TANDEM MASTER CYLINDER

Description

The master cylinder comprises two independent systems housed in a single cast-iron body, should one system develop a fault the other remains operative. The primary cylinder operates the front brakes and has a tipping valve. The secondary cylinder operates the rear brakes and has a centre valve. Both cylinder outlets have a trapped line pressure valve (T.L.P.V.). A fluid level warning switch is mounted in the reservoir cap. This operates a red warning light on the dashboard.

Operation

In the "Brake Off" position the hydraulic fluid can move unrestricted between each split-line system and its separate compartment reservoirs in the fluid supply tank. When the brakes are applied, a push rod moves the primary plunger up the cylinder bore and allows a spring load tipping valve to return to centre. The fluid supply port from the primary reservoir to the cylinder is closed by the tipping valve and further movement of the primary plunger results in hydraulic pressure being transmitted via the trapped-line pressure valve to the front brakes. At the same time the pressure created acts in conjunction with the increasing force of the intermediate spring to overcome the stronger secondary spring, thus actuating the secondary plunger.

Initial movement of the secondary plunger compresses the secondary spring and relieves the pressure on the centre valve head. The spring washer fitted under the valve head is allowed to resume its natural "bowed" shape and moves the centre valve head and seal to close the fluid entry port in the secondary plunger. As the plunger continues to move up the bore, fluid is forced via the trapped-line pressure valve to the rear brakes.

On return stroke the plungers move back, the ports are opened and the fluid can again move unrestricted between separate systems and the fluid reservoir.

Should a failure occur in one system, brake pedal travel will increase, with the remaining system operating effectively.

