

SECTION 5

BRAKES

The following caution applies to one or more steps in the assembly procedure of components in this portion of the manual as indicated at appropriate locations by the terminology "See Caution on page 1 of this section".

CAUTION: *THIS FASTENER IS AN IMPORTANT ATTACHING PART IN THAT IT COULD AFFECT THE PERFORMANCE OF VITAL COMPONENTS AND SYSTEMS, AND/OR COULD RESULT IN MAJOR REPAIR EXPENSE. IT MUST BE REPLACED WITH ONE OF THE SAME PART NUMBER OR WITH AN EQUIVALENT PART IF REPLACEMENT BECOMES NECESSARY. DO NOT USE A REPLACEMENT PART OF LESSER QUALITY. OR SUBSTITUTE DESIGN TORQUE VALUES MUST BE USED AS SPECIFIED DURING REASSEMBLY TO ASSURE PROPER RETENTION OF THIS PART.*

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DELCO TANDEM POWER BRAKE UNIT UNIT REPAIR

Disassembly (Fig. 5-1A)

NOTE: Scribe a line across front and rear housings to facilitate reassembly.

1. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate damage to studs. Clamp base in a bench vise with the power section up (fig. 5-2A).

2. Separate front and rear housings as follows:

a. **Straight Mounting Bracket (Fig. 5-2A)** - Place Spanner Wrench J-9504 over studs on rear housing and attach with nuts and washers. Draw nuts down tight to eliminate bending or damaging of studs.

b. **Tilt Mounting Bracket (Chevelle)** - Secure Spanner Wrench J-9504 to bracket with three bolts and nuts. Draw nuts down tight to eliminate damage to bracket.

c. **Tilt Mounting Bracket Except Chevelle** - Place Tool J-22893 inside tilted mounting bracket. Place Spanner Wrench J-9504 on top of J-22893 and tighten nuts and washers, securing spanner wrench.

d. Press down on Spanner Wrench J-9504 and rotate the rear housing counterclockwise to separate the two housings.

CAUTION: *Care must be exercised not to damage or loosen studs in housing. Also, take care that no pressure is brought to bear on plastic power piston.*

3. Remove Tools J-9504 and J-22893 from rear housing (tilted mounting bracket type), Tool J-9504 on regular type.

Front Housing Group

1. Remove the power piston return spring. Remove and discard the vacuum check valve and grommet from the front housing.

2. Remove the front housing seal.

Rear Housing Group

1. Remove the boot retainer and boot from the rear housing. Remove the felt silencer from inside the boot.

3. Remove the power piston group from the rear housing and remove the primary power piston bearing from the center opening of the rear housing.

Power Piston Group

1. Remove the piston rod retainer and piston rod from the secondary piston.

NOTE: Due to an optional construction design on the primary and secondary power pistons, Tool J-23101 will have to be reworked as shown in Figure 5-3A.

2. Mount double-ended Tool J-23101 (with large diameter end up) in a vise. Position the secondary power piston so that the two radial slots in the piston fit over the ears (tangs) of the tool (fig. 5-4A).

3. Fold back primary diaphragm from the O.D. of the primary support plate. Grip the edge of the support plate and rotate counterclockwise to unscrew the primary power piston from the secondary power piston.

NOTE: It is possible that the primary support plate will unlock from the primary piston before the primary piston unscrews from the secondary piston. If this happens, continue to turn the primary support plate counterclockwise. Tabs (stops) on the primary support

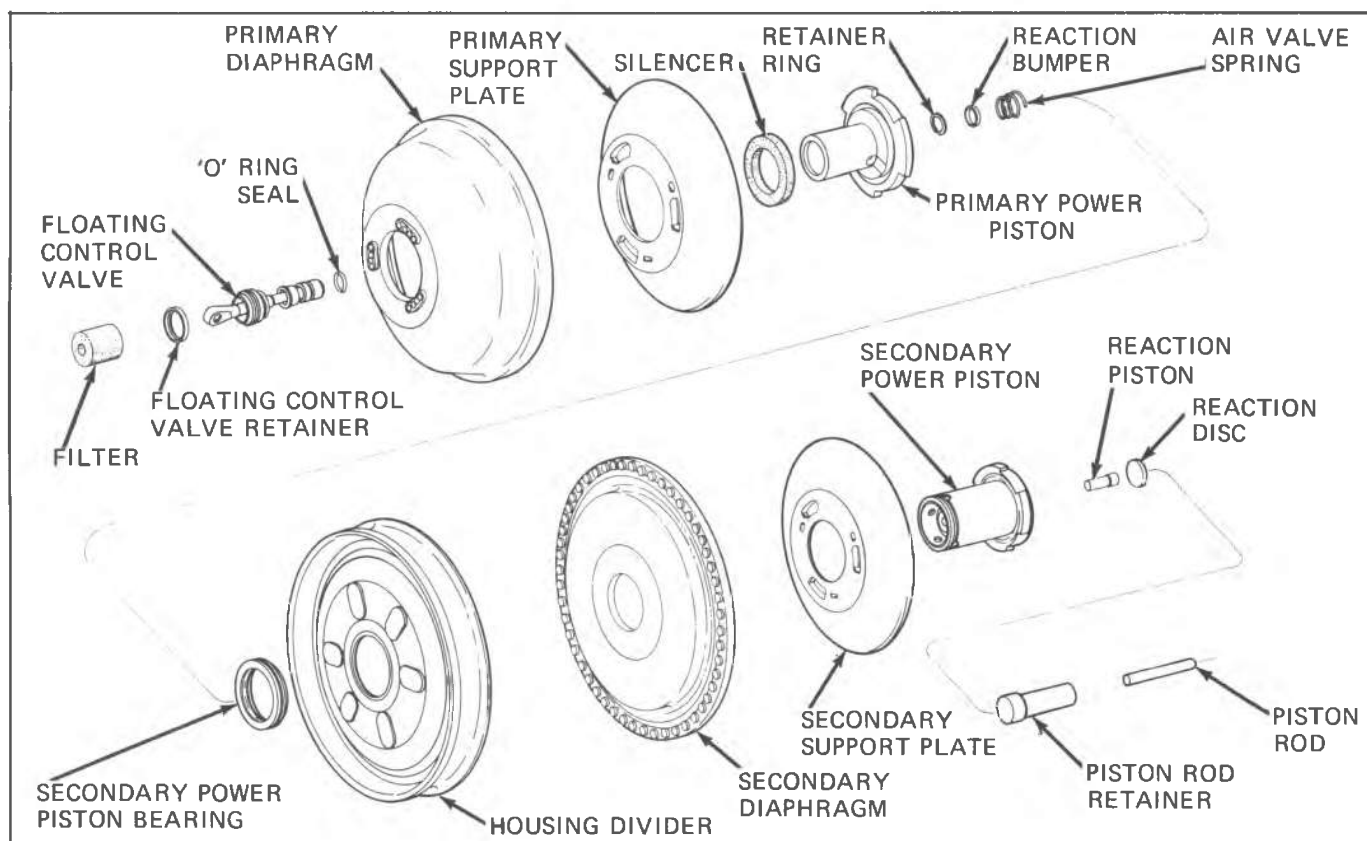


Fig. 5-1A—Power Piston Group

will temporarily lock the primary support plate to the primary power piston and permit continued counter-clockwise rotation to unscrew the primary power piston from the secondary power piston (fig. 5-5A).

4. Remove the housing divider from the secondary power piston. Remove the secondary power piston bearing from the housing divider.

5. The secondary power piston should still be positioned on Tool J-23101. Fold back secondary diaphragm from O.D. of secondary support plate. Grip the edges of the support plate and rotate clockwise to unlock the secondary support

plate from the secondary power piston (fig. 5-6A).

6. Remove the secondary diaphragm from the secondary support plate.

7. Remove the reaction piston and reaction disc from the center of the secondary power piston by pushing down on the end of the reaction piston with a small object, such as a pencil, wooden dowel or metal rod (fig. 5-7A).

8. Remove the air valve spring from the end of the air valve (if it didn't come off during disassembly of the power piston).

9. Mount Tool J-23101 in a vise (with small diameter end up). Position the primary power piston so that the two radial slots in the piston fit over the ears (tang) of the tool (fig. 5-8A).

10. Fold back primary diaphragm from the support plate. Grip the edge of the support plate and rotate in a counterclockwise direction to unlock the primary support plate from the primary power piston (fig. 5-9A).

11. Remove the primary diaphragm from the primary support plate.

12. Remove the air filter from the tubular section of the primary power piston.

13. Remove the power head silencer from the neck of the power piston tube.

14. Remove the rubber reaction bumper from the end of the air valve.

15. Using Snap Ring Pliers J-4880, remove the retaining ring from the air valve (fig. 5-10A).

16. Remove the air valve-push rod assembly from the tube end of the primary power piston. The following removal method is recommended:

