| Document Title: | Function Group: | Information Type: | Date: |
|---|---|---|---|
| **Brake system, overview** | **500** | **Service Information** | **2015/2/3 0** |
| Profile: **GRD, G960 [GB]** | | | |

# Brake system, overview

Oil disc service brakes are standard on all models. A hydraulic power booster is used with a dual reservoir brake master cylinder. The brake power booster includes an integral electric back-up pump. The back-up pump provides sufficient boost to either bring the machine to a safe stop or hold it on a slope until the parking brake can be applied.

A gear type hydraulic pump, which is externally mounted on the transmission, draws oil through a suction screen in the transmission oil sump and supplies oil to the brake booster circuit. The pump relief valve is set to 10 MPa (103 bar, 1500 psi) to provide protection in the event that one of the brake relief valves fail.

This circuit is an open center type. Therefore, oil circulates through the power booster until required before draining into the transmission case.

The oil disc service brakes are designed as a modular assembly and can be removed intact without performing any disassembly on the machine. A threaded hole for a hoisting eyebolt is located at the top of the brake housing. Most parts are common between models. The main differences are the quantity of friction discs and reaction plates used, and the axle shaft design. The tandem oil is used to cool and lubricate the friction pack and bearings. Check the oil level by using the dipstick on the tandem case.

**Brake circuit**

The outlet ports on the master cylinder are connected in a diagonal pattern to the four brake units. This provides two independent brake circuits. If a failure occurs in one of the two circuits, a differential pressure switch activates when the brake pedal is depressed. This switch energizes a warning lamp and alarm to alert the operator. Braking remains effective on all four drive wheels through the tandem chains.

A flow switch mounted in the outlet port of the brake power booster monitors the flow of oil through the booster. This switch controls the electrical circuit that activates the back-up pump. The circuit is designed to operate the back-up pump with the ignition key in either the on or off positions.

**Ignition key in the on or running “I” position:**
If the engine stalls or there is an oil flow interruption, the flow switch activates the back-up pump to provide boost at a reduced level. A warning lamp in the center display and a separate alarm alert the operator that the back-up pump is working. The pump automatically shuts down when main hydraulic flow is restored.

**Ignition key in the off “O” position:**
The brake light switch takes the place of the ignition key switch in supplying power to the back-up pump electrical circuit. With the engine off, the flow switch on the power booster is closed to complete the electrical circuit. The back-up pump will operate as long as the brake pedal is depressed. As the ignition key is off, the warning lamp and alarm will not energize to alert the operator.

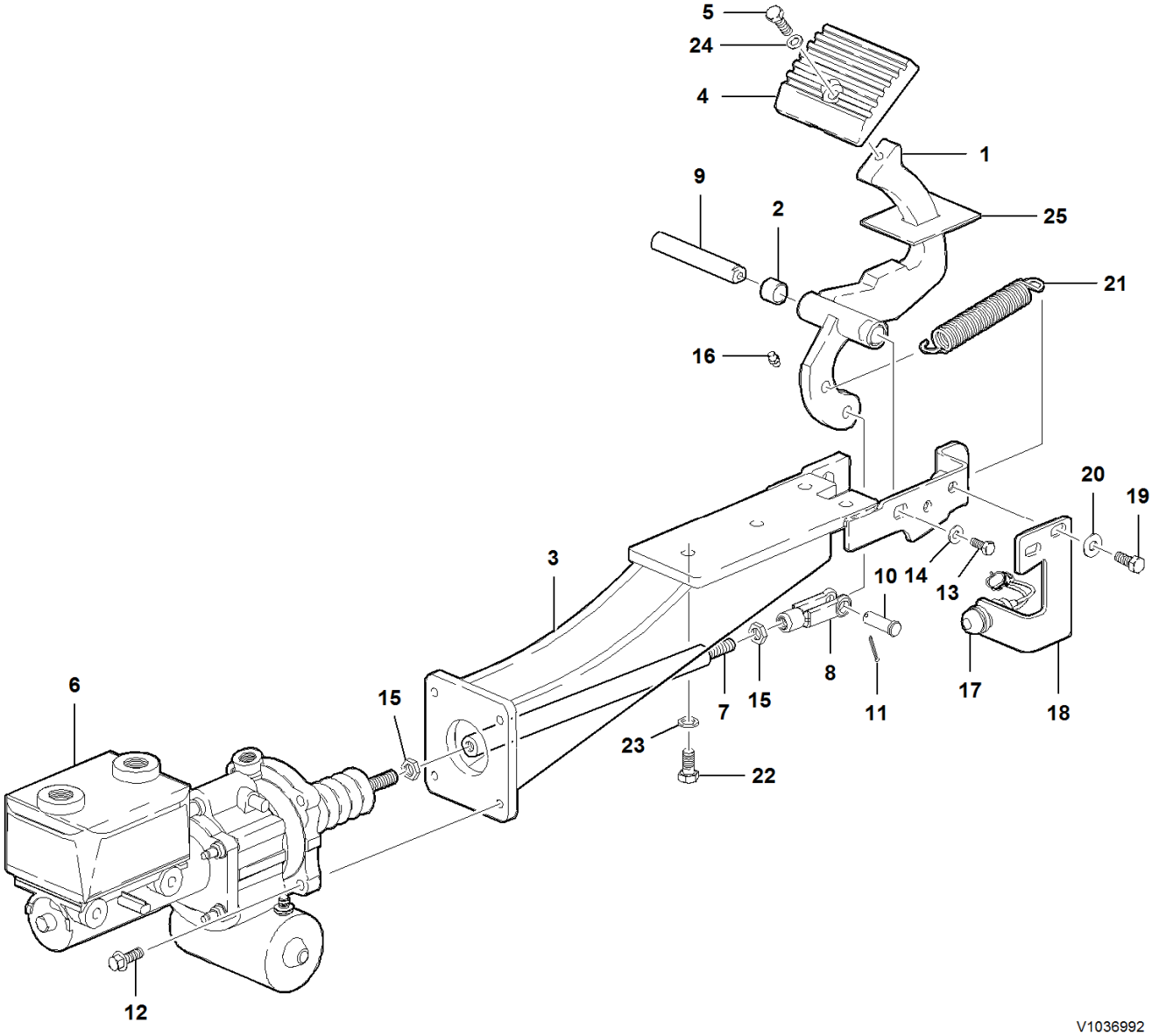


**Figure 1**

1. Brake pedal
2. Bearing
3. Bracket
4. Brake pad
5. Hexagon screw
6. Master cylinder
7. Rod
8. Clevis
9. Shaft
10. Clevis pin
11. Cotter pin
12. Flange screw
13. Hexagon screw
14. Washer
15. Hexagon nut
16. Nipple
17. Switch
18. Bracket
19. Hexagon screw

