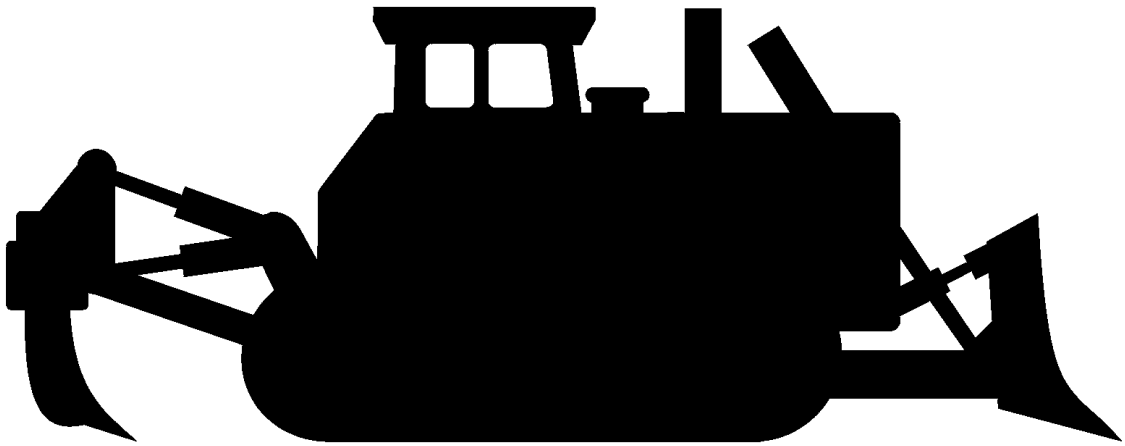
SMTD40C98/1E

SERVICE MANUAL

TD-40C

SERIAL NUMBERS
1501 AND UP



DRESSTA Co. Ltd.

A JOINT VENTURE OF KOMATSU AMERICA INTERNATIONAL CO. AND HUTA STALOWA WOLA S.A.

SAFETY PRECAUTIONS

Observe the following precautions:

1. Follow the correct method for starting the engine. Refer to the OPERATOR'S MANUAL.
2. Do not use the ether injector when the ambient temperature is above freezing.
3. For your own personal safety, always remove the ether container when welding, grinding or using a torch on the machine.
4. Do not let ether come in contact with your skin, as it can cause localized freezing.
5. Do not breathe the hazardous ether vapor.
6. Keep the fluid container out of the reach of children.
7. Never puncture the fluid container or put it into a fire. Dispose of empty container properly.
8. Do not store fluid containers in the operator’s compartment.

Never mix gasoline, gasohol or alcohol with diesel fuel. This creates an extreme fire or explosion hazard, which could result in personal injury or death.

5. SHUTDOWN

If parking on or near traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals. Also provide advance warning signals in the traffic lane for approaching traffic. Park the machine in a non-operating and non-traffic area. Park machine on level ground whenever possible. Lock the transmission selector in neutral.

Do not leave the machine with the attachment raised above the ground.

In case the machine is left without supervision, interlock the gear change lever in the neutral position and the foot brake should be applied and interlocked. The working equipment of the machine should be positioned or supported in such a way so as to exclude the possibility of damage or accident. Main electrical switch should be in the OFF position and key removed. The machine should be left in such a place that it makes no obstacle for other machines working close by.

IF THE MACHINE IS LEFT WITHOUT SUPERVISION, THE WORKING EQUIPMENT CAN NOT BE HELD BY THE HYDRAULIC SYSTEM.

Leaving the machine, lock the cab door with key.

When the machine is to be loaded onto a transport truck and trailer do so carefully. Load only when the trailer is level. The steel track shoes will slide easily on the trailer. When the machine is properly positioned, chain it securely so it can not move on the trailer.

When operating in bad weather and storm lightning is nearby, dismount and seek shelter away from the machine. Lightning will be attracted to the machine and cause serious injury or death.

SERVICE / SPECIAL TOOLS

1st Speed Range Clutch Bridge

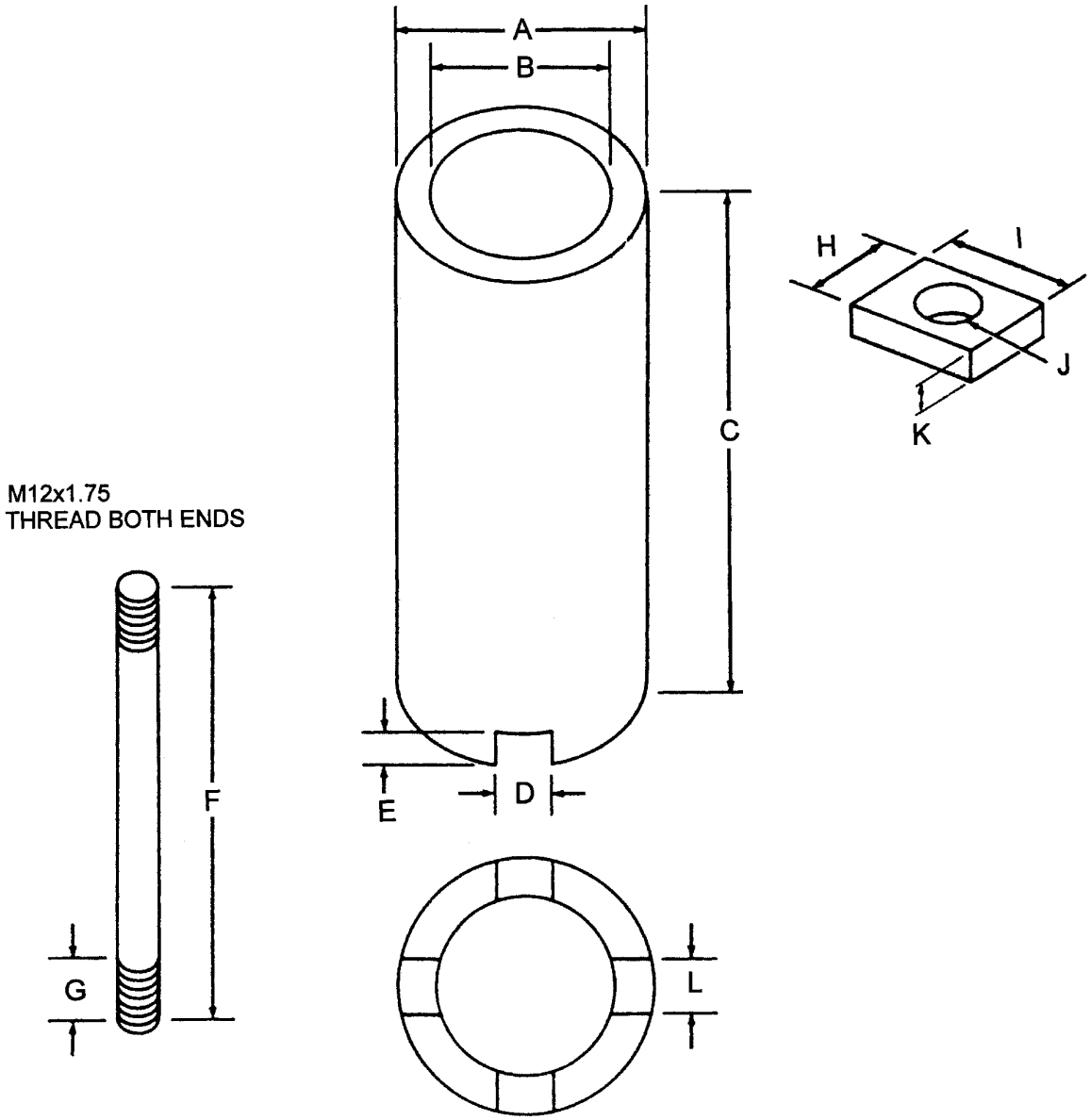


Fig. 1.6. 1st Speed Range Clutch Bridge

A .....114 mm
B .....102 mm
C .....318 mm
D .....25 mm
E .....20 mm
F.....90 mm
G.....38 mm
H .....50 mm
I.....127 mm
J .....14 mm
K .....13 mm
L.....4 slots to dimensions D and E

SERVICE / SPECIAL TOOLS

Bulkhead Spacer Fixture

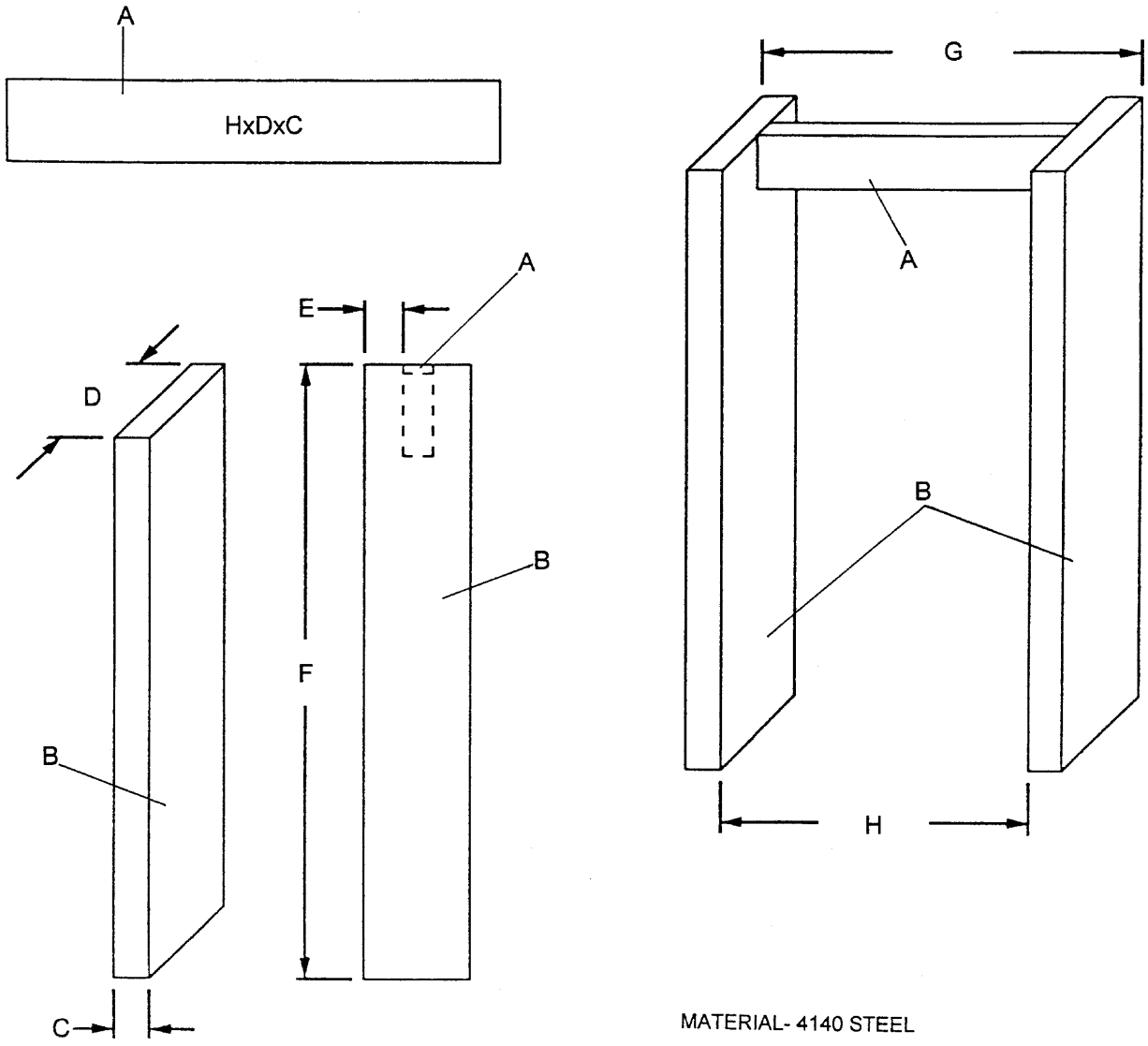


Fig. 1.16. Bulkhead Spacer Fixture

A .....Plate
B ..... Plate (2pcs)
C .....20 mm
D .....76 mm
E ..... 32 mm
F.....330 mm
G.....229 mm
H .....190 mm

SERVICE / SPECIAL TOOLS

Pivot Shaft Seal Tool

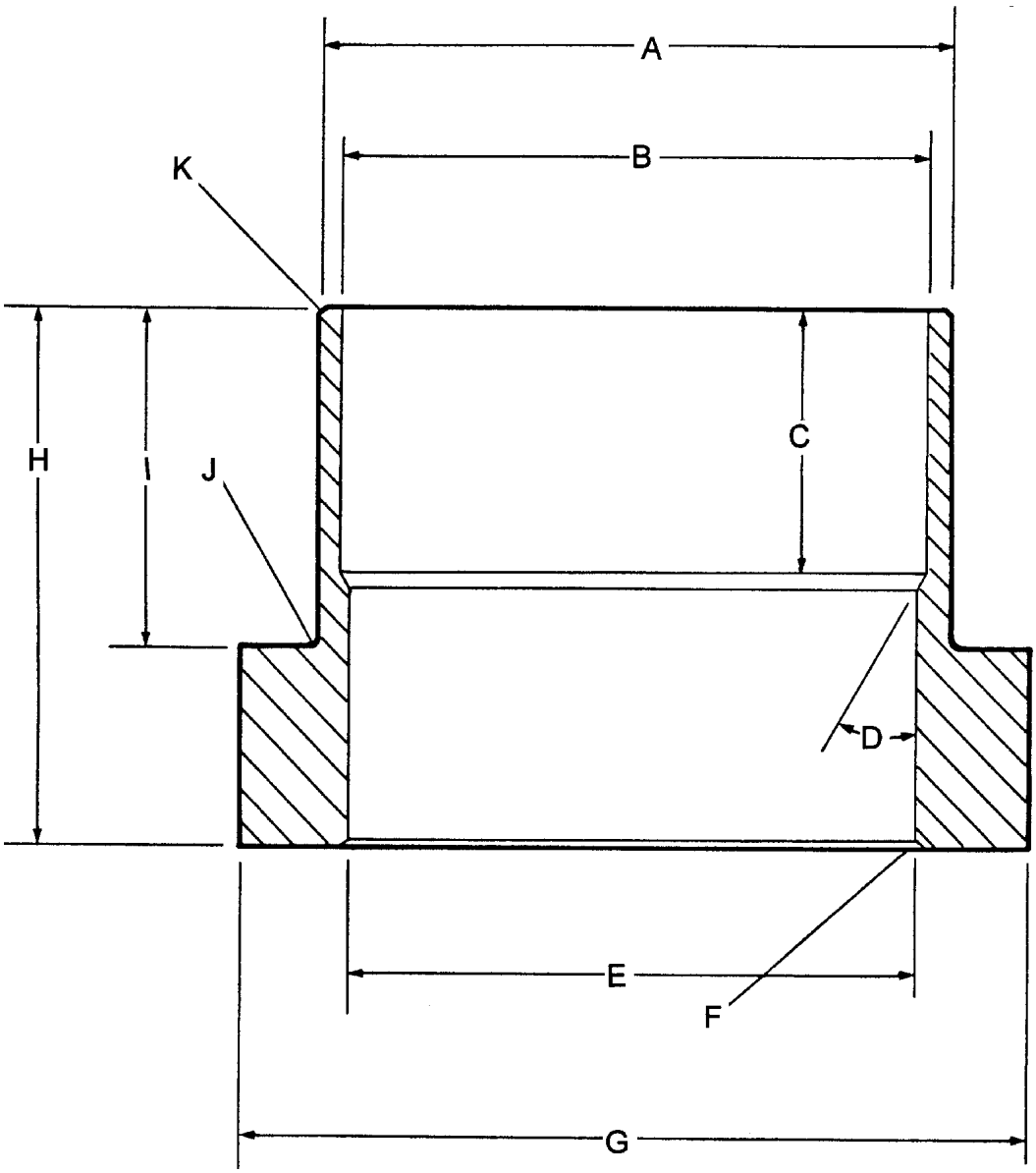


Fig. 1.29. Pivot Shaft Seal Tool

A ..... 198 ± 0.1 mm
B ..... 190 ± 1 mm
C ..... 40 mm
D ..... 30° Chamfer
E ..... 187 ± 0.5 mm
F ..... 0.5 x 45°
G ..... 220 ± 2 mm
H ..... 80 ± 1 mm
I ..... 50 ± 0.1 mm
J R2
K ..... 0.4 x 45°