a. Place the primary power piston in an arbor press, and

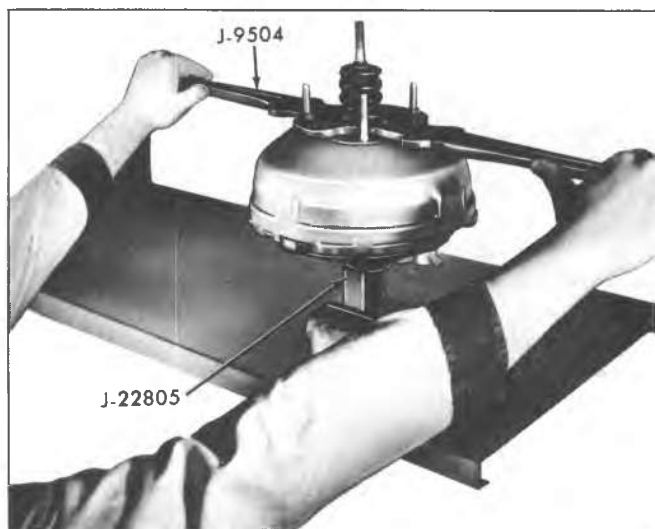


Fig. 5-2A—Unlocking Front and Rear Housings

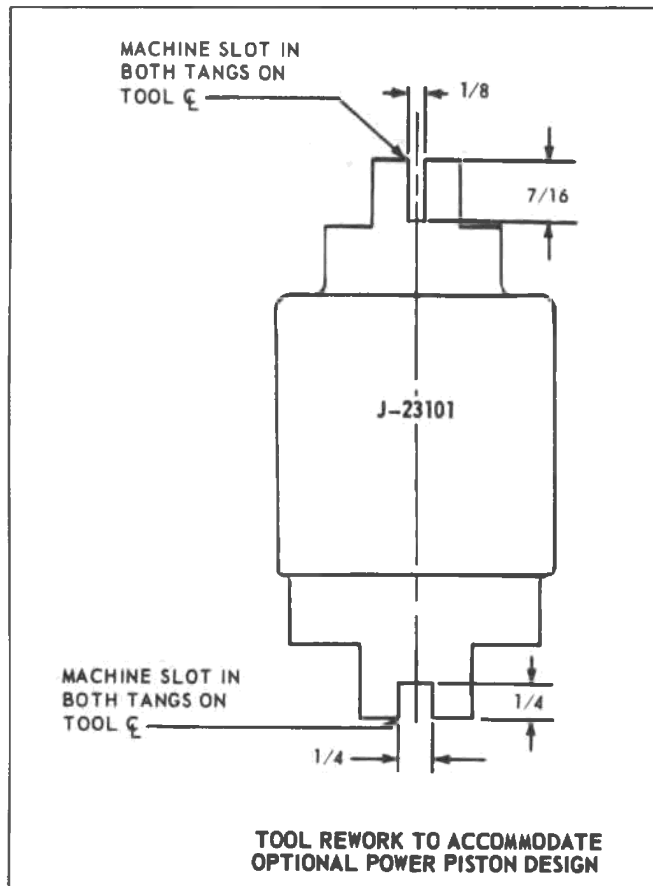


Fig. 5-3A--Rework of Tool J-23101

press the air valve-push rod assembly out the bottom of the power piston tube with a rod not exceeding 1/2" in diameter.

b. An alternate method would be the use of a heavy,

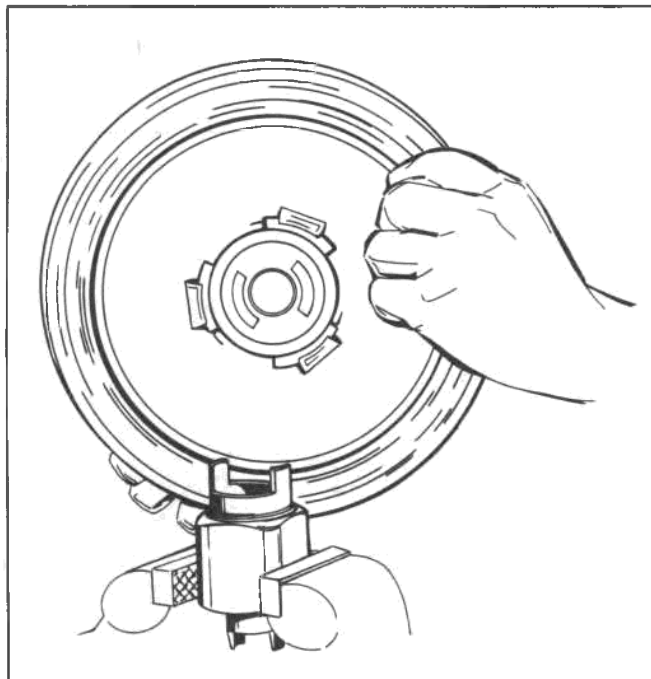


Fig. 5-4A--Positioning Secondary Power Piston in Tool J-23101 (Large Dia. End Up)

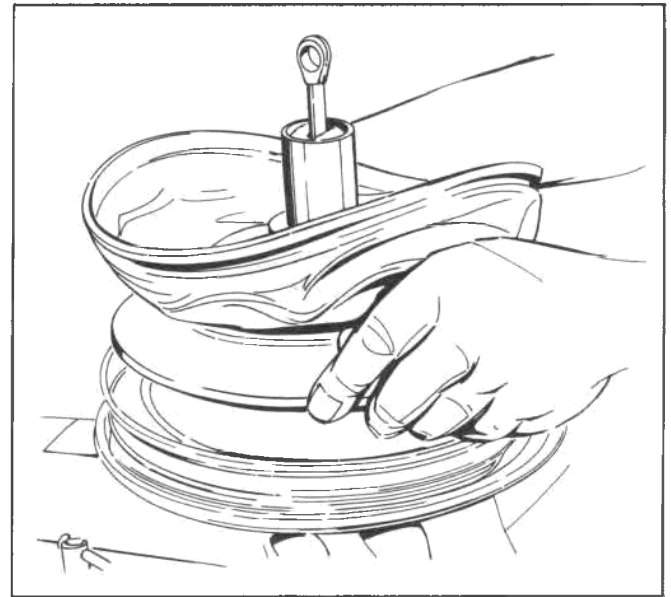


Fig. 5-5A--Locking or Unlocking Primary and Secondary Power Pistons

round shanked screwdriver. Insert screwdriver on both sides of the push rod and pull the air valve-push-rod assembly straight out. A considerable force will be required.

c. Another method requires the use of snap ring pliers. Approximately 5/8" from the pointed ends of the pliers, file or saw a small slot (approximately 1/32" - 1/16" wide and 1/10" deep) on each half of the pliers. Round off the pointed ends of the pliers. Slip the slots in the pliers into tangs on the control valve spring retainer. Grip the pliers and pull the air valve-push rod assembly straight out.

17. Removal of the air valve-push rod assembly will disassemble the control valve retainer.

18. Remove the "O" ring seal from the air valve.

19. Models using air valve-push rod assemblies with a formed eye on the end of the push rod will be serviced using a complete assembly, since the floating control valve cannot be removed over the eye end of the push rod.

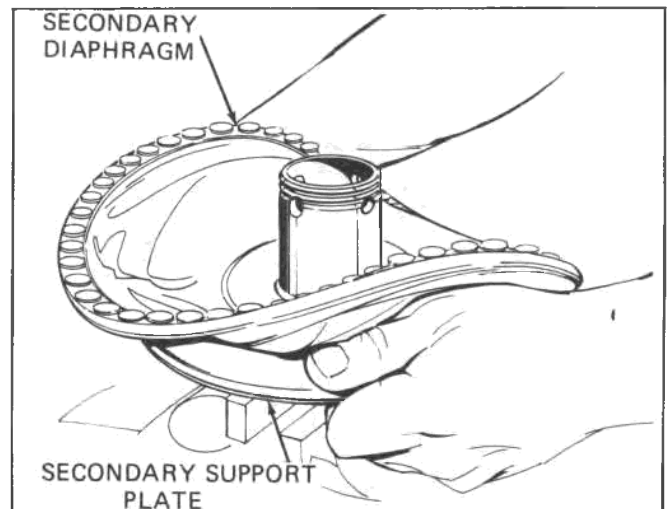


Fig. 5-6A--Locking or Unlocking Secondary Support Plate and Secondary Power Piston

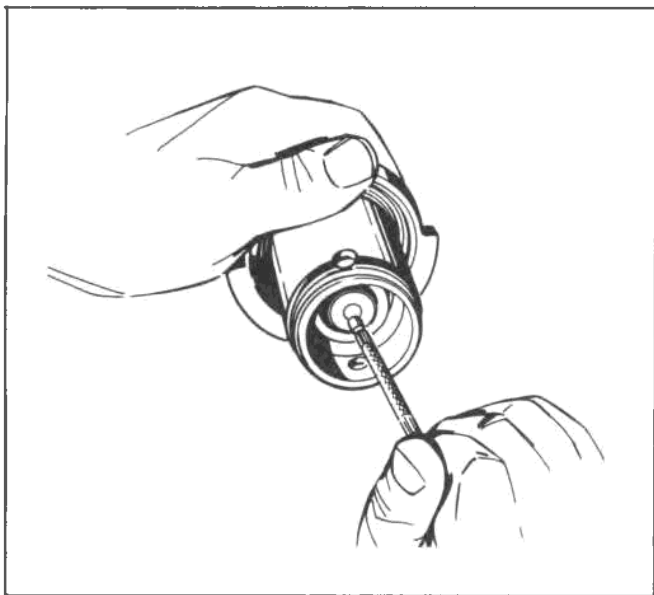


Fig. 5-7A--Removing Reaction Piston and Reaction Disc From Secondary Power Piston

Cleaning

Use clean brake fluid to thoroughly clean all reusable brake parts. Immerse in the cleaning fluid and brush metal parts with hair brush to remove foreign matter. Blow out all passages, orifices and valve holes. Air dry and place cleaned parts on clean paper or lint free clean cloth. If slight rust is found inside either the front or rear half housing assemblies, polish clean with crocus cloth or fine emery paper, washing clean afterwards. Dirt is the major cause of trouble and wear in service. Be sure to keep parts clean until re-assembly. Re-wash at re-assembly if there is any occasion to doubt cleanliness--such as parts dropped or left exposed for eight hours or longer.

