Massey Ferguson
275 / 290
Tractor
Workshop Service Manual

Contents

Hoses and Tubes

Always replace hoses and tubes if their ends are damaged.

When installing a new hose, loosely connect each end and make sure the hose takes up the designed position before tightening the connection. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing or contact with other parts.

Before removing hoses or tubes make sure they are identified so that they can be correctly re-assembled.

Be sure any hose which has been installed is not kinked or twisted after it is tightened.

Bearings

Bearings which are considered suitable for further service should be cleaned in a suitable solvent and immersed in clean lubricating oil until required.

DO NOT spin bearing with compressed air the centrifugal force could cause a ball or roller to fly outward with enough force to cause an injury.

Installation of a bearing can be classified in two ways. Press fit on rotating parts such as shafts & gears. Push fit into static locations such as reduction gear housings. Where ever possible, install the bearing onto the rotating component first.

Always use pullers or a press to remove and / or install bearings, bushings and cylinder sleeves, etc. Use hammers, punches and chisels only when absolutely necessary and be sure to wear safety goggles.

Shims

When shims are removed, tie them together and identify them as to location. Keep shims clean and flat until they are re-installed.

Gaskets

Be sure the holes in the gasket correspond with the lubricant passages in the mating parts. If gaskets are to be made, select material of the proper type and thickness. Be sure to cut holes in the right places. Blank gaskets can cause serious damage – always renew gaskets prior to re-installation.

Lip Type Seals

Lubricate the lips of the lip-type seals before installation. Use petroleum jelly. DO NOT use grease. Ensure that the oil seal is fitted the right way round, the lip of the seal is placed next to the lubricant that is sealed. Some seals have a second auxiliary lip, which is used to prevent the ingress of dirt to the seal lip.

During Installation, if the seal lip must pass over a shaft that has splines, a keyway, rough surface or a sharp edge, the lip can be easily damaged. Always use a seal protector, when one is provided.

Use of Bolts in Blind Holes

Use bolts of the correct length. A bolt which is too long may 'bottom' before the head is tight against the part it is to hold. The threads can be damaged when a 'long' bolt is removed. If a bolt is too short, there may not be enough threads engaged to hold the part securely.

Locking Devices

Lockwashers, flat metal locks or split pins are used to lock nuts and bolts.

Flat metal locks must be installed properly to be effective. Bend one end of the lock around the edge of the part. Bend the other end against one flat surface of the nut or bolt head. Always install new locks.

Always fit new split pins / cotter pins and bend the ends round so that they will not catch in clothing and help to prevent cuts.

Cables and Wires

When removing or disconnecting a group of cables or wires, tag each one to assure proper re-assembly.

Always clip back wires and cable looms properly to prevent chafing, cable damage and possible damage by fire.

TRACTOR IDENTIFICATION

Each tractor is identified by a tractor serial number and an engine serial number. To ensure prompt response to ordering of service parts or repair from your dealer, always record the tractor model, tractor serial number and engine serial number.

The tractor model number,type & serial number (chassis serial number) is stamped on the serial number plate fixed at the right-hand side of the binnacle - Fig.1 Record this number for future reference.

The engine serial number is stamped on the right-hand side of the engine block - Fig. 2

The engine serial number for MF 275 Xtra 2WD/4WD will be as follows :

S440 XXXXX

Record the exact serial number of the engine fitted to your tractor for future reference.

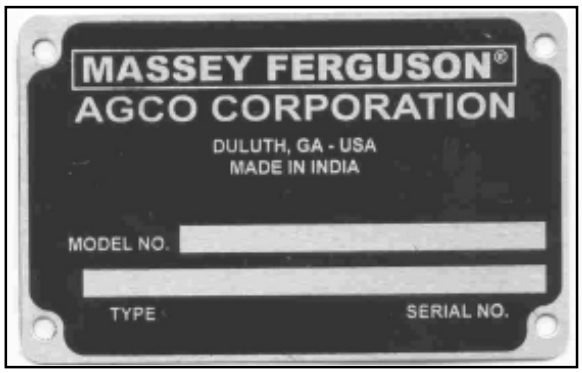


Fig. 1

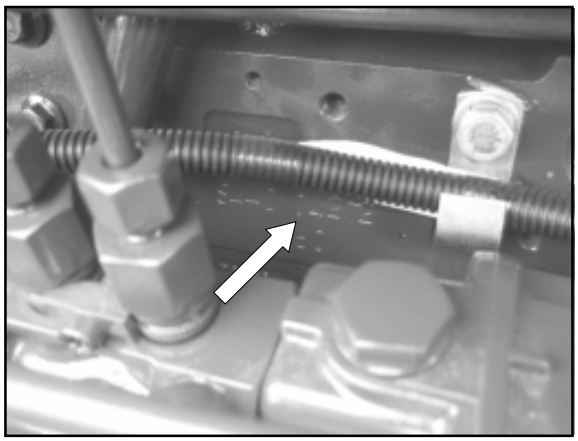


Fig. 2

4. REAR AXLE & FINAL DRIVE

Type	...	Direct type with crown wheel and pinion and differential with epicyclic at wheel end.
Rear Track Adjustments	...	60 inch – 84 inch (1524 mm – 2134 mm)
Weights (Optional)	...	2 numbers (35 Kg each) on both sides

5. STEERING

Type	...	Hydrostatic
Location	...	Above clutch housing
Dia of Steering Wheel	...	17.51 inch (445 mm)

6a. FRONT AXLE(2WD)

Type	...	Three piece, telescopic heavy duty straight front axle
Front Track Adjustments	...	56 inch (1422 mm) to 72 inch(1829 mm)
Weights (Optional)	...	Front Weight Frame with 6 nos (25 Kg each)

6a. FRONT AXLE(4WD) (if fitted)

Type	...	4 WD
Front Track Adjustments	...	60" – 76" (1524 – 1930 mm), adjustable in steps of 4" (102 mm
Weights (Optional)	...	Front Weight Frame with 6 weights (25 Kg each)

7. BRAKES

Type	...	Multi disc wet brakes.
Method of operation	...	Manual, individual left- hand /right -hand or combined through classic pedal operation
Parking Brake Type & Location	...	Mechanical, hand operated, mounted on left-hand fender.
Method of Operation	...	By hand lever through cable
Size of Liners and Liner Material	...	Diameter 8.81 inches (223.775mm) and thickness 0.18 inches (4.5mm) – 4 Nos

8. HYDRAULIC SYSTEM

Type	...	MarkIII, 4 cylinder skotch yoke piston pump with suction strainer.
Control	...	Position and draft control on right-hand side of driver Seat
Pump Capacity	...	4.75 gpm (18 lpm) @ 2000 Erpm (basic)
Lift Capacity (Max.)	...	2050 kgf (4520 lbf) – horizontal range
External Tapping points	...	3
Lower Links	...	Cat II,levelling of implement by turn buckle arrangement on right-hand side.
Accessories	...	Chain stabilizers, Oil Pipe Kit and Swinging Drawbar.

11. Support the front axle assembly using crane and chains.
12. Support the tractor under the engine sump using suitable stand.
13. Remove front support casting securing bolts and nuts.
14. Carefully roll the two front wheels, front axle and crane forwards away from the engine.

Re-assembly

For reassembling, follow the reverse procedure above,

1. Reconnect the hydrostatic steering cylinder hoses to the steering cylinder and bleed air from the system. If necessary, top up the oil in reservoir.
2. Tighten all bolts and nuts as per the torque value.

Splitting the tractor between the engine and transmission

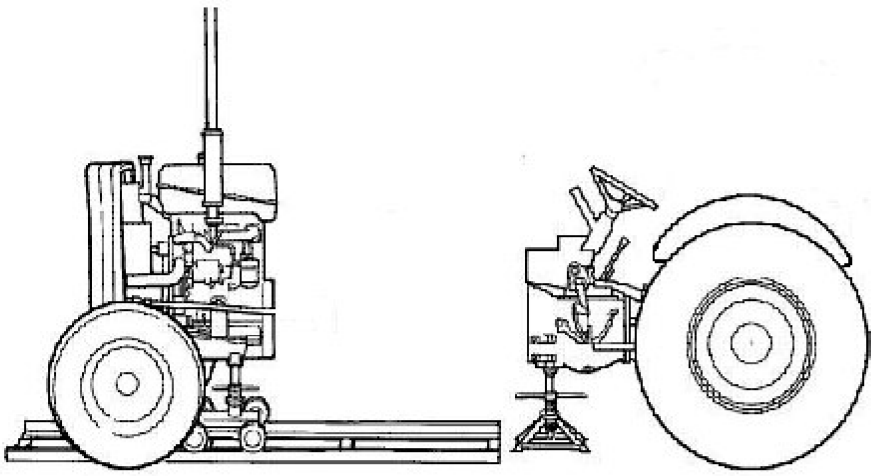


Fig 2

4A.3 SPLITTING THE TRACTOR BETWEEN THE ENGINE AND TRANSMISSION

Splitting Procedure

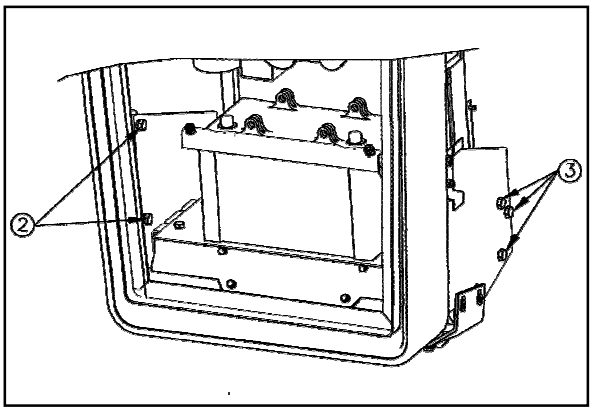
Special Tool

SER / 054 - Tractor spliting stand

Dis-assembly

1. If the tractor is four-wheel drive, first disconnect the drive shaft at the front axle end. To turn the drive shaft to gain access to the coupling split pin it may be necessary to move the tractor under power. The shaft cannot be turned without the engine running. Remove the drive shaft assembly
2. Apply the tractor parking brake and fit wheel chocks to hold the rear wheels.
3. Disconnect the battery terminals and remove the battery earth cable and battery.
4. Disconnect the head light wiring connections in grille assembly and remove the bonnet / hood from the tractor.
5. Disconnect the air cleaner hose.
6. Disconnect the hydrostatic steering hoses and pipe joints.
7. Close the fuel shut off
8. Fit a suitable wooden wedge between the engine cylinder head cover and fuel tank. Take care not to damage the fuel tank.
9. Disconnect the fuel tank rear support bolts.
10. Disconnect theengine fuel pump shut off control linkage.
11. Remove the two bolts securing the battery platform to the rear of the Engine.
12. Disconnect the front wiring harness.
13. Disconnect tractormeter drive cable from the rear of the engine.
14. Disconnect the throttle control linkages.
15. Loosen the Starter motor bolts and remove the starter motor with gasket.
17. Place hard wooden wedge between the Front support casting and centre beam to avoid pivoting.

5.8 WRAPPER MOUNTING BRACKET



1. Remove the battery tray.
2. Remove the two bolts and washers securing the wrapper.
3. Remove the three bolts and washers securing the wrapper mounting bracket to the front support.

Refitment

4. Reverse procedures 1 to 3.

5.9 HOOD SEAL, FRONT

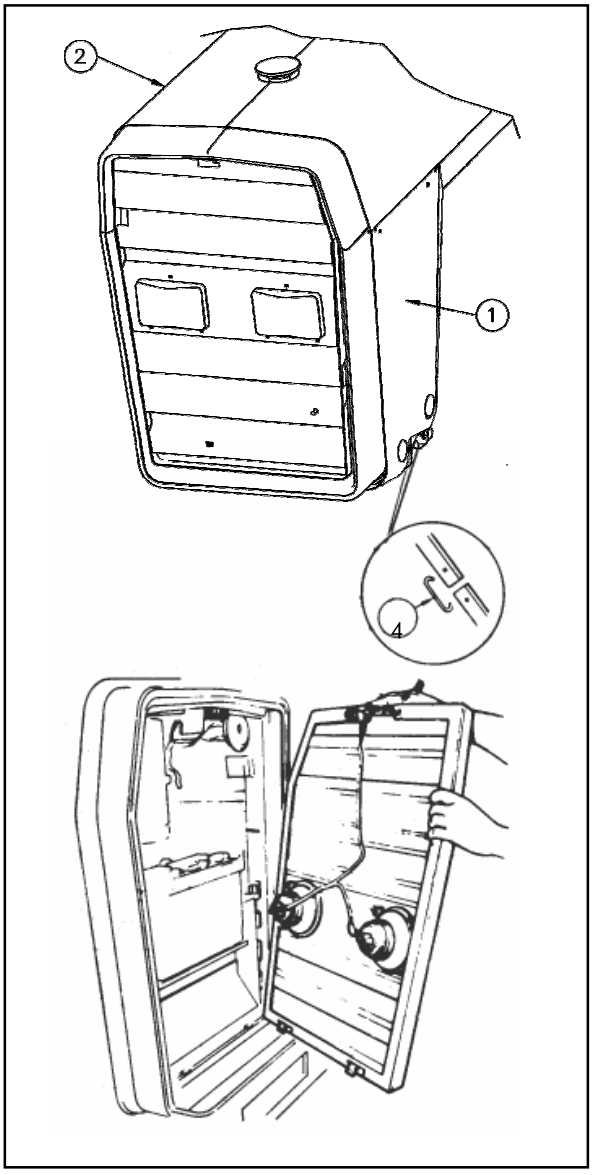
Removal and Refitment

Removal

1. Remove the two front side panels.
2. Remove the hood.
3. When necessary, remove the front weight frame.
4. Remove the rod from the two ends.
5. Mark the centre and peel the hood seal from the wrapper assembly.

Refitment

6. Mark the centre point or seat. Starting at the top centre, locate its recessed edge on the rear of the nose assembly and join the two ends with the rod, hooked ends upwards.
7. Reverse the procedure 1 to 4.