SERVICE / SPECIAL TOOLS

Stress Reliever Bushing Tool

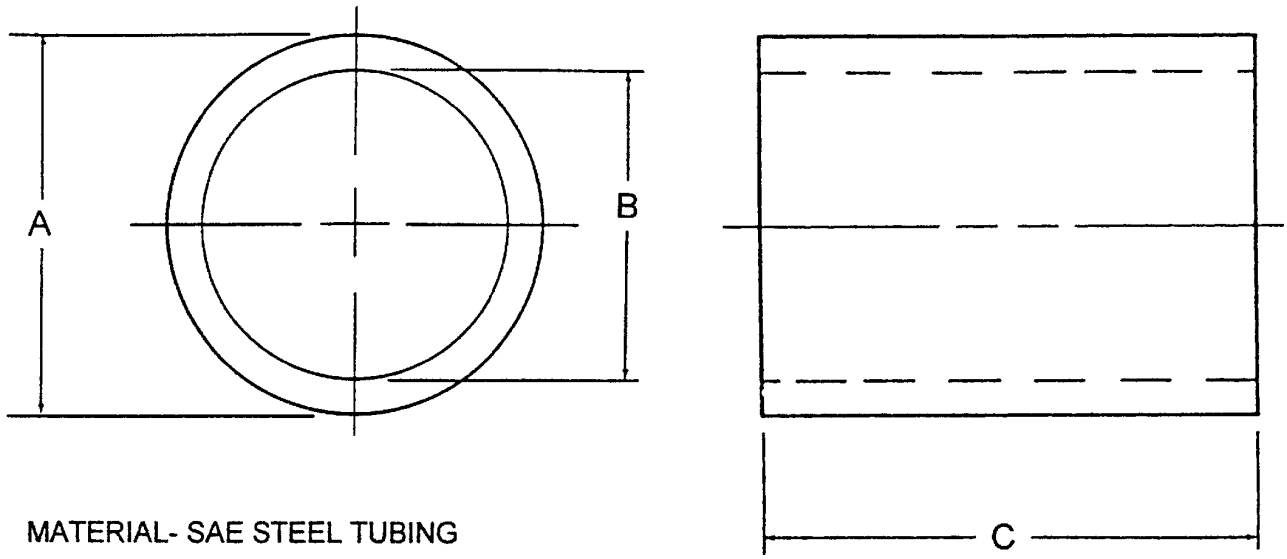


Fig. 1.41. Stress Reliever Bushing Tool

A ..... 140 MM
B ..... 114 MM
C ..... 180 MM

COOLING SYSTEM

RADIATOR

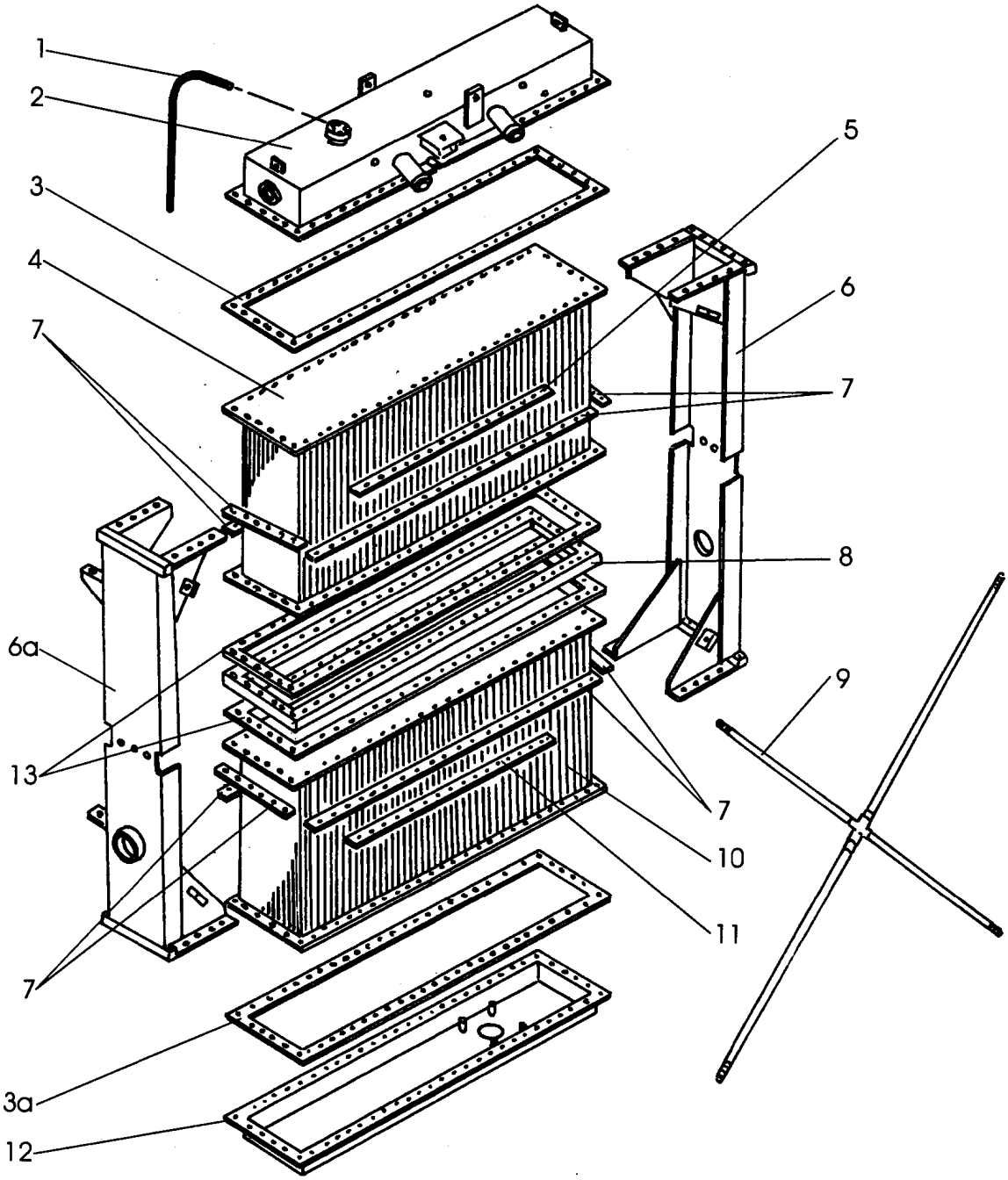


Fig. 2.6. Radiator Exploded View

1. Over Flow Tube	4. Top Core	7. Header Bars	10. Bottom Core	13. Gaskets
2. Top Tank	5. Header Bars	8. Spacer	11. Header Bars	
3, 3a. Gaskets	6, 6a. Side Channels	9. Tie Rod	12. Bottom Tank	

9. REASSEMBLY (Refer to Fig. 2.6)

1. Be sure gasket surface of cores (4, 10), spacer (8) and tanks (2, 12) are clean.
2. Set bottom tank (12) in flat position. Position new gasket (3a).
3. Set radiator core (10) on bottom tank. Position header bars (11) and secure loosely with mounting hardware.

ALTERNATOR

As the speed and voltage increase the voltage between (R2) and (R3) increases to the value where Zener diode (D1) conducts. Transistor (TR2) then turns on and (TR1) and (TR3) turn off. With (TR1) off, the field current and system voltage decrease and (D1) then blocks current flow causing (TR1) and (TR3) to turn back on. The field current and system voltage increase and this cycle then repeats many times per second to limit the voltage to the adjusted value.

If the connection between "BAT" and (R2) should become open-circuit (TR3) and (TR1) will turn off, thus preventing high system voltage.

Capacitor (C1) smoothes out the voltage across (R3), resistor (R4) prevents excessive current through (TR1) at high temperatures, and diode (D2) prevents high-induced-voltages in the field windings when (TR1) turns off.

6. TROUBLESHOOTING PROCEDURES

a. Energizing speed

The energizing speed is the rpm at which the regulator turns on to energize the field coil. This speed is higher than some speeds at which output can be obtained. Therefore, when checking output at low speeds, increase the speed until the regulator turns on, then reduce the speed to check the output. No output can be obtained until the regulator turns on. Once the regulator turns on, it will remain turned on until the engine is stopped.

b. Rated voltage

The Integral Charging System output preferably should be checked at the "RATED VOLTAGE" given below. However, it is permissible to check the output in amperes at any voltage within the "OPERATING RANGE" listed below, since the current output will be quite close to the value that would be obtained at "RATED VOLTAGE". The voltage should never be allowed to rise above the "OPERATING RANGE" for any length of time.

SYSTEM VOLTAGE	RATED VOLTAGE	OPERATING RANGE
24	28.0	26.0÷30.0

It should be noted that the voltage may be below the "OPERATING RANGE" if the battery is in a low state of charge. However, as the battery receives a charge, the voltage will rise to some value within the "OPERATING RANGE"

c. Magnetizing the rotor

The rotor normally retains magnetism to provide voltage buildup when the engine is started. After disassembly or servicing, however, it may be necessary to reestablish the magnetism. To magnetize the rotor connect the Integral Charging System to the battery in a normal manner, then momentarily connect a jumper lead from the **battery positive post to the Integral Charging System relay terminal,** identified in Fig. 3.6. This procedure will restore the normal residual magnetism in the rotor.

ELECTRICAL

BATTERY

Voltage Chart

Estimated Electrolyte Temperature	Minimum Required voltage is under 15 second load
21°C and above	9.6
16°C	9.5
10°C	9.4
4°C	9.3
-1°C	9.1
-7°C	8.9
-12°C	8.7
-18°C	8.5

If the voltage is less than the minimum specified, replace the battery. If the voltage meets or exceeds the specified minimum, return it to service.

d. Charging low water loss batteries

Refer to "SAFETY PRECAUTIONS". If, when charging the battery, violent gassing or spewing of electrolyte occurs, or the battery case feels hot 52°C, reduce or temporarily halt charging to avoid damaging the battery. For best results, batteries should be charged while the electrolyte is at room temperature (13-30)°C. Since age, state of charge of batteries vary. Time and attention must be given to batteries during any charging process.

The charge a battery receiver is equal to the charge rate in amperes multiplied by the time in hours. Thus a five ampere rate applied to a battery for ten hours would be a 50 ampere-hour charge to the battery. To fully recharge a battery, you must replace the ampere-hours or ampere-minutes removed from it: plus an extra 20% charge.

12. BATTERY CHARGING GUIDE

Recommended Rate and Time for Fully Discharged Condition

Rated Battery Capacity	Slow Charge	Fast Charge
Above 170 to 250 Minutes	23 hrs. @ 6 Amperes	7,5 hrs. @ 20 Amperes 3 hrs. @ 50 Amperes

Determine the state-of-charge of the battery with a hydrometer or open circuit voltmeter. The best method of making certain a battery is fully charged, is to measure the specific gravity of a cell once per hour. The battery is fully charged when the cells are gassing freely at low charging rate and less than 0.003 change in specific gravity occurs over a three hour period.

When any battery is being charged, periodically measure the temperature of the electrolyte, if the temperature exceeds 52°C, or if violent gassing or spewing of electrolyte occurs, the charging rate must be reduced or temporarily halted.

The battery generally cannot be fully charged the fast charge method. But it will receive sufficient charge (70 to 90%) for practical service. To completely recharge a battery, follow the fast charge with a slow charge until to change in specific gravity occurs over a three hour period.

CRANKING MOTOR

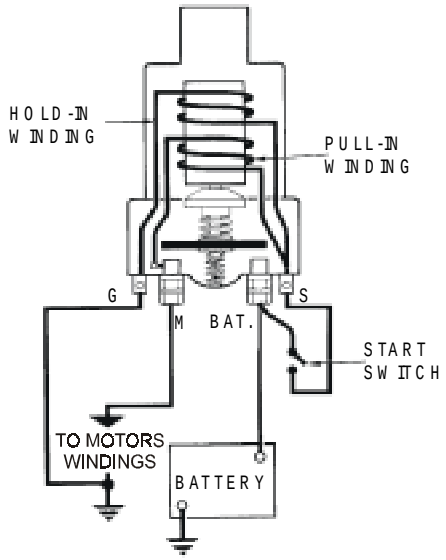


Fig. 3.14 Internal Solenoid Circuit ("G" and "S" Terminals Moved to Clarify Illustration)

n. Field Coil Checks

The various types of circuits used are shown in the wiring diagrams of Fig. 3.13. The field coils can be checked for grounds and opens by using a test lamp. Grounds-if the motor has one or more coils normally connected to ground, the ground connections must be disconnected during this check.

Connect one lead of the 110-volt test lamp to the field frame and the other lead to the field connector. If the lamp lights, at least one field coil is grounded which must be repaired or replaced. This check cannot be made if the ground connection cannot be disconnected.

Opens-Connect test lamp leads to ends of field coils. If lamp does not light, the field coils are open.

o. Field Coil Removal

Field coils can be removed from the field frame assembly by using a pole shoe screwdriver. A pole shoe spreader should also be used to prevent distortion of the field frame. Careful installation of the field coils is necessary to prevent shorting or grounding of the field coils as the pole shoes are tightened into place. Where the pole shoe has a long lip on one side and a short lip on the other, the long lip should be assembled in the direction of armature rotation so becomes the trailing (not leading) edge of the pole shoe.

p. Solenoid Checks

A basic solenoid circuit is shown in Fig. 3.14. Solenoids may differ in appearance but can be checked electrically by connecting a battery of 24 V a switch, and an ammeter to the two solenoid windings. With all leads disconnected from the solenoid, make test connections as shown to the solenoid switch terminal and to the second switch terminal, (G), to check the hold-in winding (Fig. 3.15). Use the carbon pile to decrease the battery voltage to the value specified in Service Bulletin IS-188 and compare the ammeter reading with specifications. A high reading indicates a shorted hold-in winding, and a low reading excessive resistance. To check the pull-in winding connect from the solenoid switch terminal (S) to the solenoid motor (M or MTR) terminal (Fig. 3.16).

5. Disassembly side doors and shields of engine.

WARNING! This procedure requires extreme caution. Use suitable blocking equipment while under confines of machine.