20. Washer
21. Spring
22. Hexagon screw
23. Washer
24. Washer
25. Seal

VOLVO

Construction Equipment

**Service Information**

| Document Title: | Function Group: | Information Type: | Date: |
|---|---|---|---|
| **Wheel brake, description** | **510** | **Service Information** | **2015/2/3 0** |
| Profile: **GRD, G960 [GB]** | | | |

# Wheel brake, description

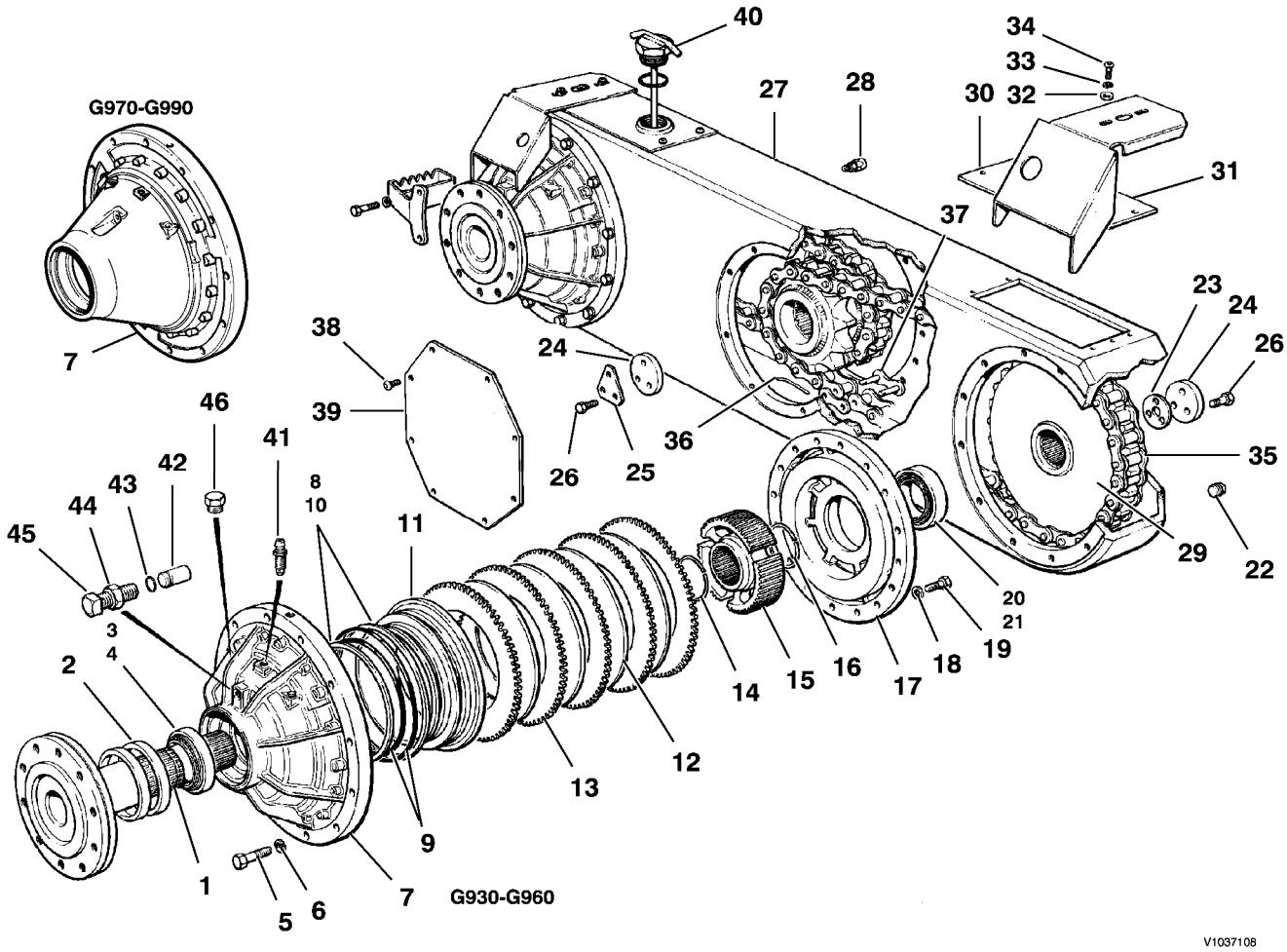


**Figure 1**
**Oil disc brake assembly**

1. Axle
2. Duo-cone seal
3. Outboard bearing cup
4. Outboard bearing cone
5. Brake housing bolt
6. Lock washers
7. Brake housing
8. Inner back-up ring
9. O-rings
10. Outer back-up ring
11. Piston
12. Friction disc
13. Reaction plate
14. Outer snap ring

15. Hub
16. Inner snap ring
17. Back-up plate
18. Washer
19. Back-up plate bolt
20. Inboard bearing cup
21. Inboard bearing cone
22. Drain plug
23. Shim pack
24. Retainer plate
25. Tab washer
26. Retainer plate bolt
27. Tandem case
28. Breather
29. Driven sprocket
30. Inspection cover
31. Brake line shield
32. Flat washer
33. Lock washer
34. Bolt
35. Drive chain
36. Cotter pin
37. Connector link
38. Side cover plate bolt
39. Side cover plate
40. Oil level dipstick
41. Bleeder screw
42. Adjusting pin
43. O-ring
44. Jam nut
45. Piston travel limiting screw
46. Blanking plug