CAUTION: *If there is any suspicion of*

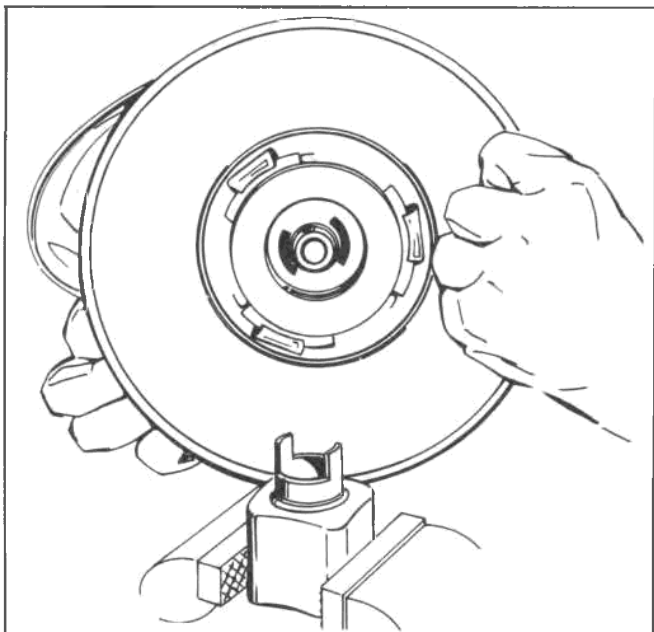


Fig. 5-8A--Positioning Primary Power Piston in Tool J-23101 (Small Dia. End Up)

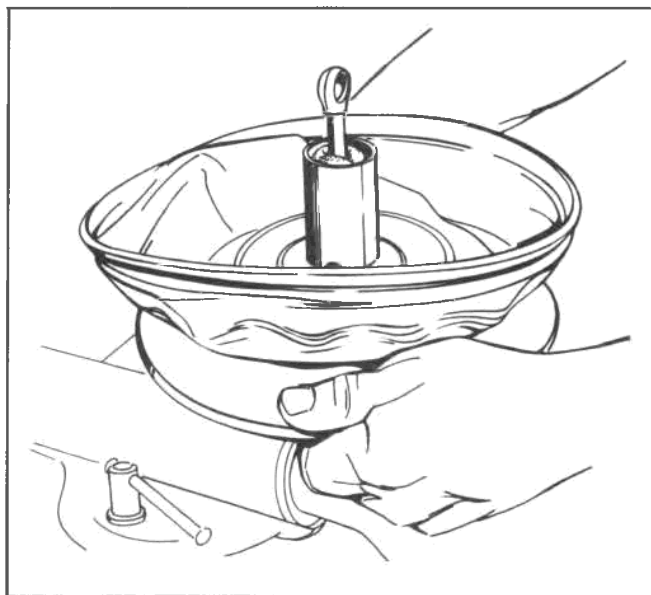


Fig. 5-9A--Locking or Unlocking Primary Support Plate From Primary Power Piston

contamination or any evidence of corrosion, completely flush the vehicle hydraulic brake system. Failure to clean the hydraulic brake system can result in early repetition of trouble. Use of gasoline, kerosene, anti-freeze, alcohol or any other cleaner, with even a trace of mineral oil, will damage rubber parts.

Inspecting Rubber Parts

Wipe fluid from the rubber parts and carefully inspect each rubber part for cuts, nicks, or other damage. These parts are the key to the control of fluid or air flow. If the unit is in for overhaul or if there is any question as to the serviceability of rubber parts, **REPLACE** them.



Fig. 5-10A--Removing Retaining Ring From Air Valve

Inspecting Metal Parts

BADLY DAMAGED ITEMS, OR THOSE WHICH WOULD TAKE EXTENSIVE WORK OR TIME TO REPAIR, SHOULD BE REPLACED. In case of doubt, install new parts. Do not rely on the brake unit being overhauled at an early or proper interval. New parts will provide more satisfactory service, even if the brake unit is allowed to go beyond the desired overhaul period.

Assembly

1. Be careful during the rebuild procedure that no grease or mineral oil comes in contact with the rubber parts of the power brake unit.

2. Lubricate power head parts, as outlined below, with power brake silicone lubricant. This lubricant is provided in the service repair kit.

Front Housing Group

1. Install a **new** vacuum check valve and a **new** grommet in front housing.

2. Place **new** front housing seal in housing so flat surface of cup lies against bottom of depression in housing.

Power Piston Group

1. Lubricate the I.D. and O.D. of the "O" ring seal with silicone lubricant and place on the air valve.

2. Wipe a thin film of silicone lubricant on the large and small O.D. of the floating control valve.

3. If the floating control valve needs replacement, it will be necessary to replace the complete air valve-push rod assembly, since the floating control valve is a component part of this assembly and cannot be disassembled from the push rod.

4. Place the air valve end of the air valve-push rod assembly into the tube of the primary power piston. Manually press the air valve-push rod assembly so that the floating control valve bottoms on the tube section of the primary power piston. Installer Tool J-23175 can be used to manually press the floating control valve to its seat.

5. Place the I.D. of the floating control valve retainer on the O.D. of floating control valve Retainer Installer J-23175 (fig. 5-11A). Place over the push rod so that the closed side of the retainer seats on the floating control valve. With Installer J-23175, manually press the retainer and floating control valve assembly to seat in the primary power piston tube (fig. 5-12A).

6. The filter element can now be stretched over the push rod and pressed into the primary power piston tube.

7. Using Snap Ring Pliers J-4880, place the retaining ring into the groove in the air valve (fig. 5-10A).

8. Position the rubber reaction bumper on the end of the air valve.

9. *Tolerances of those component parts affecting output of the tandem power brake are very critical.* Always use the factory gaged power piston kit, containing both the primary and secondary power pistons with factory gaged reaction piston, when replacement of any of these parts is required.

10. After determination of the correct reaction piston, apply a light film of silicone lubricant to the O.D. of the rubber reaction disc.

11. Place the rubber reaction disc in the large cavity of the secondary power piston and push the disc down to seat on the reaction piston.

12. Unlock the secondary power piston from the primary power piston.

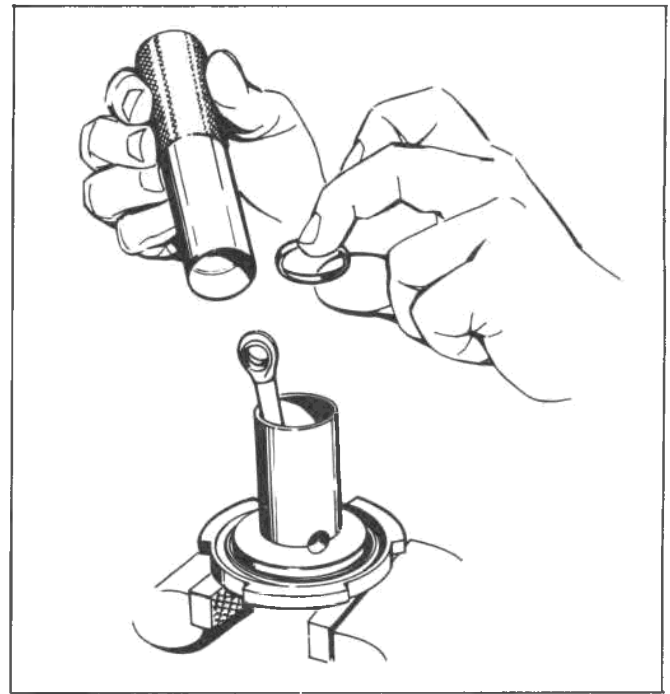


Fig. 5-11A--Installing Floating Control Valve Retainer with Installer J-23175

13. Assemble the primary diaphragm to the primary support plate from the side of the support plate opposite the locking tangs. Press the raised flange on the I.D. of the diaphragm through the center hole of the support plate. Be sure that the edge of the support plate center hole fits into the groove in the raised flange of the diaphragm. Lubricate the diaphragm I.D. and the raised surface of the flange (that fits into a groove in the primary power piston) with a light coat of silicone lubricant.

14. Mount Tool J-23101 (small diameter end up) in a

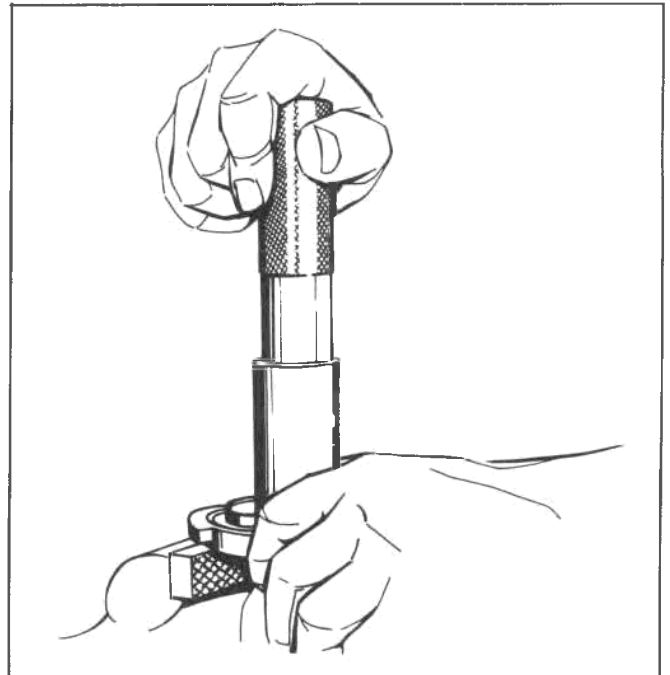


Fig. 5-12A--Seating Floating Control Valve Assembly with Installer J-23175

wise. Position the primary power piston so that the two radial slots in the piston fit over the ears (tang) of the tool (fig. 5-8A).

15. Fold the primary diaphragm away from the O.D. of the primary support plate.

16. Holding the edges of the support plate, with the locking tangs down, place the primary support plate and diaphragm assembly over the tube of the primary power piston. The flange on the I.D. of the primary diaphragm will fit into a groove in the primary power piston.

17. Grip the edges of the primary support plate, press down, and rotate clockwise until the tabs on the primary power piston contact the stops on the support plate (fig. 5-9A).

18. Place the power head silencer on the tube of the primary power piston so that the holes at the base of the tube are covered.