6. Remove bolts securing oil sump shield and lower it on the ground.
7. Open valve (1, Fig. 4.4) and drain coolant from cooling system.

NOTE: *In order to completely drain engine cooling system open drain valves (1, Fig. 4.5) and (1, Fig. 4.8).*

8. Remove bracket (2, Fig. 4.4) of suction tube. Loosen clamp and remove the rubber link (2, Fig. 4.5) from the water pump.
9. Remove baffle (1, Fig. 4.6)
10. Remove bolts securing front shield (3, Fig. 4.3). Remove the shield.

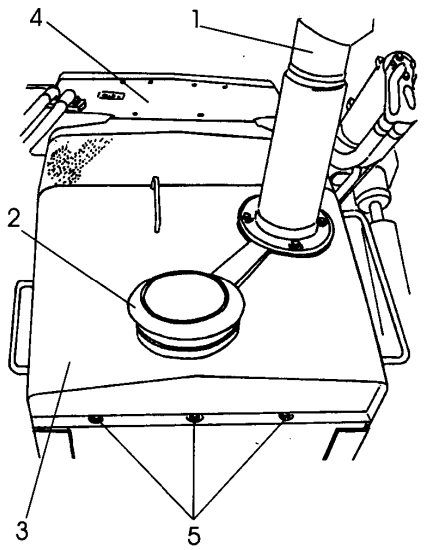


Fig. 4.3. Disassembly Points.

1. Exhaust Pipe
2. Air Precleaner
3. Roof
4. Front Shield
5. Bolts

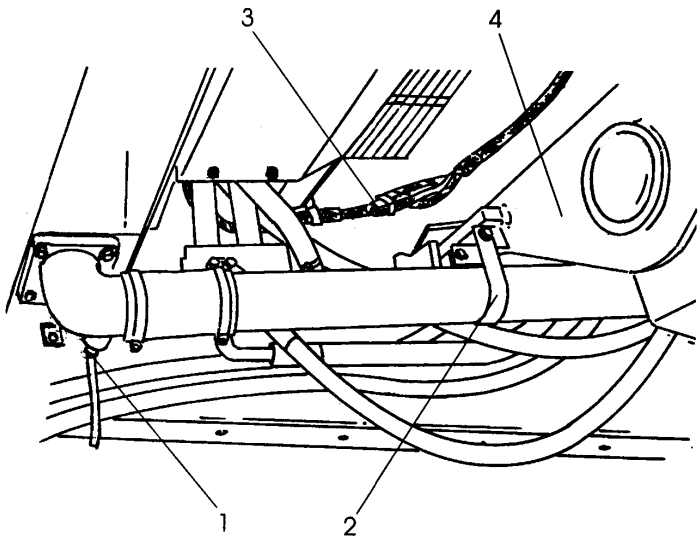


Fig. 4.4. Disassembly Points.

1. Drain Valve
2. Bracket
3. Connector
4. Engine Front Support

11. Remove bolts (5) securing roof (3, Fig. 4.3) to bracket and catch (1, Fig. 4.7). Remove the roof.
12. Remove tube (2, Fig. 4.8) between air cleaner and muffler.
13. Disconnect wire from air cleaner restriction indicator switch (3, Fig. 4.8) at air cleaner tube.
14. Remove rubber link (4, Fig. 4.8).
15. Remove air cleaner assembly (5, Fig. 4.8) from the bracket.
16. Loosen clamp (1) remove bolts (2) and muffler (3, Fig. 4.9).

IMPORTANT: *Turbocharger openings must be capped with correct size plastic cap. Turbocharger openings must never be plugged with rags. This practice could introduce dirt or lint into turbocharger.*

17. Remove pipes (1) and venting hose (2, Fig. 4.10).
18. Remove rod type shield (3, Fig. 4.10) of fan.
19. Remove radiator fan and remove it.
20. Disconnect water temperature gauge wire (3, Fig. 4.5).
21. Disconnect harness cables from the alternator (4, Fig. 4.5).

GENERAL

1. DESCRIPTION

The torque converter automatically varies the output required at the tracks to meet the changing load requirements of the machine. Engine power is transferred by the converter with little change in torque when the load is light. When a heavy load is encountered, the torque multiplication becomes greater, but with a resulting loss of machine speed. It is important to note that the converter does not increase engine horsepower, but does increase the amount of torque available at the tracks.

The converter has three basic parts (Fig.'s 5.1 and 5.2). The IMPELLER (21) is bolted to the converter drive housing and the drive housing is driven by the engine flywheel. The STATOR (16) is splined to the stationary ground sleeve hub and contains a row of stationary blades, sometimes called guide blades or reactor blades. The TURBINE (13) is splined to the output shaft. These three parts, when assembled in place, form a torque transmitting unit. This unit is filled with fluid and held at a pressure above 345 kPa during operation to suppress vacuum pockets which form at the blades under high fluid velocities. There is no direct mechanical connection between the impeller and turbine or stator.

2. OPERATION

The impeller (21) draws fluid from the opening surrounding the hub and ejects it from its blades at high velocity. The turbine (13) is positioned opposite the impeller and its blades receive the full impact of this velocity. Fluid exits from the turbine in the opposite direction of rotation from that of the impeller. The curved blades of the stator (16) (positioned between the impeller and turbine) re-directs the flow back to the impeller in the same direction as the impeller is moving, completing the cycle.

Torque multiplication is determined by the speed of the turbine in relation to the impeller. A ball thrown at a paddle will strike it with more force if the paddle is stationary than it will if the paddle is moving in the same direction as the ball. Similarly, when the turbine is rotating as fast as the impeller, the fluid passes easily through the turbine applying little or no force to the blades. As the output shaft slows down, the fluid strikes the turbine blades with more force. The maximum striking force of the fluid is reached when the turbine is stopped. This occurs in the machine when the output shaft is stalled by a heavy load.

The reservoir for the torque converter fluid is in the rear main frame. The flow from the reservoir to the converter and from the converter back into the lubricating system is covered in Section 6, "TRANSMISSION". Also covered in Section 6 is the procedure for checking the pressures in the transmission / converter circuit.

3. SPECIFICATIONS

Special Bolt and Nut Torque Data

Universal joint mounting bolts	270 to 275 Nm
Torque converter mounting bolts	110 Nm
Input drive cover bolts	50 to 60 Nm
Drive housings retainer plate bolts	70 to 90 Nm
Spur gear mounting bolts	115 to 130 Nm
Rear bearing retainer mounting bolts	50 to 60 Nm
Yoke retainer flange bolts	50 to 60 Nm
Drive housing to impeller housing bolts	110 to 130 Nm
Torque converter leakage rate (high idle neutral)	4 to 9.5 lpm

4. An output shaft end gap of 0 to 0.1 mm must be maintained in the converter assembly. Proceed as follows for checking and obtaining the proper end gap (Fig. 5.22).

   Be sure bearing (29) is bottomed on hub (2). Install virgin lead (~ 1.5 mm thick) on outer bearing race. Install retainer (31) and gasket (30), (DO NOT install shims) and tighten mounting bolts to standard torque. Remove retainer (31) and compressed lead. Carefully measure thickness of compressed lead with a micrometer. This measurement, less 0 to 0.1 mm, is amount of shims (33) to be installed between output shaft bearing and retainer (31, Fig. 5.23). Install retainer (31) with gasket (30) and secure with hardware. Torque to specifications.

NOTE: *Shim pack should never be same or greater than thickness of gap measurement (compressed lead).*

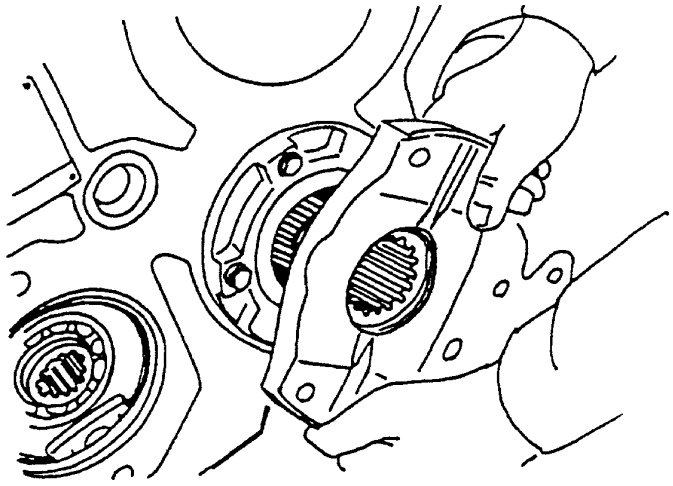


Fig. 5.24. Installing Flange

5. Install output flange (26, Fig. 5.14), flange retainer (25) and lock plate (24) and secure with bolts. Bend up tabs of lock plate (24) after torquing to specifications. Press bearing (3) into gear (22) until it bottoms. Secure gear (22) to impeller (21) with hardware and torque bolts to specifications. Bend up tabs retainer plate

6. Place housing (11) on bench with gear up. Position bearing (12) in bore of housing (11) so that retaining ring end is up. Drive bearing into bore until retaining ring bottoms. Turn housing (11) over and position turbine (13) inside housing (11) so that hub of the turbine enters bearing (12). Tap turbine (13) into bearing being careful not to drive bearing out of housing (11). Position bearing (19), thrust ring (18) in turbine (13). Be sure pins (17) are in position in stator (16). Position stator (16) in turbine (13) so that pin (17) engages ring (18). Position ring (18) on stator (16) so that it engages pin (17). Place bearing (19) on ring (18). Position impeller (21) over turbine (13). Secure impeller (21) to housing (11) with bolts (21A) with washer (21B) and torque to specifications.

7. Turn complete assembly over so that gear (22) is down. Secure a hoist as shown in Fig. 5.4 and lower assembly into housing (4). As assembly is lowered into housing (4), splines of stator (16) will engage with splines of hub (2); then splines of turbine (13) will engage splines of shaft (27) and finally, gear (22) will mesh with gears (7). If at any point when contact is made, hoist sling becomes slack, place a slight strain on sling and rotate housing (11) to engage properly, then continue to lower assembly onto housing (4).

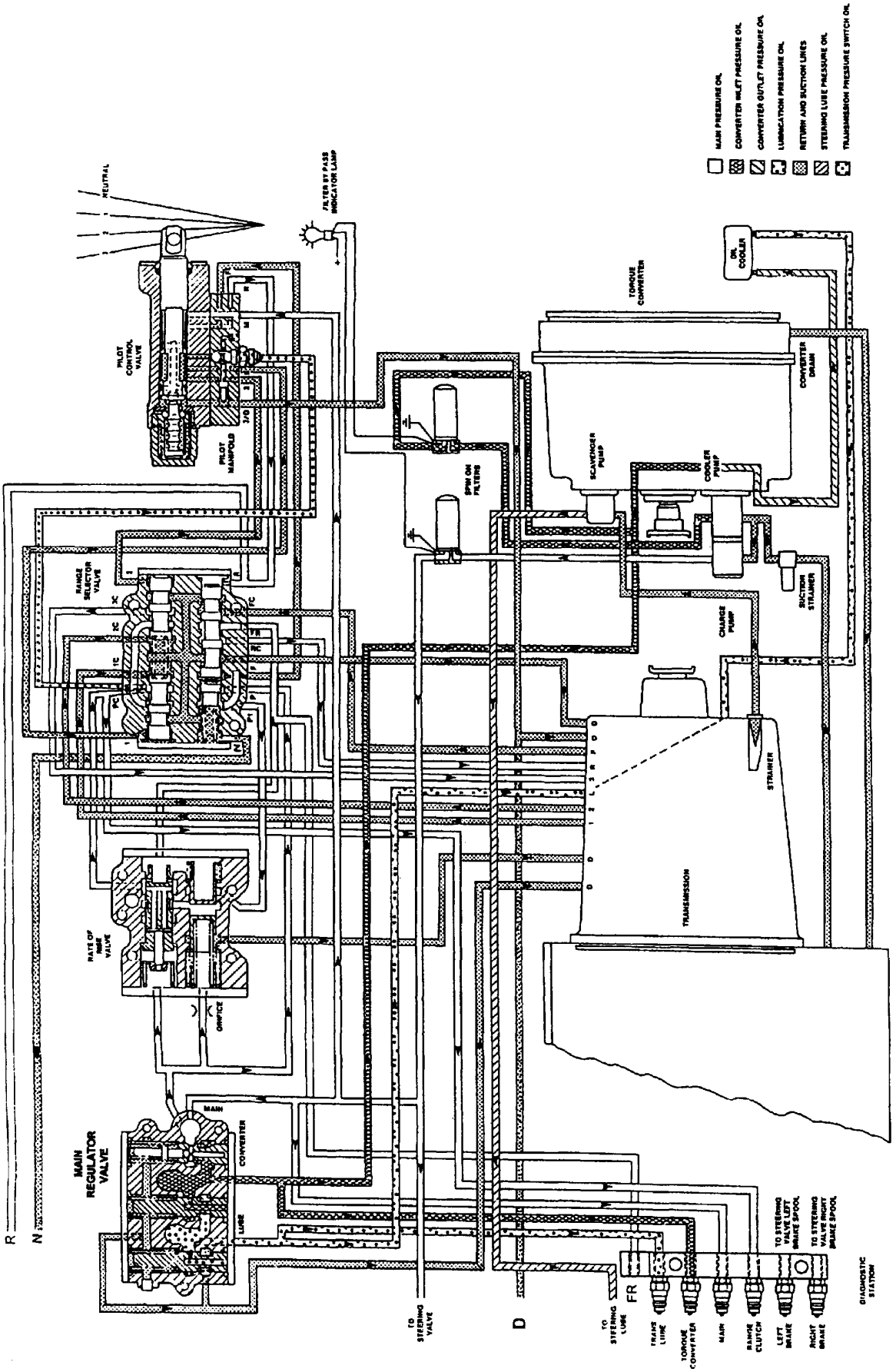


Fig. 6.1. Hydraulic Oil Flow with Transmission in Third Reverse

COMPLETE ASSEMBLY

NOTE: *When disconnecting hydraulic lines for any reason, they should be properly capped with correct size plastic cap. If these caps are not available, tape or clean rubber corks may be used. Hydraulic openings must never be plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components of machine. Tag all disconnect oil lines to facilitate installation.*

WARNING! Turn master switch to OFF position and remove key or remove one of cables from battery to prevent accidental starting.

2. Unscrew ten bolts securing shield ROPS. Remove shield (Fig. 6.5). Disconnect cab panel electric connector (4, Fig. 6.7) from platform. Unscrew bolts (1, Fig. 6.7) securing the cab. Remove cab using a hoist (Fig. 6.6).