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Section B
Specification

Description	Thread Size	Torque		
		Nm	Lbf ft	Kgf m
Cylinder Block:				
Setscrews, fitted instead of piston cooling jets	3/8 UNF	27	20	2.8
Aspiration System:				
Nuts, high-pressure fuel pipes	M10	44	33	4.5
Setscrews, atomizer	M6	9	7	0.9
Fuel System:				
Nuts, high-pressure fuel pipes	M12	22	16	2.2
Setscrews, atomizer	M8	12	9	1.2
Setscrews, fuel lift pump	M8	22	16	2.2
Nut for gear of fuel injection pump	M14	80	59	8.2
Nuts for flange of fuel injection pump	M8	22	16	2.2
Lubrication System:				
Plug, lubricating oil sump	3/4 UNF	34	25	3.5
Setscrews, oil pump to front bearing cap	M8	22	16	2.2
Setscrews, cover for oil pump	M8	28	21	2.9
Fasteners, lubricating oil sump	M8	22	16	2.2
Cooling System:				
Setscrews, fan drive housing to timing case	M10	44	33	4.5
Setscrews, fan drive pulley to hub	M8	22	16	2.2
Setscrews, fan drive pulley to hub	M10	44	33	4.5
Setscrews, fan	M8	22	16	2.2
Connector, oil cooler to oil filter head	3/4 UNF	58	42	5.8
Setscrews, coolant pump to timing case	M8	22	16	2.2
Flywheel and Housing;				
Setscrews, flywheel to crankshaft	1/2 UNF	105	77	10.7
Setscrews, cast iron flywheel housing to cylinder block	M10	44	33	4.5
- Stamped 8.8	M12	75	55	7.6
- Stamped 10.0	M10	63	46	6.4
- Stamped 10.9	M12	115	85	11.7
Electrical Equipment:				
Nut, alternator pulley:				
-Lucas A 127	M17	80	59	8.2
-BOSCH 65A (12V)	M16	50	37	5.1
-Fuelled start aid to induction manifold	7/8 UNF	31	23	3.1
Auxiliary Equipment:				
Nut, compressor drive gear:				
-6,4 mm (0.25 in) thick	3/4 UNF	80	59	8.2
- 10 mm (0.4 in) thick	3/4 UNF	130	95	13.3
Nuts for gears of auxiliary drive assembly:				
-6,4 mm (0.25 in) thick	3/4 UNF	80	59	8.2
-10 mm (0.4 in) thick	3/4 UNF	130	95	13.3
Nut for gears of auxiliary drive assembly	M20	130	95	13.3

12. Remove the atomizer leak-off pipe.
13. Remove the atomizers, operation Section K2. Fit suitable covers to the nozzles and the open connections.
14. If a compressor is fitted: Remove the coolant pipe which is fitted between the cylinder head and the compressor, then remove the coolant pipe which is fitted between the by-pass connection and the compressor.
15. Release the clip of the coolant by-pass hose at the cylinder head. Release the setscrews and remove the coolant by-pass connection and the hose.
16. Disconnect the coolant temperature sender unit.
17. For turbocharged and some naturally aspirated engines: Remove the oil cooler, operation Section L7.
18. Remove the rocker cover, operation Section C1.
19. Remove the rocker assembly, operation Section C2.
20. Remove the push rods.
21. Release the cylinder head setscrews evenly and gradually in the reverse sequence. Check the setscrews for distortion with a straight edge (Fig.C17/1) held along the setscrew (Fig.C17/2). If there is a visible reduction in the diameter of the thread (Fig.C17/3) that has not been in engagement with the cylinder block, the setscrew must be discarded.

Caution Do not use a lever to separate the cylinder head from the cylinder block.

22. Remove the cylinder head and put it on a surface that will not damage the face of the cylinder head.

To Fit Valve Seat Inserts Section C14

1. Remove the valve guide and clean the bore into which the guide is to be fitted.
2. Fit new valve guides, operation Section C11.
3. With the bore of the new valve guide used as a pilot, machine the recess in the cylinder head to the dimensions shown in data and dimensions at the end of this section, or machine out the old insert. Remove all debris and clean the insert recess.
4. If the bottom face of the cylinder head has been machined, the insert will have to be surface ground on the back face to ensure that there is no protrusion of the insert above the bottom face of the cylinder head. After the back of the insert has been ground, ensure that the outer edge of the back face has a 0.9/1.3mm(0.035/0.051 inch) chamfer at 30° to the vertical.
5. With the bore of the valve guide used as a pilot, and with the rear face of the insert towards the cyhlinder head, press in the insert with the valve seat insert tool, see data and dimensions. Do not use a hammer on a insert and do not use lubrication. Use a hydraulic press or a hand press in one continuous movement. Ensure that the bottom of the insert is in contact with the bottom of the recess.
6. Cut the valve seat at an included angle of 88° for 46° valve seats or 118° for 31° valve seats, operation Section C13, and lap the valve on to the valve seat. Ensure that the depth of the valve head below the face of the cylinder head is within the production limit, see data and dimensions. Work as near as possible to the minimum figure to allow for future wear on the valve seat.

8. Check that the crankshaft will rotate freely.
9. Check the piston height above the top face of the cylinder block, operation Section D6.
10. Fit the lubricating oil strainer and suction pipe, operation Section J4 or fit the balancer unit, operation section E10.
11. Fit the lubricating oil sump, operation Section J3.
12. Fit the cylinder head assembly, operation Section C7.
13. Fill the sump to the correct level with lubricating oil of an approved grade.
14. Fill the cooling system.

Section E
Crankshaft Assembly

General Description

The crankshaft is a chrome-molybdenum forging which was five main journals.

End-float is controlled by two half thrust washers on both sides of the centre main bearing.

The main bearings have steel backs with a aluminium/ tin bearing material.

The main bearing caps are made of cast iron or spheroidal graphite (SG) iron.

The front and the rear oil seals are Nitrel seals with a dust lip to the outside of the main lip and with oil return grooves on the face of the main lip.

The crankshaft pulley is held in position by a plain thrust block and three setscrews. The nose of the crankshaft is serrated for location.

A balancer unit is fitted to certain engines which have rigid mountings or which are part of the chassis or frame. The purpose of the balancer unit is to reduce the effect of the out-of-balance forces to a satisfactory condition.

> ***Note:*** *The current engines have bearings caps made of SG iron.*

Caution: When the sump joint is removed, damage can occur to the seal in the grooves of the bridge piece. If the seal is damaged, apply sufficient sealant to completely fill the grooves.

Note: *Most of the latest engines have set screws in place of studs to fasten the sump to the bridge piece. The threads of the set screws have a sealant applied by the manufacturer. When the set screws are to be used again, ensure that the threads of the set screws and of the bridge piece are clean and a sealant is applied to the threads of the set screws. These instructions would also apply to studs.*

10. Fit the connecting rod caps, operation Section D1. Rotate the crankshaft two turns to ensure free movement.
11. Fit the balancer unit, if necessary, operation Section E10. If a balancer unit is not used, fit the lubricating oil pump, the lubricating oil suction pipe and strainer, the delivery pipe and the relief valve and if necessary, the lubricating oil crossover pipe, see Section J.
12. Fit the rear oil seal housing, operation Section E2.
13. Fit the fly wheel housing and the flywheel, see Section M.
14. Fit the timing case and the time gears, see Section F.
15. Fit the fuel injection pump, See Section K.
16. Fit the timing case cover, operation Section F1.
17. Fit the compressor and its drive assembly or fit the exhauster, see Section O.
18. Fit the alternator and its mounting bracket, see Section N.
19. Fit the crankshaft pulley, operation Section E1.
20. Fit the coolant pump, the fan drive pulley and housing, the drive belts and the fan, see Section L.
21. Fit the lubricating oil sump, operation Section J3.
22. After the engine has been installed, fill the lubricating oil sump to the correct level with an approved oil. Fill the cooling system.

Section E
Crankshaft Assembly

To Inspect — Section E9

Check the crankshaft for wear and other damage. The maximum permissible wear and ovality on the crankshaft journals and crank pinks is 0.04 mm (0.0016 inch).

The main journals and the crankpins of standard size crankshafts can be machined to 0.25 mm (0.010 inch), 0.50 mm (0.020 inch) or 0.75 mm (0.030 inch) undersize on diameter, see the data and dimensions. Special undersize bearings are available.

If the seal has been used in all the service positions, the crankshaft palm can be machined to remove the wear marks. Further information can be found in the data and dimensions.

Section E
Crankshaft Assembly

Data and Dimensions

Note: This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factory.

Crankshaft

Diameter of main journals	76.16/76.18 mm (2.998/2.999 inch)
Maximum wear and ovality on journals and crank pins	0.04 mm (0.0016 inch)
Width of front journal	36.93/37.69 mm (1.454/1.484 inch)
Width of centre journal	44.15/44.22 mm (1.738/1.741 inch)
Width of all other journals	39.24/39.55 mm (1.545/1.549 inch)
Diameter of crank pins	63.47/63.49 mm (2.499/2.500 inch)
Width of crank pins	4035/40.42 mm (1.589/1.591 inch)
Diameter of flange	133.27/133.37 mm(5.247/5.251 inch)
Depth of recess for spigot bearing	20.22/20.98 mm (0.796/0.826 inch)
Bore of recess for spigot bearing	46.96/46.99 mm (1.849/1.850 inch)
Crankshaft end-float	0.05/0.38 mm (0.0020/0.015 inch)
Maximum permissible end-float	0.51 mm (0.020 inch)
Fillet radii of journals and crank pins	3.68/3.96 mm (0.145/0.156 inch)
Undersize journals and crank pins	–0.25mm (-0.010 in); -.051 mm (-0.020 in); -0.76 mm (-0.030 inch)

Crankshaft heat treatment:

-Induction hardened	Part numbers 31315662. 31315992 and 3131H024
-Nitrocarburised	Part numbers 31315661. 31315991 and 3131H022
-60 hour Nitride	Part number 3131H021

Crankshaft overhaul

Notes:

- *Induction hardened crankshafts need not be hardened after they have been machined undersize.*
- *Nitrocarburised crankshafts must be hardened again each time they are machined. These crankshafts must be nitrocarburised or, if this process is not available, they can be nitrided for 20 hours. If neither process is available a new crankshaft, or Power Exchange crankshaft, must be fitted.*
- *Crankshafts which have been nitrided for 60 hours can be reground 0,25 mm (0.010in) without the need to harden them again.*
- *Check the crankshaft for cracks before and after it is ground. Demagnetise the crankshaft after it has been checked for cracks.*
- *After the crankshaft has been machined remove any sharp corners from the lubricating oil holes.*
- *Surface finish and fillet radii must be maintained.*

To Fit

1. Ensure that the key is fitted correctly in the fuel pump shaft. Fit the gear and the spring washer and loosely fit the nut.
2. Rotate the fuel pump gear (Fig.10/2) to ensure that the relevant marked tooth of the fuel pump gear will align with the marked teeth of the idler gear (Fig.10). Fit the idler gear, operation Section F3. the fuel pump gear fitted to CAV fuel injection pump will have “4” and “6” marks punched on it. “4” mark to be matched for 4 cylinder engines.
3. Tighten the nut of the fuel pump gear to 80 Nm (59 lbf ft) 8.2 kgf m. The teeth of the drive gear and the idler gear should be fully in mesh when the fuel pump gear is tightened onto the hub of the fuel injection pump.
4. If a new gear has been fitted, check the backlash.
5. Fit the timing case cover, operation Section F1.
6. For gear driven coolant pumps: Fit the coolant pump, operation Section L2.
7. Fit the crankshaft pulley, operation Section E1.
8. If necessary, fit the fan drive pulley, operation Section L7.
9. Fit the drive belts, operation Section N3 and adjust the belt tension, operation Section N2.
10. Fit the fan, operation Section L6.
11. Fill the cooling system.

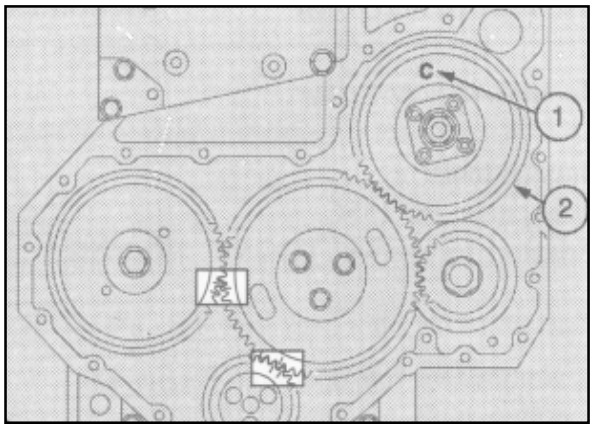


Fig .F10

Section F
Timing Case and Drive Assembly

Data and Dimensions

Note: This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factory.

Timing Case and Drive Assembly

Camshaft

Diameter of number 1 journal ..... 50.71/50.74 mm (1.9965/1.9975 inch)

Diameter of number 2 journal ..... 50.46/50.48 mm (1.9865/1.9875 inch)

Diameter of number 3 journal ..... 49.95/49.98 mm (1.9665/1.9675 inch)

Clearance of all journals ..... 0.06/0.14 mm (0.0025/0.0055 inch)

Cam lift: .....

-Inlet ..... 7.62/7.69 mm(0.2999/0.3029 inch)

-Exhaust ..... 7.71/7.79 mm(0.3036/0.3066 inch)

Maximum permissible ovality and wear on journals ..... 0.05 mm (0.021 inch)

End-float:

-Production limits ..... 0.10/0.41 mm (0.004/0.016 inch)

-Service limit ..... 0.53 mm (0.021 inch)

Width of spigot for thrust washer ..... 5.64/5.89 mm (0.222/0.232 inch)

Camshaft Thrust Washer

Type ..... 360^0

Depth of recess in cylinder block for thrust washer ..... 5.46/5.54 mm (0.215/0.218 inch)

Thickness of thrust washer ..... 5.49/5.54 mm (0.216/0.218 inch)

Relationship of thrust washer to front face of cylinder block ..... -0.05/+0.08 mm(-0.002/+0.003inch)

Camshaft Gear

Number of teeth 56

Diameter of bore ..... 34.93/34.95 mm (1.3750/1.3760 inch)

Outside diameter of hub of camshaft ..... 34.90/34.92 mm(1.3741/1.3747 inch)

Clearance fit of gear on hub ..... 0.008/0.048 mm(0.0003/0.0019 inch)

Fuel pump Gear

Number of teeth 56

Bore ..... Tapered

Crankshaft gear

Number of teeth 28

Diameter of bore ..... 47.625/47.650 mm(1.8750/1.8760 inch)

Diameter of hub for gear on crankshaft ..... 47.625/47.645 mm(1.8750/1.8758 inch)

~~Transition fit of gear on crankshaft ..... 0.020/+0.048 mm(0.0008/+0.0010 inch)~~

Section G
Cylinder Block Assembly

7. Lubricate and ratchet of the handle and the threaded rod with Shell Spirax oil or an equivalent oil. Operate the handle and press the liner into the parent bore to within 50 mm (2.0 in) of the fitted position. Clean the area below the flange of the liner with Loctite Safety Solvent. Apply POWER PART Retainer (Oil Tolerant) to the top 25 mm (1.0 in) of the outer surface of the liner and under the flange; also apply POWER PART retainer (oil tolerant) to the bottom of the flange recess in the parent bore.
8. Press the liner in to the fully fitted position. Remove the tool and clean the retainer from the top of the cylinder block.
9. Allow 15 minutes to elapse before the liner bore dimension is checked. The retainer will reach full strength after 6 hours.

   The inside diameter of a service liner, when fitted, should be 100.00/100.06 mm (3.937/3.939 in).
10. Use tool PD.41D to check that the liner flange is between 0,10 mm (0.004 in) above to 0,10 mm (0.004 in) below the top face of the cylinder block (Fig.G3)
11. Fit new piston rings, operation Section D5.
12. Fit the piston and connecting the rod assembly operation Section D3.
13. If necessary, fit the piston cooling jet, operation Section D10.
14. Fit the cylinder head assembly, operation Section C7.
15. Fit the lubricating oil sump, operation Section J3, and fill it to the correct level, with an approved lubricating oil.

Caution: After a new service liner has been fitted, these recommendations are advised for the first 240 km (150 miles) or 5 hours of operation:

- Do not operate the engine at full load
- Do not operate the engine at high speed.
- Do not allow the engine to run at low idle speed for long periods.

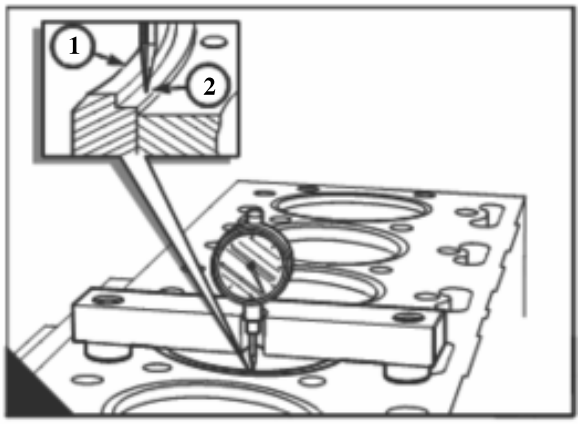


Fig .G3

Section I
Aspiration System

General Description

Warning! Turbochargers operated high speed and high temperatures. Keep fingers, tools and other jets away from the Inlet and outlet ports of the turbocharger and avoid contact with hot surfaces.

