint of the spring opposite the ring end. Finally put the piston –connecting rod assembly into the cylinder bore (with the point of the piston crown upwards) by mean of a special toll.



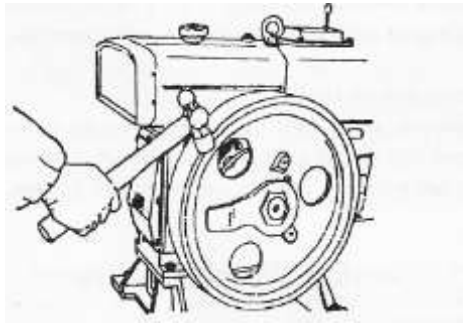


The tooth-mesh-marks of the timing gears and dismantling of balancing shaft gear by means of a puller.
1-fixing bolts
Puller

Installing the piston connecting rod assembly

Before the connecting rod bolts are to be completely tightened, it is necessary to turn the flywheel to check whether the moving parts of the assembly can move freely. Then tighten the bolts evenly and firmly. If it is necessary to replace the small end bushing of the connecting rod, then after replacement, the connecting rod should be fitted back on the piston as it was before with the small end oil hole upwards.

7. Dismantling the flywheel
Remove the pulley. Unlock washer of the flywheel nut knock the handle of the 60 spanner with a hammer and then screw off the flywheel nut.



Screwing off the flywheel nut

- Pull out the flywheel by means of the puller .In case the flywheel refuses to be pulled out, hammer may be used to knock the Centre of the puller's bridge. During this operation, be careful not to damage the thread on the end of the crankshaft, the rotor and stator of the flywheel alternator.

layer of this oil. Then set the piston at its top dead center position in the compression stroke by turning the engine slowly, in order to isolate the inside of the cylinder from outside.

9. Add about 0.2 kg of industrial Vaseline to the remains of the dehydrated oil and heat it with agitation until the mixing is homogeneous.
10. Remove the cylinder head cover and clean it. Smear the rocker arm, rocker arm shaft and other parts with the treated mixture by brushing evenly.
11. Install the parts that have been dismantled. Clean all the outside surfaces of the engine.
12. Wrap up properly the air filter, the exhaust pipe outlet with any kind of preservative paper in order to prevent any dust from getting in.
13. Smear with the above- mentioned mixture all the exposed surfaces of the engine parts, which have not been painted, such as flywheel, oil pipe.
14. It is advisable not to smear the mixture on the surfaces of any parts made of rubber or plastics.
15. The engine so preserved should be stored in room of good ventilation and low humidity but without any dust. It is strictly forbidden to store the engine wherever there are chemicals such as synthetic fertilizer, agricultural insecticide.
The preservation according to the above procedure may be good for six months. Over this period, repeat this procedure.

Model	KK-PTDE-15105
Type	Single cylinder, 4-stroke, horizontal
12 hr. Rated Power	10.5 kW / 2200 rpm
Cylinder bore x piston stroke	100 X 115
Piston displacement (L)	0.903
Compression ratio	17.5
Specific fuel consumption	$\leq$ 238 g/kwh
Advance angle of fuel delivery	20 ± 1^0
Opening pressure of fuel injector	18.1$\pm$ 0.5 MPA (185 $\pm$ 5kg/cm^2
/Valve clearance	Intake valve: 0.35 mm Exhaust valve: 0.45mm
Type of starting	Hand cranking
Overall dimension (L X W X H)	821 X 497 X 671 MM
Net weight	155 kg
Valve timing of the engine: Intake valve opens Intake valve closes exhaust valve opens exhaust valve closes fuel injection timing	15^0 before T.D.C 43^0 after B.D.C 43^0 before B.D.C 15^0 after T.D.C 20 $\pm$ 1^0 before T.D.C

Preservation and storage of the Engine

If the engine is to put out of service for a comparatively long time, it is necessary to preserve it according to the following procedure, in order to prevent any erosion.