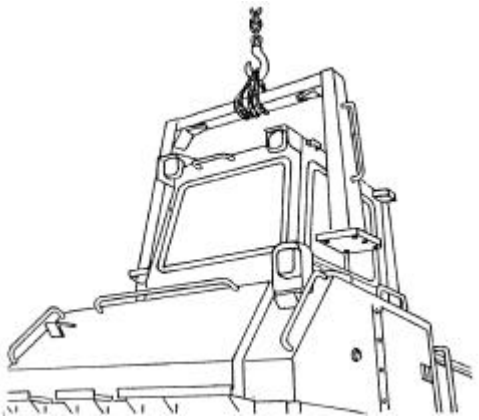


Fig. 6.5. Disassembly Shield ROPS

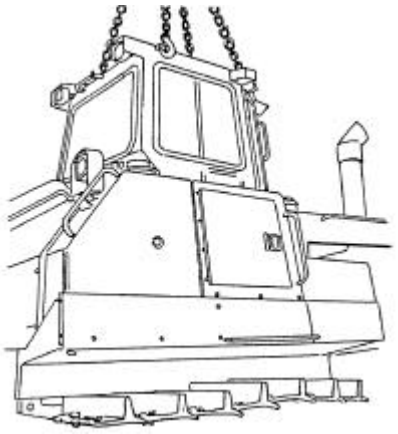


Fig. 6.6. Disassembly Cab.

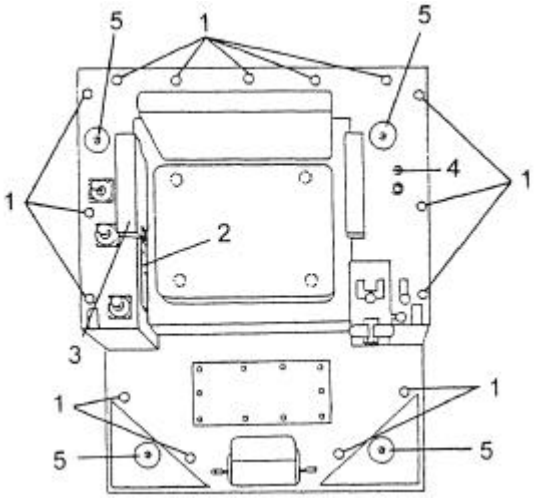


Fig. 6.7. Platform

1. Bolts
2. Plate
3. Armrest
4. Electric Connector
5. Bolts

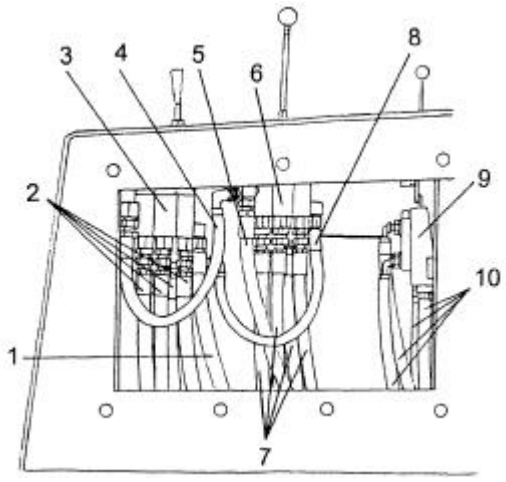


Fig. 6.8. Mounted Equipment Steering Disconnecting Points

1. Return Hose
2. Control Hoses
3. Blade Pilot Valve
4. Supply Hose
5. Supply Hose
6. Ripper Pilot Valve
7. Control Hoses
8. Return Hose
9. Ripper Pin Puller Valve
10. Hoses

COMPLETE ASSEMBLY

3. Apply Loctite #515 gasket (purple color) eliminator to flange surface of cover. With input (11) and output (32) manifolds and countershaft (14) cover removed from case, lower housing over cover assembly guiding upper end of three shaft assemblies into their respective bores in case until mating surfaces of housing (6) and cover (1) are contacting each other. When case and cover flange surfaces are in full contact and dowelled together, install and torque case and cover bolts to 75 to 88 Nm.
4. Install baffle (37) bolts through case using special copper washers.

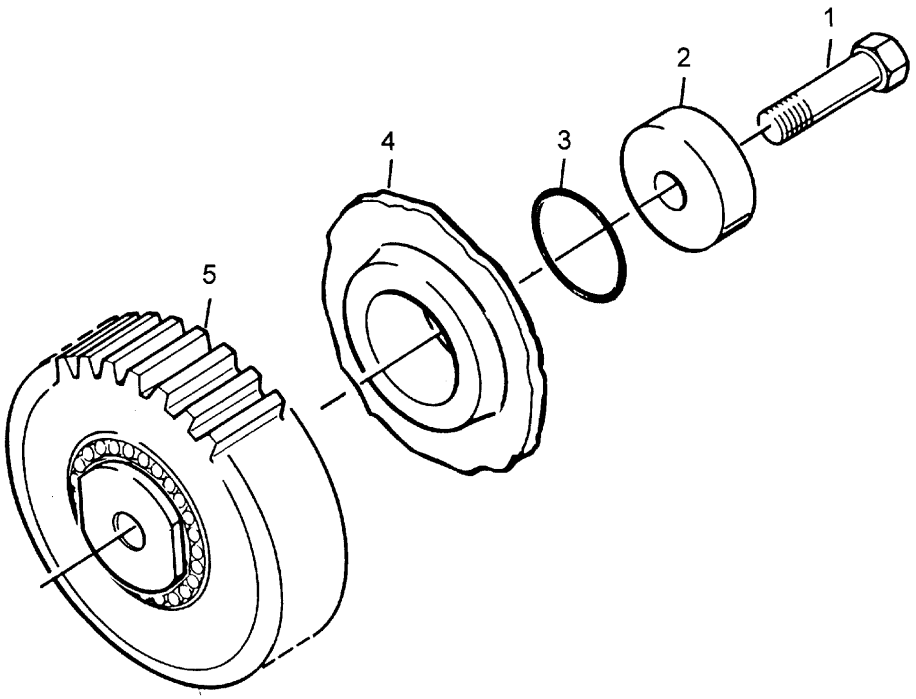


Fig. 6.31. Reverse Idler Gear Installation

1. Mounting Bolt
2. Spacer
3. O-ring
4. Rear Cover
5. Reverse Idler Gear Assembly (Shaft and Tapered Bearings)

11. END PLAY ADJUSTMENT

Directional Clutch

1. Assemble an oversize shim pack of 4.32 mm from shims (12) and position on manifold (11).This will give an excess end float condition. Install directional shaft manifold (11) with oversize shim pack, being sure to align pilot dowel in manifold with slot in manifold. Do not install O-ring (13) at this time.

NOTE: *Direction shaft assembly must have its bearing cones pressed solidly against its respective shoulder before end play (float) is adjusted.*

2. With orifice plug still removed from direction shaft place a 90 mm diameter x 6.5 mm thick plate over end of directional shaft to act as a pusher plate. Place a 250 mm puller bridge across two aligning manifold mounting holes. Install the puller bridge as shown in Fig. 6.32 utilizing the two selected manifold mounting bolt holes. Torque the pusher screw to 108 Nm. Then remove the puller bridge and pusher plate.

DIRECTIONAL CLUTCH PACK

7. Apply light to medium load 90 to 270 kg on arbor press while rotating gear 10 to 12 revolutions. (Refer to Fig. 6.45).
8. Increase load lightly (180 to 360 kg) on arbor press and attempt to spin gear. If gear spins freely redo Step 6 but replace black bearing cone spacer with a red bearing cone spacer 16.485 mm.
9. If gear with black bearing cone spacer does not spin freely, change to a blue bearing cup spacer 12.825 mm and redo Step 8.

NOTE: *If after repeating step 8 gear still does not spin freely with blue bearing cup spacer, then parts are out of tolerance or wrong parts were used. Consult your local distributor.*

10. If gear with red bearing cone spacer does not spin freely, bearing cup and cone spacers are correct and can be installed in clutch pack.
11. If gear with red bearing cone spacer spins freely, replace red bearing cone spacer with an orange bearing cone spacer 16.408 mm and repeat process.
12. If gear with orange bearing cone spacer does not spin freely, bearing cup and cone spacers are correct and can be installed in clutch pack.
13. If gear with orange bearing cone spacer spins freely, replace orange bearing cone spacer with a yellow bearing cone spacer 16.332 mm and repeat process.
14. If gear with yellow bearing cone spacer does not spin freely, bearing cup and cone spacers are correct, and can be installed in clutch pack.
15. If gear with yellow bearing cone spacer spins freely, replace yellow bearing cone spacer with a green bearing cone spacer 16.256 mm and repeat process.

NOTE: *Refer to bearing adjustment and installation chart (Fig. 6.46) for quick reference to bearing cup and cone combinations and options.*

16. After correct combination of bearing cup and cone spacers has been determined, they are to be assembled onto shaft as a group. Heat one bearing cone (11) to 135°C and install bearing cone down to bearing spacer, oil bearing when it cools. Install cone spacer (32) (preselected) to bearing cone. Install gear. Heat second bearing cone (11) to 135°C and install second bearing cone, oil bearing when it cools. Heat third bearing cone (7) to 135°C and install it on shaft (Fig. 6.47).
17. Place two thick shims (6), after measuring their thickness B, on bearing cone so that top face of shim is above bottom edge of retaining ring groove. Install clutch bridge assembly (Fig. 6.48) to top of third bearing. Apply 100 Nm of torque to nut while rotating and tapping rim of gear with a soft hammer until torque stabilizes. Allow assembly to cool with bridge in place. Measure distance from top face of shim to upper edge of retaining ring groove with a feeler gauge (Gap A, Fig. 6.48). Record it. Stone faces of retaining ring (1) and record its thickness. Determine the shim pack thickness and retaining ring to dimension (A+B). When shim pack thickness is determined, install with thickest shim toward retaining ring.

NOTE: *Refer to service special tools in SECTION 1 for clutch bridge assembly fabrication*.

18. Install retaining ring (1). Insure it is fully seated in shaft groove. Install new seal rings (5). Lightly grease rings to hold seal rings in position and reduce friction when manifold is installed. Install bearings (3) in manifold (4). Do not install manifold at this time. Position shaft to allow access to assemble reverse side.
19. Install new O-rings (49 and 51) and teflon seals (50 and 52) on hub and drum (9) and reverse piston (47). Lightly grease teflon seals install reverse piston. Install ten piston return springs (46) and spring guide (45).

COUNTERSHAFT

1. Remove countershaft from transmission cover. Install a bearing puller under bearing cone (1) and press or pull bearing off shaft. Remove retaining ring (2). Remove gear (3) from shaft.
2. Install a bearing puller under bearing cone (10) and press or pull bearing from shaft. Remove retaining ring (9). Remove gears (8) and (7) from shaft (5).
3. Inspect all gears, shaft, splines and bearing surfaces for wear and replace any parts as required.

17. REASSEMBLY

1. Install retaining rings (6) and (4) on shaft (5) if removed. Heat gear (3) to 135°C and install it on shaft (5). Install retaining ring (2).
2. Heat bearing cone (1) to 135°C and install on shaft. Heat gears (7) and (8) to 135°C and install gear (7) first, then install gear (8). Install retaining ring (9). Heat bearing cone (10) to 135°C and install on shaft.

REVERSE IDLER GEAR

18. DISASSEMBLY AND ASSEMBLY

1. Remove bolt (1, Fig. 6.55) from transmission cover and remove idler gear assembly from cover. Press shaft (8) off bearings (5). Remove bearing cups from gear assembly.
2. If removed, install ring (6) in gear with spacer. Press bearing cups into gear until shoulder on retaining ring (6) and spacer contact. Install shaft (8) with bearing cones.

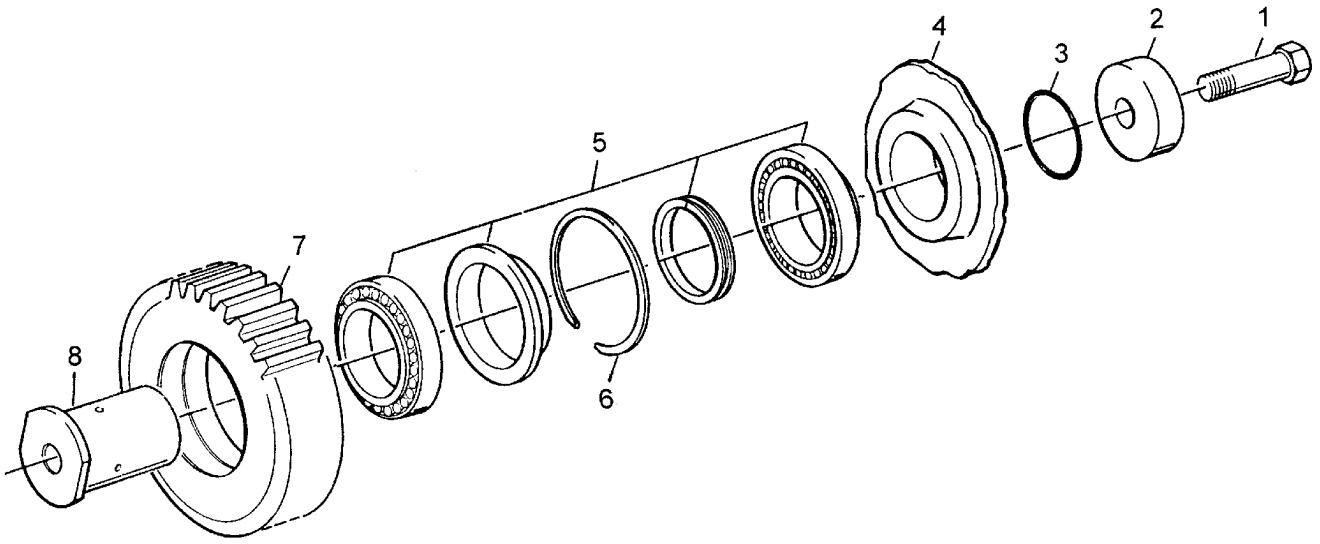


Fig. 6.55. Exploded View of Reverse Idler Gear

1. Mounting Bolt
2. Backing Plate
3. O-Ring
4. Rear Cover
5. Double Tapered Roller Bearing Assembly
6. Retaining Ring
7. Reverse Idler Gear
8. Reverse Idler Gear Shaft

RATE OF RISE VALVE

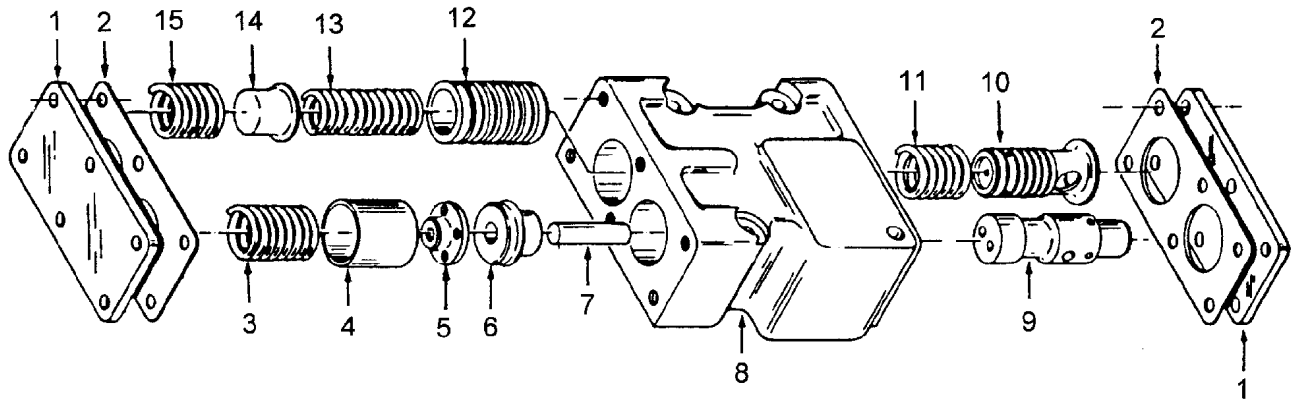


Fig. 6.72. Exploded View of Rate of Rise Valve

Legend for Fig. 6. 71 and 6.72

1. End Cover
2. Cover Gasket
3. Sequence Valve Spring
4. Spring Spacer
5. Sequence Valve Disc
6. Sequence Valve Spacer
7. Dowel Pin
8. Valve Housing
9. Sequence Valve Spool
10. Reducing Spool
11. Spool Spring
12. Modulating Piston
13. Inner Piston Spring
14. Spring Retainer
15. Outer Piston Spring

CAUTION! Turn the master switch in the "OFF" position and take key out to prevent accidental starting.