A turbochargers fitted between the exhaust and induction manifolds. The turbocharger is driven by exhaust gases and supplies air to the engine at more than atmospheric pressure. It is lubricated by oil from the main gallery. The passes through the bearing housing of the turbocharger and returns to the lubricating oil sump

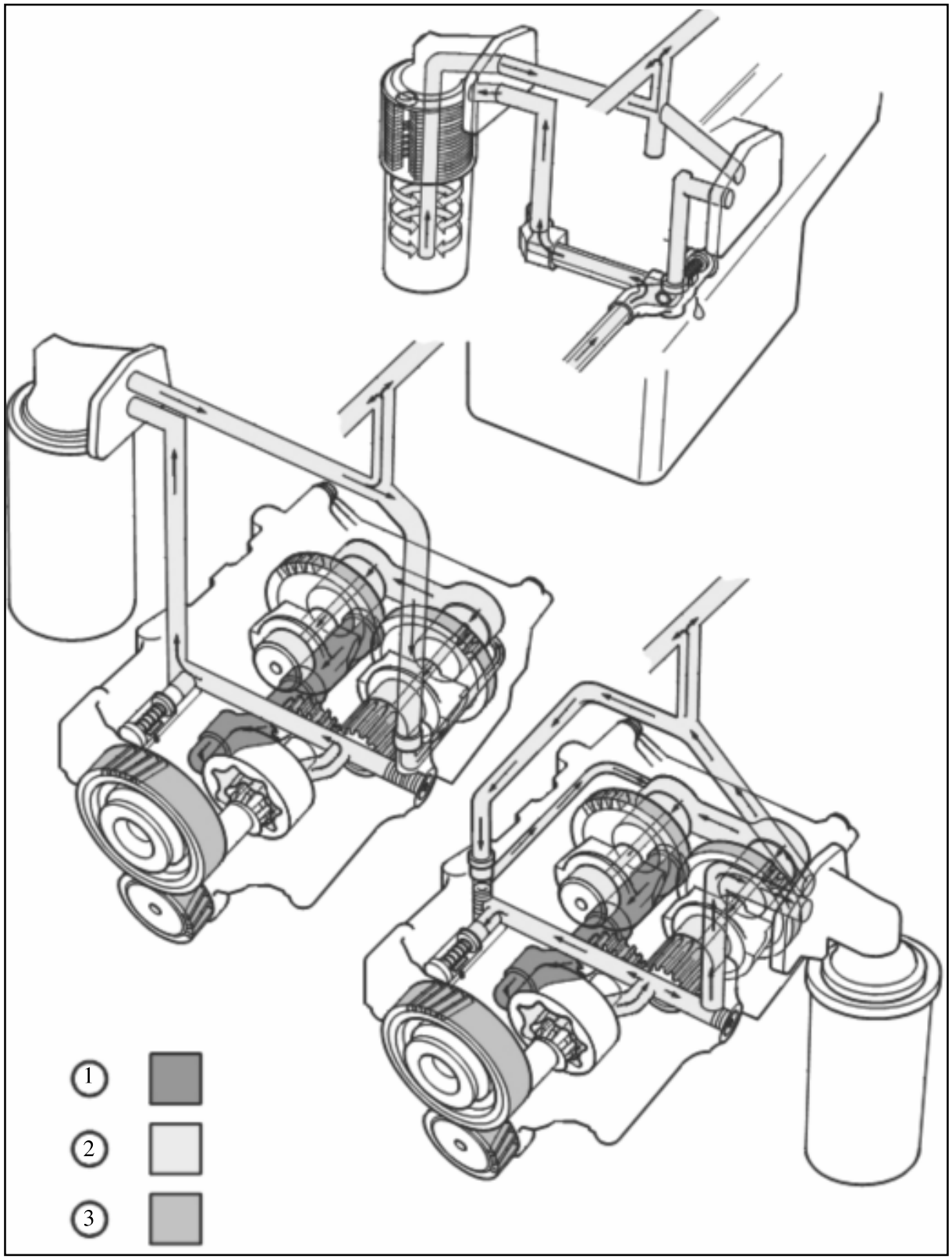


Fig .J2

Section J
Lubrication Systam

Data and dimensions

Note: This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factor.

Coolant pump

Type ..... Differential rotor, gear driven
Number of lobes ..... Inner rotor 6, outer rotor 7
Clearance of outer rotor to body
- Without balancer unit ..... 0.15/0.34 mm (0.005/0.0013 inch)
- With balancer unit ..... 0.31/0.45mm(0.012/0.017 inch)
Clearance of inner rotor to outer rotor 0.04/0.13mm (0.0015/0.0050inch)
End-float of rotor assembly ..... 0.03/0.10 mm (0.001/0.004 inch)

Idler gear for lubricating oil pump

End float ..... 0.03/0.33 mm (0.001/0.0013 inch)
Inside diameter of bush (fitted) ..... 22.23/22.26 mm (0.875/0.866 inch)
Outside diameter of idler shaft ..... 22.19/22.21 mm (0.873/0.874 inch)
Clearance of bush of idler gear on shaft ..... 0.020/0.066 mm (0.0008/0.0026 inch)

Oil pressure relief valve (standard)

Diameter of bore for plunger ..... 7.1/7.5 mm (0.28/0.30 inch)
Outside diameter of plunger ..... 0.6/2.6 mm (0.024/0.102 inch)
Clearance of plunger in bore ..... 0.06/0.11 mm (0.002/0.004 inch)
Length of spring (fitted) ..... 59.8 mm (2.4 inch)
Load on spring (fitted) ..... 15.9/23 inch (3.6/5.2 lbf) 1.6/22.4 kgf
Pressure to open valve
= Without piston cooling jets ..... 340/395 kPa (49/57 lbf/inch^2) 3.4/4.0 kgf/cm^2
– With piston cooling jets ..... 415/470 kPa (60/68 lbf/inch^2) 4.2/4.8 lbf/cm^2

Oil pressure relief valve (with balancer)

Diameter of bore for plunger ..... 16.00/16.03 mm (0.630/0.631 inch)
Outside diameter of plunger ..... 15.95/15.98 mm (0.628/0.629 inch)
Clearance of plunger in bore ..... 0.02/0.08 mm(0.0008/0.003inch)
Length of spring (fitted) ..... 42.7mm (1.7 inch)
Load on spring (fitted)
– Engines without piston cooling jets ..... 24.30 N (5.4/6.7 lbf) 2.4/3.1 kgf
– Engines with piston cooling jets ..... 34.38 N (7.6/8.5 lbf) 3.5/3.9 kgf
Pressure to open valve:
– Engines without piston cooling jets ..... 414 kPa (60 lbf/in^2) 4.2 kgf/cm^2
– Engines with piston cooling jets ..... 523 kPa (76 lbf/in^2) 5.3 kgf/cm^2

Oil filter

Type ..... Full flow, screw-on type canister
Pressure to open by-pass valve in filter ..... 55.83 kPa (8/2 lbf/in^2)0.6/0.8 kgf/cm^2
Pressure to open by-pass valve in oil cooler ..... 172 kPa (25 lbf/in^2)1.8 kgf/cm^2

To adjust – Lucas DPA and DPS pumps Section K7

1. Operate the engine until it reaches its normal temperature of operation and check the idle speed. If necessary, adjustment can be made by the inner adjustment screw clockwise to increase the speed or counter-clockwise to decrease the speed. When the speed is correct, tighten the locknut. The setting of the idle speed can change for different applications. The correct speed will normally be given in the manufacturer's handbook for the application. If it is not given, apply to your nearest Perkins distributor or to Technical Services Department. Perkins International Ltd., Peterborough, England.

   Caution: *The setting for the maximum no loan speed can change for different applications. Always check the fuel injection pump data plate (Fig.K12) fitted to a particular engine, before making any adjustment to the maximum no load speed.*

2. With the engine at its normal temperature of operation, check the maximum no load speed. The maximum no load speed is indicated by the last part of the setting code for the fuel injection pump. The setting code can be found on the data plate (Fig.K12/1) on the side of the fuel pump. A typical setting code is 2643C618DM/1/2420. In this example, the maximum no load speed is 2420 rev/min. If necessary, this speed can be adjusted by the outer adjustment screw (Fig.K11/2). Release the locknut and rotate the adjustment screw counter-clockwise to increase, or clockwise to decrease, the speed. When the speed is correct, tighten the locknut and seal the screw. The person who fits the pump must ensure that the adjustment screw is suitably sealed against interference after it has been set initially.

   The adjustment screw on original fuel pumps is set and sealed by the manufacturer. The setting must not be changed as this could affect the engine warranty.

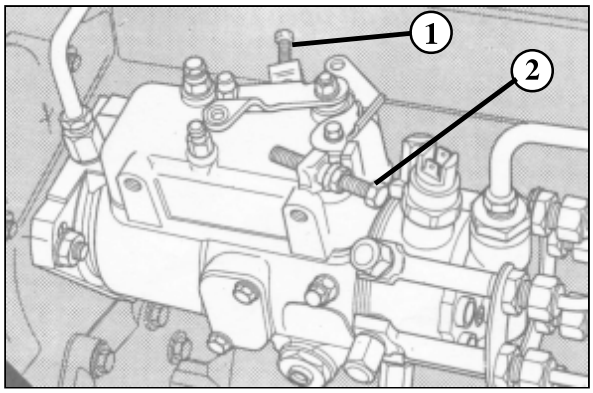


Fig. K11

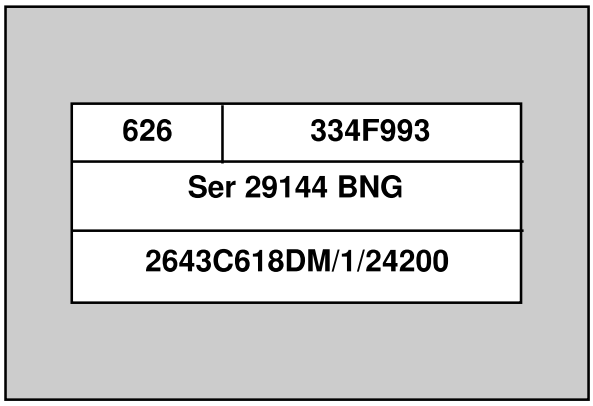


Fig. K12

Section L
Cooling System

General Description

Coolant from the bottom of the radiator passes through the centrifugal coolant pump, which is fitted onto the front of the timing case to assist the flow of the coolant through the system

The pump is gear driven from the gear of the fuel injection pump.

On certain applications the pump is driven by a “V” belt from the crankshaft pulley.

From the pump, the coolant passes through a passage in the timing case.

Coolant pumps driven by a “V” belt pass the coolant through the pump body to the front of the cylinder block.

The coolant passes through a passage in the left side of the cylinder block to the rear of the cylinder block.

If a lubricating oil cooler is fitted, some of the coolant passes around the element of the cooler and then to the rear of the cylinder block.

If the plate type oil cooler is fitted on the left side of the engine, coolant from the by-pass connection at the rear of the coolant pump passes through a pipe to the oil cooler.

Some engines have modine type oil cooler fitted between the oil filter canister and the oil filter head (Some naturally aspirated engines and 4.41 engine).

The coolant then passes around the cylinders and up into the cylinder head. The coolant leaves the cylinder head at the front and passes into the thermostat housing.

If the thermostat is closed, the coolant goes directly through a by-pass to the inlet side of the coolant pump. If the thermostat is open, the thermostat closes the by-pass and the coolant passes to the top of the radiator

Coolant pump – belt driven

To dismantle and To assemble **Section L5**

Special Tool:
Standard bench press
Consumable products:
POWERPART Retainer (Oil tolerant)

To Dismantle

1. Remove the coolant pump (Fig.L12) from the engine, operation Section L4
2. Remove the circlip (Fig.L12/4) for the bearing housing
3. Support the pulley end of the pump and press the shaft (Fig.L12/6) through the impeller (Fig.L12/1) and coolant seal (Fig.L12/2). This will remove the bearing (Fig.L12/7).
4. Remove the impeller. Discard the coolant seal.
5. Support the pulley end of the pump and press out the bearing (Fig.L12/8). Discard the bearings.
6. Clean the body of the pump in a suitable safe cleaning fluid. Examine the pump body for cracks.

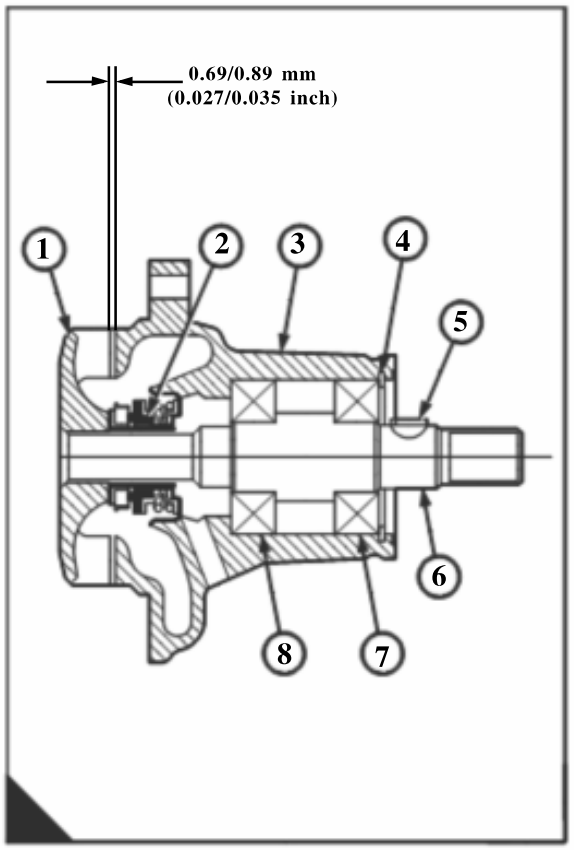


Fig. L12

Section M
Flywheel and Flywheel Housing

Flywheel housing

To Remove and to Fit **Section M3**

Warning! *The flywheel housing is heavy, use lift equipment or get help to assist with the lift operation before removal of the flywheel housing fasteners.*

To Remove

1. Remove the starter, operation N5, and the flywheel, operation Section M1.
2. Release the housing setscrews and with a soft face hammer, hit carefully the housing to remove it from the dowels.

To Fit

1. Ensure that the rear face of the cylinder block and the faces of the housing are clean and free from damage. Ensure that the location dowels are fitted correctly. If a felt seal is fitted to the rear flange of the sump, renew the seal.
2. Fit the housing onto the dowels and tighten lightly the setscrews.
3. Check the housing concentricity with a dial test indicator (Fig.M3). The run-out limit is given in the data and dimensions. If any adjustment is necessary, it must be made on the housing and the concentricity checked again.
4. Tighten the setscrews to the torque recommended in Section B.
5. Check the housing alignment (Fig.M4). The maximum tolerance is given in the data and dimensions. Any necessary adjustment must be made on the housing and not on the cylinder block.
6. Fit the flywheel operation Section M1 and the starter motor operation Section N5.