**G930 - G960 brake housing assembly**

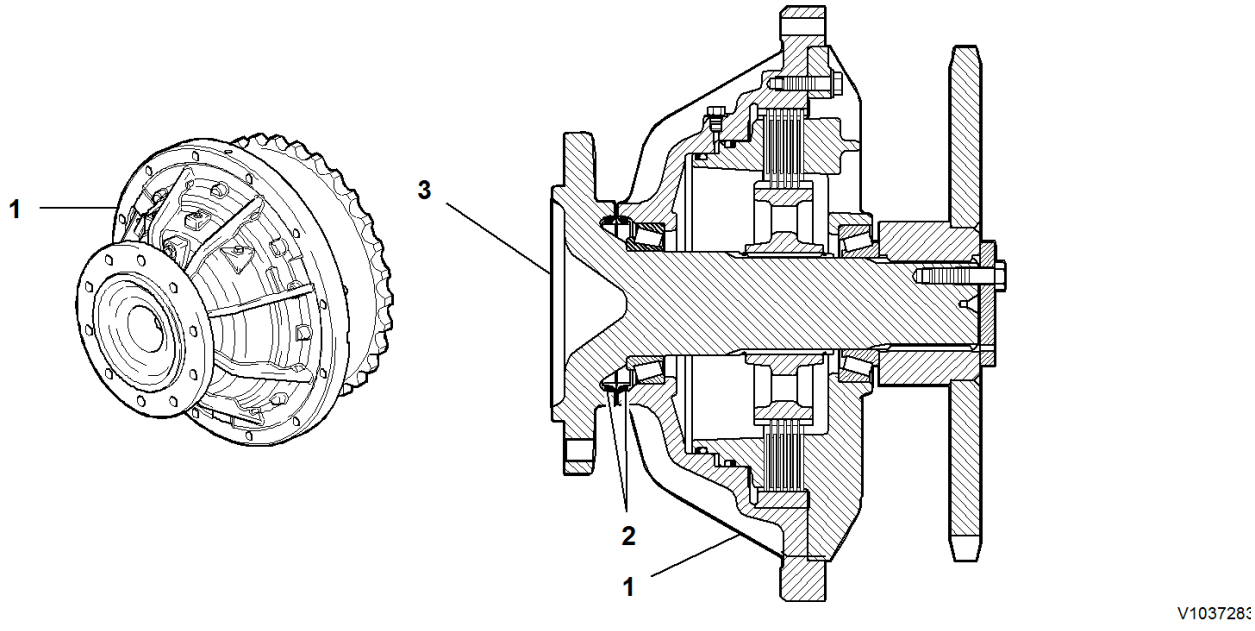


**Figure 2**

1. Brake housing
2. Duo cone seal

3. Axle

**G970 - G990 brake housing assembly**

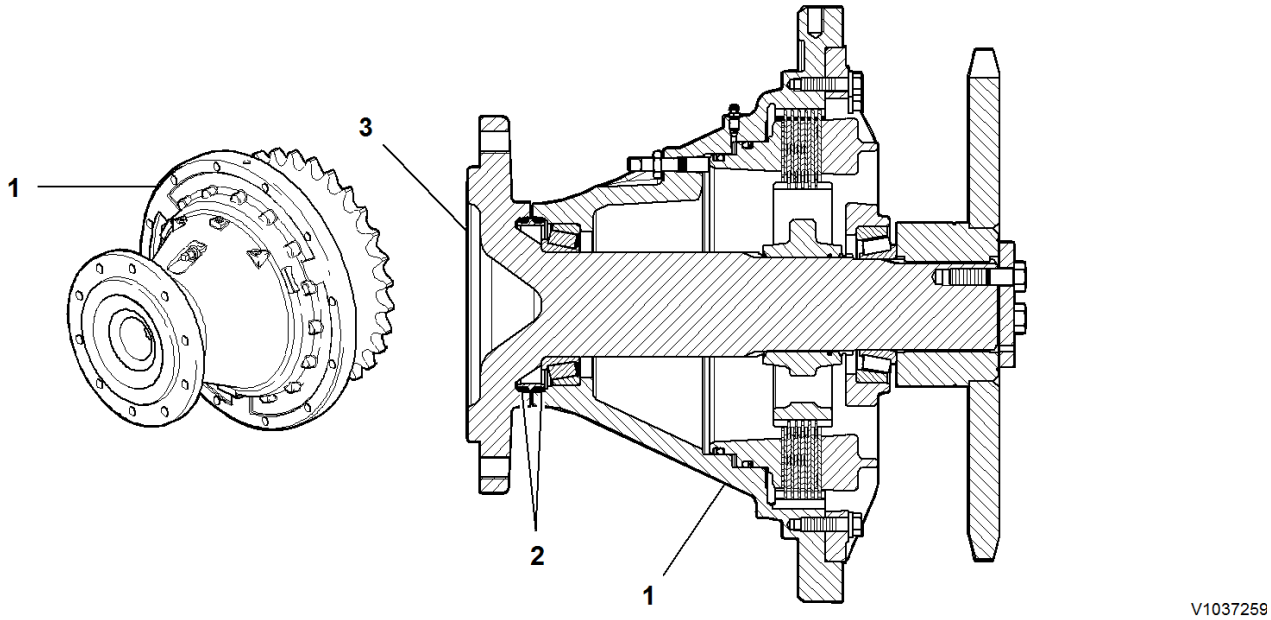


**Figure 3**

1. Brake housing
2. Duo cone seal
3. Axle

The oil disc service brakes are hydraulically actuated and located at the four tandem drive wheels. The crossover dual braking circuits provide even braking on both sides of the machine.

If the engine stalls or hydraulic boost pressure becomes unavailable, full braking capability is available through a reserve system. An electric motor supplies the power required to bring the machine to a safe stop.