1. Remove floor mat (cab equipped machines) and center floor plate. Remove hardware securing rate of rise valve to transmission. Remove valve assembly and gasket. Discard gasket.
2. Disassemble component parts per Fig.'s 6.71 and 6.72.

NOTE: *Springs (11) and (15) appear to be identical, however, they are different. Intermixing will result in a 345 kPa loss of range clutch pressure and a 415 kPa loss of directional pressure*.

NOTE: *Lubricate spools and valve bores with transmission oil upon reassembly*.

3. Reassemble component parts in reverse sequence of disassembly using new gaskets. Tighten hardware securing covers to a torque of 25 to 30 Nm.
4. Install valve with a new gasket on top of transmission housing and torque mounting bolts to 42 to 50 Nm.

WARNING! Before starting engine, be sure floor platform is in place. As soon as engine starts, observe transmission clutch oil pressure lamp gauge on dash. If lights, immediately turn off engine.

5. Install platform. Start engine. If transmission clutch oil pressure lamp is OFF, it is safe to remove platform and check for leaks. Test pressure to verify rate of rise valve is sequencing shifts. Refer to Par. 4. „CHECKING DRIVE TRAIN OIL PRESSURE" in this Section.
6. Install center floor plate. Install floor mat if equipped. Check oil level in main frame as described in OPERATOR'S MANUAL.

STEERING SYSTEM

SECTION 7

CONTENTS

GENERAL

SPECIFICATIONS

SERVICE DIAGNOSIS

STEERING DRIVE

STEERING VALVE

STEERING MANIFOLD

STEERING VALVE FEEL POINT

STEERING SYSTEM

SPECIFICATIONS

Right spool (42)

Free length	62.9 mm
Test length	27.4 mm
Test load	115.6 N
Number of coils	8

STEERING MANIFOLD (Fig. 7.46)

Manifold spool:

Free length	46.2 mm
Test length	30.9 mm
Test load	333 N
Number of coils	10

SERVICE DIAGNOSIS

7. TROUBLE SHOOTING

COMPLAINT	
PROBABLE CAUSE	REMARKS
Machine Fades to One Side	
1. Steering valve metering spool seizured	Remove valve „HI" and check metering spool movement
2. Steering valve metering spring broken	Change spring
Steering Malfunction	
1. Steering valve gasket cracked	Remove steering valve and change gasket
Machine will not Move or Weak („LO" and/or „HI" range)	
1. Low main oil pressures	Refer to SECTION 6 Par. 5 „CHECKING DRIVE TRAIN OIL PRESSURE"
2. Low steering drive oil pressures	Refer to Par. „Oil Pressure Check" and „Diagnostic Chart"
3. Friction plate worn	Repair steering unit
Machine Braking in Front Direction	
1. Mechanical malfunction	Check foot brake spool movement
2. Valve „HI" system problem:	
2a. Voltage on speed electrovalve coil	Change speed magnetic sensor or speed electrovalve switch
2b. Main oil pressure in point C speed electrovalve	Repair or change speed electrovalve
2c. Valve „HI" damaged	Check spools and springs condition

STEERING SYSTEM

STEERING DRIVE

NOTE: *If steering drive is lowered to bottom of rear frame, it may damage rear frame suction tube.*

21. Remove bolts securing steering drive to front surface of main frame. Move steering drive back as far as possible, be sure spline sleeve stays with steering drive. Lift steering drive up about 50 mm and then tilt it back so that mounting flanges will clear main frame opening. Then lift assembly out of rear frame. Set assembly down, disconnect manifold hoses from steering drive and remove manifold with hoses. Items 2, 5, 8, 11, 15, 17, 19, 21 and 22. Fig. 7. 18.

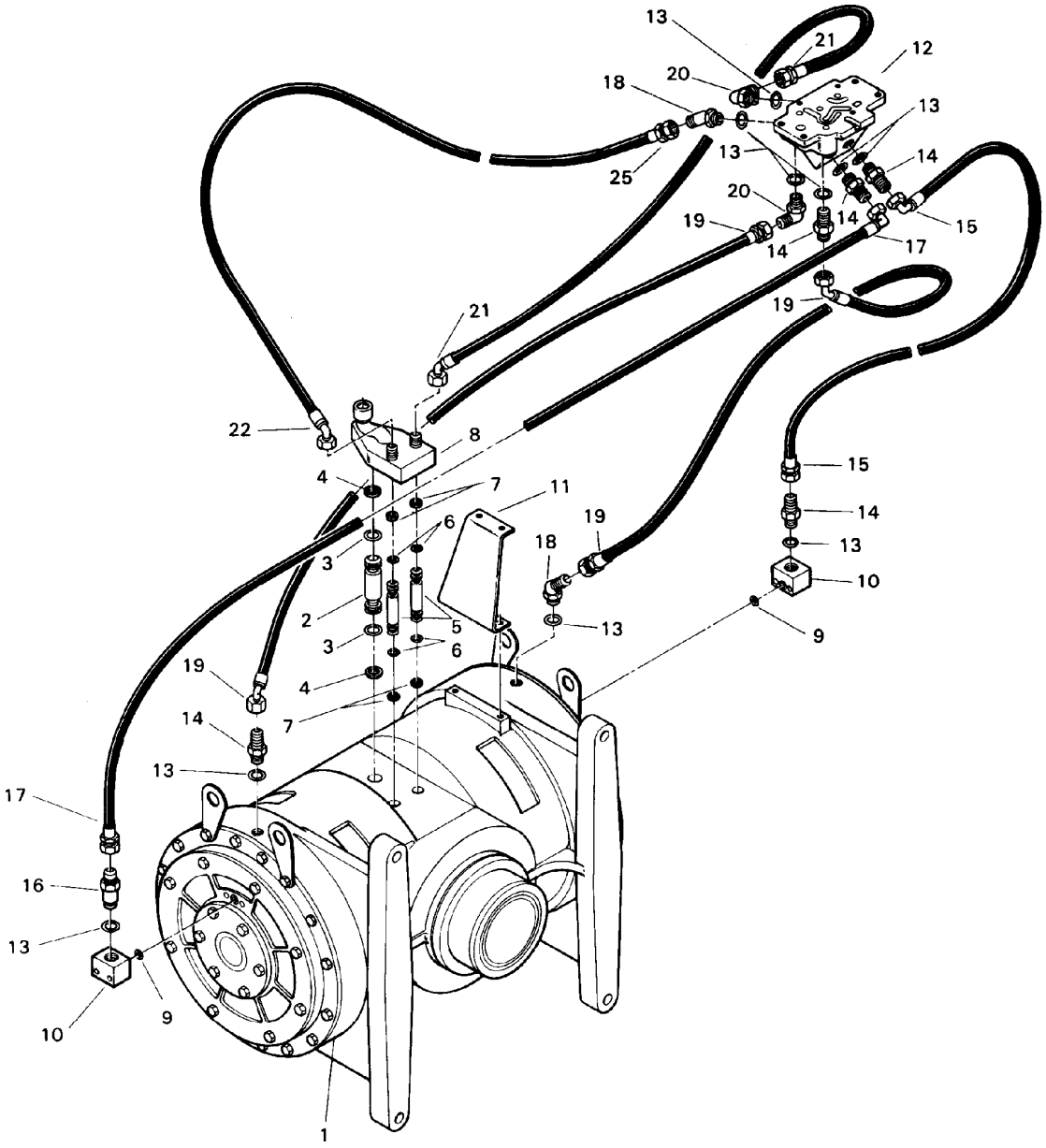


Fig. 7.18. Complete Steering Assembly

1. Steering Drive
2. Lube Tube
3. O-ring
4. Seal Ring
5. High Range Tube
6. O-ring
7. Seal Ring
8. Lube and High Manifold
9. O-ring
10. Low Range Adapter
11. Manifold Bracket
12. Steering Manifold
13. O-ring
14. Connector
15. Left Low Range Hose
16. Connector
17. Right Low Range Hose
18. 45° Elbow
19. Right or Left Brake Hose
20. 90° Elbow
21. Left High Range Hose
22. Right High Range Hose

12. If retainer plate (60) was removed from retainer plate (59), assemble them with bolts and torque to 92 Nm. With a hoist assemble retainer (59 and 60) onto housing (Fig. 7.36). Align with marks made during disassembly. Install nine friction discs (12) and eight separator plates (15). Start with a friction disc and end with a friction disc. Install new seal rings and O-rings (62 thru 65) on piston (61). Lubricate seals and carefully install piston into retainer (59).

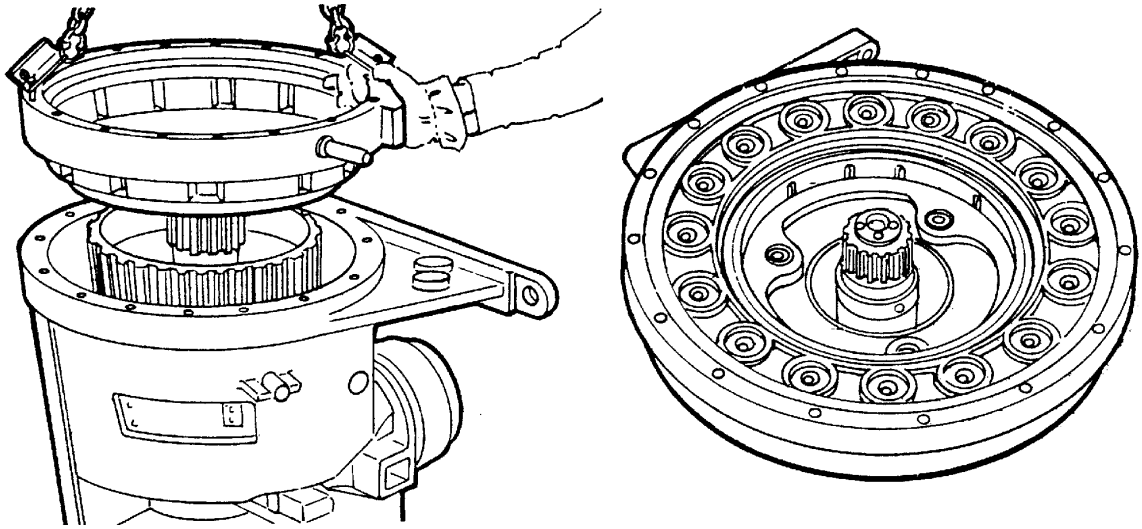


Fig. 7.36. End and Brake Retainer Plate with Piston

13. Assemble brake plate retainer (70) with retainer baffle (71) onto housing and retainer (59). Align with marks made during disassembly (Fig. 7.37).

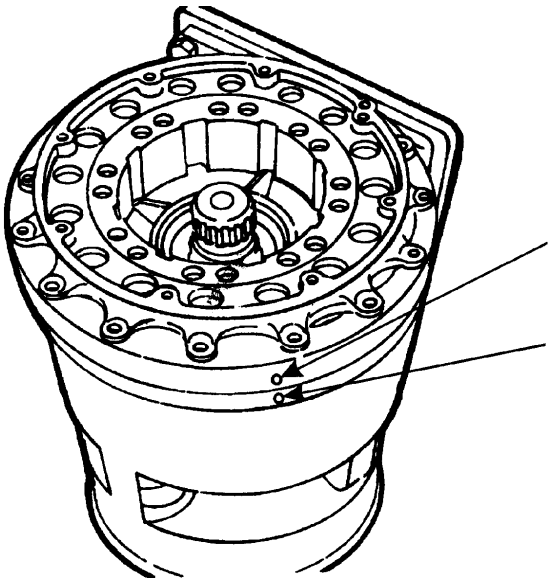


Fig. 7.37. Retainer Brake Plate

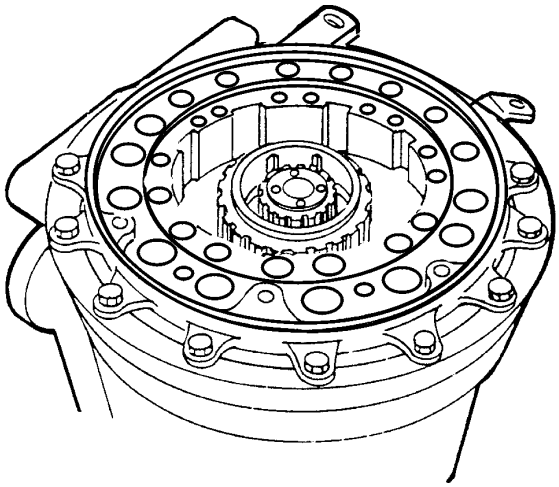


Fig. 7.38. Sun Gear

14. Place sun gear (47) on sun gear hub (50) with items (49, 51, 52 and 53) attached over sun gear spline so that it meshes with planet gears (41, Fig. 7.38). Coat retainer (70) bolts Loctite #12017 and torque to 92 Nm.
15. Assemble spring retainer cover (84) with new seals and O-rings (78 thru 81). Lubricate seals and install low range piston (77).

STEERING VALVE

20. STEERING VALVE REASSEMBLY (Fig. 7.42)

1. Put the balls (3 and 4) into their seats.

2. Install between upper and lower steering valve new gasket (2). Install six bolts and torque them 52 Nm.

3. Install parts (10 to 15).

21. INSTALLATION

1.. Remove covering from steering valve opening and install steering valve as follows:

Install studs (1, Fig. 7.45) in steering valve junction manifold and position a new gasket (5, Fig. 7.13) over studs.

Be sure mating surfaces of rear main frame cover, a valve spacer, and steering valve.

Apply Loctite #504 to rear main frame cover in a continuous bead on centerline of valve mounting holes (Fig. 7.45). Position valve spacer on rear main frame cover.

Apply Loctite #504 to valve spacer in a continuous bead on centerline of valve mounting holes. Lower steering valve onto studs. Secure valve with three nuts (1, Fig. 7.13) and washers on studs and ten bolts (2 and 3).

2. Reconnect hoses (3,4,6,7,8,9, Fig. 7.11) and connecting pins with cotters (10), linkage (1) and brake linkage (2) to steering valve. Pressure test rear main frame (after specified set-up time of liquid gasket) as follows:

Remove rear main frame breather and introduce air through breather opening. Maximum pressure should not exceed 35 kPa.

Use a soap solution around edge of rear main frame cover, power take off cover, steering valve and mounting bolts. If bubbles occur, mark area of leakage, remove part and check for proper surface finish and flatness, reseal and recheck. Reinstall rear main frame breather.