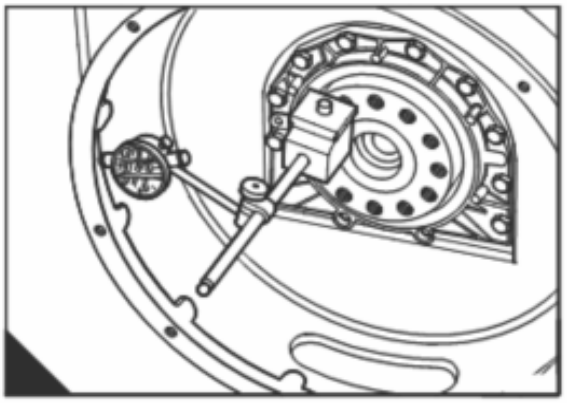


Fig. M3

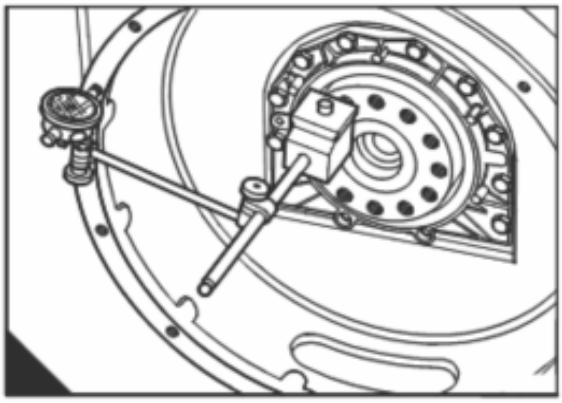


Fig. M4

Section N
Electrical Equipment

Data and Dimensions

Note : This information is given as a guide for personnel engaged on engine overhauls. The dimension which are shown are those which are mainly used in the factory.

Electrical equipment

The information which follows is general and can change with individual applications.

Starting aid

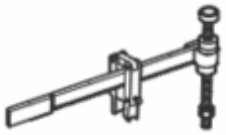
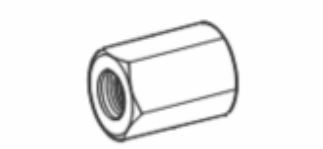
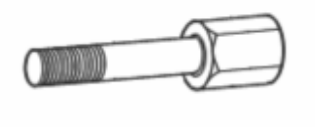
Type ..... Fuel fed, electrically operated heater

Voltage ..... 12V(dropping resistor used on 24V system)

Flow rate of fuel through starting aid ..... 3.5/5.9 ml/min

PROBLEM	POSSIBLE CAUSES	REMEDY
BLUE/WHITE SMOKE	Incorrect grade of lubricating oil	Drain and refill with specified grade of oil
	Overfilled air cleaner oil or use of incorrect grade (wet type air cleaner)	Check the oil level and remove as necessary or of oil refill with correct grade oil
	Incorrect fuel pump timing	Check and reset
	Excessive Fuel / Oil consumption	Check and reset
	Faulty injectors	Check / renew
	Incorrect valve timing	Check and reset
	Poor compression	See Problem – Poor Compression
	Cylinder head gasket leaking	Check the cylinder head bolts torque or renew the gasket
	Incorrect tappet adjustment	Check and reset the adjustment
	Worn cylinder bores	Re-sleeve block and fit new pistons
	Broken, worn or sticking piston ring/s	Fit new rings, check bore and pistons for damage
	Worn valve stems and guides	Renew valves and guides
	Piston seized damage	Replace piston assembly and check the bore for
LOW ENGINE OIL PRESSURE	Incorrect grade of lubricating oil	Drain and refill with specified grade of oil
	Worn or damaged big end bearings	Renew the bearings
	Insufficient oil in sump	Top up as necessary
	Oil gauge faulty	Fit new gauge
	Oil pump worn	Renew oil pump
	Oil pressure relief valve faulty	Fit new relief valve
	Faulty suction pipe	Renew the pipe
	Chocked/Plugged oil filter	Replace with new filter
	Blocked sump strainer	Clean the strainer

Section S
LIST OF SPECIAL TOOLS

Number	Description	Illustration
PD.206	Replacer tool for pistons Part number 21825617	
PD.208	Dial gauge for use with PD.41D. Part number 21825617	
PD.221A	Piston position probe Part number 21825630 (now available with a whistle PD.221A) Part number 21825947	
PD.6118B	Valve spring compressor. Part number 21825947	
PD.6118-7	Stud adaptor for use with PD.6118B Part number 21825672	
PD.6118-8	Setscrew adaptor for use with PD.16118B Part number 21825673	
MS.67B	Universal timing gauge Part number 21825610	

7A.5 FRONT HUB

Overhaul

Dis-assembly

1. Raise the front of the tractor
2. Remove the wheel
3. Remove the hub – cap.
4. Remove and discard the split pin.
5. Remove the slotted nut and washer
6. Remove the hub assembly complete with bearing and seal from the spindle housing assembly.
7. Remove the outer bearing cone.
8. Tap out the outer bearing cup.
9. Remove the seal.
10. Drive out the inner bearing cup.
11. Remove the bearing cone.
12. Remove the dust shield.

Examination :

13. Completely clean the hub components using cleaning solvent and check the condition of the hub, spindle and bearings. Any worn or damaged components should be replaced. Always fit a new seal with the lip facing outward and fit the seal right into the recess of the hub.

Re-assembly:

14. Reverse procedures 1 to 11.
15. Pack the bearings with an approved grease during assembly.
16. Always fit a new seal with the lip facing inward and fit the seal right into the recess of the hub.
17. Tighten the slotted nut to 60 lbf ft (80 Nm) then slacken off the nut to the nearest split pin hole to give the correct end float.
18. Refit the hub cap.
19. Front wheel nut torque 70 lbf.ft (95 Nm).

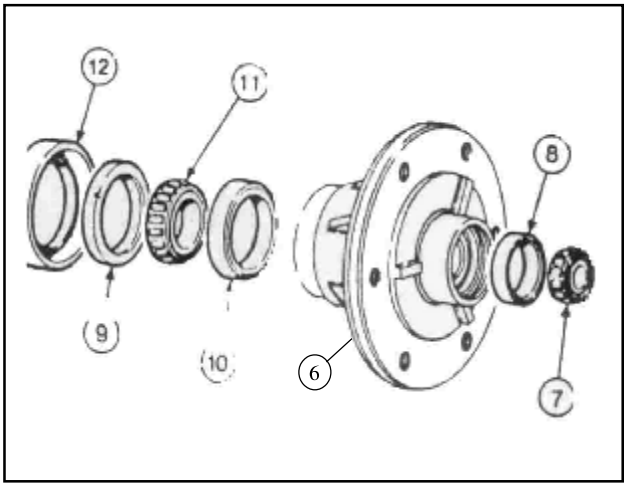


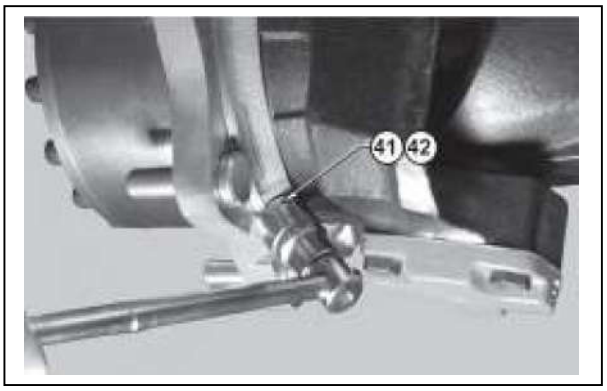
Fig 4

7B.4 PLANETARY REDUCTION
Removal & Refitment

Removal

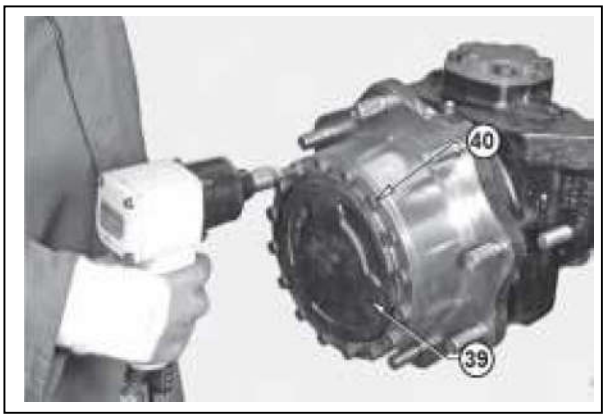
CAUTION! Perform all operations on both arms.

Remove the oil-level plug (41) (42)



7

Remove the securing screws (40) from the spider cover (39)

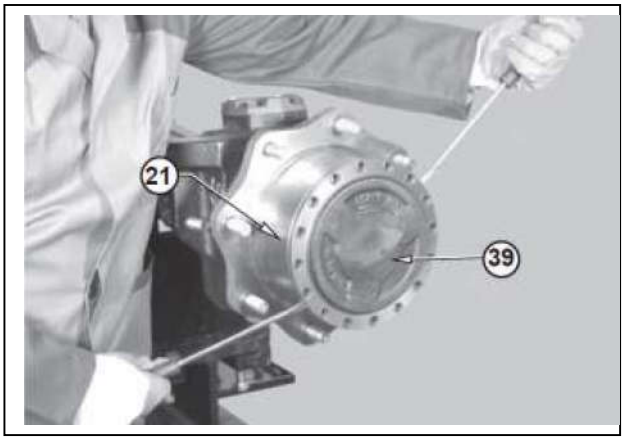


8

Using two screwdrivers or two level inserted in the

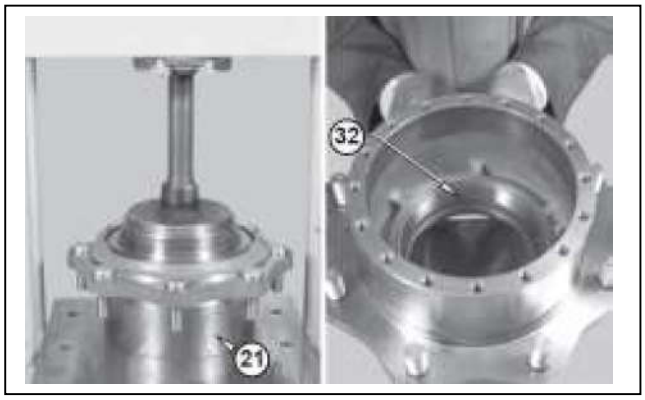
Slots provided, pry the planetary gear carrier (39)

Away from the wheel hub (21).



9

Position the upper part of tool and press the thrust blocks (32) into the hub (21) all the way down.



37

Fit the hub (21)

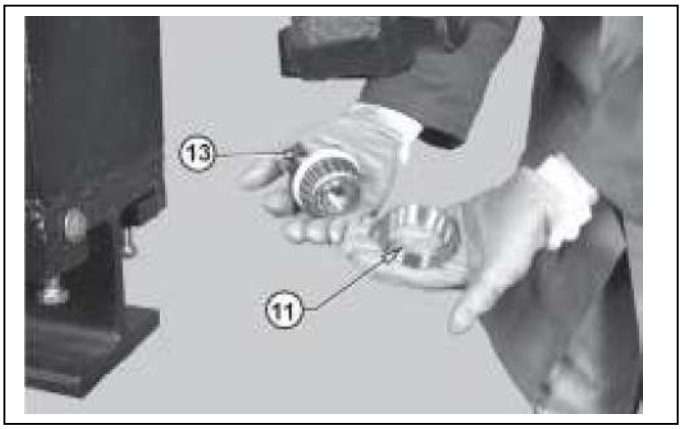
38

In order to fasten the flange, use a plastic hammer and alternately hammer on several equidistant points.

39

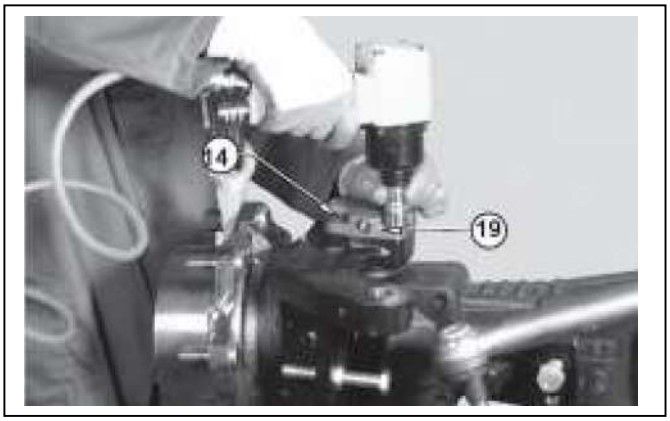
67

Remove the thrust block(11)and the pivot pin (13).



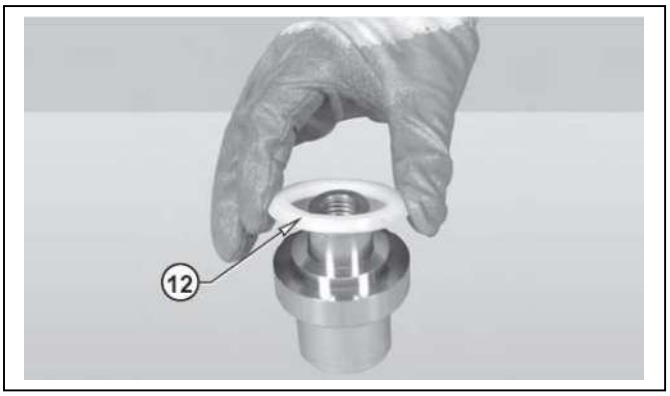
68

Unloose and remove the fittin screws (14) from the cover (19)



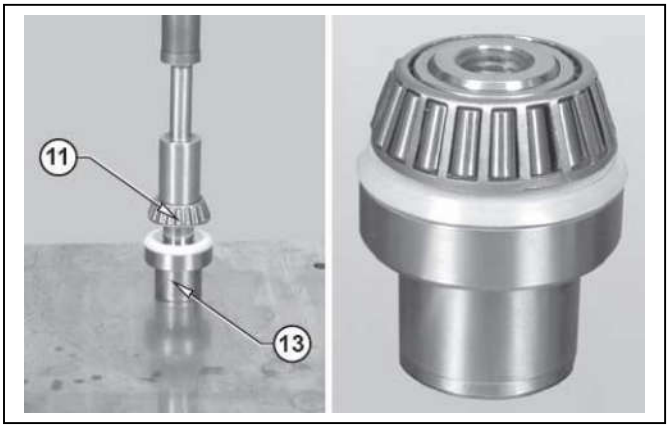
69

Install the backup-ring (12).



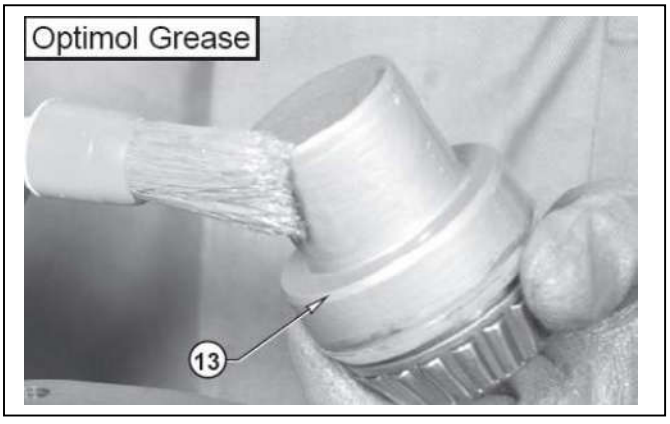
97

Press the bearing (11) on the pivot pin (13).



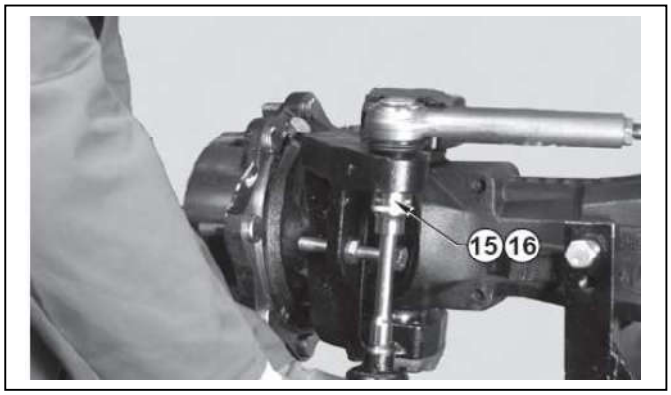
98

Lubricate the pivot pin (13)



99

Remove the nuts that lock the steering case (15)(16).