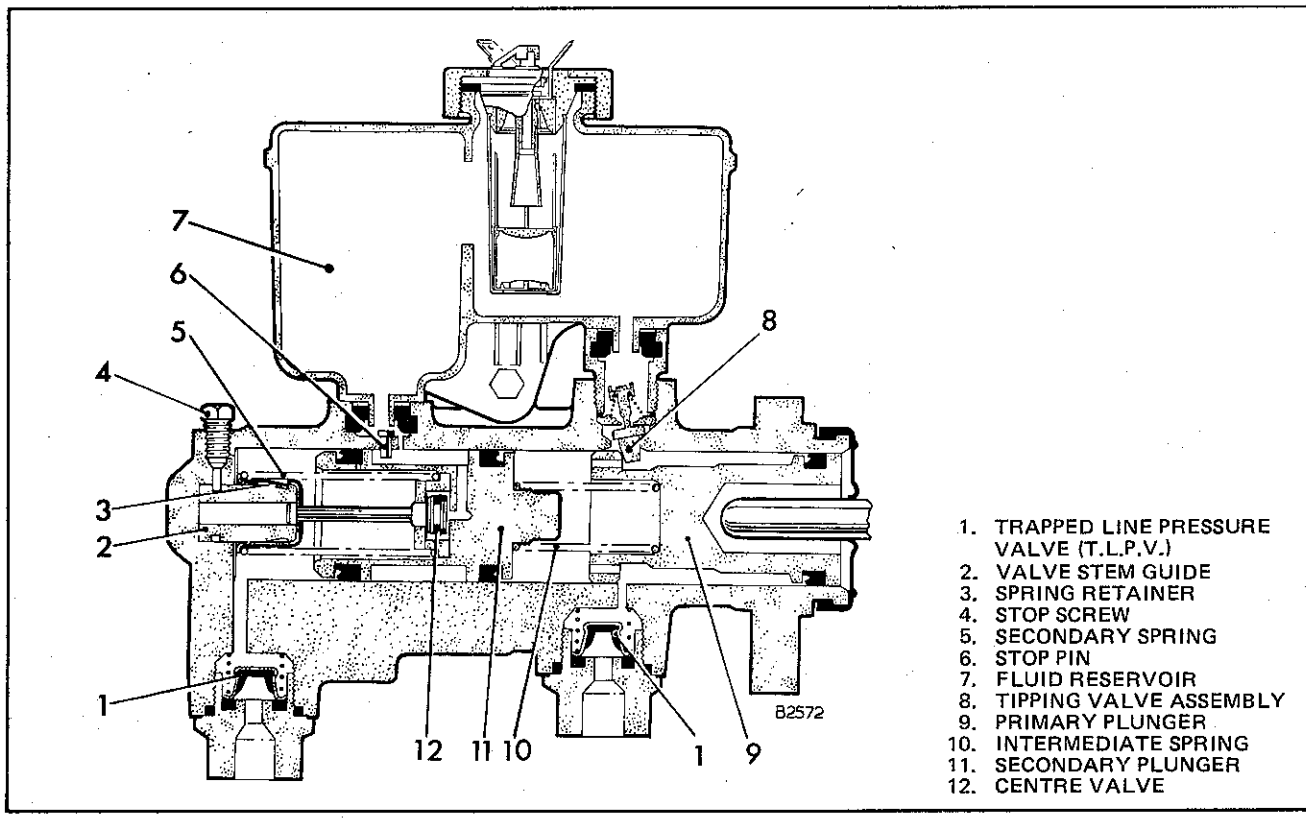


Fig. 1 *Tandem master cylinder – sectional diagram*

Tandem Master Cylinder (Air/hyd Models)

Maintenance

Check the fluid level in the reservoir.

To check operation of warning system:

To check the low level warning light bulb simply open the cab door. The warning light should illuminate.

To check the operation of the low level warning switch mounted in the cap of the fluid reservoir, proceed as follows:

Ensure that the cab interior lamps are switched to the courtesy position i.e. lamps light only when doors are open.

Close both cab doors.

Press warning switch and check that cab interior lamps illuminate.

Check the hydraulic pipe connections for leaks and tightness.

Check the mounting nuts for security.

At the time stated in the Maintenance Schedule overhaul and renew the seals in the master cylinder.

To Remove

Disconnect the battery.

Disconnect the two lucar connections to the low level warning switch.

Clean the pipe connections and disconnect the hydraulic pipes from the master cylinder. Plug the ends of the pipes to minimise the loss of fluid and prevent entry of dirt.

Remove the three nuts and washers securing the master cylinder to the mounting bracket and tandem actuator. Remove the master cylinder, noting the spacing shims.

To dismantle

Remove the reservoir filler cap and warning switch, invert the master cylinder and discard the fluid.

Bend back tabwasher and remove reservoir retaining bolt.

Remove the reservoir from the master cylinder.

Remove the reservoir seals from the master cylinder.

Unscrew the reservoir adaptor from the master cylinder.

Remove dust cover.

Depress primary plunger against the intermediate spring and lift out tipping valve assembly and copper washer.

Pull out primary plunger and intermediate spring. Remove seal from primary plunger.

Pull out stop pin, accessible through reservoir feed port. Unscrew stop screw.

Tap cylinder on wooden surface to remove secondary plunger and valve assembly. If necessary, lubricate cylinder bore with unused brake fluid to ease removal. Remove valve assembly from secondary plunger. Remove seals from secondary plunger.

Remove guide washer from valve assembly.

Lift the leaf of the spring retainer and remove valve stem guide.

Position the valve assembly in a vice, compress the spring sufficiently to remove load from valve stem, release the valve stem from the keyhole of the spring retainer. SLOWLY OPEN VICE UNTIL SPRING IS RELAXED. Separate parts; valve, spring washer, valve spacer, spring and spring retainer. Remove seal from valve head.

Caution: The strength of the spring necessitates care being taken when dismantling the valve assembly.