1. Drain out the lubricating oil from the oil sumo by screwing off the oil draining plug. Screw back the plug after draining. This operation may better be performed immediately after the engine stops running when the oil temperature is comparatively high.
2. Drain out completely the cooling water by opening the water-draining cock.
3. Drain out the fuel from the fuel tank
4. Remove the rear cover of the cylinder block and oil sumo. Take out the strainer, dismount and clean it.
5. Clean the crankcase and re-install the oil strainer and oil sump.
6. Clean the filtering cartridge and precipitation cup of air filter.
7. Take 1.8kg of filtered lubricating oil of grade HC-8 and give it a dehydration treatment (heat it to 100^0 C-150^0C until all bubbles on the surface of the oil disappear). Pour into the crankcase about 1 kg of this treated oil and turn the engine until the float in the oil indicator rises up, so as to make sure that the lubricating system is completely filled up with this oil.
8. Pour into the intake about 0.3kg of this dehydrated oil, turn the engine to make sure that the piston, the cylinder liner and the valve seats are all covered with a

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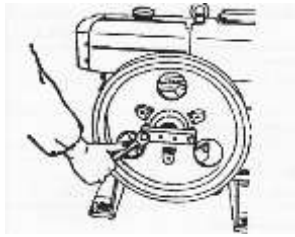
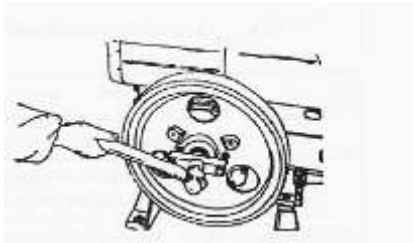


Pulling out the flywheel by means of the puller



Knocking the puller's bridge to pull out the flywheel

8. Removing the crankshaft
   - Detach the oil pipe
   - Screw off the fastening bolts of the main bearing housing (Dismount the stator of the alternator first if it is provided)
   - Pull out the main bearing housing by screwing two M8 bolts simultaneously and slowly in to the two holes which are diagonally spaced on the housing until it is pulled out.
   - Carefully take the crankshaft out of the crankcase. During this operation, all the journals of the crankshaft should be protected from being scratched or damaged.
9. Removing the balancing shaft
   In ordinary circumstances it is not recommended to remove the balancing shaft. But if the ball bearing need to be replaced, they may be removed and re-assembled according to the following procedure.
   - Take off the bearing covers and lubricating oil pump on the flywheel side of the engine.
   - Remove the clamping washer on the gear end and remove the gears by means of the puller.
   - Remove the circlip from the block.

   Tap the two balancing shaft from the flywheel side of the engine by means of a wooden hammer or a copper rod, until the ball bearings on the other end of the shaft separate from their journals and remove the ball bearing. And then remove the ball bearing on the gear side in a similar way.

Maintenance

Regular Technical Maintenance

Item	Maintenance	Period
1.Oil sump and strainer assembly	Clean the crankcase, oil strainer assembly and oil sump. And replace oil with new one.	Initially 100 hours But 200 hours afterwards

Item	Maintenance	Period
2.Air Filter	Clean the filter element and change the oil inside	100 hours:50 hours (for tractor or constriction machinery use)
3.Fuel filter	Brush and wash the paper element of the filter with clean diesel fuel or kerosene oil. Replace the element if worn.	200 hours
4.Valve clearance	Check and adjust according to the procedures recommended under item 2,1 .	100 hours
5.Fuel tank and fuel filling screen	Clean the screen with clean diesel fuel. Wash the inside of the tank with clean fuel.	50 hours 500 hours
6.Oil ducts in the crankshaft	Screw off the duct plugs from the crankshaft .Clean the center hole of the crankpin, and the two 6mm oil passages in the crankshaft with fresh diesel fuel.	500 hours
7.Cylinder head nuts, connecting rod bolts, fly wheel nut, etc.	Check for their tightness and security	Initially 50hours, but 500 hours afterwards
8.Fuel injector	Check the atomization quality and injecting pressure. Cleanly wash, lap or replace the nozzle body(with needle valve)	Initially 100 hours but 300 hours afterwards
9.Valve tightness	Smear the valves or the valve seats with a bit of lapping paste and lap them together carefully .Cleanly wash them after lapping has been finished. In order to check the valves for tightness, pour into the intake and exhaust ports a small quantity of diesel fuel and observe whether leaks out around the valve seats.	500 hours