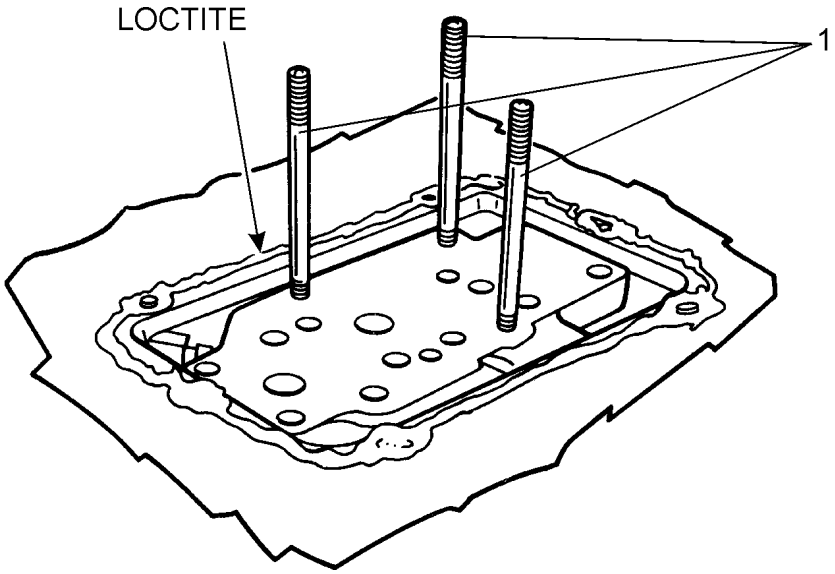


Fig. 7.45. Loctite to Rear Cover

1. Stud

SPROCKET DRIVE

COMPLETE ASSEMBLY

Legend for Fig.'s 8.3. and 8.4.

1. Drive Cover
2. Pinion Gear Bearing Housing
3. Pinion Gear
4. Input Shaft Retainer
5. O-Ring
6. Retaining Ring
7. O-Ring
8. Pinion Bearing Cover
9. O-Ring
10. Bull Gear
11. Retaining Ring
12. Retaining Ring
13. Sun Gear Shaft
14. Retaining Ring
15. Sprocket Hub
16. Oil Seal Shield
17. Bearing Spacer
18. Ring Gear Hub
19. Bearing Retainer Plate
20. Plate Shim
21. Planetary Ring Gear
22. Retainer Plate
23. Planetary Carrier Housing
24. O-Ring
25. Magnetic Plug
26. Thrust Button
27. Cork Plug
28. Planetary Gear
29. Planetary Gear Shaft
30. Steel Ball
31. Retaining Ring
32. Retaining Ring
33. Track Chain Sprocket
34. Tapered Roller Bearing
35. Bearing Spacer
36. Tapered Roller Bearing
37. Tapered Roller Bearing
38. Oil Seal
39. Spherical Bearing
40. Oil Seal
41. Tapered Roller Bearing
42. Bar Magnet

6. DISASSEMBLY

NOTE: *Unless otherwise notated, following reference numbers refer to Fig.´s 8.3. and 8.4.*

1. Set sprocket drive assembly down on housing (23) so that gear (10) is up.

2. Rotate bull gear (10) so retaining ring (11) hooks are showing. Through hole in gear remove ring up out of its groove.

3. Remove bolts and washers securing housing (2) to cover (1). Attach a hoist to bull gear hub (Fig. 8.5.) and lift slowly until gear (10) contacts housing (2). Install jack screws in holes provided in housing (2) and free housing from cover (1). Remove housing.

NOTE: *If disassembly of pinion gear assembly is necessary, refer to "PINION GEAR" in this section.*

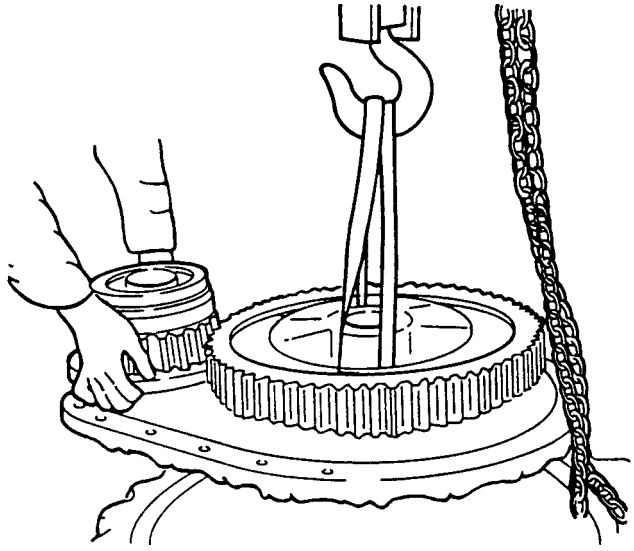


Fig. 8.5. Pinion Gear Assembly

TRACK AND TRACK FRAME ASSEMBLY SECTION 9

TRACK FRAME SPRING

TRACK FRAME GUIDE

PIVOT SHAFT

TRACK FRAME

EQUALIZER BAR

TRACK CHAIN

3. Start the machine and slowly turn the sprocket counterclockwise. Continue to rotate the sprocket slowly until upper section of the track chain is on the ground and free of sprocket.

4. Place a plank flush against the rear of the track when the track is flat on the ground as shown in Fig. 9.6. The plank should be approximately the same thickness as the track and long enough so that the entire dozer can rest on the plank. If a new track is to be installed, remove the old chain as described above, and place the new chain on the ground ahead of the dozer, with the open link end flush against the front of the old chain.

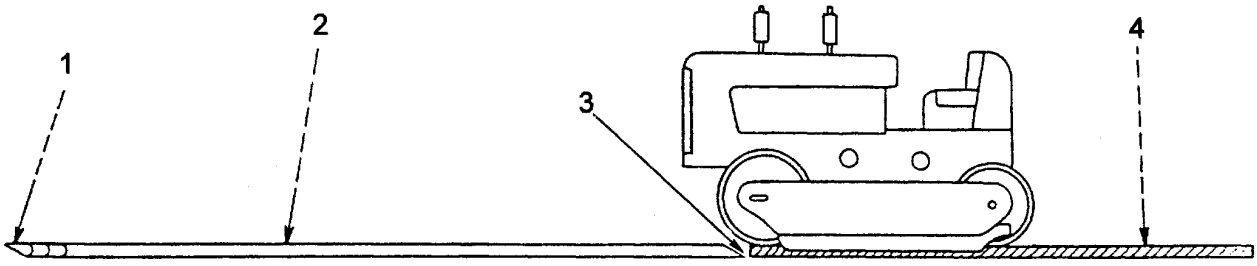


Fig. 9.6. Removing the Track Chain

1. End with Wearing Surface
2. New Track
3. End with No Wearing Surface
4. Plank or Old Track

8. TRACK CHAIN REPAIR

To repair or replace worn track pins, bushings or links, a hydraulic track press will be necessary. The operation and procedure instructions for each track press will vary, so specific disassembly instructions will be found with the MANUFACTURER'S OPERATIONAL INSTRUCTIONS.

LUBRICATED TRACK SYSTEM

Sprocket wear must also be considered in conjunction with track chain wear. Wear of sprocket teeth decreases pitch length of track. Results are that pitch lengths of sprocket and track become more and more out-of-phase; and bushings ride higher on sprocket teeth. Combined wear of sprocket and track should never be allowed to reach this point as spinning of sprocket may result and cause serious breakage whenever new or rebuilt track chains are installed. Sprockets should also be replaced.

Never remove one link to bring a stretched track to within range of proper track adjustment. A track that is worn badly enough to take up length of one link will be so far out of pitch that increased wear on sprocket will far more than offset saving obtained by removal of one link in track chain. Refer to CHECKING UNDERCARRIAGE WEAR in this Section.

Sealed and lubricated track pins have a hollow center which is used as an oil reservoir. A cross-drilled passage permits oil to enter bushings for lubrication of pins, bushings and oil seals. If seals become dry, dirt can enter and cause sealing surface of bushing to wear. Track chains are factory lubricated; no oil level checks are necessary.

TRACK CHAIN

Bushing outside diameter (Fig. 9.21)

Close 100 mm outside caliper (1) around bushing with a minimum amount of drag, making certain that one of caliper tips is positioned in forward drive side wear area. Slide caliper off bushing and measure distance between caliper tips using about 300 mm scale. Repeat on the reverse drive side wear area. Measure two or more bushings to get an average and compare with dimensions given. Whichever wear is greater, determines percentage of wear remaining.

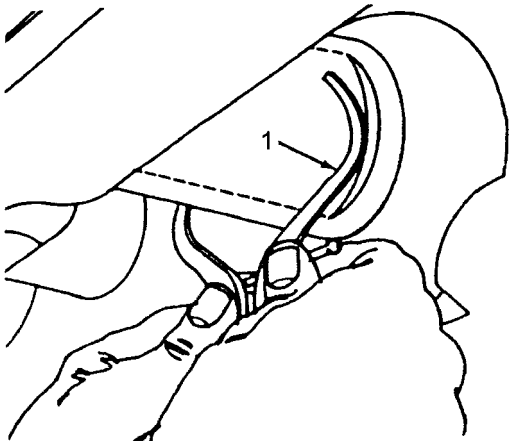


Fig. 9.21. Measuring Bushing OD

Fig. 9.22. Measuring Track Pitch

Internal pin and bushing wear (pitch) (Fig. 9.22)

With track chain tight, place end of 3000 mm tape on front one track pin and measure length of 4 links to front of 5th track pin. Compare with dimensions given in SPECIFICATIONS.

Front idler flange height (Fig. 9.23)

Insert about 300 mm scale (1) in squeeze bar. Rest squeeze bar on top of flange and push scale down until it makes contact in middle of treat area as shown and take a reading. Compare with dimensions given in SPECIFICATIONS.

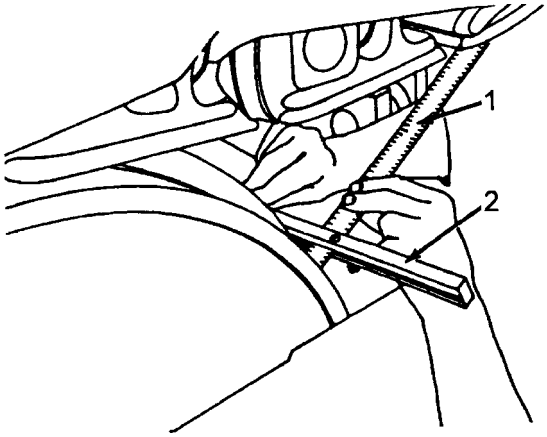


Fig. 9.23. Measuring Flange Height

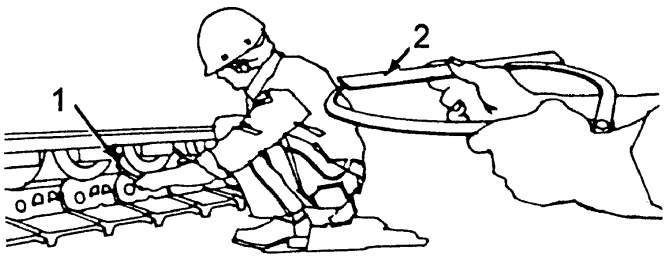


Fig. 9.24. Measuring Track Roller Rolling Diameter

TRACK ROLLER

26. DESCRIPTION

The track rollers are attached to the underside of the track frames and carry the weight of the dozer. The rollers are heat-treated steel forging, and rotate around bushings. The rollers are equipped with metal face type seals which maintain a leak and dirt-proof seal.

Rollers have single or double flanges, and they are positioned in the track frame as shown in Fig. 9.44.

27. REMOVAL

1. Release the tension in the track chain. (refer to "Adjusting Track Tension" in Par. 6, "MAINTENANCE.")
2. Wedge a steel plate between the frame and equalizer bar.
3. Remove the track roller rock shields.
4. Place a jack under the front frame and also place one under the rear main frame. Place a heavy steel plate between the jacks and the frames. This will prevent any damage being done to the rear main frame. Run up the jacks until the rollers are free of the track approximately 150 mm.
5. Remove the bolts securing the track roller brackets to the track frame (Fig. 9.35)
6. If there is not enough track chain slack to remove the roller, position two small jacks between the track and track frame. Jack up until sufficient clearance exists to remove the track roller.

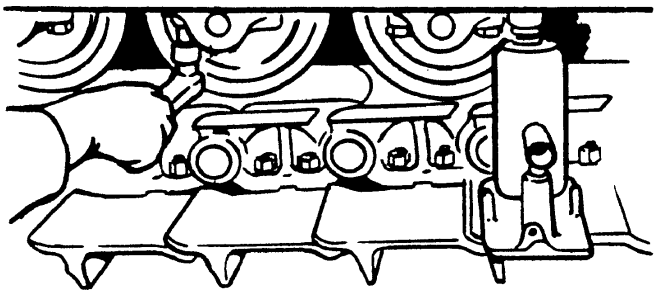


Fig. 9.35. Removing Roller

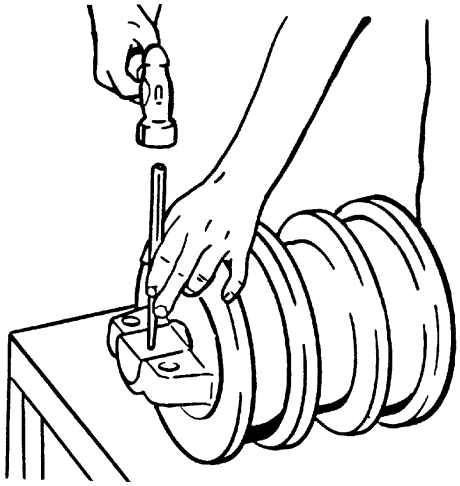


Fig. 9.36. Removing Spring Pin

28. DISASSEMBLY (Fig. 9.37)

1. Remove plug (11) and drain roller. Drive out spring pin (10) securing the bracket (9) on each side of the shaft (3) as shown in Fig. 9.36.
2. Remove the track roller shaft brackets (9) with the O-Rings (8) and the stators of the seals kit (7). Discard the O-Rings. Remove the seal kit stators from the brackets and discard the rubber rings.
3. Remove the bolts securing the seal retainers (6) to each side of the roller body and remove the retainers with sealing rings (5) and the rotors of the seals kit (7). Discard the sealing ring (5). Remove the seal kit from the retainers and discard rubber rings.

IMPORTANT: *Keep original mated metal rings as a set, Do not mix a metal ring from the oil seal on one side of the roller with a metal ring from the oil seal on the opposite side of the roller.*

TRACK FRAME GUIDE

38. REMOVAL (Fig. 9.52)

1. Remove bolts securing plate (27) to track frame and front top idler bracket and remove plates (23, 23A and 27), spacer (25 and 26) and shims (44).
2. Remove hardware securing plate (24) to machine frame and remove plate with shims (28). Keep shims with plate (24) for proper installation.

39. INSPECTION AND REPAIR

1. Wash all parts thoroughly in a suitable solvent. Dry thoroughly with compressed air.
2. Inspect wear plates and guide plate for excessive wear or damage.
3. Check the guide bracket for broken welds. Any track frame guide parts that are damaged must be replaced with new parts.