127

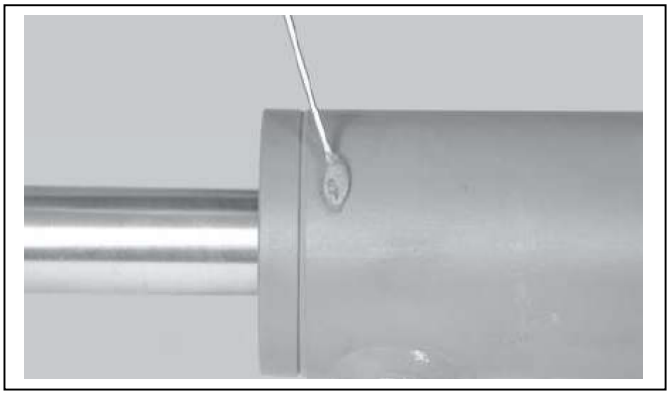
Disconnect the tapered pins of the articulation from the steering case by a hammer of a puller.

128

Disconnect steering bars (2) from the piston(1).

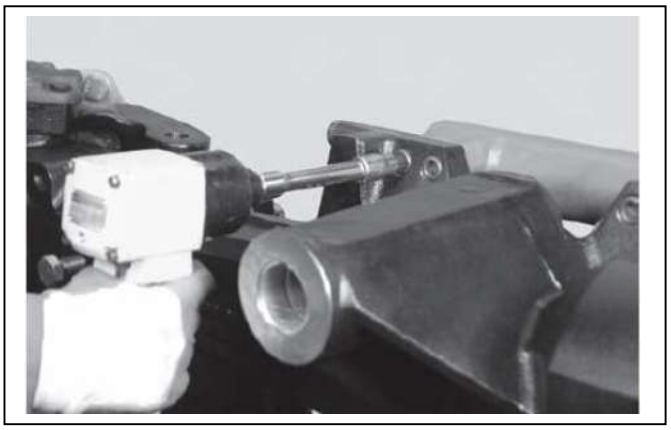
129

Seal the hole with silicon.



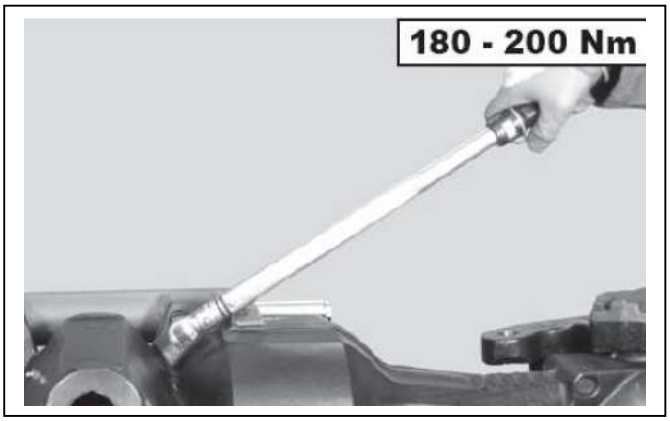
157

Lock the cylinder by cross-tightening the screw (4).



158

Torque wrench setting: 180-200Nm.



159

Using the plastic hammer, take the half box (21) (23) to pieces.

187

Remove the No SPIN (24) differential system.

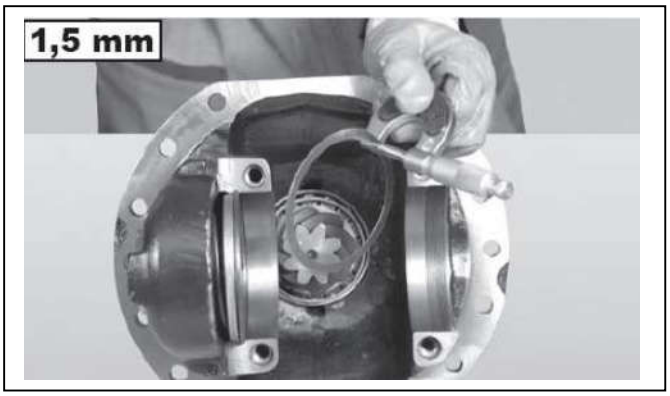
188

Remove the pinion (10).

189

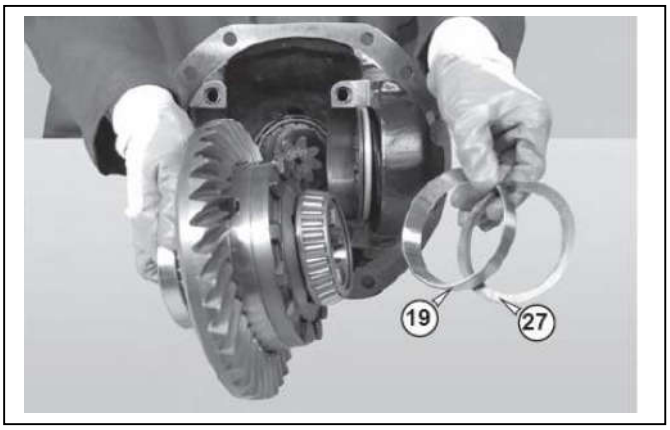
SETTING OF THE CROWN WHEEL AND PINION

Insert the thrust block of the bearing (9) opposit side of the crown wheel shim 1,5mm about.



217

Install the shim (27) and the thrust block (19).



218

Insert complete differential.

ATTENTION! Do not damage the gearwheel.

219

Dual Clutch

Part A

Table of Contents

8 X 2 Transmission

SECTION 9

Transmission

INDEX

Part A

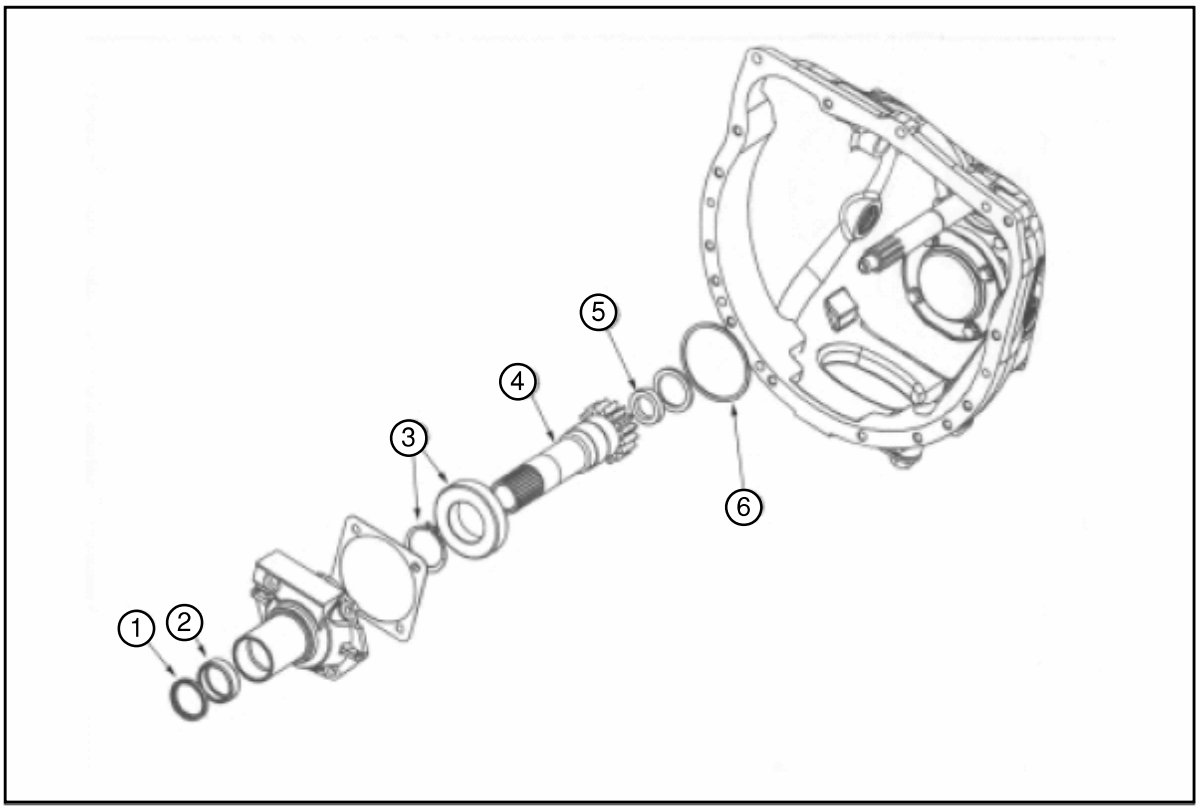


Fig. 8

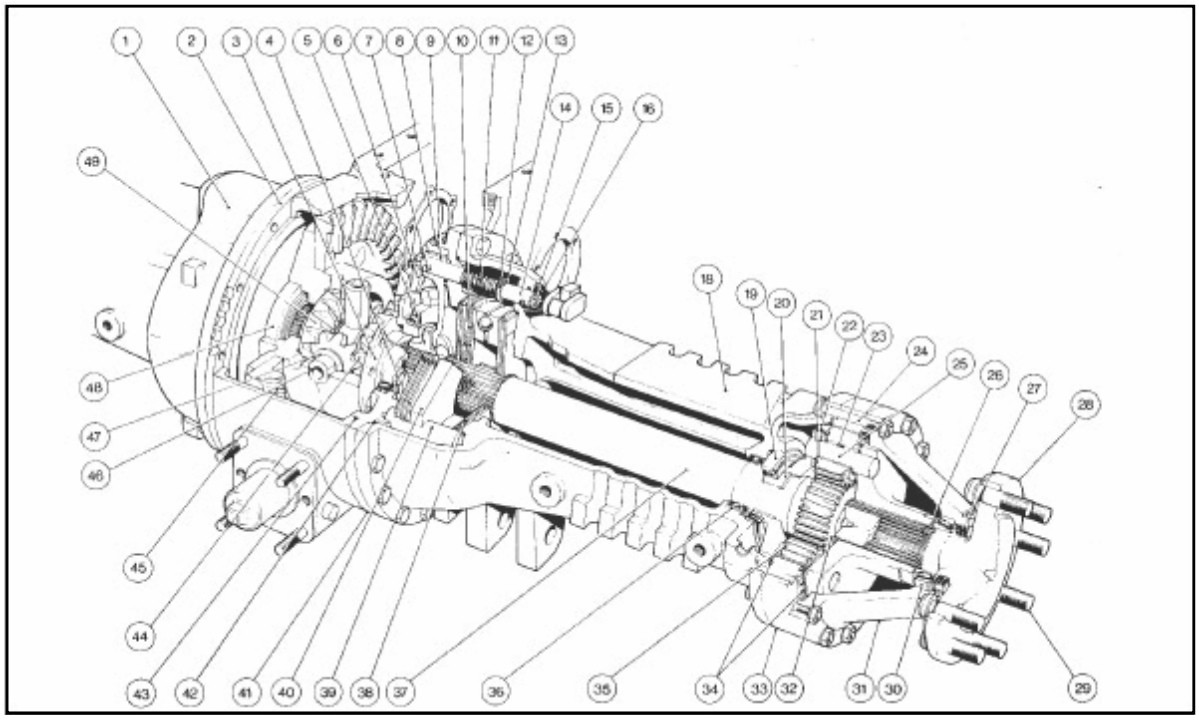
Removal and Disassembly

1. Remove the clutch release mechanism.
2. Loosen and remove the main drive retainer bolts
3. Remove the main drive retainer housing with PTO pinion shaft and gasket.
4. Remove the PTO pinion shaft retaining ring. (Item 6 in Fig. 8).
5. Push the PTO pinion shaft complete with bearing out of the housing.
6. If necessary remove the circlip and press the bearing off the Shaft. (Item 3 in Fig. 8) by using SER / 038 hand press tool.
7. Remove the PTO pinion shaft oil seal. (Item 5 in Fig. 8).
8. Remove the oil seal from main drive housing (Item 1 in Fig. 8).
9. Remove the needle roller bearing by using SER / 075 (Item 2 in Fig. 8).

Reassembly and Refitment

1. Install the needle roller bearing into the housing by using SER / 075 (Item 2 in Fig. 8).
2. Fit a new oil seal into the housing by using SER / 036 and seal lip facing away from the tool. (Item 1 in Fig. 8).
3. Fit a new oil seal in the PTO pinion shaft with lip of the seal facing the tool by using SER / 076 (Item 5 in Fig. 8).
4. Refit the PTO pinion shaft bearing onto the PTO pinion shaft and refit the circlip, and check that it is properly seated. (Item 3 in Fig. 8).
5. Refit the PTO pinion shaft into the main drive housing.
6. Refit the circlip (Item 6 in Fig. 8) and check that it is properly seated.
7. Smear petroleum jelly to lubricate oil seals lips.
8. Insert the main drive retainer housing with new gasket and PTO pinion shaft into the Input shaft.
9. Replace the housing bolts (pre coated) and tighten the bolts to a torque of 45 lbf. ft. (61 Nm).

Rear Axle Oil Immersed Brake



Key to Figure – 1

1	Axle Housing- Left-hand	18	Axle Housing – Right-hand	34	Gasket
2	Carrier Plate - Left-hand	19	Epicyclic Hub-Inner bearing	35	Planet Gear
3	Differential lock Coupler cap	20	Epicyclic hub – bush	36	Inner Oil seal
4	Differential lock Coupler	21	Thrust Washer	37	Axle shaft
5	RH Differential bearing	22	Roll pin	38	Brake friction plate
6	Pinion Assembly	23	Needle rollers	39	Brake stop rod
7	Roll pin	24	Epicyclic unit securing bolts	40	Actuator unit
8	Ground Speed gear	25	Planet gear-shaft	41	Carrier plate-Right-hand
9	Differential lock coupler fork	26	Half ring	42	'O' ring- Outer
10	Brake interplate	27	Outer oil seal	43	'O' ring- Inner
11	Differential lock return spring	28	Stub axle	44	Differential gear-RH
12	Washer	29	Wheel stud	45	Crown wheel
13	Circlip	30	Outer Bearing	46	Cross shaft
14	Differential lock actuating shaft	31	Cover Rear Drive	47	Thrust washer
15	Differential lock adjusting nut	32	Sun gear	48	Differential Bearing
16	Dust cover	33	Ring Gear	49	Differential Gear-Left-hand

c. Apply a few drops of stud lock, then fit and tighten the stabilizer mounting bolts to a torque of 170 lbf ft (230 Nm).
d. Brush the wheel stud threads clean.
e. Refit the rear wheel and lightly oil the stud threads before fitting the wheel nuts.

Tractors fitted with 11/16 inch (17.5 mm) diameter studs.

Tighten the nuts progressively and evenly to a torque of 240 lbf ft (325 Nm).

Note : *The full quantity of oil, as stated in the specification will not be required as approximately 0.66 gal (2.5 liter) will be trapped by the carrier plates in the axle housing.*

16. Adjust and balance the brakes.

ACTUATOR MECHANISM

Removal and Refitment

Removal

1. Remove the right-hand axle housing. (see operation 10 .8)
2. Manoeuvre the axle housing assembly off the jack and stand it on end.
3. Lift up the rubber seal
4. Release the locknut.
5. Rotate the differential lock operating lever out of engagement with the actuator fork.
6. Unscrew the fork from the shaft complete with its locknut and rubber seal.
7. Remove the carrier plate. (see operation 10 .11)
8. Remove the shaft, complete with the spring, washer, circlip and 'O' ring.