The parking brake is a spring applied hydraulically released multi disc type brake. It is mounted in the rear axle on the input shaft. An accumulator in the circuit stores system pressure, allowing the brakes to remain released in the event of system pressure loss for approximately twenty minutes.

**Construction**

Two tapered roller bearings support the axle shaft in the brake housing. The outboard bearing is a press fit and the inboard bearing is a slide fit on the axle shaft. The assembly contains shims to exert a slight preload on the bearings. The oil disc brake friction pack consists of:

- A set of organic faced friction discs with internal spline teeth. The friction discs mount onto a hub splined to the axle shaft.
- A set of steel reaction plates. External spline teeth retain the reaction plates in the brake housing.

The discs and plates are alternately installed in the brake housing; starting and ending with a reaction plate. The number of discs and plates varies between models as follows:

- G930: 3 Disc/ 4 Plate
- G940, G946, G960: 4 Disc / 5 Plate
- G970, G976, G990: 5 Disc / 6 Plate

The difference in the number of plates and discs is compensated by using backing plates of different thicknesses. All axle shafts are hardened; one axle shaft is used for models G930 - G960 and another for models G970 - G990. The G990 axle shaft has a bolt pattern for rims with larger tires.

A Duo-cone seal is used at the outboard bearing. A breather maintains a slight pressure to prevent dust and dirt entering the tandem case. Make sure the breather does not become clogged as over-pressurizing the tandem case can cause seal

leakage.

**Application circuit**

System fluid enters one of two inlets on the top of the brake housing. Rear mounted brake assemblies use the rear port; front mounted brake assemblies use the front port. The system fluid moves the piston away from the piston travel limiting screw towards the friction pack. Braking action occurs as the piston compresses the discs and plates against the backing plate. When the brake pedal is released, the system fluid returns to the brake master cylinder and the friction pack disengages. The grooves in the friction discs allow oil to enter between the discs and the reaction plates. This allows the discs and plates to separate slightly, moving the piston toward the piston travel limiting screw. Once the piston has released its clamping force, the axle rotates freely.

VOLVO

Construction Equipment

**Service Information**

| Document Title: | Function Group: | Information Type: | Date: |
|---|---|---|---|
| **Service brakes, function check** | **510** | **Service Information** | **2015/2/3 0** |
| Profile: **GRD, G960 [GB]** | | | |

# Service brakes, function check

**Op nbr 510-005**

1. After repair work has been completed in any brake related system, a service brakes function check must be performed as described below:

    1. Drive the machine onto an incline with at least a 20% grade where it is safe to allow the machine to roll forward without power.
    2. Move the transmission shifter into the Park (P) position.
    3. Move the transmission shifter into the Neutral (N) position when it is safe to do so. Allow the machine to roll forward at about 3-5 km/h (2-3 mph). Apply the service brakes. The machine must stop abruptly.
       **NOTE!**
       A supplementary power source automatically supplies hydraulic power assist in the event of an engine failure or any situation where hydraulic oil flow is interrupted to the service brake system.
    4. When the machine comes to a complete stop, move the transmission shifter into the Park (P) position.
    5. Lower the moldboard and all attachments to the ground. Do not apply down pressure.
    6. Shut down the engine.
    7. Check for fault codes.

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Construction Equipment

# Service Information

| Document Title: | Function Group: | Information Type: | Date: |
|---|---|---|---|
| **Brake circuit hydraulic schematic** | **510** | **Service Information** | **2015/2/3 0** |
| Profile: **GRD, G960 [GB]** | | | |