40. INSTALLATION (Refer Fig. 9.52)

1. Secure plate (24) to machine frame with same thickness of shims (28) as were removed. Torque bolts to 1500Nm.
2. Position wear plate (23) between track frame and plate (24). Insert top bolts through holes in block (14) and plate (23) and install spacer (25). Position plates (23A and 27) between plate (24) and machine frame and loosely secure with bolts. Install five shimsă(44) between spacer (25) and plate (23A).
3. Working from underneath machine, position spacer (26) between plates (23 and 23A) and insert hardware. Install five shims (44) between spacer (26) and plate (23A). Torque all bolts 1500Nm.
4. Measure clearances A and B (Fig. 9.52). If total of clearances is 6.4 mm or less, adjust by removing shims (44) from between spacers (25 and 26) and plate (23A). Remove enough shims to allow for equal spacing. If removal of all shims (44) will not provide a total clearance of less than 6.4 mm, replace worn guide plate (24) and / or wear plates (23 and 23A) as required. Reinstall shims and repeat check.

PIVOT SHAFT

41. DESCRIPTION

The pivot shaft supports the rear track frame and permits free track oscillation in conjunction with the equalizer bar. It is fitted with bushings to take the wear as the frames oscillation. One end of the shaft is mounted in the rear frame and held in place with a lock pin. The shaft mounts to the track frames and is lubricated in a oil reservoir within the track frame itself.

42. REMOVAL (Fig.'s 9.1 and 9.53)

NOTE: *The pivot shaft has a 0,05 to 0,13 mm press fit into rear frame outer pivot shaft bore. Because of press fit, special tooling is required to pull pivot shaft from rear frame. In addition to special tooling, heating of rear frame area (outer pivot shaft bore), which houses pivot shaft, is required. Special tooling should be fabricated locally per SPECIAL/SERVICE TOOLS in SECTION 1.*

HYDRAULICS

TEST AND ADJUSTMENT

5. BLADE LIFT CYLINDER DRIFT TEST (Fig. 10.4 and Fig. 10.6)

The problem of cylinder drift can be traced to two main causes, which are internal and external leakage. External leakage is not detailed here, since it can be visually. Internal leakage is not always readily pin pointed to its source and may require a series of tests to isolate the problem.

There are six places that might be a source of leakage; hydraulic cylinders might be leaking past check valves or piston packing, control valve could leak at spool and/or quick drop valve spool could be stuck, shuttle valve(s) or pilot supply valve could leak.

Following is a series of tests to trace the source of internal leakage.

1. Raise and lower blade through its full travel to wash out any foreign material which might prevent piston by pass poppets from seating. Oil temperature should be 50°C.
2. Lower the ripper to the ground.
3. Fully raise blade and move lever to LOWER position releasing it to HOLD before blade drops to ground. Check cylinder for drift, rod should travel out of cylinder no more than 18 mm per minute.
4. Perform blade lift cylinders drift test.

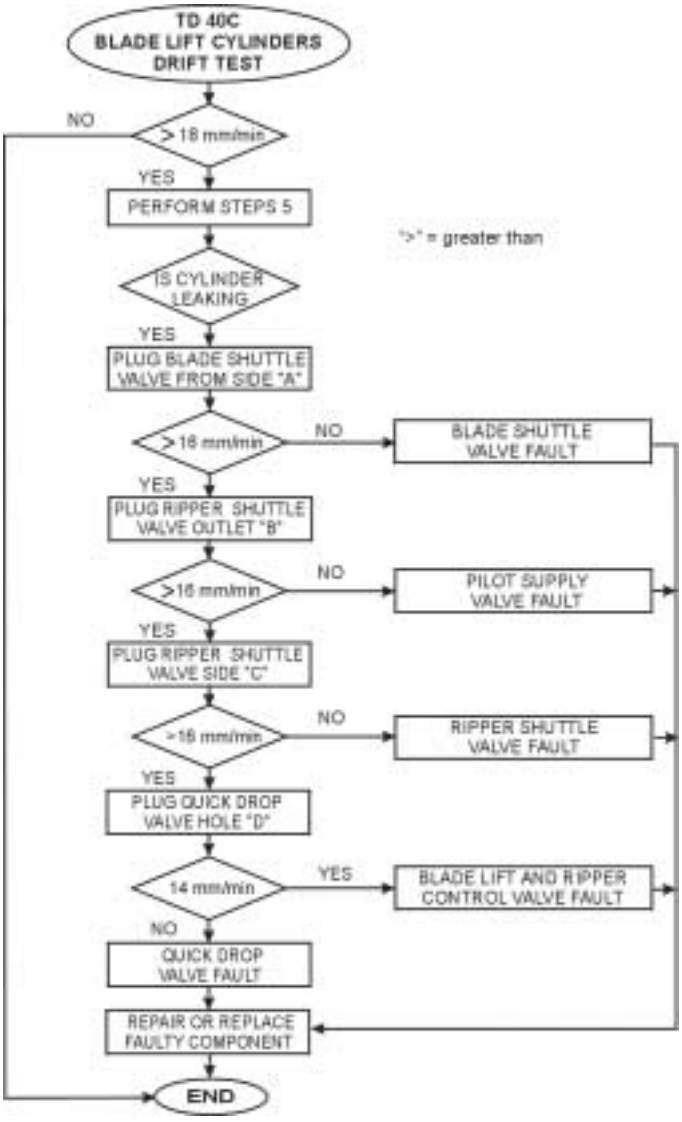


Fig. 10.4. Diagnostic Chart

EQUIPMENT PUMP

1. Drain the equipment hydraulic system as described in the Operator's Manual. Remove the platform center access plate.
2. Remove flexible pull rod (1, Fig.10A.2).
3. Disconnect supply tube from reservoir (2, Fig.10A.3), pilot pump supply hose (5), blade lift and ripper control valve supply hose (3) and tilt control valve supply tube (4).
4. Remove two mounting flange bolts. Pull the equipment pump free of torque converter (6) and lift it out of machine.

5. PUMP SERVICE (Ref. to Fig. 10A.4 and Fig. 10A.5)

Be sure work is done in a clean area. Clean unit thoroughly with a solvent. Remove all sharp edges from splines, drill points, key ways and end of shaft. Mark cover and housing sections to ensure correct reassembly. To aid you in disassembly and reassembly, pump should be retained in some manner. We recommend use of a steel plate bolted to end extending over edge of a work bench. Plate should have a hole large enough for adapter flange pilot to drop through, and two holes matching location of mounting holes in adapter flange. Pump can now be firmly fixed to plate by bolts. This is especially helpful in removal and torquing of bolts.

Complete Assembly

1. Position pump assembly on bench. Remove bolts securing rear pump to adapter plate (17). Remove bolts securing adapter plate to front pump (1). Separate pumps.
2. With front pump (1) shaft end down, spline pump coupling (21) onto gear shaft. Install bushing (16) into pump. Position shim (14) onto rear face. Position gasket (15) into shim. Install adapter plate (17) with mounting hardware and torque to 230 Nm. Position shim (20), slotted holes down, gasket (19) and bushing (18) into adapter plate. Position rear pump (22) onto adapter plate. Install long bolts to top and remaining bolts to bottom and torque to 70 Nm.

Front Pump

1. Remove cover / housing bolts and lock washers. Housing (11) can be now separated. There are two methods of separation:

   As illustrated in Fig. 10A.6, or remove two bolts 180^0 apart leaving two engaged approximately three or four threads into adapter section. Lay pump on its side and tap bolts with soft head hammer until housing and adapter plate separate. Remove bolts, lay pump, housing down and remove adapter plate.

NOTE: *Do not attempt to pry sections apart with a screwdriver or similar tool, as such action can damage machined sealing surfaces.*

2. Remove seal plate (9), drive and driven gear set (10).

NOTE: *If gears are to be reused, they should be marked before removal to ensure replacement in same position - see Fig. 10A. 7.*

3. Remove O-ring (5). Remove back-up ring (7) and seal (8) from both seal plates. Note position of seal and back-up ring for correct installation upon reassembly. Remove roller bearing (6) with bearing puller. Remove dust seal (2), shaft seal (3). Use extreme caution in removal of these parts to avoid damaging seal bore area.
4. If pump is to be rebuilt and operate in original direction of rotation, it is not necessary to remove plug in cover. This completes disassembly.

NOTE: *In all cases, O-rings and seal components should be replaced. Following factors should be considered in determining reusability of a component.*

SCAVENGING AND PILOT PUMPS

1. Position pump assembly as shown on Fig. 10.A.17 and install into torque converter aligning pump shaft splines with converter drive gear. Using mounting hardware secure the pump to torque converter. Mounting bolts torque to 250 Nm.
2. Connect scavenge pump outlet hose (3, Fig. 10A.17), pilot pump outlet hose (5) and pilot pump supply hose (4).
3. Connect supply hose (2) to the transmission sump and to the pump.
4. Start the engine and check all hydraulic connections for leakage.
5. Check the rear frame oil level (refer to the OPERATOR'S MANUAL)
6. Install transmission case guard securing the bottom of machine.
7. Install platform center access plate.

RIPPER PILOT VALVE

4. SPECIFICATIONS

LUBRICANTS AND SEALANTS

Mounting plate bolt	Loctite # 262
Plate to Plunger Contact Area	HS 851-106
Ball and Socket Joint	HS 850-106

SPECIAL TORQUES

Metering Capsules	47 ± 8 Nm
Control Nut	47 ± 8 Nm
Housing Bolts	20 ± 1 Nm

5. REMOVAL AND INSTALLATION

NOTE: *When disconnecting hydraulic lines for any reason, they should be properly capped with correct size plastic caps. If these cap are not available, tape or clean rubber corks may be used. Hydraulic openings must never be plugged with rags. This practice could easily induce dirt, lint or contaminants into critical hydraulic components. Tag disconnected lines to facilitate correct and faster installation.*

WARNING! Be sure the blade and ripper are completely lowered to the ground. Turn master switch in „OFF" position and take key out to prevent starting.

1. Remove vertical valve plate cover at right side of operators seat. Tag, disconnect and plug inlet and outlet hoses at sides of valve. Disconnect pilot hoses at valve and move out of the way. Remove mounting hardware securing valve to mounting bracket.
2. Installation is reverse of removal.

6. SERVICE

NOTE: *Unless otherwise notated all callouts are in reference to Fig. 10B.7 and 10B.8.*

NOTE: *Each of the following steps are for complete service of that individual component. For complete teardown of valve perform the first portion of each step. For complete rebuild of valve perform second portion of each step in reverse.*

Complete Valve

A. Unclasp boot (1) from control nut (2). Unthread nut from pivot bolt (6) and remove. Loosen boot from clamp (5) and remove. Remove pivot plate (3) from pivot bolt. Slowly remove mounting bolts (4) until spring tension is relieved, then remove bolts. Separate pivot bolt from mounting plate (7). Remove plunger capsules (9) and metering capsules (10) from housing (8). Clean all parts except thoroughly using a non-flammable solvent. Flush out all the passages in housing. Dry using compressed air. Inspect parts for excessive wear, cracks or breakage. Replace as necessary.

B. Install metering capsules (10) into housing (8) and torque to 47 ± 8 Nm. Position plunger capsules (9) into housing and secure with mounting plate (7), boot clamp (5) and bolts and torque to 20 ± 1.5 Nm. Thread pivot plate (3) onto pivot bolt (6) until plate barely makes contact with all plunger actuators (9). Install boot (1) on valve under clamp. Thread control nut (2) onto pivot bolt and bottom against pivot plate. Torque nut to 47 ± 8 Nm. Connect boot to control nut.

BLADE TILT VALVE - STACK TYPE VALVE

12. REMOVAL AND INSTALLATION

NOTE: *When disconnecting hydraulic lines for any reason, they should be properly capped with correct size plastic caps. If these cap are not available, tape or clean rubber corks may be used. Hydraulic openings must never be plugged with rags. This practice could easily induce dirt, lint or contaminants into critical hydraulic components. Tag disconnected lines to facilitate correct and faster installation.*

CAUTION! Be sure the blade and ripper are completely lowered to the ground. Turn master switch in „OFF" position and take key out to prevent starting.

1. Remove valve plate cover at front of right fender. Disconnect and plug return hose at side of valve, work port hoses, high pressure carry-over hose at bottom of valve and inlet tube at top of valve. Tag, disconnect pilot hoses at valve and move out of the way.
2. Attach a hoist to valve and remove mounting hardware securing valve to mounting bracket.
3. Installation is reverse of removal.

13. SERVICE

NOTE: *It may not always be necessary to completely disassemble control valve. There are several subassemblies that can be removed independently of each other. As spools and other components that are subject to wear are removed, be sure to tag them for reassembly in their original locations if they are suitable for reuse. This will maintain existing wear patterns. Also mark valve housing to indicate detent housing, spool actuator and relief valve adjusting side to aid in reassembly. Each of the following steps are for complete service of that individual component. For complete teardown of valve perform the first portion A of each step. For complete rebuild of valve perform second B portion of each step in reverse.*

NOTE: *Unless otherwise notated all callouts are in reference to Fig. 10B.15.*

Valve (Refer to Fig. 10B.17)

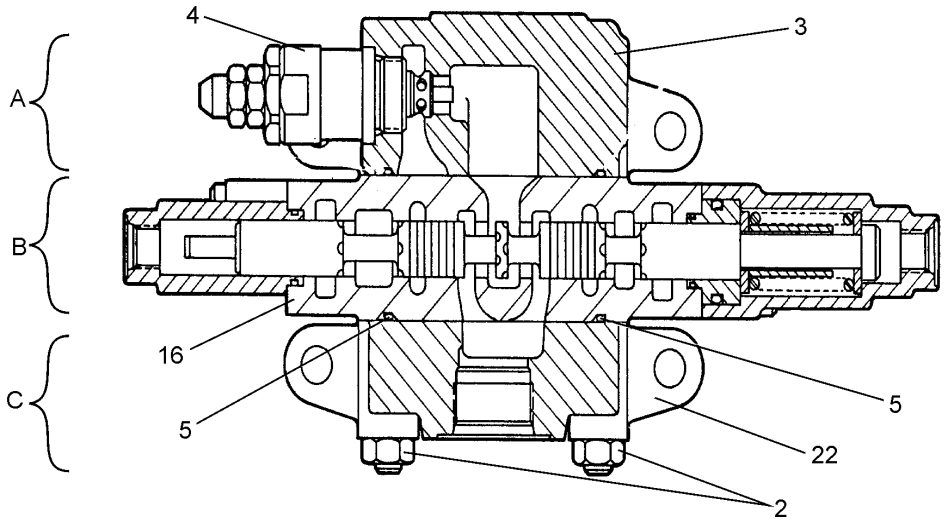


Fig. 10B.17. Valve

A - Inlet Section B - Valve Section C - Outlet Section
All callouts are in reference to Fig. 10B.15

CYLINDERS

CONTENTS

GENERAL

BLADE TILT CYLINDER (without pitch cylinder)

BLADE TILT CYLINDER (with pitch cylinder)

BLADE PITCH CYLINDER

RIPPER LIFT AND PITCH CYLINDER

RIPPER PIN PULLER CYLINDER

BLADE TILT CYLINDER (without pitch cylinder)

3. Using the hoist, pull the cylinder rod out to approximately 1/2 stroke.
4. Remove the bolts and washer (16 and 17, Fig. 10C.12. and 10C.13.) securing cylinder cover (5) to gland (4) and tie the cover up to the socket cap as shown in Fig. 10C.15. to provide working clearance.
5. Using a brass drift as shown in Fig.10C.15, drive gland into cylinder housing (1) until the tension of the lock ring (6) is off.
6. Move O-Ring (18) and remove three piece lock ring (6) from cylinder housing and pull rod assembly out of housing.
7. Remove piston rod nut (7).