19. Apply silicone lubricant to the O.D. of the primary power piston tube.

20. Remove the primary piston assembly from Tool J-23101 and lay it aside.

21. Assemble the secondary diaphragm to the secondary support plate from the side of the support plate opposite the locking tangs. Press the raised flange on the I.D. of the diaphragm through the center hole of the support plate. Be sure that the edge of the support plate center hole fits into the groove in the raised flange of the diaphragm. Apply a thin coat of silicone lubricant to the I.D. of the secondary diaphragm and the raised surface of the flange (that fits into a groove in the secondary power piston).

22. Mount Tool J-23101 (with large diameter end up) in a vise. Position the secondary power piston so that the radial slots in the piston fit over the ears (tang) of the tool. Apply a light coat of silicone lubricant to the tube of the secondary power piston (fig. 5-4A).

23. Fold the secondary diaphragm away from the O.D. of the secondary plate.

24. Holding the edges of the support plate with the locking tangs down, place the secondary diaphragm and support plate assembly over the tube of the secondary power piston. The flange on the I.D. of the secondary diaphragm will fit into the groove in the secondary piston.

25. Grip the edges of the secondary support plate, press down, and rotate counterclockwise until the tabs on the secondary power piston contact the stops on the support plate. Fold the secondary diaphragm back into position on the secondary support plate. Leave the secondary power piston assembly on Tool J-23101 in the vise (fig. 5-6A).

26. Apply a light coat of talcum powder or silicone lubricant to the bead on the O.D. of the secondary diaphragm. This will facilitate reassembly of front and rear housings.

27. Hold the housing divider so that the formed over flange (that holds the primary diaphragm) of the divider faces down. Place the secondary bearing in the I.D. of the divider so that the extended lip of the bearing faces up.

28. Lubricate the I.D. of the secondary bearing with silicone lubricant.

29. Position secondary Bearing Protector Tool J-23188 on the threaded end of the secondary power piston (fig. 5-13A).

30. Hold the housing divider so that the six oblong protrusions on the middle of the divider are facing up. Press the divider down over the tool and onto the secondary power

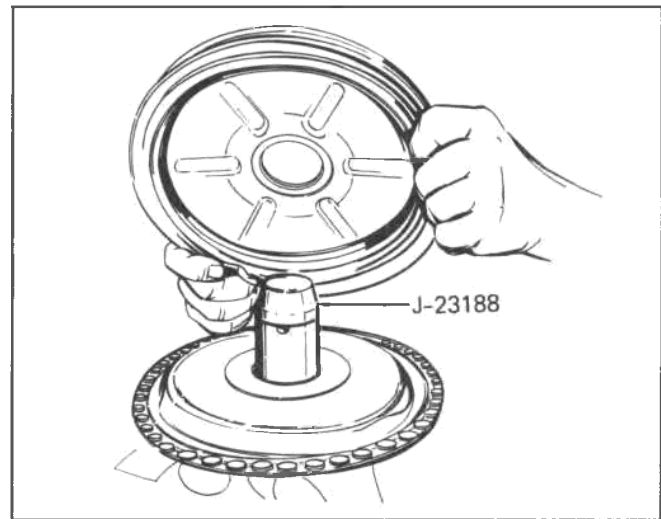


Fig. 5-13A--Positioning Housing Divider Over Secondary Bearing Protector Tool J-23188

piston tube where it will rest against the diaphragm support ring. Remove Tool J-23188 from secondary power piston; however, do not remove the secondary power piston sub-assembly from Tool J-23101.

31. Pick up the primary power piston assembly and fold the primary diaphragm away from the O.D. of the primary support plate.

32. Position the small end of the air valve return spring on the air valve so that it contacts the air valve retaining ring.

33. Position the primary power piston on the tubular portion of the secondary power piston, making sure that the air valve return spring seats down over the raised center section of the secondary piston.

34. Grip the edge of the primary support plate, press down, and start the threads on the secondary power piston into the threaded portion of the primary power piston by rotating in clockwise direction (fig. 5-5A).

35. Continue to tighten the primary power piston until it is securely attached (approximately 5-15 ft. lbs.) to the secondary power piston.

36. Fold the primary diaphragm back into position on the primary support plate and pull the diaphragm O.D. over the formed flange of the housing divider. Check that the bead on the diaphragm is seated evenly around the complete circumference.

37. Wipe a thin film of silicone lubricant on the O.D. of the piston rod retainer. Insert the master cylinder piston rod retainer into the cavity in the secondary power piston so that the flat end bottoms against the rubber reaction disc in the bottom of the cavity.

Rear Housing Group

1. Place the NEW primary power piston bearing in the rear housing center hole so that the formed flange of the housing center hole fits into the groove of the seal. The thin lip of the bearing will protrude to the outside of the housing.

2. Coat the I.D. of the primary power piston bearing with silicone lubricant.

Final Assembly

1. Mount Holding Fixture J-22805 in a vise and position the front housing on the tool so that the housing studs fit in the holes provided in the tool.

2. Position the power piston return spring over the inset

in the front housing.

3. Assemble the power piston group to the rear housing by pressing the tube of the primary piston through the rear housing bearing. Press down until the housing divider seats in the rear housing and the primary power piston bottoms against the housing.

4. Hold the rear housing assembly (with mounting studs up) over the front housing (make sure that the piston rod retainer does not dislodge from the secondary power piston during this operation). Position the rear housing so that when the tangs on the edge of the front housing are locked in the slots on the edge of the rear housing, the scribe marks on the top of the housings will be in line.

5. Lower the rear housing assembly onto the front housing. The power piston spring must seat in the depression in the face of the secondary power piston. Check that the bead on the O.D. of the secondary diaphragm is positioned between the edges of the housings.

6. Assemble front and rear housings as follows:

a. **Straight Mounting Bracket** - Place Spanner Wrench J-9504 over studs on rear housing, and attach with nuts and washers--draw nuts down tight to eliminate bending or damaging of studs.

b. **Tilt Mounting Bracket (Chevelle)** - Secure Spanner Wrench J-9504 to bracket with three bolts and nuts. Draw nuts down tight to eliminate damage to bracket.

c. **Tilt Mounting Bracket Except Chevelle** - Position Tool J-22893 inside tilted mounting bracket. Place Spanner Wrench J-9504 on top of J-22893 and tighten nuts and washers to bolts provided, securing Spanner Wrench.

d. Press down on spanner wrench and twist rear housing clockwise in relation to front housing until fully locked.

NOTE: If unit is not easily locked, hold housings together and apply vacuum to check valve in front housing. Do not put pressure on power piston extension.

7. Remove Tool J-9504 and, if used, Tool J-22893 from the rear housing.

8. Place the silencer in the closed end of the power head boot. Push the boot retainer over the boot. Stretch the boot over the push rod and over the flange in the center of the rear housing.

9. Remove the power head assembly from Holding Fixture J-22805 and remove Fixture J-22805 from the vise.

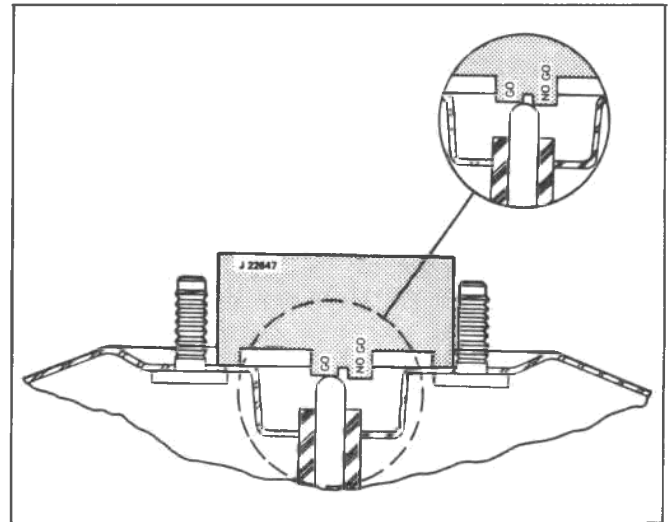


Fig. 5-14A--Gaging Piston Rod

Gaging

1. Place the power head assembly in a padded vise (front housing up). *Do not clamp tight.*

2. Insert the master cylinder piston rod, flat end first, into the piston rod retainer.

3. Press down on the master cylinder piston rod (with approximately a 40-50 pound load) to be sure it is properly seated.

4. Remove the front housing seal to assure that no vacuum is in the power head while gaging.

5. Place Gage J-22647 over the piston rod in a position which will allow the gage to be slipped to the left or right without contacting the studs (fig. 5-14A).

6. The center section of the gage has two levels. The piston rod should always contact the longer section (lower level) of the gage. The piston rod should *never* contact the shorter section (higher level) of the gage. Move gage from side to side to check piston rod height.

7. Any variation beyond these two limits must be compensated for by obtaining the service adjustable piston rod and adjusting the self locking screw to meet gaging specifications.

8. Wipe a thin film of silicone lubricant on the I.D. of the front housing seal and position seal in the depression in the housing.

BENDIX TANDEM POWER BRAKE UNIT

UNIT REPAIR

Disassembly

1. Scribe a line across the front and rear housings to facilitate reassembly.
2. Carefully remove hydraulic push rod and seal and slide seal from rod.
3. Remove vacuum check valve and grommet.
4. Remove dust boot and silencer from operating valve rod.

5. Remove dust guard retainer, dust guard and silencers from rear plate hub with an awl. Then, reinstall steel retainer on hub.

6. Squirt denatured alcohol down the operating valve rod to lubricate rubber grommet in the valve plunger.

7. Position two small blocks of wood on either side of air valve rod and install end of air valve rod in vise, leaving just enough clearance to position two (2) open end wrenches between the vise and retainer on hub of rear plate.

8. Using the wrench nearest the vise as a pry, force the air valve off the ball end of the rod. **DO NOT** damage the plastic hub or allow vacuum cylinder to fall to the floor (fig. 5-1B and 5-2B).