## Brake circuit hydraulic schematic

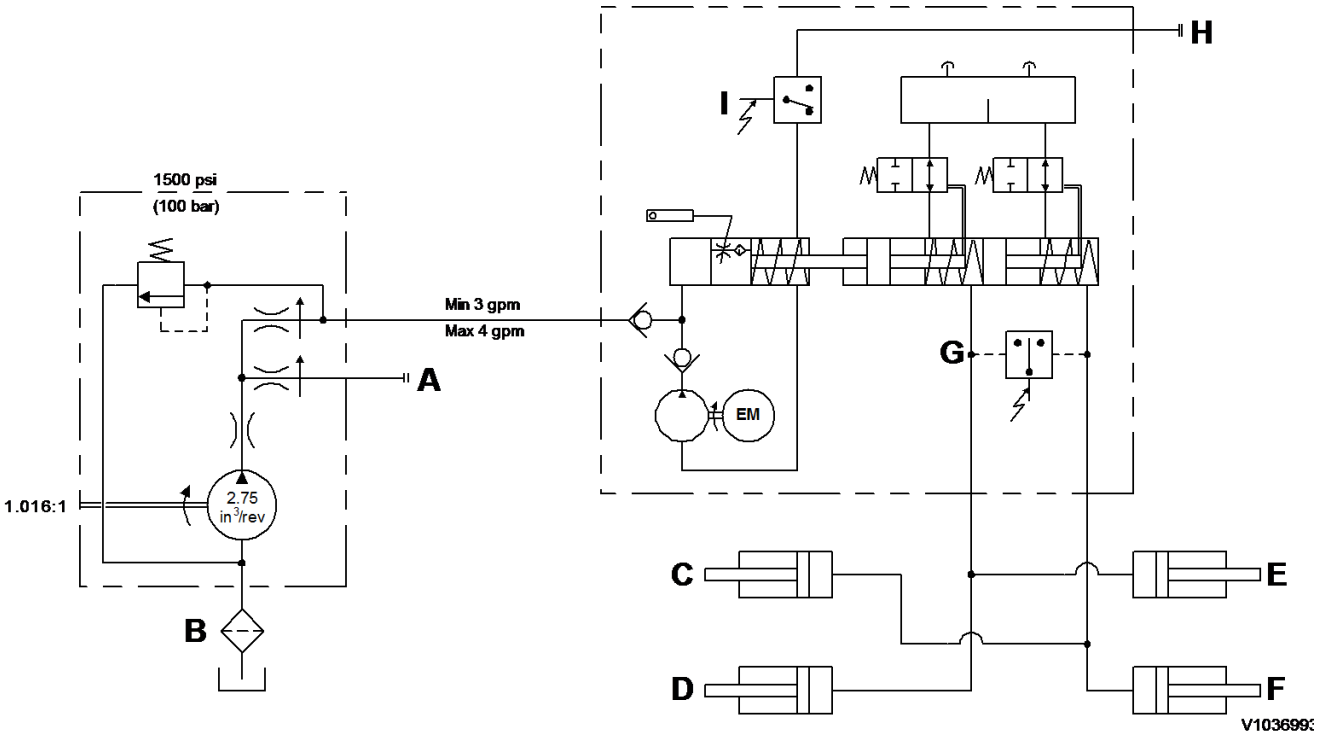


**Figure 1**

A. To transmission
B. Transmission sump
C. LH front
D. LH rear
E. RH front
F. RH rear
G. Differential pressure switch - closes at 0.5 MPa - 2 MPa (4.8 bar - 15.5 bar; 70 psi - 225 psi)
H. To transmission
I. Flow switch

| Document Title: **Oil disc brake assembly, removing** | Function Group: **517** | Information Type: **Service Information** | Date: **2015/2/3 0** |
|---|---|---|---|
| Profile: **GRD, G960 [GB]** | | | |

# Oil disc brake assembly, removing

**Op nbr 517-071**

1. Start the engine when it is safe to do so. Position the moldboard centrally on the circle and 90º to the frame. Operate the blade lift cylinders and raise the tandem. Shut down the engine.

2. Place a safe, adequate stand or blocking under the tandem on the same side as the wheel to be removed. The blocking should be high enough to prevent both tandem wheels from touching the ground. Start the engine when it is safe to do so. Operate the blade lift cylinders and lower the machine onto the blocks. Shut down the engine. Remove and retain the ignition key. Turn the battery disconnect switch off and remove it.

3. Place the machine in the 191 Service position.

4. Remove the wheel rim bolts and washers. Roll the wheel away from the tandem case.

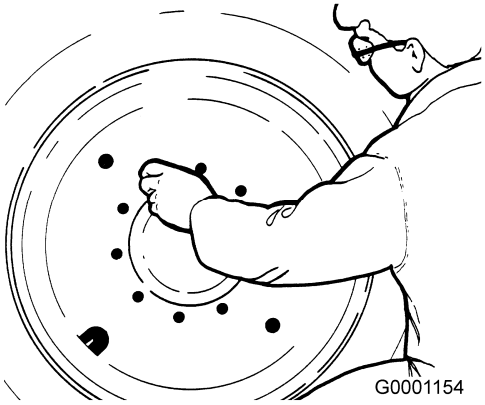


**Figure 1**

**WARNING**

**Only use lifting devices with adequate capacity.**

**NOTE!**
If the oil disc brake assembly removal procedure is done on the left side of the machine, the battery box will have to be lifted to remove the inspection port cover. If the removal is done on the right side, this procedure is not required.

5. Loosen the mounting bolts on the opposite side of the battery box from the inspection cover to be removed.

**WARNING**

**Only use lifting devices with adequate capacity.**

6. Lift the battery box slightly using a safe lifting device. Place a block under the end of the battery box.

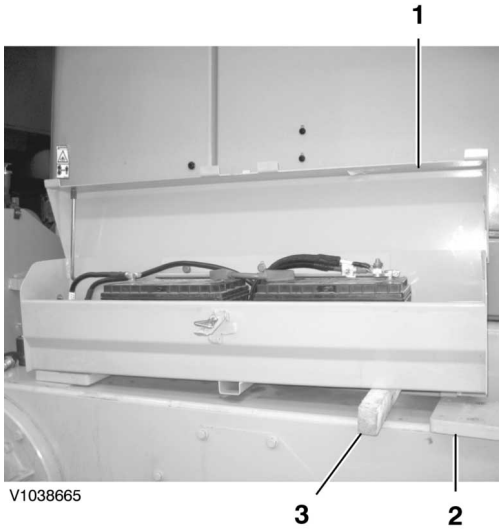


**Figure 2**
**Battery box with block underneath**

1. Battery box
2. Spacer block
3. Block

7. Remove the bolts retaining the inspection port cover at the brake assembly end being serviced.

8. Remove the battery box top cover plates for air venting before draining. Remove the drain plug from one end of the tandem case. Drain the oil into a suitable container. Clean the drain plug and apply a bead of Teflon pipe thread sealant. Fully install the drain plug. Refer to 030 Tandems, volume (Models G930 - G976).

9. Remove the bolts and washers securing the cover plates and brake line shields. Remove the cover plates and brake line shields of the brake assembly to be serviced.

10. Disconnect the brake line at the brake housing. Immediately plug the open ports and fittings to prevent contamination. Reinstall the drain plug.

11. Manually release the parking brake. Refer to 551 Manual release of parking brake.

12. Working through the inspection port on top of the tandem, turn the driven sprocket until the connector link (37) of the drive chain is accessible. Remove and discard the cotter pins. Remove the connector link from the drive chain.

**WARNING**

**Risk of cuts! Wear safety glasses and use protective gloves.**

**NOTE!**
For removal of G990 tandem drive chains with press fit chain connector links refer to: **Service Bulletin 463GRD3** and **Installation Instructions document ref. No. 21A1000920**.

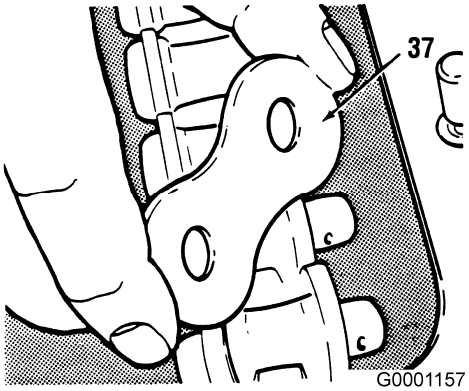

**Figure 3**

13. Remove the chain from the sprocket.

**WARNING**

**Only use lifting devices with adequate capacity.**

14. Attach a lifting eye in the drilled and tapped hole in the brake housing. Remove the brake housing mounting bolts and washers. Remove the brake assembly from the tandem case. **Weight 250 kg, 550 lbs**

**NOTE!**

The oil disc brake assembly may need to be pried away from the tandem.