Examination

Examine the shaft for signs of wear or scoring. Clean and degrease the threads in the end of the shaft, and on the actuator fork.

Refitment

9. Fit a new 'O' ring to the shaft. If renewing the shaft, a new washer and circlip should be fitted.
10. Refit the shaft taking care not to damage the 'O' ring.
11. Refit the spring.
12. Refit the carrier plate. (see operation 10 .11)
13. Smear the threads of the actuator fork with loctite 241, then screw the fork fully into the shaft.
14. Unscrew the actuator fork until it will engage the differential lock operating lever in the horizontal position.
15. Tighten the locknut.
16. Push the rubber seal into position.

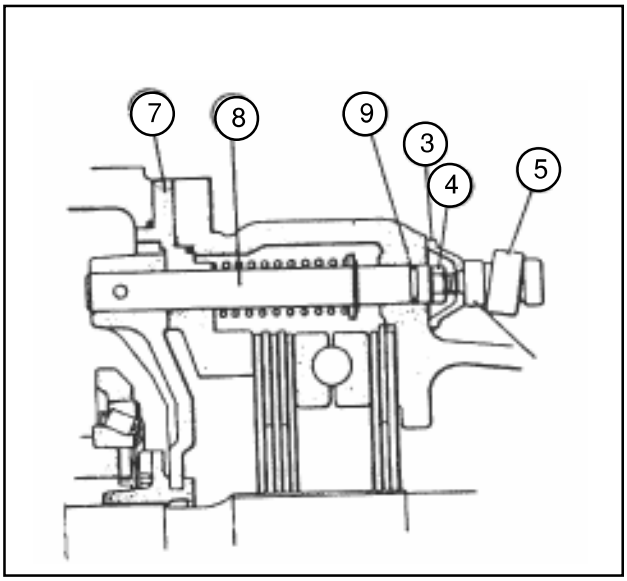


Fig 26

locking collar.

Before refitment, the pinion assembly should be freely lubricated with clean transmission oil.

17. Refit the pinion assembly.

Fig 47

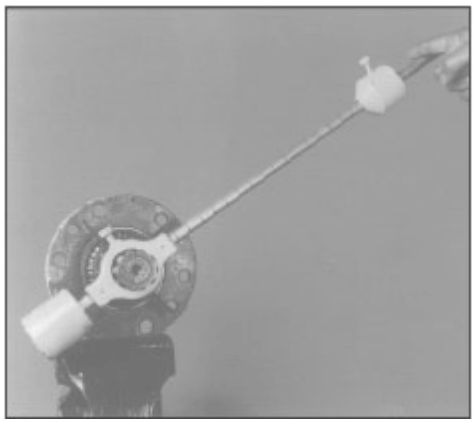


Fig 48

10 .26 REAR DRIVE SHAFT

Servicing

Special tools: SER/022 Needle Roller Bearing Puller
SER/063 Needle Roller Bearing Driver
SER/058 Universal Handle

Disassembly

1. Remove the lift cover.
2. Remove the split pin from the shear tube.
3. Remove the shear tube.
4. Remove the rear drive shaft.
5. Locate the end of SER/022 underneath the bearing cage.
6. Extract the bearing.
7. Remove the plunger and spring.

Examine the drive shaft for signs of wear and fit a

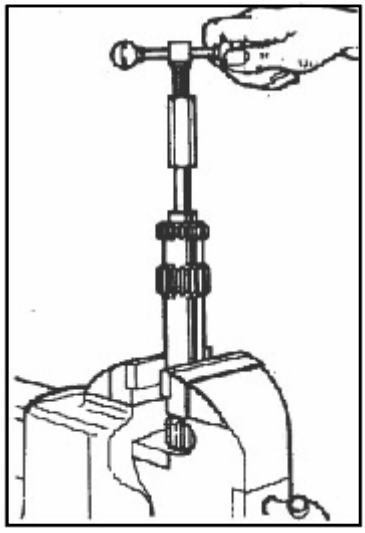


Fig 49

Draft Control - tension force in the top link (Fig. 9).

Variations in ground conditions will cause fluctuations in the draft force in the top link. If the draft force decreases, the compression force in the control spring decreases. The Draft Control linkage follows the control spring plunger under the influence of the breakout spring in the guide rod (7), and moves the Draft Control link rearwards. The vertical lever (4) pivots and moves the pump control valve, via the lever (5), towards discharge. When the correct depth is obtained, the valve is restored to neutral. An increase of draft force in the top link will have an opposite effect.

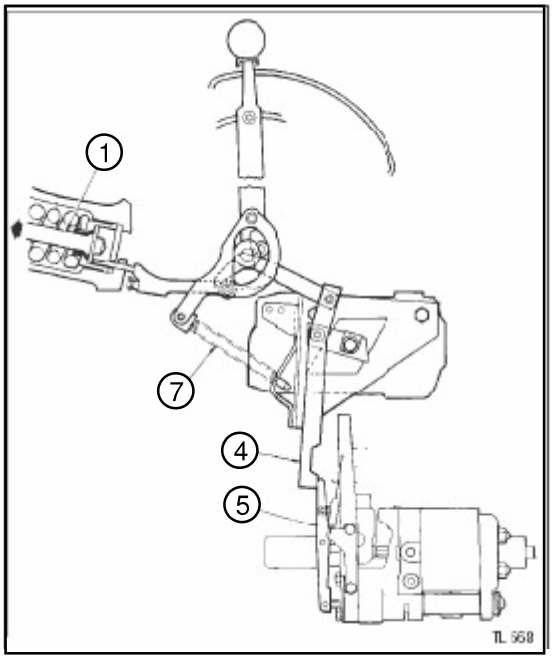


Fig.9

Position Control - implement lowering (Fig. 10).

With the Draft Control in the fully UP position downward movement of the Position Control Lever causes the eccentric roller (2) to force the cam (3) downwards. The breakout spring pushes the Position Control link (1) to maintain contact between the roller (8) and the eccentric cam on the cross shaft (9), and the front roller (6) moves the cam (3) rearwards, causing the vertical lever to pivot and move the pump control valve, via the lever (5) into the discharge position.

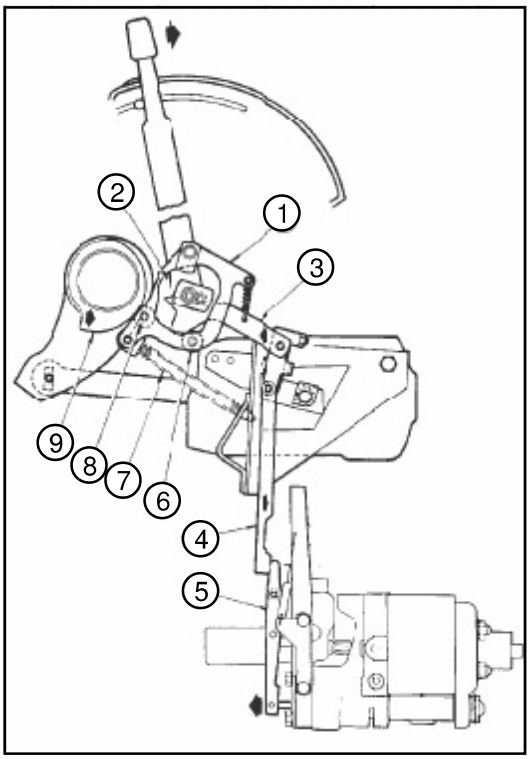


Fig.10

Quadrant location:

1. Slacken the two bolts.
2. Slacken the two barrel nuts.
3. Locate the inner quadrant in the centre of the elongated hole.
4. Tighten the two barrel nuts.
5. Locate the outer quadrant in the centre of the elongated hole.
6. Tighten the two bolts.

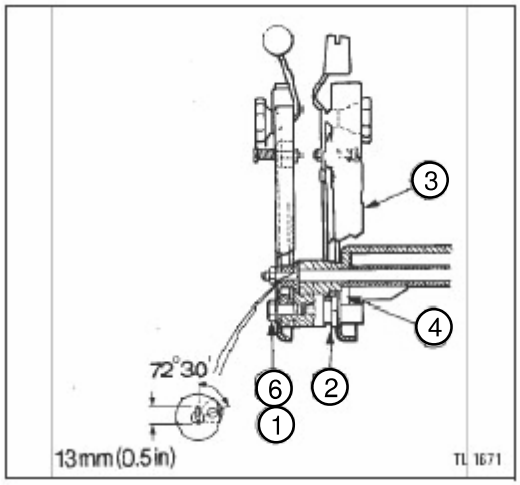


Fig 29

Draft Control rod adjustment

1. Place the Draft Control lever in the UP position.
2. Place the Position Control lever in the Transport position.
3. Using MF.333, adjust the set screw to give a clearance of 0.228 inch (5.8 mm) between the set screw and the lift cover casting.

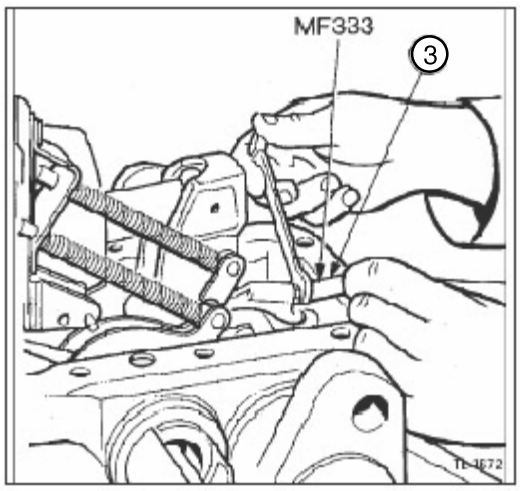


Fig 30

Draft Control neutral setting

1. Slacken the locknut.
2. Slacken the hexagon socket grub-screw and locknut on the vertical lever to the end of its thread. This will ensure that no interference from the Position Control linkage takes place.
3. Release the tabwasher.
4. Slacken the nut.
5. Position MF.273 A on the lift cover.
6. Apply a load of 1.3 kg (2.86 lbs) to the end of the vertical lever. This simulates the force of the linkage pump control spring (a spring balance can be used if no tool is available).
7. Locate MF.356C on the lift cover
8. Place the Draft Control lever in the Sector position.
9. Place the Position Control lever in the Transport position.
10. Adjust the slide pivot, until the vertical lever just touches the pin on MF.356C.
11. Tighten the nut.
12. Re-check the setting.
13. Secure the nut with the tabwasher.

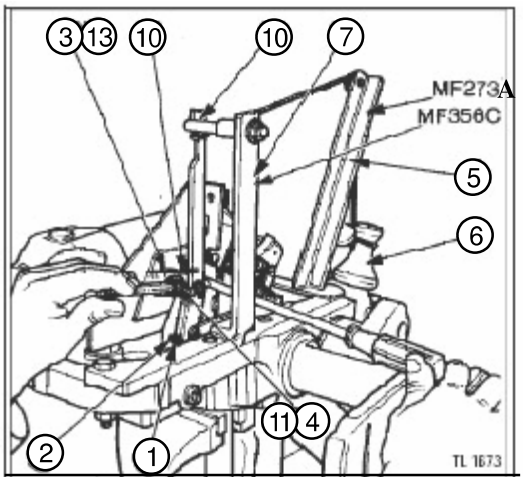
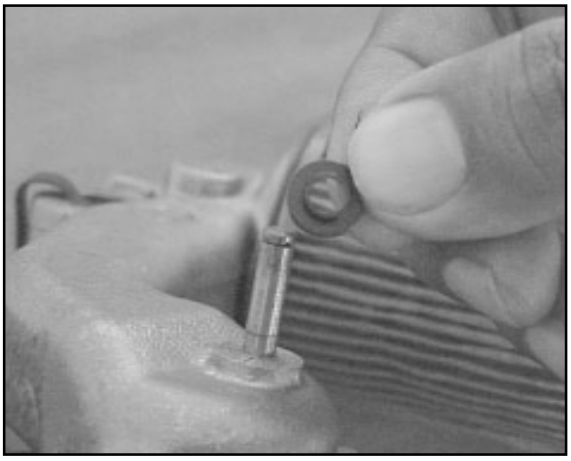
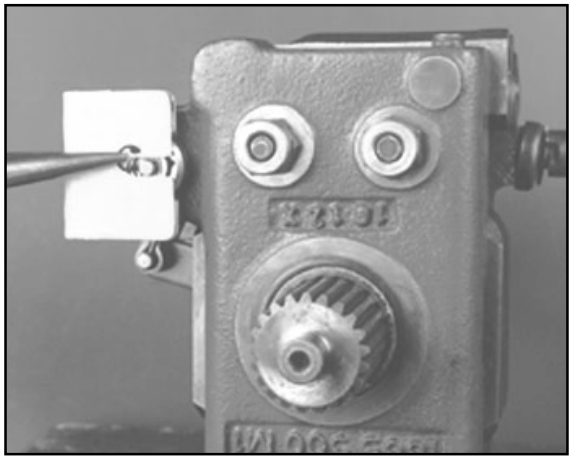


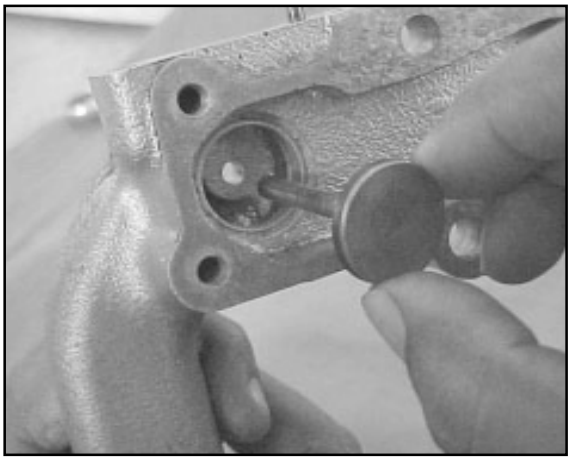
Fig 31



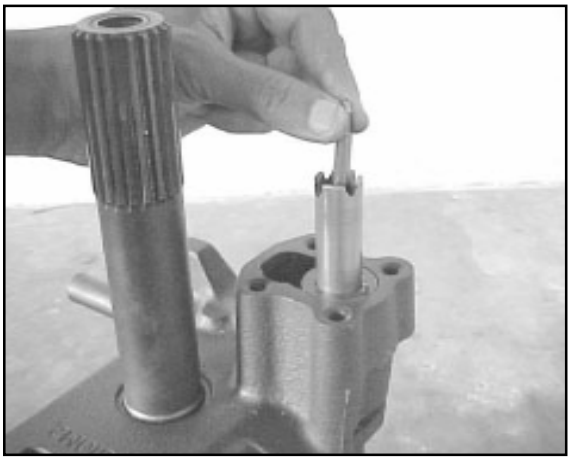
33. Remove the seal and discard it (fig 72).