9. The edge of the rear housing contains twelve (12) lances. Four (4) of these lances (one in each quadrant) are deeper than the other lances. The metal that forms the four (4) deep lances must be partially straightened so that the lances will clear the cutouts in the front housing. If the metal tabs that form the deep lances break during straightening, the housing must be replaced (fig. 5-3B).

10. Remove the hydraulic push rod and vacuum seal from the front housing.

11. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damage to studs.

12. Place power unit with Holding Fixture J-22805 in

an arbor press with rear housing up and secure to plate of press by a suitable means of holding Tool J-22805 (fig. 5-4B). By using a 1-1/2" open end wrench on Tool J-22805 and allowing unit to turn against back of arbor press, press will hold unit from turning.

13. Place Spanner Wrench J-9504 over studs on rear shell (fig. 5-4B). Use three washers and nuts to attach wrench to housing. Use a suitable piece of pipe of approximately two inches I.D. and approximately three inches in length. Place over plastic diaphragm plate hub. Place a piece of flat stock steel over end of pipe and press rear housing down far enough to relieve tension of diaphragm rubber lip and spring.

14. Rotate spanner bar counterclockwise until the lances in the edge of the rear housing are aligned with the cut-outs in the front housing. Considerable effort may be required to rotate the front housing.

WARNING: The diaphragm return spring is compressed in the power section and expands as the pressure on the housings is removed. If the housings do not separate when the screw has been turned slightly to reduce the pressure, tap the housings with a rubber hammer to break the bond.

15. Slowly release press to permit the two housings to separate.

16. Continue to release press until diaphragm spring tension has been removed.

17. Remove the front housing and return spring.

18. Remove three nuts and washers from Spanner Wrench and separate wrench and rear housing.

19. Remove Holding Fixture J-22805 from front housing.

20. Work edges of front diaphragm from under lances of rear housing and remove complete vacuum assembly from

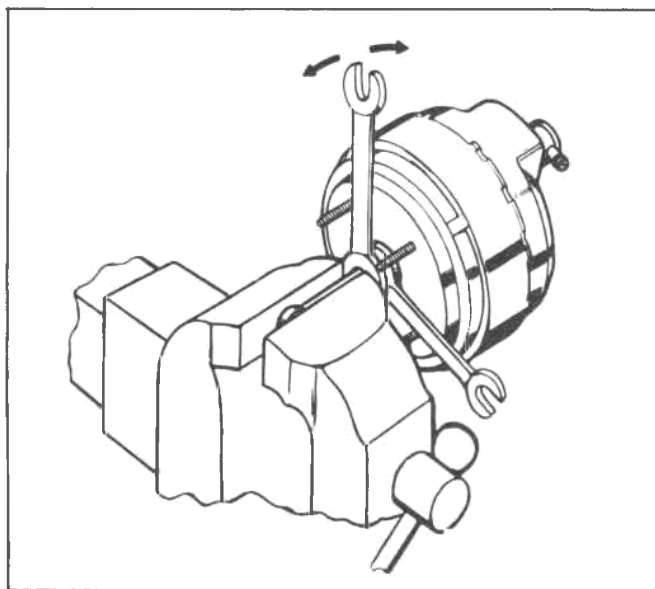


Fig. 5-1B--Removing Air Valve Rod

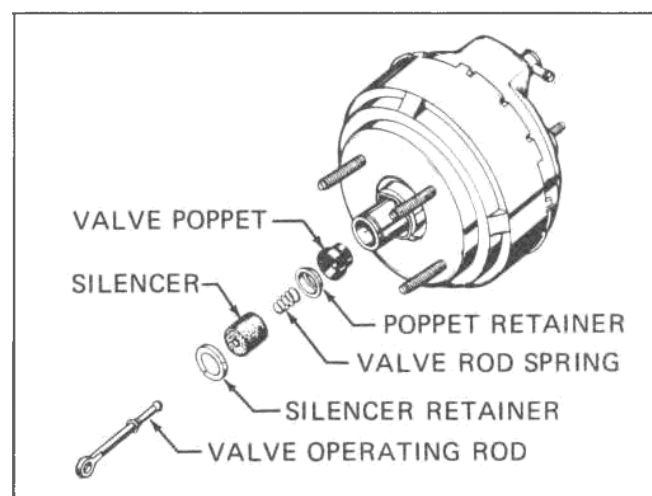


Fig. 5-2B--Air Valve Rod Assembly

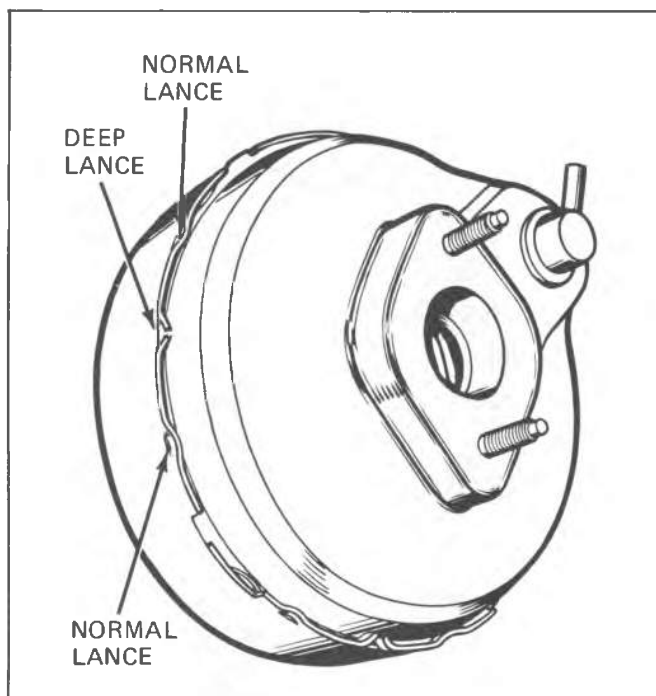


Fig. 5-3B--Lances in Rear Housing

rear housing, using care not to damage rear housing seal. Bosses on center plate must be aligned with cutouts in rear housing to remove the assembly.

21. Wet the rear diaphragm retainer with denatured alcohol and remove the retainer using fingers only.

22. Clamp Tool J-22839 in a vise. Place the diaphragm and plate assembly on the tool with the tool seated in the hex opening in the front plate.

23. Twist the rear diaphragm plate counterclockwise, using hand leverage on the outer edge of the plate. It may be necessary to use a 1" x 1-3/16" x 8" wood strip as a lever in cover slot on outside circumference of rear plate.

24. After the two (2) plates have been loosened, remove the plates from Tool J-22839 and place on a bench with the front plate down. Unscrew the rear plate completely and carefully lift it off the front plate hub, grasping the air valve

plunger and valve return spring as the parts are separated (fig. 5-5B).

25. Remove the square ring seal from the shoulder of the front diaphragm plate hub.

26. Remove the reaction disc from inside the front diaphragm plate hub. Carefully slide the center plate off the hub of the front plate.

27. Remove the diaphragms from the plates.

28. Use a blunt punch or 1-1/4" socket to drive seal from rear housing (figs. 5-6B and 5-7B).

Cleaning

All parts to be reused should be washed in denatured alcohol or brake fluid. Dry the parts with compressed air and place them on clean paper or lint free cloth.

Small rust spots inside the shells may be removed with crocus cloth or fine emery cloth. Be sure to clean thoroughly after using any abrasive.

Inspect all parts and replace any that are damaged or show excessive wear.

Assembly

1. Press the new bearing and seal into the cavity in the rear housing using Tool J-22677 (fig. 5-8B). The flat rubber surface of the seal should be 5/16" below the flat, inside surface of the rear housing.

2. Install reaction disc in hub of front plate with small tip toward hole. Use rounded rod to seat disc.

3. Mount Tool J-22839 in vise.

4. Install front diaphragm on front plate. Long fold of diaphragm must be facing down.

5. Install Tool J-22733 over threads on front plate hub (fig. 5-9B).

6. Apply a light film of silicone lubricant to front plate hub and to seal in center plate, then guide center plate, seal first, onto the front plate hub, being careful not to damage center plate seal. Remove Seal Protector J-22733.

7. Apply a light coat of silicone lubricant to bearing surfaces of air valve plunger, being careful not to apply lubricant to rubber grommet inside plunger. Install square ring seal on shoulder of front plate hub and install valve plunger return spring and plunger in base of front plate hub (fig. 5-10B).

8. Set rear plate over hub of front plate, and using hands only, screw plate on hub, making sure that valve and spring are properly aligned. Hand torque plates to 150 in. lbs. Check travel of valve plunger with index finger.

9. Assemble rear diaphragm to rear plate and place lip of diaphragm in groove in rear plate. Install diaphragm retainer over rear diaphragm and lip of center plate. Using fingers, press retainer until it seats on shoulder of center plate (fig. 5-11B).

10. Apply talcum powder to inside wall of rear housing and silicone lubricant to the scalloped cutouts of front housing and to seal in rear housing. Assemble diaphragm and plate assembly into rear housing by carefully guiding rear plate hub through seal in rear housing. Bosses on center plate must be aligned between lances in rear housing for reassembly. Work outer rim of front diaphragm into rear housing with screwdriver blade so that it is under lances in housing.

11. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damage to studs.