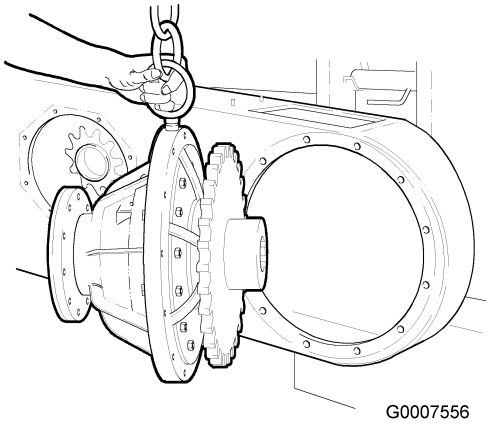


**Figure 4**

| Document Title: **Oil disc brakes, disassembling** | Function Group: **517** | Information Type: **Service Information** | Date: **2015/2/3 0** |
|---|---|---|---|
| Profile: **GRD, G960 [GB]** | | | |

# Oil disc brakes, disassembling

**Op nbr 517-072**

Puller

1. Place the oil disc brake assembly, with the wheel mounting flange down, onto a level work surface.

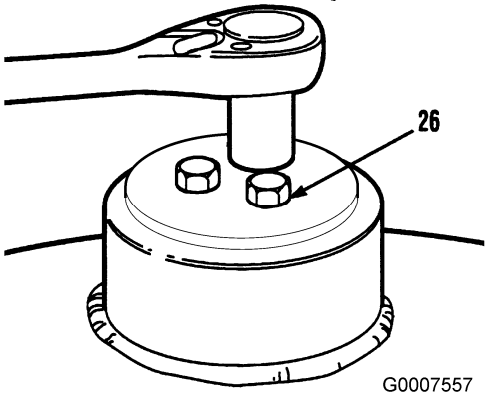


**Figure 1**

2. Remove the bolts, retainer plate (24) and shims (23). Keep the original shims for installation.

3. Use a safe lifting device to remove the sprocket. Note the proper orientation of the sprocket flange to prevent incorrect installation **Weight 36 kg (80 lbs)**.

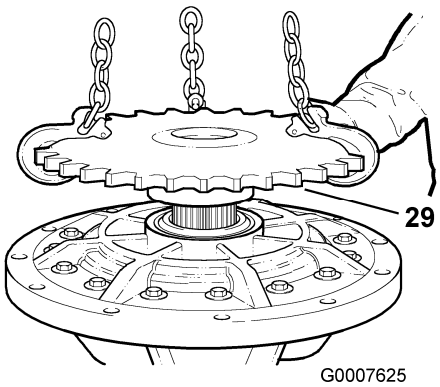


**Figure 2**

4. Remove the back-up plate retaining bolts and washers. Install an appropriate puller to remove the inboard bearing cone and back-up plate. (It may be necessary to tap the inner housing if sealant leaked between the housings.) Remove the bearing cone and place to one side for cleaning and inspection. **Weight 35 kg (77 lbs).**

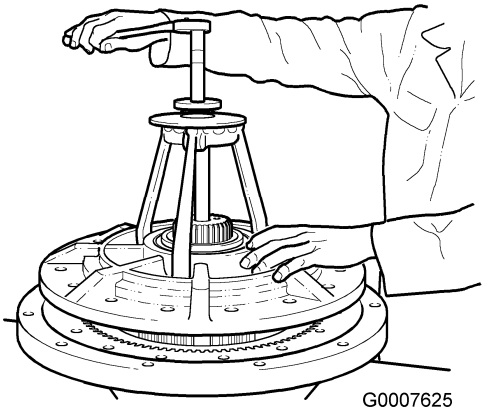


**Figure 3**

5. Place the back-up plate (17) in a hydraulic press and remove the inboard bearing cup. Place the bearing cup to one side for cleaning and inspection.

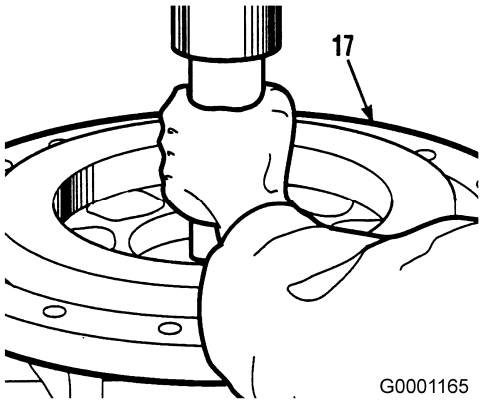


**Figure 4**

6. Remove and discard the inner snap ring (16) from the axle shaft (1).

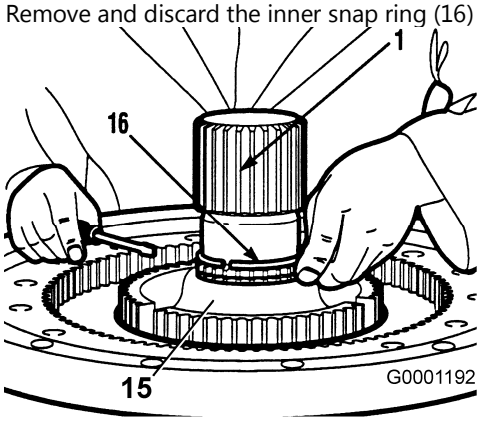


**Figure 5**

7. Remove the hub (15) from the axle shaft (1).

8. Remove the friction discs and the reaction plates (13) from the brake housing (7). Be sure to keep them in order. Place each plate and disc to one side for cleaning and inspection.