NOTE: *It will be necessary to hold the ball end of the rod stationary when removing the nut. A suggested method is to clamp the ball end of the piston rod in a hydraulic press and use a torque multiplier as shown in Fig. 10C.16, or an impact tool.*

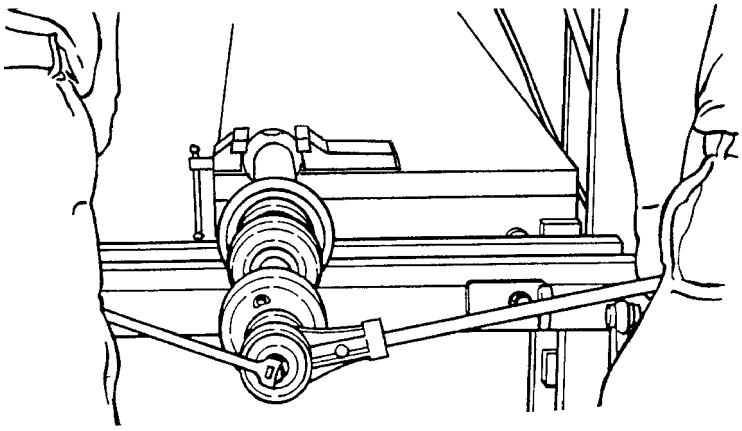


Fig. 10C.16. Removing the Piston Rod Nut

8. Remove washer (13) and piston (3) from the rod (2). Remove wear rings (8), O-Rings (21) and piston seal (9) from the piston (3).
9. Slide gland (4) from rod (2). Remove wear ring (20), O-Ring (10), backup ring (14), buffer ring (19), O-Ring (22) and seal ring (11) from gland (4).
10. Remove O-Ring (18) and slide cover (5) and socket cap (15) off of rod (2) and remove wiper ring (12) from cover (5).

8. INSPECTION AND REPAIR

1. It is recommended that all new O-rings, wear rings, seals and scraper ring be installed when the cylinder is disassembled.
2. Wash all parts in a solvent and air dry. Lubricate machined surfaces of usable parts to protect them.
3. Inspect the cylinder housing for roundness throughout its length. If a tight spot is noticed when removing the piston, the area of binding should be given particular attention. A cylinder housing that is out-of-round should be replaced.
4. Check the cylinder housing and piston rod for scratches or grooves. Shallow scratches can be polished out with fine emery cloth and oil so a smooth surface is presented to the packing.
5. Inspect all sealing ring grooves for scratches, burrs or other damage. "Dress-up" grooves or replace as necessary.
6. Inspect tapped holes for damaged threads.
7. If the housing eye bushings were removed, remove all rust, scale or paint from the bushing bore.

BLADE PITCH CYLINDER

18. INSPECTION AND REPAIR

1. It is recommended that all new O-Rings, backup rings, wear rings, packings and seals be installed when the cylinder is disassembled.
2. Wash all parts in a suitable solvent and air dry. Lubricate machined surfaces of usable parts to protect them.
3. Inspect cylinder housing for roundness through its length. If a tight spot is noticed when removing the piston, the area of binding should be given particular attention. A cylinder housing that is out-of-round should be replaced.
4. Check cylinder housing and piston rod for scratches or grooves. Shallow scratches can be polished out with fine emery cloth and oil so a smooth surface is presented to the packing.
5. Inspect all sealing rings grooves for scratches, burrs or other damage. „Dress-up" grooves or replace part as necessary.
6. Inspect tapped holes for damaged threads.
7. If the housing eye bushings were removed, remove all rust, scale or paint from the bushing bore.

19. REASSEMBLY

IMPORTANT: *Unless otherwise notated all callouts refer to Fig. 10C.27.*

1. Install wiper ring (8), lips facing out, into cover (5) and install cover onto rod (2).

IMPORTANT: *Outer end of gland is determined as bolts end and inside end as facing piston.*

2. Coat bores and grooves of gland (17) with fresh grease. Install seal ring (12) by squeezing side of the seal together and starting the seal into the groove. Then work remainder in with thumbs. Do not use a screwdriver as it will damage seal.
3. Install O-Ring (15), buffer ring (16), notched edge facing in into gland (17) and follow with wear ring (19). Install backup ring (13) and O-Ring (14) into gland (17). Install O-Ring (10) and slide gland (17) onto rod (2), tapped holes toward rod ball.
4. Install buffer ring (20) and O-Ring (21) onto rod (2).
5. Install wear ring (24) and piston seal (23) onto piston (4). Install piston seal (23), wear ring (24) and O-Ring (25) onto piston (3).
6. Slide piston (4), ring (22) and piston (3) onto rod (2). Position the halves of pistons (3 and 4) and ring (22) align the bolts holes. Apply LOCTITE 262 to bolts (27). Install bolts (27) with washer (26) and torque to 380 Nm.
7. Apply a generous amount of fresh grease to inside of housing (1) and secure to hoist frame. Install ring compressor on piston and compress wear rings. Compressing wear rings will memory rings back to size and greatly reduce possibility of damage during installation. Attach hoist to rod ball and lower rod (2) into housing (1) using extreme care not to damage wear ring (24) and piston seal (23). Once piston (3 and 4) has entered housing, drive piston rod (2) into housing to approximately 1/2 stroke.

CROSSTUBE

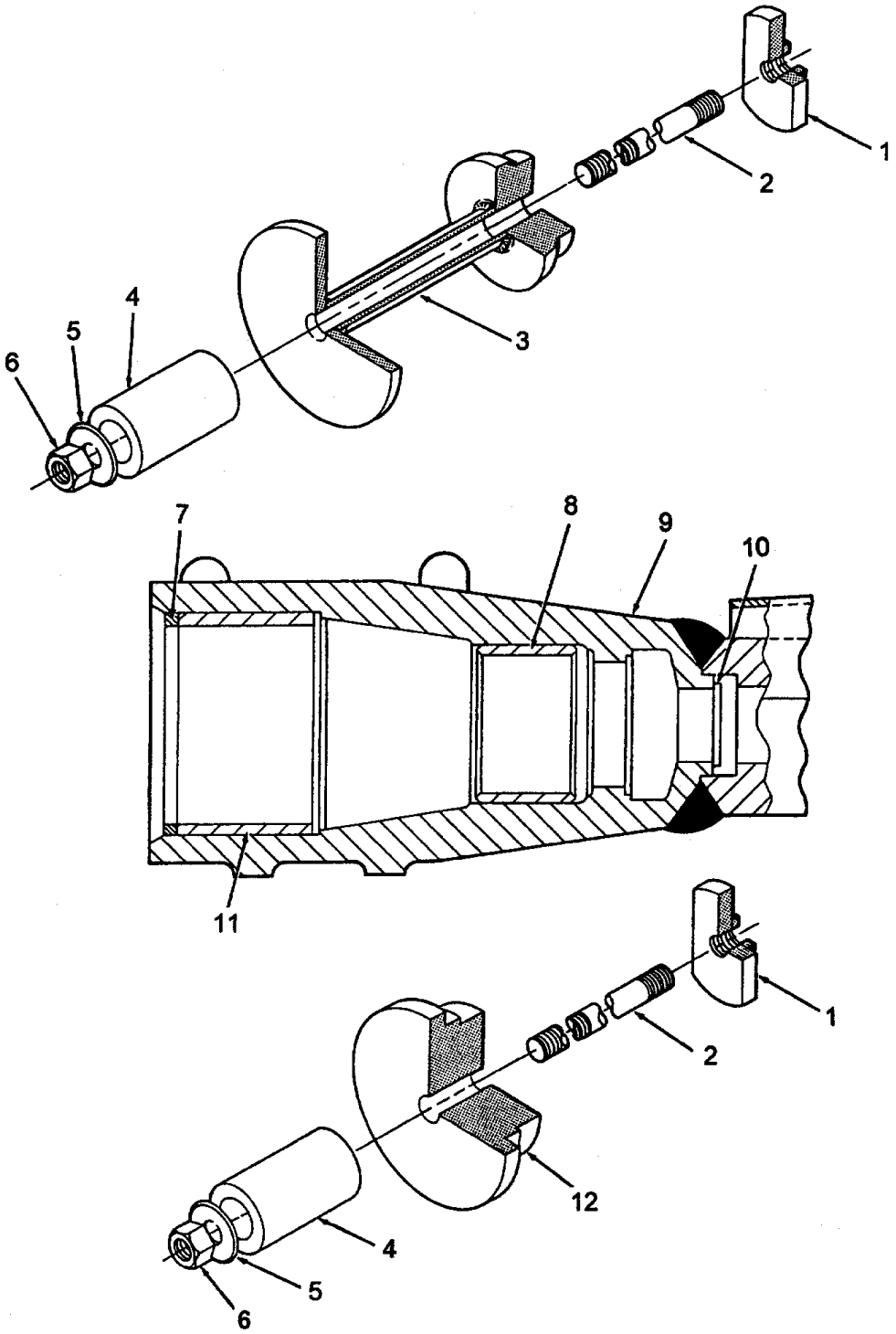


Fig. 10C.41. Crosstube Bushing Service

1. Base Plate
2. Pusher Support Rod
3. Inner Bushing Pusher Plate
4. Center Hole Ram - OEM 6028
5. Washer - 26665R1
6. Nut - 25531R1
7. Yoke Seal
8. Inner Bushing
9. Crosstube
10. Yoke Retainer Slot
11. Outer Bushing
12. Outer Bushing Pusher Plate

BULLDOZER

Dimensions for Fig. 11.2

Lift Cylinder Bracket (1):

1A. Centerline of Blade to Pin Boss . . . . . 956 mm
1B. Bottom of Blade to Centerline of Pin Hole . . . . . 766 mm
1C. Back of Blade to Centerline of Pin Hole . . . . . 134 mm
1D. Bottom Fillet Weld - @ . . . . . 12 mm
1E. Inner Side Bevel Weld - @ . . . . . 12 mm
1F. Top and Side Fillet Weld . . . . . 12 mm

Side Cutter Edge (2):

2A. Top Front Edge Parallel to Blade Face . . . . . 15 + 1 mm
2B. Bottom Front Edge to Top of Edge Mounting Plate . . . . . 35 + 1 mm
2C. Side Cutting Edge Above Lower Wear Plate. . . . . 12 + 1 mm
2D. Top, Rear and Inner Fillet Weld . . . . . 13 mm
2E. Bottom Square Weld . . . . . Fill Area

Lower Wear Plates (4 or 5):

5A. Lower Wear Plate Below Side Cutting Edge . . . . . 12 + 1 mm
5B. Lower Wear Plate Below Edge Mounting Plate . . . . . 15 mm
5C. Top Square Weld . . . . . Fill Area
5D. Top and Side Fillet Weld . . . . . .13 mm
5E. Bottom Bevel Weld . . . . . Between Plates

Upper Strut or Pitch Cylinder / Tilt Cylinder Socket (14):

14A. Centerline of Blade to Centerline of Socket . . . . . 1925 + 1 mm
14B. Centerline of Socket to Centerline of Pivot Pin Hole. . . . . .1032 + 12 mm
14C. Center Point of Socket to Rear of Blade . . . . . 188 mm
14D. Sides and Bottom Fillet Welds - @. . . . . 13 mm
14E. Top V Weld - @ . . . . . Socket to Contact Rear of Blade

Pusharm Pivot Bracket (13 or 15):

15A. Centerline of Blade to Outer Inside Pin Boss . . . . . 2017 mm
15B. Outer Inside Pin Boss to Centerline of Bracket . . . . . 91 + 1 mm
15C. Bottom of Blade to Centerline of Pivot Pin Hole . . . . . 510 mm
15D. Rear of Blade to Centerline of Pivot Pin Hole . . . . . 252 mm
15E. Outer Inside Pin Boss to Side of Blade . . . . . 169 + 2 mm
15F. Diameter Pin to Pass Through Bores After Welding . . . . . 90 mm
15G. Top Bevel then Fillet Weld . . . . . 13 mm
15H. Inner Area Fillet Weld . . . . . 13 mm
15I. Inner Side Fillet Weld . . . . . 13 mm
15J. Bottom Bevel Weld . . . . . Fill Area Between Plates
15K. Outer Side Bevel Weld. . . . . Fill Area Between Plates

@ - WELD REQUIRES PREHEATING OF PART FROM 180 TO 230^{o}C

BULLDOZER

Dimensions for Fig.11.10

A. Strut Ball to Housing. . . . . 215 ± 1 mm
B. Strut Ball to Housing Fillet Weld . . . . . 20 mm
C. Locking Bar Mounting Tube (Material For Tube: AISI 1010 Steel Tubing):
  C1. Length . . . . . 90 ± 1. mm
  C2. Outer Diameter. . . . . 48 mm
  C3. Wall Thickness . . . . . 7 mm
  C4. End Chamfer . . . . . 3 ± 0.3 mm x 45°
D. Centerline of Locking Tube Bar to Housing . . . . . 55 ± 1 mm
E. End Cap on Locking Bar. . . . . 15 ± 0.55 mm
F. End Cap to Locking Bar Fillet Weld . . . . . 10 mm
G. Strut Assembled Length:
  Opened Length . . . . . 1759 to 1761 mm
  Closed Length . . . . . 1599 to 1601 mm
  Mean Strut Length . . . . . 1679 to 1681 mm

Service

1. Remove strut eyebolt (1) and lubrication fitting (3) from strut housing (2). Cut off locking bar with ends and mounting tube from strut housing and discard. Air arc off strut ball through six holes in housing and end weld. Remove ball and socket cap. Clean up weld areas on strut housing. Check cap against ball for excessive wear and replace if necessary.

2. Place socket cap on strut ball and position to dimension A. Fillet weld (B) ball to housing. Plug weld ball to housing at six holes. Fabricate locking bar tube (C) as shown. Position tube to dimension D and bevel weld to housing. Position one end cap on locking bar to dimension E. Fillet weld (F) end cap to locking bar. Position remaining end cap on locking bar to dimension E. Fillet weld (F) end cap to locking bar. Coat inside threads of housing with fresh grease and install strut eyebolt (1). Install lubrication fitting (3) into housing. Thread eyebolt in or out to obtain mean dimension G. Pump fresh grease through fitting until grease appears around eyebolt threads.

9. STRESS RELIEVER BUSHING

1. Insert bushing tool, (refer to SERVICE/SPECIAL TOOLS in SECTION 1), between stress reliever ears. Drive out top bushing and discard. Remove bushing tool. Weld lower bushing to shrink and remove from stress reliever. Clean bushing mounting areas.

2. Freeze both bushings. Position lower bushing in place and through top hole press in bushing flush with top surface of lower ear. Insert bushing tool between stress reliever ears. Position upper bushing in place and press flush with top surface of top ear. Check bushing installation I.D. and between ear distance against criteria given in SPECIFICATIONS.

NOTE: *Bushing tool must be used when removing and installing top bushing as severe damage will occur to stress reliever assembly and ears.*