12. Secure front housing and Holding Fixture J-22805

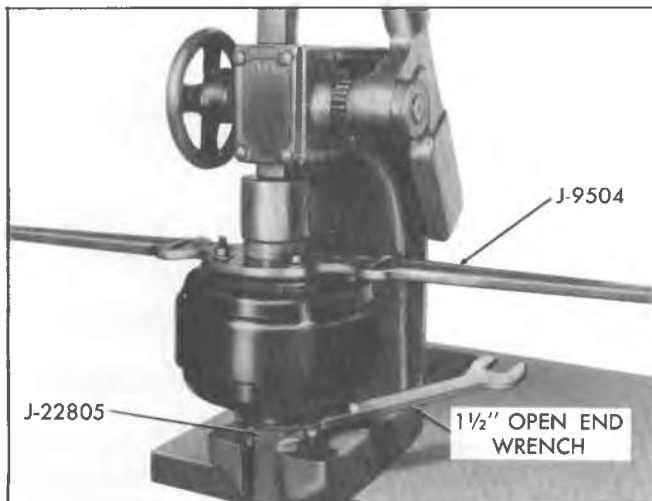


Fig. 5-4B--Holding and Separating Housings Using J-22805 and J-9504 in Arbor Press

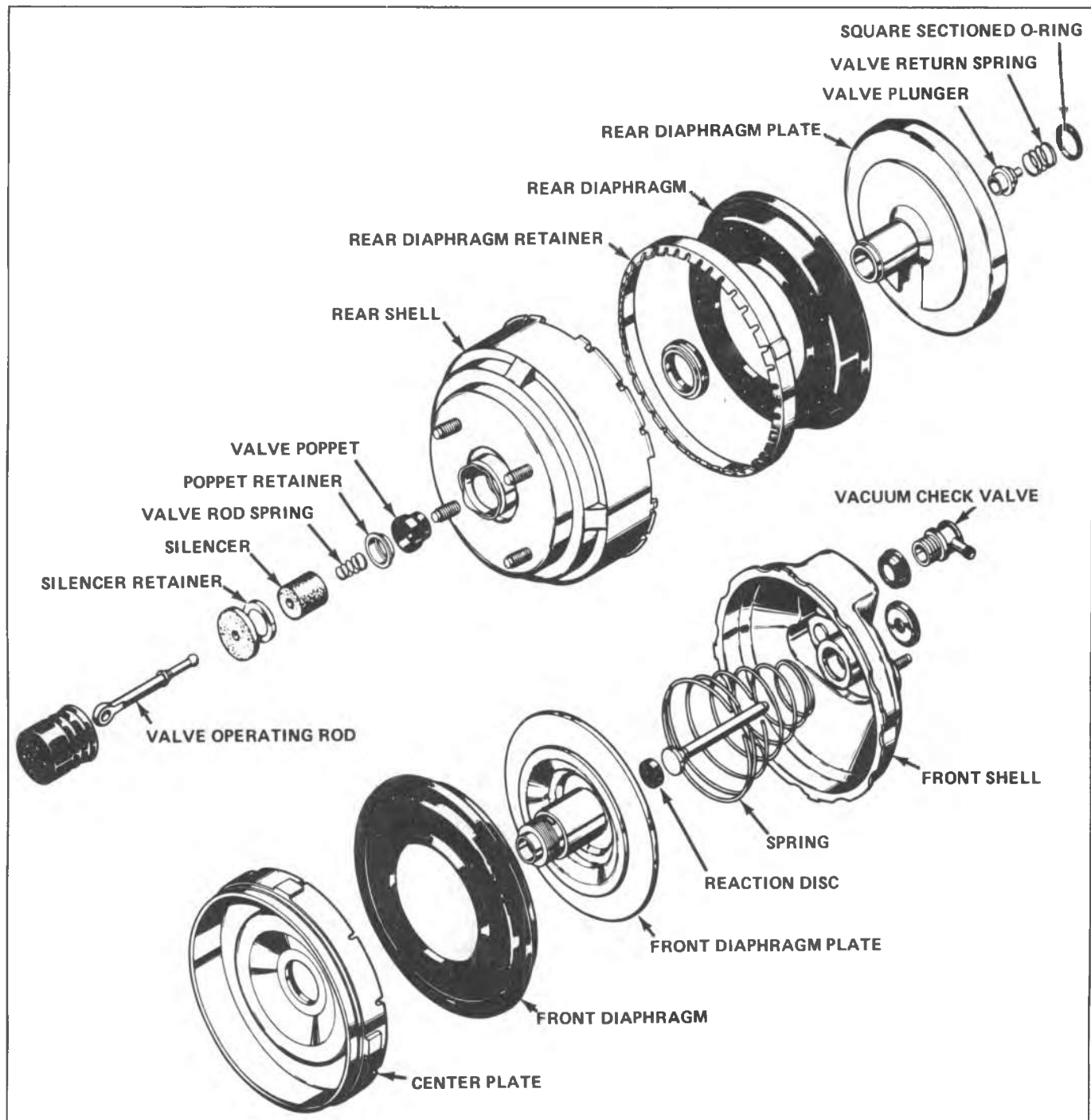


Fig. 5-5B--Diaphragm and Plates

on arbor press plate by a suitable means (fig. 5-4B).

13. Place Spanner Wrench J-9504 over studs on rear housing. Use three washers and nuts to attach wrench to housing. Place a suitable piece of pipe (approximately two inch I.D. and approximately three inches in length) over plastic diaphragm plate hub. Place a piece of flat stock steel over end of pipe.

14. Install diaphragm return spring so that small end of spring is against front housing.

15. Place rear housing over front housing, and align scribe marks.

16. Rotate spanner wrench clockwise until housings are

locked together. Bend tabs of the four deep lances back to their original position.

17. Remove three nuts and lock washers securing rear housing to spanner wrench.

18. Remove Holding Fixture J-22805 from front housing by removing two nuts and washers.

19. Wet poppet valve with denatured alcohol and assemble in rear plate hub, small end first. Wet poppet retainer with denatured alcohol and assemble with shoulder inside poppet. Assemble retainer, filters and silencer over ridge on rod and return spring over ball end of operating valve rod. Wet grommet in valve plunger with denatured



Fig. 5-6B--Removing Rear Seal

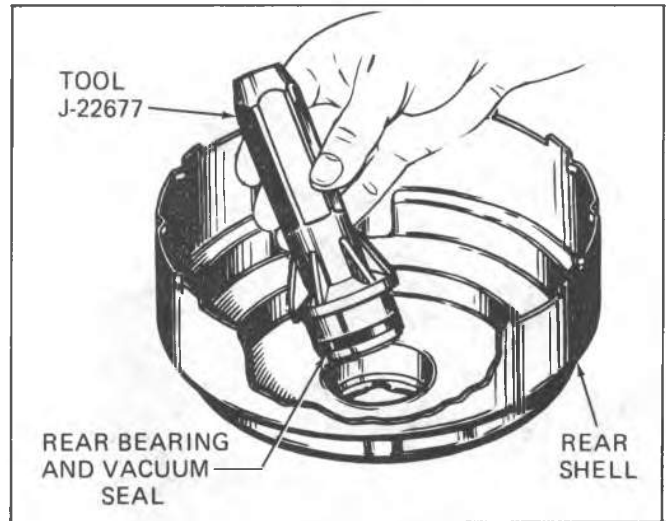


Fig. 5-8B--Installing Rear Bearing and Vacuum Seal

alcohol and guide air valve rod into valve plunger. Tap end of operating valve rod with plastic hammer to lock ball in grommet. Press filters and silencers into hub and install retainer on hub.

20. Assemble silencer in dust boot, wet dust boot opening with denatured alcohol and assemble over operating valve rod and over flange of rear housing.

21. Install **new** check valve and grommet.

22. Apply silicone lubricant to piston end of hydraulic push rod and insert in cavity in front plate. Twist rod to eliminate air bubbles at reaction disc. Assemble seal over push rod and press into recess in front housing.

Piston Rod Gauging

1. Place the power head assembly in a padded vise (front housing up); *Do not clamp tight.*

2. Remove the front housing seal to assure that no vacuum is in the power head while gaging.

3. Insert the master cylinder piston rod, flat end first, into the piston rod retainer.

4. Press down on the master cylinder piston rod (with approximately a 40-50 pound load) to be sure it is properly seated.

5. Place Gage J-22647 over the piston rod in a position which will allow the gage to be slipped to the left or right without contacting the studs (fig. 5-12B).

6. The center section of the gage has two levels. The piston rod should always contact the longer section (lower level) of the gage. The piston rod should **never** contact the shorter section (higher level) of the gage. Move gage from side to side to check piston rod height.

7. Any variation beyond these two limits must be compensated for by obtaining the service adjustable piston rod and adjusting the self-locking screw to meet the gaging specifications.

8. Wipe a thin film of silicone lubricant on the I.D. of the front housing seal and position seal in the depression in the housing.