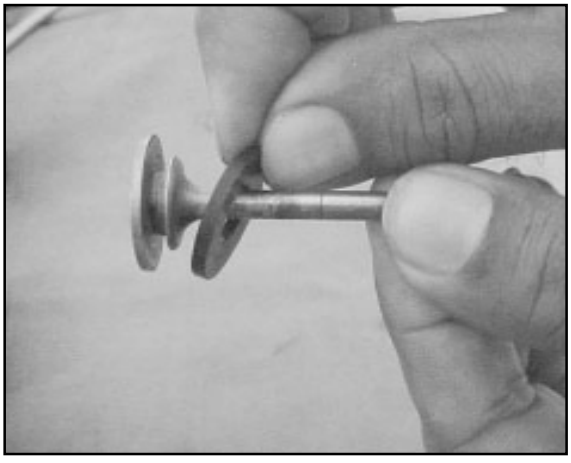
36. Remove valve spring retainer clip, slide it into position to hold back the spring tension. Remove and discard the retaining ring (fig 75)



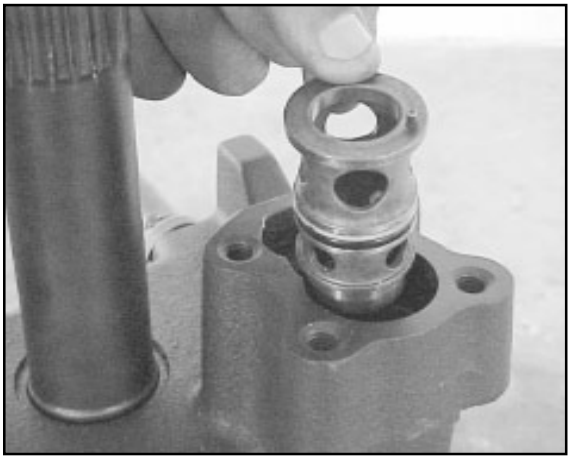
34. Remove the valve (fig 73).



37. Withdraw the control valve (fig 76).



35. Remove the seal and discard it (fig 74).



38. Withdraw the sleeve (fig 77).

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13A - 1 - Specification:

Oribitrol steering unit:

Make	...	Danfoss.
Type code	...	OSPJ 100 ON.
Nominal displacement	...	100 cubic centimeter per rev.
Relief valve presuure setting at 1200 engine RPM	...	140 bar (2030 psi).
Shock valve pressure setting	...	200 bar (2900 psi).
Reservior capacity	...	0.65 to 0.75 lts. (1.3 to 1.5 pts).

Special tools:

SER / 278	...	Holding tool.
SER / 279	...	Guide ring.
SER / 280	...	Assembly tool for 'O' ring and king ring.
SER / 281	...	Assembly tool for roto glyd.
SER / 282	...	Assembly tool for lip seal.
SER / 283	...	Assembly tool for cardan shaft.
SER / 284	...	Assembly tool for dust seal.
SER / 298	...	Hydraulic cylinder ball joint end cover tool.

Bolt torques:

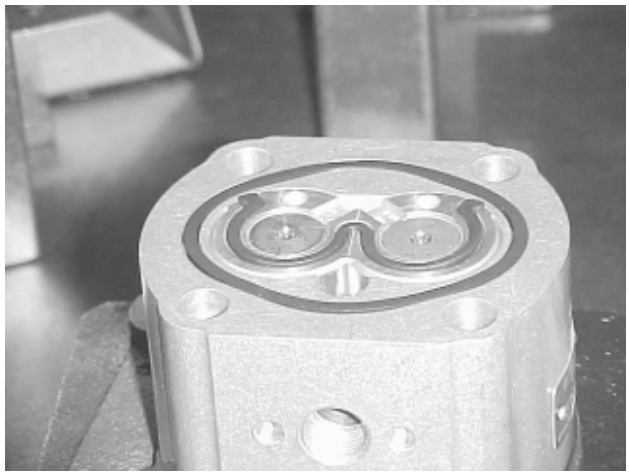
Steering uint mounting plate bolts	...	27 lbf.ft.(36 Nm).
Oribitrol mounting bolts	...	22 lbf.ft.(30 Nm).
Oribitrol relief valve plug	...	37 lbf.ft.(50 Nm).
Ball joints	...	90 lbf.ft.(122 Nm).
Clamp bolt	...	35 lbf.ft.(47 Nm).
Track adjustment bolt	...	35 lbf.ft. (47 Nm).
Ball joint nuts	...	70 lbf.ft (95 Nm).
Reservior oil fill plug	...	106 lbf.inch (12 Nm).
Mounting flange mounting bolts	...	37 + 7 lbf.ft (50 + 10 Nm).

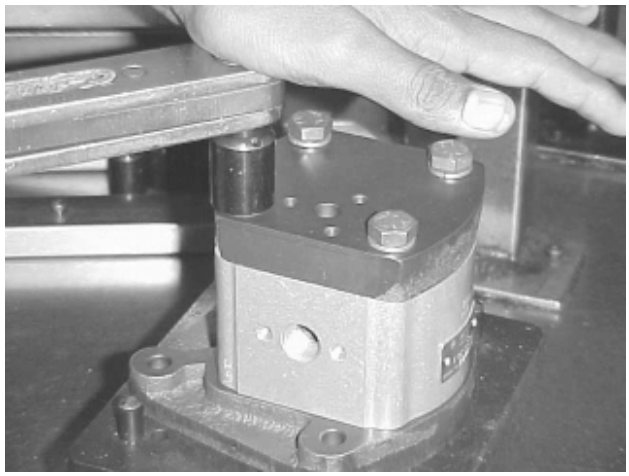
5. Remove housing along with bearing bushes & gears from mounting flange. Mark C & D on drive & driven side bush respectively
6. Remove all seals. Dis assemble bearing bushes and gears from the housing. Do not use hammer or force to separate the components.
7. Remove the mounting flange from the fixture plate. Mount it upside down. Remove circlip.
8. Remove the shaft seal
9. Clean all the components with a suitable cleaning media. Remove burrs from housing.

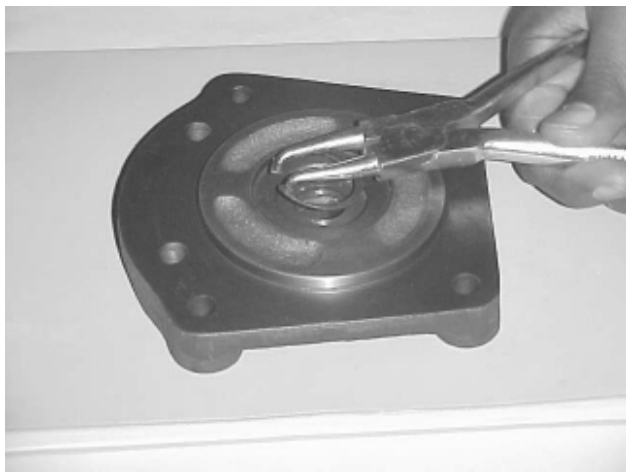
   Do not use file to deburr, use a sharp tool to scrape, such as a triangular scraper.

   Do not use cotton waste or cloth for cleaning/ wiping.
10. Examine the housing, bearing bush surfaces and the bearing sleeves for wear due to contamination etc.
11. If no severe wear is seen in the housing and bearing bushes, re-assemble the pump with new seals as per re-assembly procedure and use the pump.

    If the wear is severe, the pump can not be repaired.



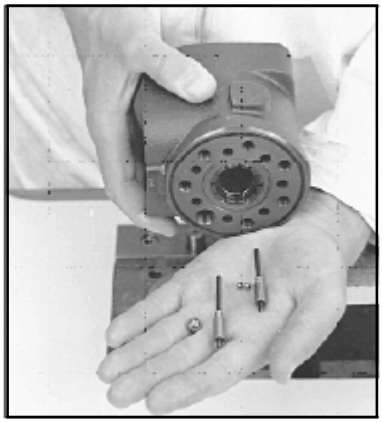




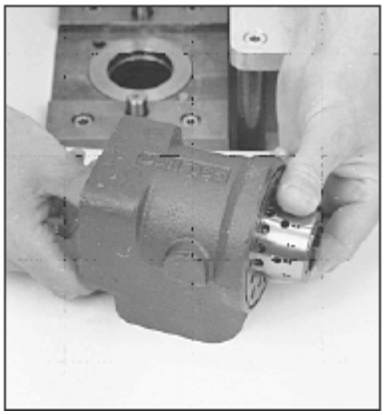
OSPJ 100 ON:

8. Shake out the check valve ball and suction valve pins and balls.

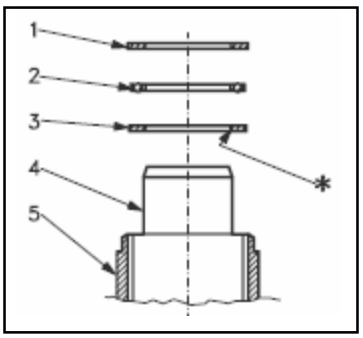
   Note:*On some pins in the OSPJ 100 ON there are two springs.Replace these pins prior to the reassembly.*



9. Take care to keep the cross pin in the sleeve and spool horizontal.The pin can be seen through the open end of the spool.Press the spool inwards and the sleeve,ring,bearing races and needle bearing will be pushed out of the housing together.



38. Fit bearing races and needle bearing as shown in drawing.



Assembly pattern for standard bearing

1 Outer bearing race

2 Needle bearing

3 Inner bearing race

4 Spool

5 Sleeve

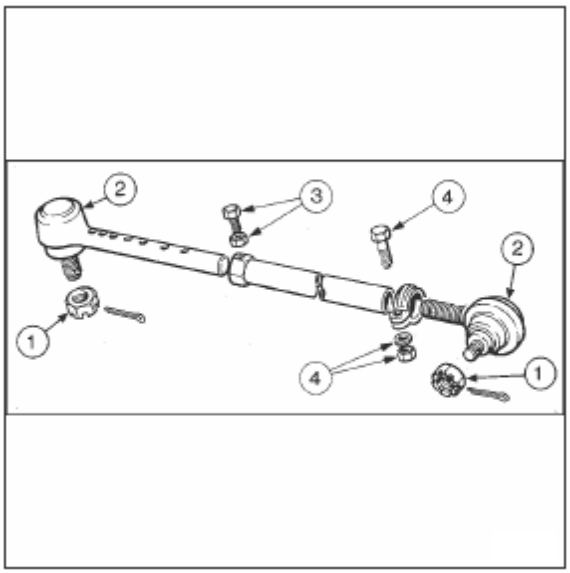
* ***The inside chamfer on the inner bearing race must face the inner spool.***

13 A - 9 - DRAG LINKS AND TIE RODS

Overhaul

Dis-assembly

1. Remove the nuts securing the ball joints to the drop arm or spindle arm.
2. Release the ball end by hitting the side of the arm while supporting the opposite side with a block of metal or heavy hammer.
3. Loosen the bolt and locknut and withdraw the ball end.
4. Loosen the clamp bolt and unscrew the ball end.



Examination

Check the ball ends for wear, replacing any defective components. These are safety critical components.

Re-assembly

5. Reverse procedures 1 to 4 except:

   a. Tighten the nuts and bolts to the following torque:

   i. Ball joint nuts 90 lbf.ft (122 Nm).

   ii. Clamp bolt 35 lbf.ft. (47 Nm).

   iii. Track adjustment bolt 35 lbf.ft.(47 Nm).

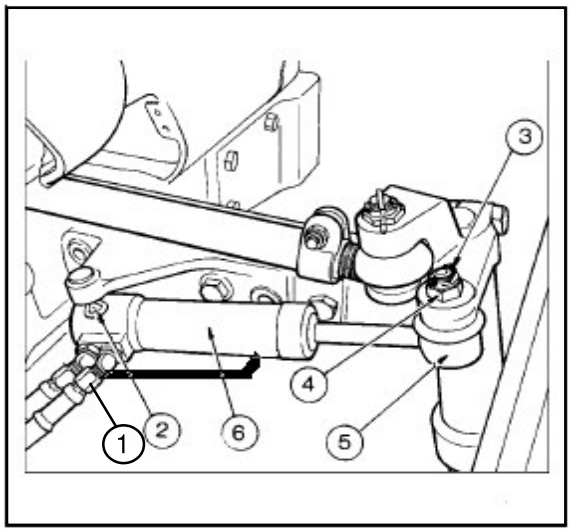
   b. Reset the front wheel toe in, see operation 7A . 2 .

13A - 10 - STEERING RAMS

Removal and refitment

Removal

1. Disconnect both hydraulic pipes to the steering ram.
2. Remove the 'R' clip from the inner pivot pin.
3. Remove the split pin.
4. Remove the slotted nut.
5. Drive the ball joint taper out of the steering arm.
6. Remove the steering ram assembly.



Refitment.

7. Reverse procedure 1 to 6 except:

   a. Tighten the ball joint nuts to a torque of 70 lbf.ft (95 Nm) for M16 UNF ball end nuts.

   b. Refill the reservoir.

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14 A . 16 FUEL TANK SENDER UNIT:

Check

Test Equipment: MF.3005 Digital Multimeter

Procedure

1. Disconnect the plug to the fuel tank sender unit.
2. Connect the MF.3005 Digital Multimeter between terminals 1 and 2. Terminal 3 is the connection for the 'Low fuel' warning light.
3. Check the contents of the fuel tank.
4. The approximate resistance reading should be as follows:

Float Position	Resistance in Ohms
Empty	10
Half	104
Full	186

5. This test will give an indication if there is a fault with the sender unit.

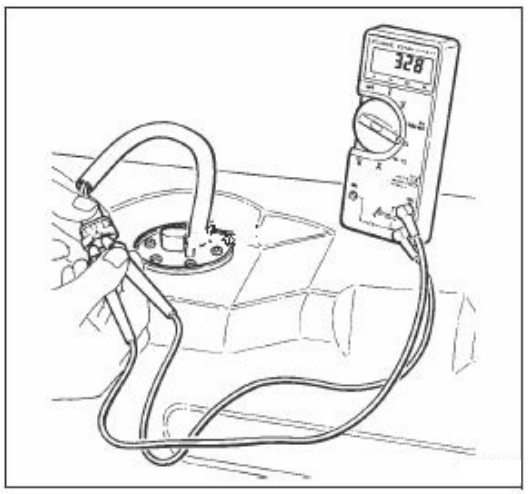

Fig 10

14 A . 17 STARTER SWITCH

Removal and refitment

Removal

1. Remove the instrument cowl.
2. Lift the hood and disconnect the battery removing the negative cable (-) first in the interest of safety.
3. Remove the rubber cover from the switch
4. Label and disconnect the wires from the rear of the switch.
5. Remove the slotted nut surrounding the key hole in the starter switch.
6. Withdraw the switch from behind the instrument panel.

Refitment

7. Reverse procedures 1 to 6.

Fig 11

Dislodge the gauge from the PCD for replacement / Service.

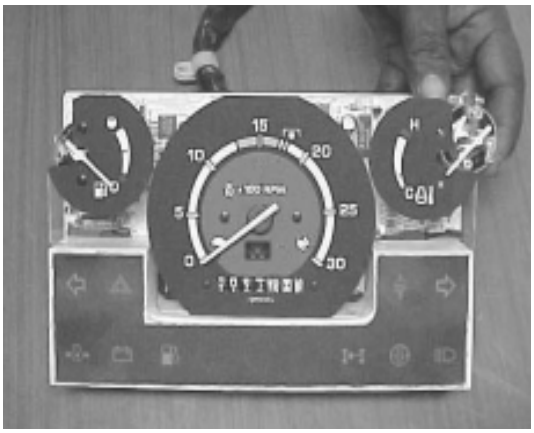

Fig 32

Take New Temperature Gauge.

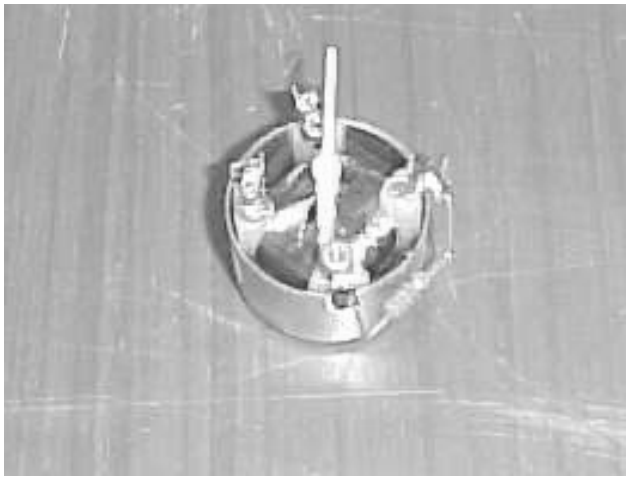

Fig 33

During Assembly, place the New Temperature gauge, such that the dummy terminal matches with the dummy hole in the PCB.