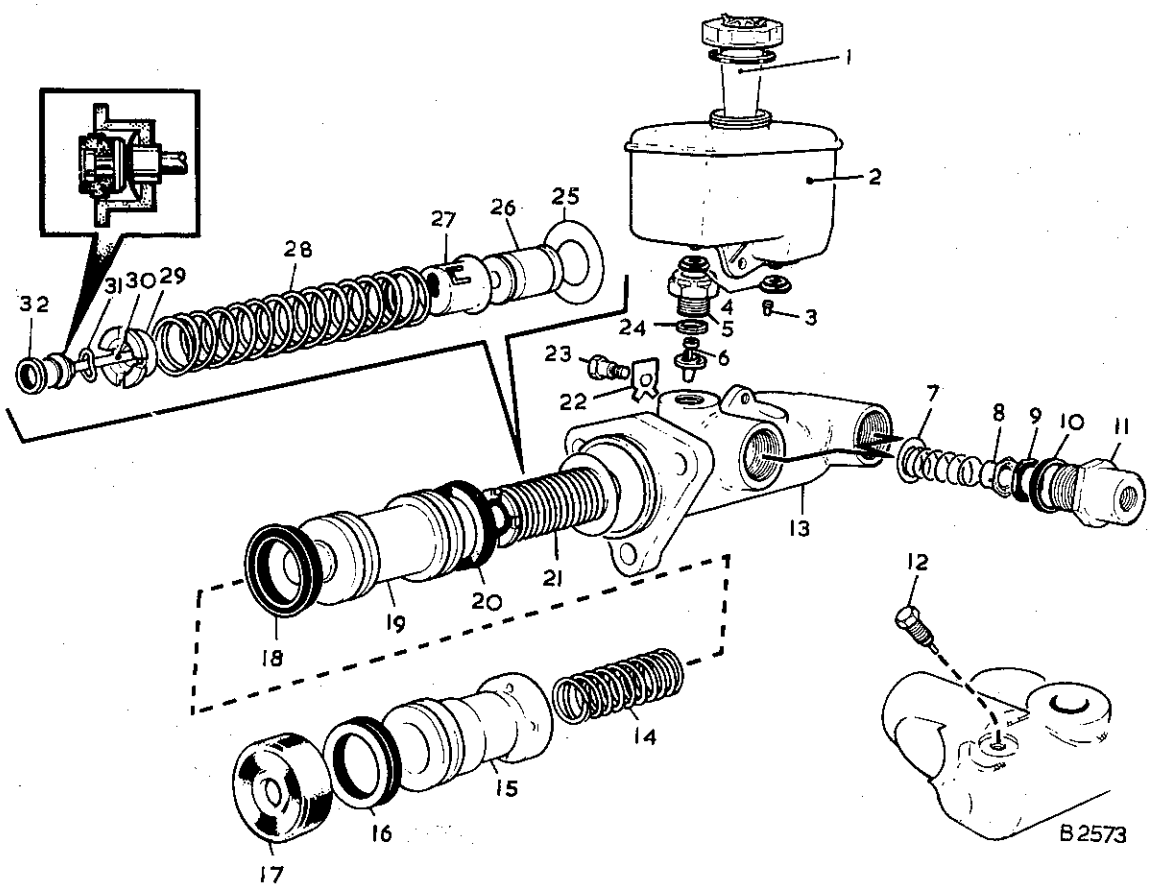
Unscrew outlet adaptors and remove the sealing ring, valve seat, T.L.P.V. seal assembly and spring.

Inspection and Overhaul

Wash all parts in the recommended brake fluid or alcohol, then dry them with a clean lintless cloth.

Examine the bore of the cylinder and the plungers for visible score marks, ridges and corrosion. Ensure the bore is smooth to the touch.

Renew all rubber components, copper gaskets and the tipping valve assembly.



1. FILLER CAP AND LEVEL INDICATOR
2. FLUID RESERVOIR
3. STOP PIN
4. RESERVOIR SEAL
5. RESERVOIR ADAPTOR
6. TIPPING VALVE ASSEMBLY
7. SPRING
8. T.L.P.V. SEAL ASSEMBLY
9. VALVE SEAT
10. SEALING RING
11. OUTLET ADAPTOR
12. STOP SCREW
13. CYLINDER BODY
14. INTERMEDIATE SPRING
15. PRIMARY PLUNGER
16. PLUNGER SEAL
17. DUST COVER
18. PLUNGER SEAL
19. SECONDARY PLUNGER
20. PLUNGER SEAL
21. VALVE ASSEMBLY
22. TAB WASHER
23. RESERVOIR RETAINING BOLT
24. COPPER WASHER
25. GUIDE WASHER
26. VALVE STEM GUIDE
27. SPRING RETAINER
28. SECONDARY SPRING
29. VALVE SPACER
30. VALVE STEM
31. SPRING WASHER
32. VALVE SEAL

Fig. 2 *Tandem master cylinder - exploded view*

To Re-assemble

Dip all the working parts in the recommended brake fluid.