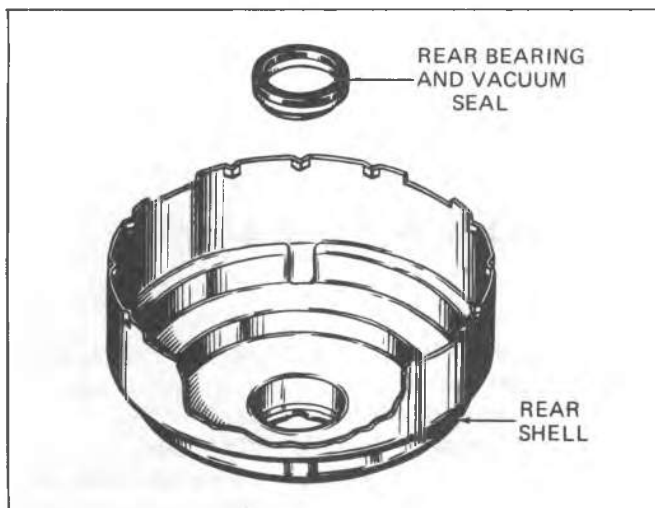


Fig. 5-7B--Rear Bearing and Rear Shell

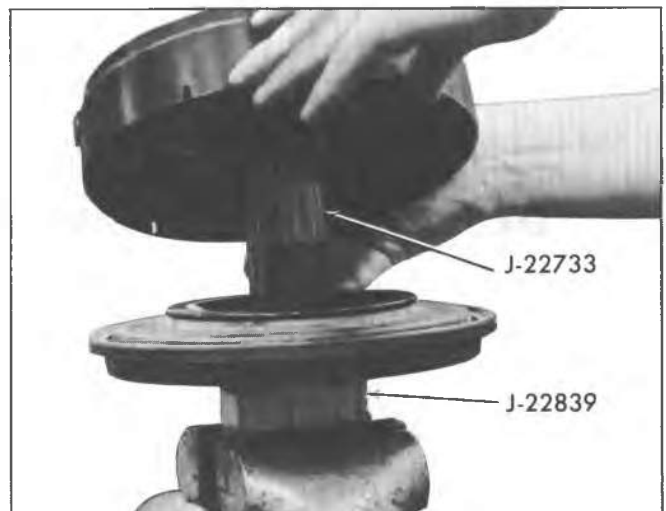


Fig. 5-9B--Seal Protector J-22733 Installed



Fig. 5-10B--Installing Air Valve Plunger



Fig. 5-11B--Installing Rear Diaphragm Retainer

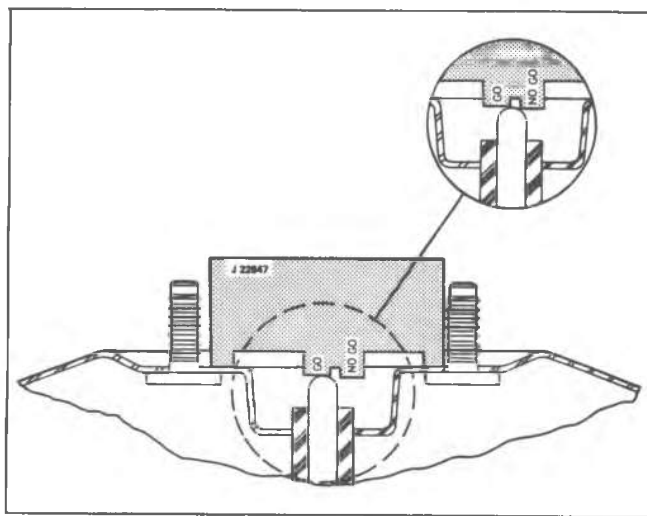


Fig. 5-12B Gaging Piston Rod

DELCO SINGLE DIAPHRAGM POWER BRAKE UNIT UNIT REPAIR

Disassembly

1. Scribe a mark on bottom center of front and rear housings to facilitate reassembly.

2. Attach base of Tool J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damage to studs. Clamp base in bench vise with power section up (fig. 5-2C).

3. Separate front and rear housings as follows:

a. **Straight Mounting Bracket (Fig. 5-3C)** - Place

Spanner Wrench J-9504 over studs on rear housing and attach with nuts and washers. Draw nuts down tight to eliminate bending or damaging of studs.

b. **Tilt Mounting Bracket (Chevelle)** - Secure Spanner Wrench J-9504 to bracket with three bolts and nuts. Draw nuts down tight to eliminate damage to bracket.

c. **Tilt Mounting Bracket Except Chevelle (Fig. 5-4C)** - Place Tool J-22893 inside tilted mounting bracket. Place Spanner Wrench J-9504 on top of J-22893 and tighten nuts and washers securing spanner wrench.

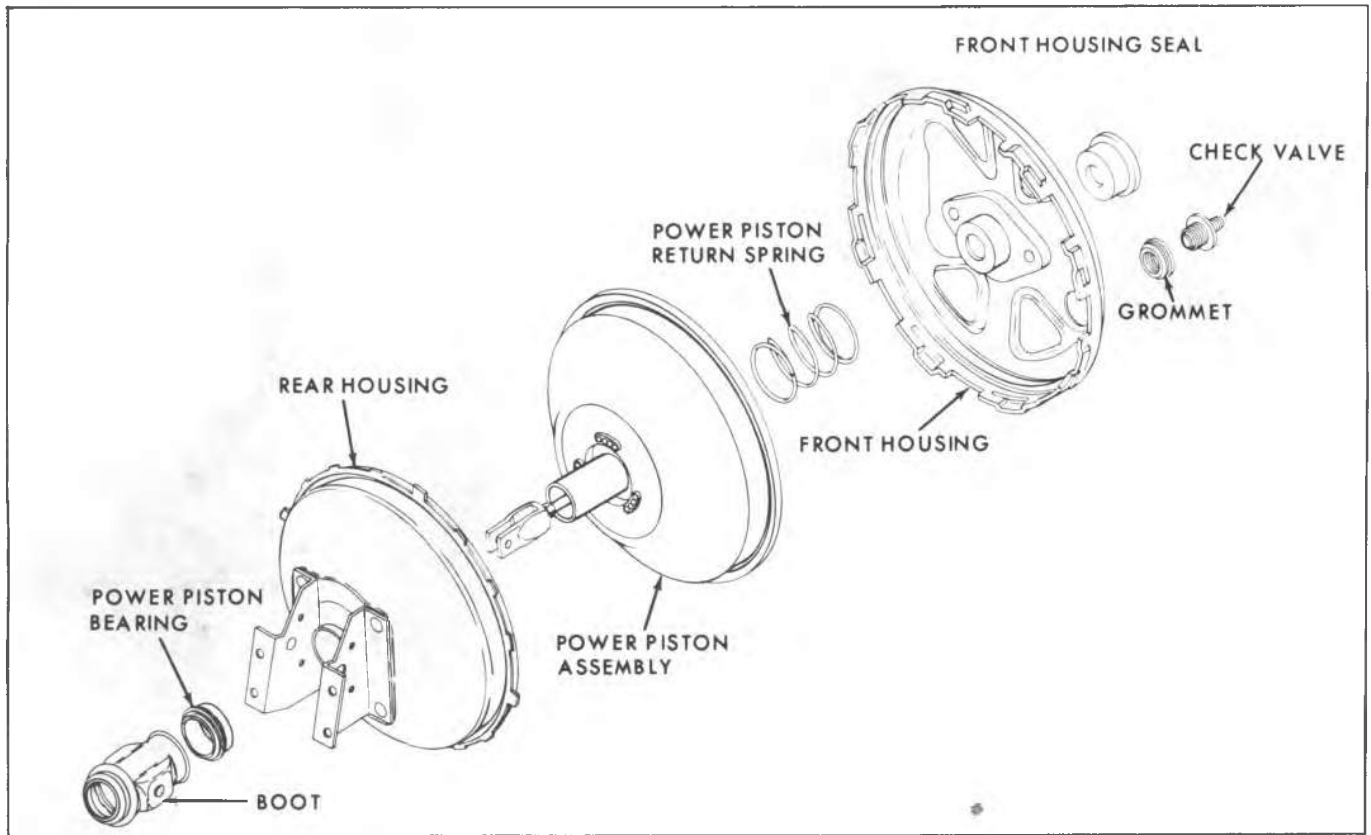


Fig. 5-1C-- Typical Power Brake Unit - Exploded View

d. Press down on Spanner Wrench J-9504 and rotate the rear housing counterclockwise to unlocked position. Loosen housing carefully as it is spring loaded.

e. Remove Tools J-9504 and J-22893 from rear housing (tilted mounting bracket type): Tool J-9504 on regular type.

4. Lift rear housing and power piston assembly from unit. Then remove return spring.

5. Remove retaining ring on push rod that holds silencer in place on push rod; remove silencer.

6. Remove seal and vacuum check valve and grommet from front housing.

Power Piston Assembly Group (Fig. 5-5C)

CAUTION: Care must be used in handling the diaphragm of power piston assembly. Guard diaphragm against grease, oil, foreign matter and nicks or cuts.

1. Remove power piston assembly from rear housing.
2. Remove silencer from neck of power piston tube.
3. Remove lock ring from power piston by prying one end out from under large divided locking lug and then proceed to pull ring from under other two locking lugs on



Fig. 5-2C--Holding Power Cylinder Using Tool J-22805

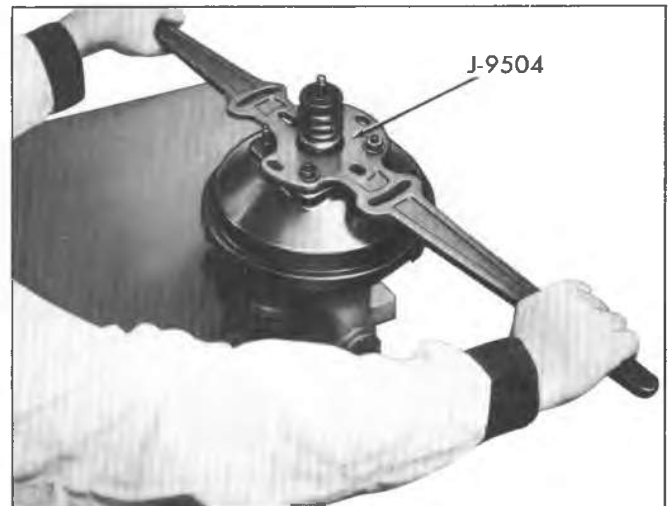


Fig. 5-3C-- Separating Housings With Tool J-9504

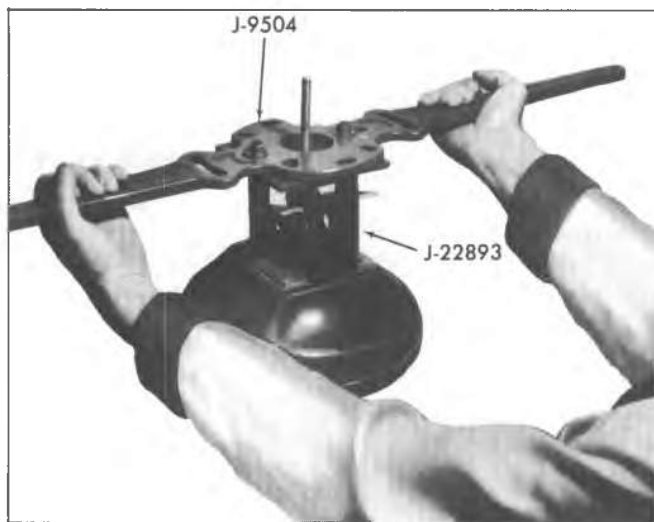


Fig. 5-4C--Separating Tilt Bracket Type Housings

power piston (fig. 5-6C).