9. Use a safe lifting device to remove the brake housing from the axle shaft. **Weight 36 kg (80 lbs)**. Remove the corresponding Duo-cone seal halves from the axle shaft and the brake housing.
   **NOTE!**
   Do not touch the lapped seal mating surfaces. The natural acidity of the skin may etch the delicate metal surfaces.

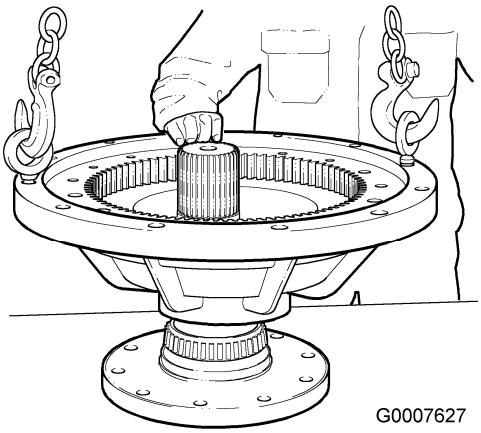


**Figure 6**

10. Remove and discard the outer wire snap ring (14) from the axle shaft.

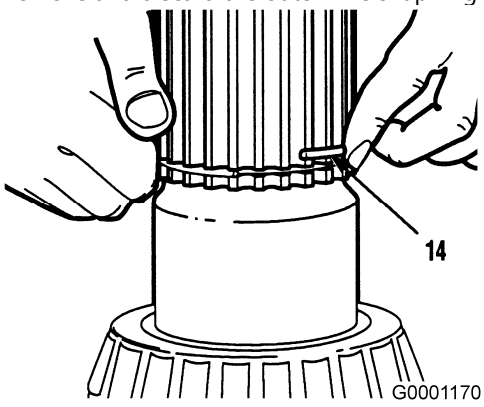


**Figure 7**

11. Use an appropriate puller to remove the outboard bearing cone (4) from the axle shaft (1). Place the bearing cone to one side for cleaning and inspection. If installed, remove and discard the wear sleeve from the axle shaft. **Axle weight 36 kg (80 lbs).**

**WARNING**

**Compressed air. Never direct to bare skin. Use protective equipment.**

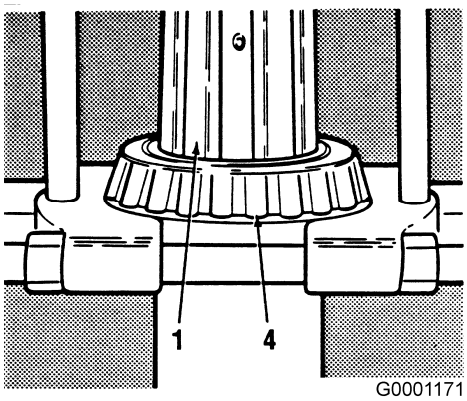

**Figure 8**

12. Place the brake housing (with the large opening down) on a sturdy, level work surface. **Weight 91 kg (200 lbs).** Use a rubber tipped air nozzle to carefully apply shop air pressure until the piston releases from the bore.

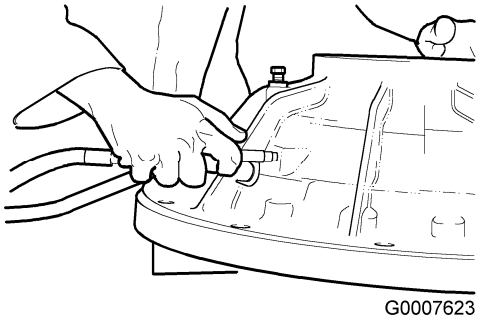


**Figure 9**

13. Remove and discard the O-rings (9) and back-up rings (8 and 10) from the piston (11).

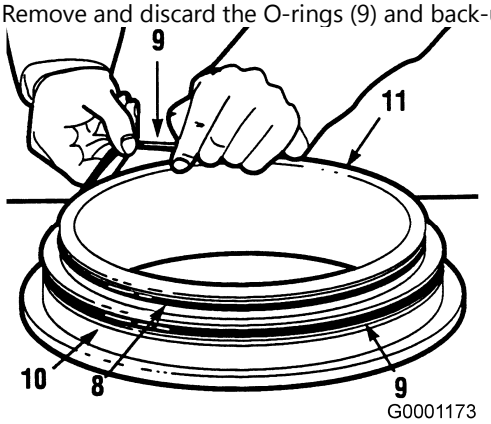


**Figure 10**

14. Place the housing in a hydraulic press. Remove the outboard bearing cup. Place the bearing cup to one side for cleaning and inspection.

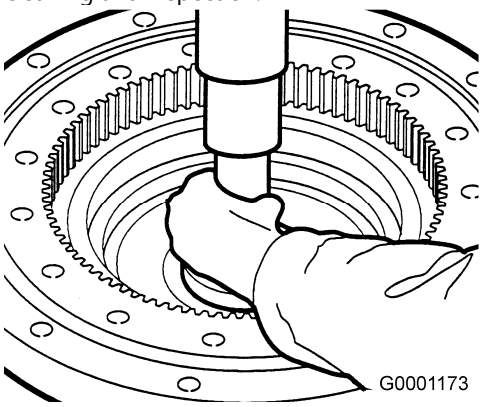


**Figure 11**

15. Remove the adjusting pin. Remove and discard the O-ring.

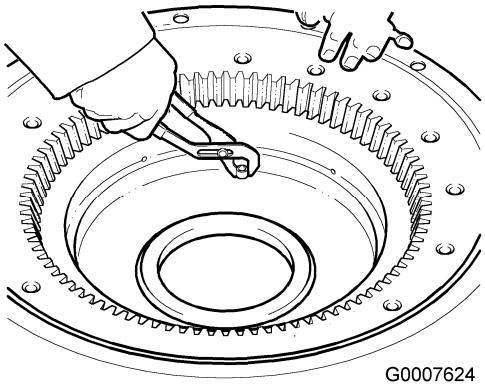


**Figure 12**

| Document Title: **Oil Disc Brake - Cleaning and Inspection** | Function Group: **517** | Information Type: **Service Information** | Date: **2015/2/3 0** |
|---|---|---|---|
| Profile: **GRD, G960 [GB]** | | | |

# Oil Disc Brake - Cleaning and Inspection

**Op nbr 517-073**

**WARNING**

**Risk of personal injury! Wear safety glasses and use protective gloves.**

For tolerances and other specifications, check 500 Brake system, overview. A careful and thorough inspection of all parts is extremely important. If there is evidence of damage or wear, replace all defective items with genuine Volvo parts.