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Technical Specifications - Diesel Engine

Model	KK-PTDE-16110
Type	Single cylinder, 4-stroke, horizontal
Type of combustion chamber	Swirl
Cylinder bore (mm)	100
Piston stroke (mm)	115
Piston displacement (L)	0.903
Average speed of piston (m/s)	8.43
Compression ratio	20
Rated power/rated speed	11 kW/2200 rpm
Average effective pressure (kPa)	666
Fuel consumption ratio (g/kWh)	$\leq$ 250
Oil consumption ratio (g/kWh)	$\leq$ 1.5
Injection pressure (Mpa)	$14^{0}_{-0.5}$
Cooling style	Water cool evaporation
Starting style	Hand cranking
Net weight (kg)	155
Overall dimensions (mm)	864x411x639
Valve gaps (cold state) (mm)	Intake valve: 0.35$\pm$0.05 Exhaust valve:0.45$\pm$0.05
Type of lubrication	Combined pressure with splashing
Oil pump rotor type	Rotor type
Tightening torque of cylinder cover nut	265$\pm$10 Nm
Tightening torque of connecting-rod nut	100$\pm$5 Nm
Tightening torque of flywheel nut	340$\pm$10 Nm
Capacity of fuel tank/lube oil/ hopper	16/3.6/18
Advance angle of fuel delivery	18^0+1^0 before T.D.C
Valve timing of the engine: Intake valve opens Intake valve closes exhaust valve opens exhaust valve closes	 14^0 before T.D.C 44^0 before B.D.C 42^0 before B.D.C 16^0 before T.D.C

Cause	Remedy
2. The connecting part of the speed governor are seized. The inner surface of the governor ball race is worm. The arch head of the governor fork or the outer ring surface of the 8106 type bearing is worn.	Check and adjust the governor. Replace the ball race and add a right amount of shims between the ball race and the 8106 bearing.
3. Piston is seized inside the cylinder liner.	Repair or replace the piston and cylinder liner
4. Main bearing shells, connecting rod bearing shell or bushing are burned.	Replace them and check the lubricating system

5. Engine Develops Abnormal Noises

Cause	Remedy
1.The clearance between the piston skirt and cylinder liner is too large, causing bevy knocking noises	Dismantle and repair them. Replace them if necessary.
2. Balancing shaft bearings clearance is enlarged or the holding frame it broken, causing abnormal noises.	Check and replace the bearings
3. Piston crown collides with the valve head.	Check and adjust the valve clearances, the thickness of the cylinder head gasket and the correctness of the valve timing

6. Lubricating oil Pressure Is Getting Low

Cause	Remedy
1.Oil level in the oil sump too low	Replenish oil make the oil level up to specified height
2. The grade of lubricating oil improper. With low viscosity.	Replace by recommended grade lubricating oil.
3. Lubricating oil lines are choked up or leak	Check and repair them
4. Main bearing are excessively worn out or oil seal leaks externally.	Repair or Replace them
5. Excessive wear of rotors and body of lubricating oil pump, or its bad assembly quality.	Check and adjust or replace them

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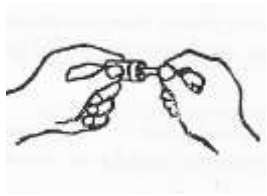
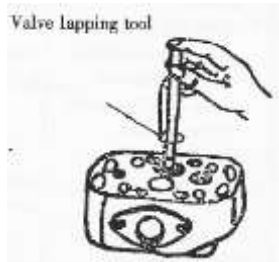
Item	Maintenance	Period
10. Cooling water jacked and passages in the cylinder block and cylinder head.	Remove the water hopper from the engine pour into the cylinder jacket a solution of hydrochloric acid (HCl) of 25% concentration. Keep it there for about 10 minutes and then drain it out. Finally blow –wash the passages with fresh water.	500 hours
11.Cylinder head, cylinder liner , and piston –connecting rod assembly	Remove carbon deposits if found any. Clean these parts with fresh diesel fuel. Check the gap of the piston rings, cylinder liner, crankshaft and its hearings for their wear rate.	100 hours

Cleaning the fuel injector



Lapping the nozzle body



Lapping contacting surfaces of the valves and their seats.