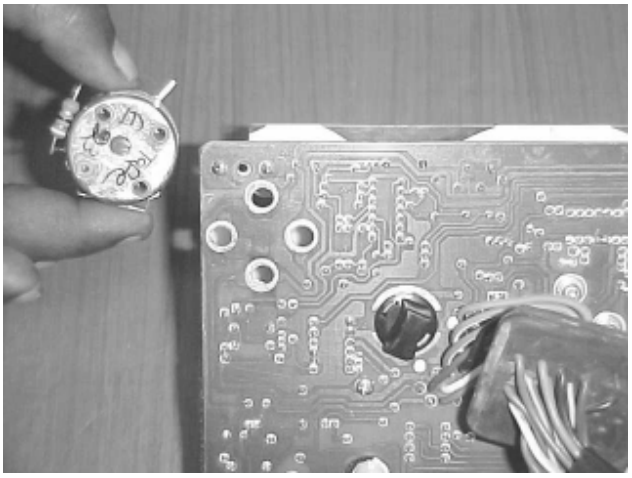

Fig 34

NOTE:

The same procedure adopted for temperature gauge from figure 10 to 14 is followed for fuel gauge dismantling also.

TEST 3 -

Checking battery voltage on load (Fig.3)Connect a voltmeter across the terminals, as shown in Fig. 3, stop control out: operate the starter switch

Diagnosis:

S.NO	RESULT	ACTION
1	Reading below 9 volts	Remove battery for recharging
2	Reading above 9 volts	Proceed to test 4

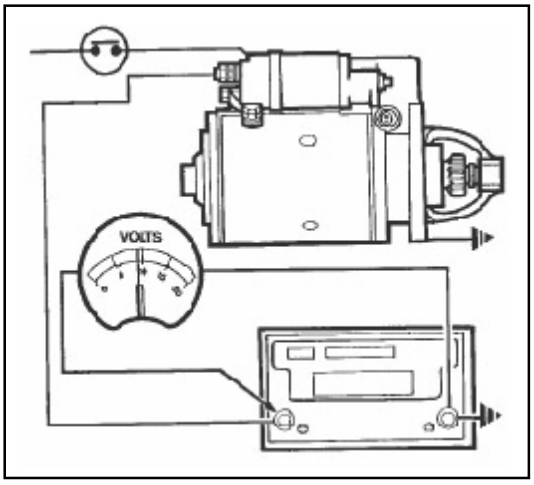

Fig. 3

TEST 4:-

Checking the voltage to the solenoid (Fig. 4)

If the solenoid operates intermittently during the test or the engine is cranked at low or irregular speed, there may be insufficient voltage at the solenoid operating winding terminal or the solenoid is faulty.

To check the circuit for high resistance (poor connections) connect the voltmeter between the solenoid operating terminal and ground (commutator end bracket) as shown in Fig. 4. When the switch contacts are closed, the reading on the voltmeter should be slightly less than the reading in the first part of test 1. A satisfactory reading indicates a negligible voltage drop in the circuit and consequently the fault may be in the solenoid.

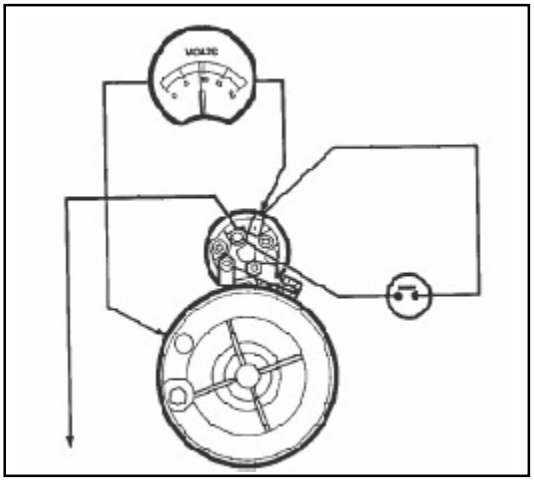

Fig. 4

TEST 5 (Fig. 5) :-

Checking the starter terminal voltage under load conditions (Fig. 5) Connect a voltmeter between the starter input terminal and ground (commutator end bracket) as shown in Fig. 5, stop control out, operate the starter switch.

Diagnosis:

S.NO	RESULT	ACTION
1	Difference in reading taken in test 3 - 0.5 volts	Check all connection
2	Same as in test 3	Proceed to test 5

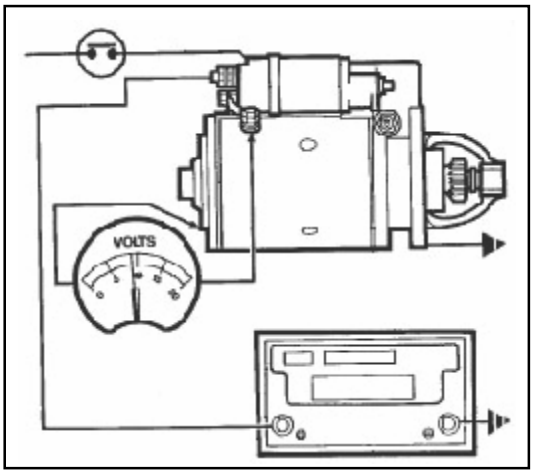

Fig. 5

TEST 6 -

Checking voltage regulator setting (Fig. 8) Before checking the voltage regulator setting, it is essential that a battery in a well charged condition is fitted to the tractor.

1. Disconnect the battery ground (-) cable.
2. Connect an ammeter between the starter solenoid terminal and the alternator main output cable.
3. Connect a voltmeter across the battery terminals. See Fig. 9.
4. Reconnect the battery ground cable.
5. Start the engine and increase the speed until the ammeter reading is less than 10 amperes. The voltmeter should be within the limits of 13.6 to 14.4 volts.

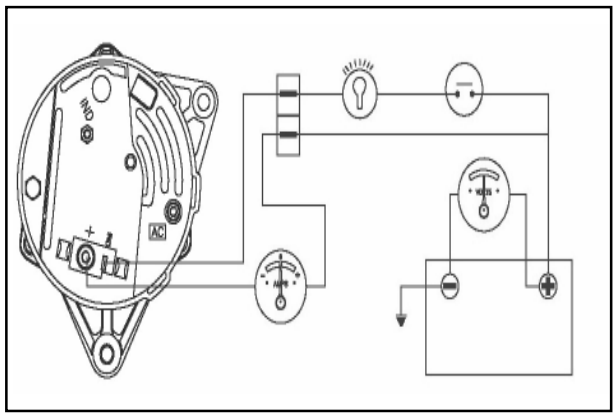

Fig 8

Diagonsis:

S.NO	RESULT	ACTION
1	Reading is unstable or outside specified limits	Voltage regulator faulty - Replace
2	Reading 13.6 - 14.4 volts	Regulator statisfactory

14C . 4 ALTERNATOR BELT TENSION:

Adjust

Procedure

1. Check the belt tension at the centre of the longest span. Allow 0.393 inch (10 mm) deflection ,when moderate finger pressure is applied to the longest run at the belt, see 'A' Fig. 4
2. If the belt tension is incorrect, slacken the mounting bolts.
3. Adjust the tension.
4. Re-tighten the bolts and recheck the belt tension.

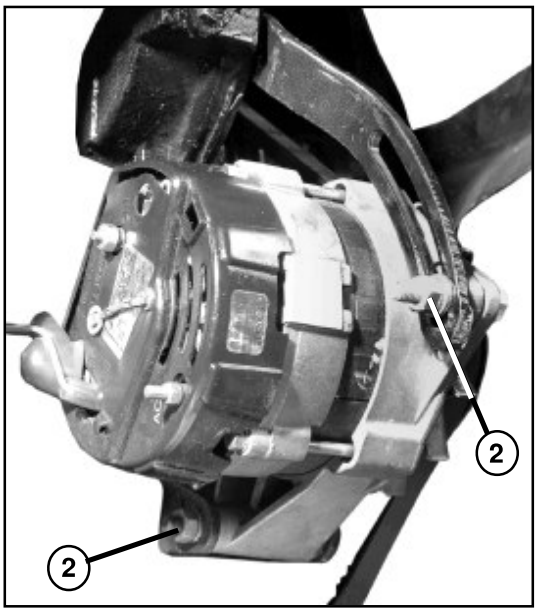

Fig 10

6. Starting at the valve location, pry the tire off the rim, taking small bites with tire levers, and ensuring that the bead on the opposite side is fully located in the mounting well. (Fig. 5).

7. With the wheel in a vertical position, pull the tire forwards and remove the tube. (Fig. 6).

Examinations

Examine the bead seating area of the rim. Remove any build-up of rust, corrosion or old rubber. Inspect inside the tire casing for foreign matter or damage.

Refitment

1. Inflate the tube until "rounded out". Place the tube in the tire with the valve located in the valve hole of the rim. Refit the valve retaining nut to finger tight. (Fig. 7).

2. Refit the tire, starting opposite the valve location taking small bites with long tire levers and keeping the fixed part of the bead fully located in the well. (Fig. 8).

   A solution of soap and water, or similar rubber lubricant, brushed onto the rim and bead will help fitment.

   Note : *Care must be taken not to pinch the tube when fitting.*

3. Centre the tire on the rim and inflate to approx. 2.5 kg/cm^2 (35 psi).

   WARNING : Never stand over the assembly when inflating, remote control inflation equipment should be used.

4. Remove the valve core and completely deflate the tire.

5. Refit the valve core and inflate to recommended pressure.

   Note : *If beads fail to seat at 2.5 kg/cm^2 (35 psi) the tube may be pinched, do not increased the pressure but remove the valve core and release tire from rim. Lubricate tire, bead and rim and re-inflate to 2.5 kg/cm^2 (35 psi) repeat process unit both beads are properly seated.*

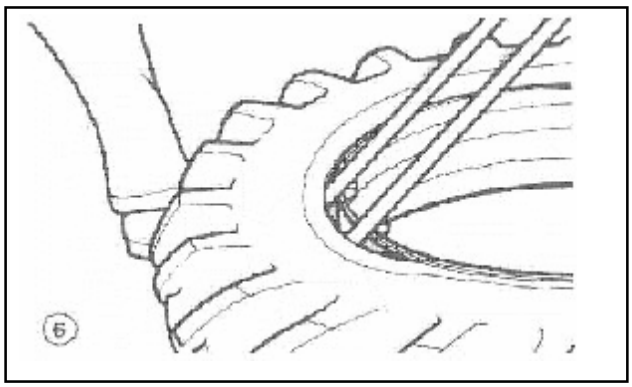

Fig. 5

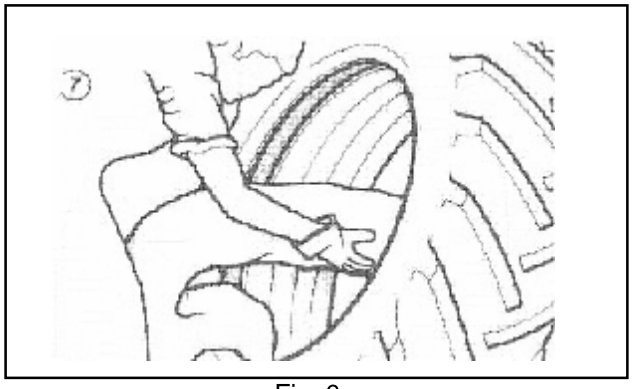

Fig. 6

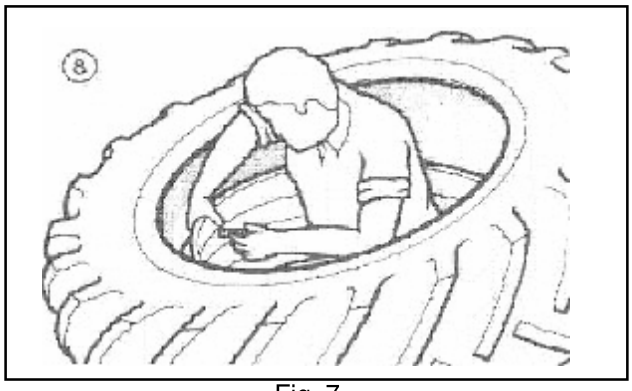

Fig. 7

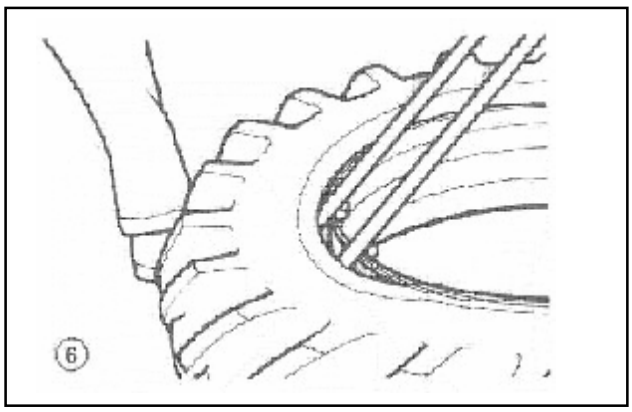

Fig. 8

16A.2 GENERAL DESCRIPTION

The three point linkage controls the vertical movements of the mounted and semi-mounted implements.

The Linkage consists of

1. Top link
2. Two lift rods
3. Two lower links
4. Two check chains
5. Interchangeable ball ends
6. Turn buckle
7. Stabilizer chains

Top link

The top link transmits the draft reaction forces from the soil engaging implements to the control spring and plunger assembly in the lift cover.

The top link consists of three main components:

1. Top ball end
2. Turn buckle barrel and spring locking clip.
3. Bottom ball end (Implement end).

The top link is adjustable for length, and the turn buckle is prevented from rotating by the spring locking clip at its top end.

Lift rods

The two lift rods connect the lift arms to the lower links having a knuckle type joint at the top end with the link arms and a swivelling bolt at the bottom end with the lower links.

The left-hand lift rod consists of two main components, knuckle joint and rod lift.

The right-hand lift rod yoke section incorporates a bevel gear levelling box, thus the length can be adjusted for attachment to the implement. By rotating the handle of the levelling box, the yoke shank is screwed out of or into the lower fork.

Lower links

The two lower links can be fitted with various types of ends as follows :

Interchangeable ball category 1 or 2.

Two holes are provided for in the lower link so that the height of lift can be varied.

A spring clip is fitted to the outer end of the lower link toward the implement for storage of the lynch pin when not in use.

Check chains

The two check chains restrict the sideways movement of the lower links to prevent or the implement fouling the inside walls of the rear tires.

The check chains are fitted between the anchor check chain bracket and the inner face of each lower link using the lift rod bolts.

Interchangeable ball ends

Interchangeable ball ends are fitted to the rear ends of the two lower links, thus category 1 and 2 implements can be used.

The ball ends are changed by pulling up a spring wire clip, laying the ball ends flat and aligning the cut out of the ball end with the slot in the lower link and sliding it out. The replacement ball is fitted by reversing the removal procedure.

Turn buckle

The turn buckles is used to adjust the length of the right-hand lift rod, to assist in hitching the implement and to adjust the implement for level.

Stabilizer chains

The two stabilizer chains are adjustable for length using the turn buckels. They must be adjusted to give implement side-swing when fully raised in the transport position.