Check for the causes of defective components. Replacing parts may not necessarily correct the problem.

Carefully inspect all bearing rollers, cages and cups, for wear, nicks, and chipping. When replacing bearings, always install new mating cups and cones.

Retain O-rings and back-up rings only for inspection and troubleshooting purposes. Replace all O-rings and back-up rings when overhauling the oil disc brake assembly.

**Cleaning**

Wear cotton gloves when handling bearings. This prevents skin acids and perspiration transferring onto the bearing races. Immerse bearings and small parts in fresh cleaning solvent. Use a hot tank system and a mild alkali solvent. Agitate the parts to remove all foreign matter.

Parts should remain in the solvent long enough to be thoroughly cleaned. In the hot tank system, heated parts help to evaporate the solvent and rinse water. Thoroughly rinse parts to remove all traces of dirt and solvent.

**NOTE!**

Do not clean the friction discs.

After rinsing, immediately dry the parts using moisture-free compressed air. Lint-free, uncontaminated wiping rags can be used. Ensure all oil passages are unblocked.

Rinse cleaned bearings and dry with moisture-free compressed air while rotating them slowly by hand. DO NOT spin bearings when drying. Lubricate all bearings with system oil. Wrap in clean, lint-free cloth or paper. Store in a cool, dry place.

**Brake housing**

Remove the remnants of silicone sealant and any other contaminants before inspection. The mating surfaces must be free of nicks and burrs. Inspect the surface finish of the housing that is in contact with the Duo-cone rubber toric. It must be free of damage and corrosion.

**Friction discs and reaction plates**

Check the thickness and condition of all friction discs and reaction plates. Compare with the specifications listed at the back of this publication. Discard all warped plates.

**Axle shaft**

Small nicks can be removed using an appropriate grinding stone. Inspect for signs of bent or twisted splines and replace any deformed axle shafts. Inspect the contact surface of the Duo-cone seal rubber toric. It must be cleaned to remove corrosion and other contamination.

| Document Title: **Brake Housing Pre - Assembly** | Function Group: **517** | Information Type: **Service Information** | Date: **2015/2/3 0** |
|---|---|---|---|
| Profile: **GRD, G960 [GB]** | | | |

# Brake Housing Pre - Assembly

**Op nbr 517-074**

1. Remove any nicks and burrs from the piston and the inside of the brake housing. Give special attention to the chamfered edges and openings of the oil passages.

2. Place the brake housing (7) (with the large opening down) on a sturdy, **weight 36 kg (80 lbs)**, level work surface. Lubricate the bearing cup (3). Install the outboard bearing cup using a hydraulic press and a piloted bearing driver with the same outside diameter as the cup. Alternatively, place the cup in a deep freeze unit or dry ice to shrink it for easier assembly. DO NOT freeze below –54ºC (–65ºF).

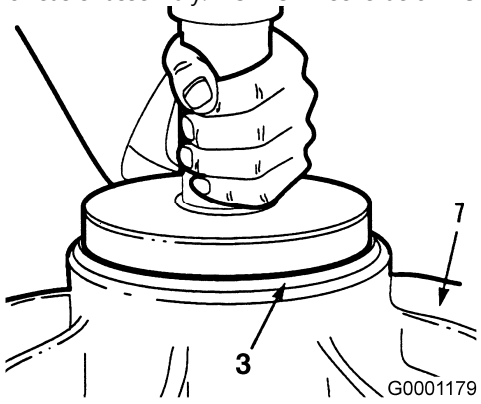


**Figure 1**

3. Turn the brake housing over. Lubricate and install a new O-ring on the adjusting pin. Install the pin into the small hole in the brake housing. **Weight 36 kg (80 lbs).**

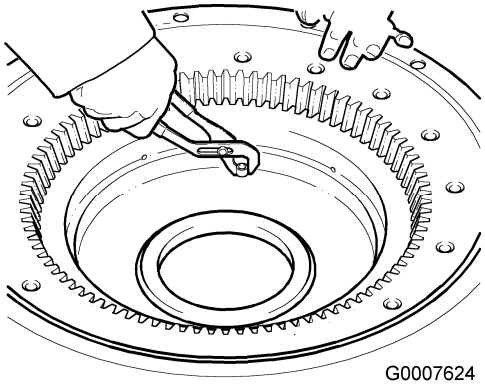


**Figure 2**

4. Lubricate and install new O-rings (9) and back-up rings (8 and 10) on the piston (11). The back-up rings are installed on the outside and the O-rings are installed on the inside.

5. Install the piston (11) in the piston bore. Both the piston and the bore must be well lubricated with system oil.

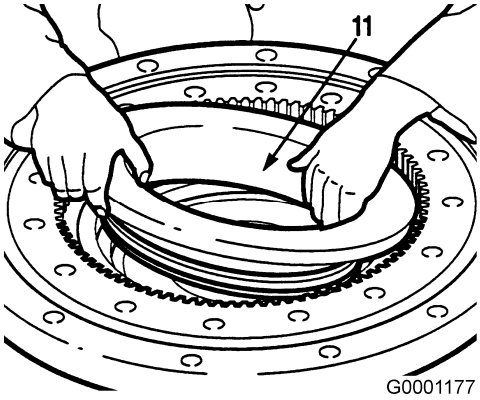


**Figure 3**

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