Typical Troubles and Remedies

1. Engine Fails to Start:

Cause	Remedy
1.Low ambient temperature	Heat the lubricating oil before use or add hot water to the hopper, Preheat the intake air or take off the belt connecting the engine to its coupled equipment.
2. Fitting clearance in correct, bearing shells or bushing are seized.	Adjust the fitting clearances. Scrape or replace the bushing.

3. Decompression device failure.	Adjust the decompression stroke or repair the device
4.The fuel system develops troubles (1) Air has entered the fuel line (2) Fuel line or fine fuel filter choked (3) Fuel injection pump fails to deliver fuel or Injection timing is incorrect (4) Fuel injector fails to work properly	(1) Release the air (2) Check and clean them through or replace them. (3) Check and adjust according to the recommended procedure. (4) Check the atomization and injecting pressure
5.Compresion pressure in the cylinder is insufficient (1) Cylinder head gasket is blasting – damaged (2) Piston ring gaps line up or excessive wearing of cylinder and piston rings. Too much carbon deposits (3) Valves leakage	(1) Replace it (2) Adjust the relative position of rings. Remove the carbon deposits if found any. Replace the cylinder liner or the piston ring. (3) Check and adjust the valve clearances. Check the tightness of the valves with their seats. Lap or ream their contacting surface if necessary.
6.The orifice of the turbulence combustion chamber insert is blocked	Take off the fuel injector. Get the orifice through with a piece of wire.

2. Engine Fails to Develop Full Power:

Cause	Remedy
1.Air filter choked up	Clean or replace the cartridge
2.Engine speed too low	Re-set the adjusting screw of the governor spring
3.Fuel system failure (a) Air has entered the fuel pipe (b) Injection timing incorrect (c) Insufficient injection pressure and poor atomization	(a) Release the air (b) Adjust it (c) check, adjust, clean or replace the nozzle of the fuel injector
4.Insufficient compression (a) Insufficient compressing pressure in the cylinder (b) The fuel injector's hole in the cylinder head is air-leaking (c) Valve clearances are excessively little (d) The piston rings are seriously burned ,deposited with carbon or seized	(a) Refer to item 5 under "Engine Fails to Start" (b) Cleanly remove the carbon deposit or replace the copper washer. (c) Adjust the clearance according to the recommended procedure (d) Clean or replace them

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Cause	Remedy
5.Engine is too hot in operation	Remove the scale in the hopper, cylinder block and cylinder head. Remove carbon deposit from the piston and piston rings. Check and adjust all the relevant fitting clearances and the lubricating system.

3. Abnormal Engine Exhaust Colors

Cause	Remedy
1.Engine exhaust dense black smoke (a) Engine runs at over speed with overload (b) Fuel injection is delayed (c) Low injection pressure and poor atomization (d) Air filter blocked (e) Incorrect valve clearances and poor valve tightness	(a) Reduce the load and speed of the engine (b) Adjust the fuel injecting timing (c) Adjust the injection pressure. Lap or replace the nozzle of the fuel injector (d) Clean the cartridge or replace it (e) Adjust the clearances. Check the tightness of the seating surface of the valves.
2.Engine exhaust white smoke (a) Low cooling water temperature (b) Water has entered the cylinder due to blasting damaged cylinder head gasket or cracks in the mounting surface of the cylinder head	(a) Extend the warming time so as to raise the cooling water temperature. (b) Replace the gasket with a new on. Replace the cylinder head when necessary.
The engine exhaust the blue smoke (a) Piston rings are seized Their gaps line up The cylinder liner, piston rings and valve guides are excessively worn. These cause the oil to enter the cylinder liner. (b) Air filter is blocked up or has too much oil inside.	(a) Check and clean the related parts. Replace them is necessary. (b) Clean the filter element. Reduce the quantity of oil inside the filter.

4. Engine Fails to Run Smoothly or Stalls Suddenly

Cause	Remedy
1.Faulty fuel system (a) Air has entered the fuel pipe (b) Fuel supply is interrupted	(a) Release the air (b) Refill the fuel tank or clean and get through the fuel line.