Fit new valve seal and spring washer onto valve head, position valve spacer on valve head (insert Fig. 2). Position secondary spring on valve spacer and fit spring retainer to the spring.

Position the valve assembly between the jaws of a bench vice, with a clean piece of paper interposed at each end of the assembly and the jaws of the vice. Close the vice to compress the spring whilst guilding the valve stem through the keyhole in the spring retainer; engage the valve stem in the small section of the keyhole and slowly slacken the vice and remove the valve assembly.

Caution: Care should be taken to ensure the valve stem is correctly engaged in the spring retainer.

Fit valve stem guide to valve assembly, press home the leaf of spring retainer to secure. Check engagement of leaf. It must be straight and firmly engaged behind head of valve stem guide. Fit guide washer to valve stem guide.

Fit new seals to secondary plunger, seal lips must face away from each other. Fit the valve assembly with the valve head leading into the secondary plunger.

Place the cylinder horizontal on a bench and insert a suitable, clean, screwdriver fully into the cylinder thorugh the stop screw hole. Ease the plunger and valve assembly into the cylinder, and gently push the plunger up the bore until the valve stem guide contacts the screwdriver blade. Slowly withdraw the screwdriver whilst maintaining pressure on the plunger until the valve stem guide fully enters its counterbore. Keeping pressure on the piston immediately screw home the stop screw, which must locate in the groove in the valve stem guide. Fit stop pin and release pressure on plunger.

Fit seal to primary plunger, seal lip must face toward piston head.

Locate the intermediate spring over the shoulder of the secondary plunger. Ease the primary plunger into the cylinder bore, and depress the primary plunger sufficiently to fit a new tipping valve. Maintaining pressure on plunger fit a new copper gasket secured with the reservoir adaptor, torque tightened to 47 to 61 Nm (35 to 45 lbf.ft). Smear sealing areas of dust cover with Girling rubber grease and fit the cover over the cylinder.

Fit spring, T.L.P.V. seal assembly, valve seat and sealing ring to each outlet. Screw in the outlet adaptors and tighten to a torque of 40 to 47 Nm (30 to 35 lbf.ft).

Fit new reservoir seals to the cylinder body. Fit reservoir and secure with bolt and washer torque tightened to 4.5 to 8.5 Nm (3 to 6 lbf.ft). Secure with locking tab.

Fill the reservoir with clean brake fluid and fit warning switch and filler cap.

Clamp the master cylinder in a vice and check that fluid is delivered from each outlet when the primary plunger is operated.

To Refit

Remove the actuator rear bracket ensuring the tandem actuator is adequately supported.

Position the actuator and master cylinder so that the push rod of the actuator is lightly touching the primary plunger of the master cylinder. Measure the distance between the two mounting flanges.

Add 0.75 mm (0.30 in) to this dimension plus the thickness of the rear mounting bracket. Select shims to this total, plus or minus 0.35 mm (0.015 in). When the shims are fitted there must be 0.35 - 1.15 mm (0.015 - 0.045 in) clearance between the push rod and primary plunger to ensure that the tipping valve is operated when the brakes are in the OFF position.

Refit the rear bracket.

Assemble the master cylinder with the shim packs to the actuator, and secure with three nuts and washers torque tightened to Data figure.

Reconnect the hydraulic pipes.

Reconnect the two lucar connections to the low level warning switch.

Reconnect the battery.

Bleed the brakes (Section M 230). Check the pipe connections for leaks.