4. Remove reaction retainer, piston, reaction plate, three (3) reaction levers and air valve spring. Also remove reaction bumper and air valve spring retainer from air valve (fig. 5-7C).

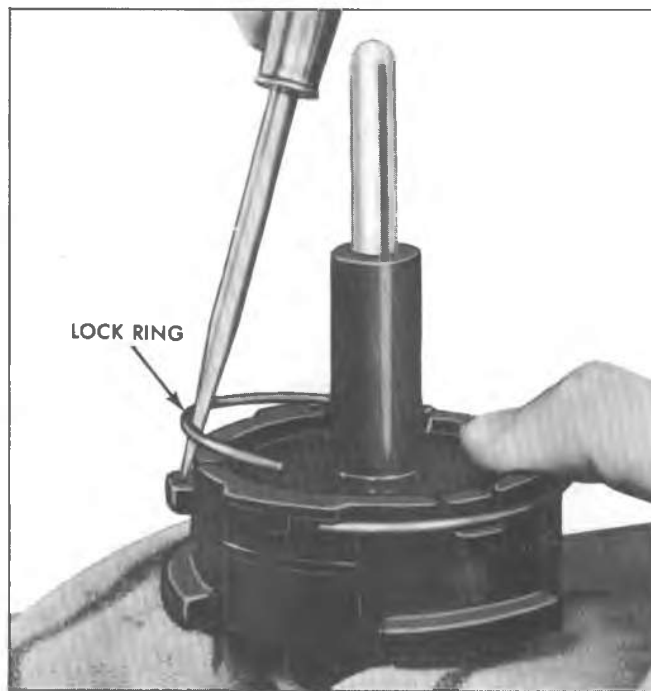


Fig. 5-6C--Removing Lock Ring From Power Piston

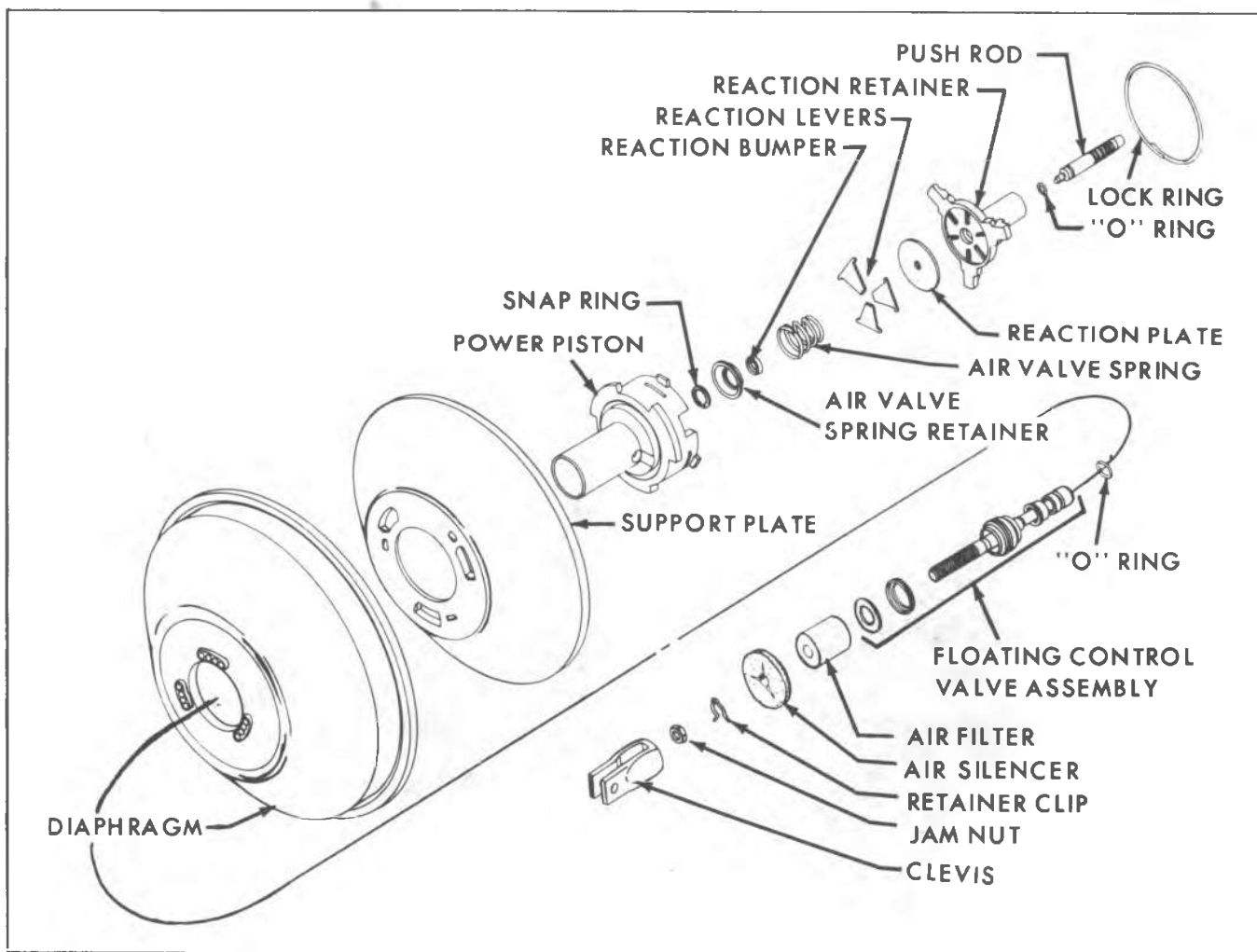


Fig. 5-5C--Power Piston Assembly - Exploded View

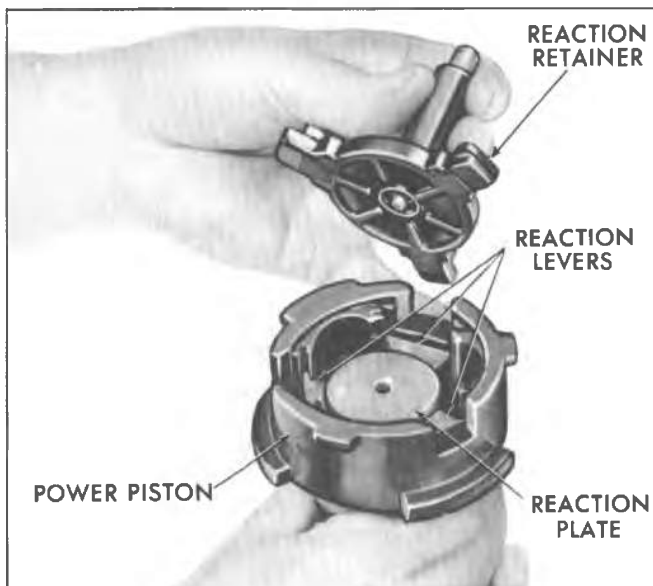


Fig. 5-7C--Removing Reaction Retainer

5. Place power piston Wrench J-21524 with square shank in vise. Hold support plate and power piston with tube of power piston up (fig. 5-8C).

6. Pull diaphragm edges away from support plate so hands can grip steel support plate. Position assembly on power piston Wrench J-21524 so three lugs on tool fit into three notches in power piston (fig. 5-9C).

7. Press down on support plate and rotate counterclockwise until support plate separates from power piston (fig. 5-10C).

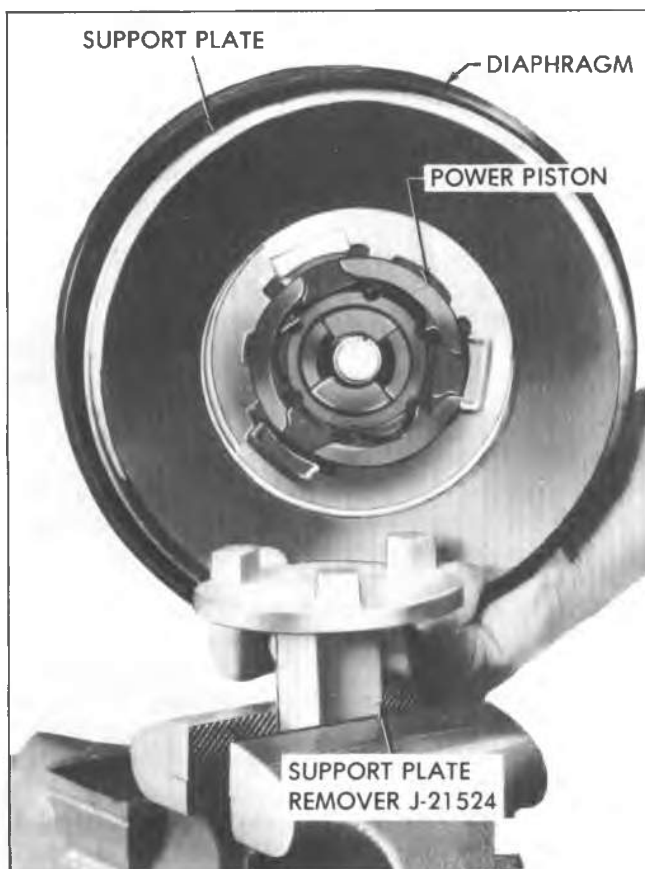


Fig. 5-8C--Positioning Support Plate Retainer in Vise



Fig. 5-9C--Positioning Power Piston on Support Plate Remover

8. Remove diaphragm from support plate and lay both parts aside.

9. Position power piston, tube down, in a tool, fabricated from a piece of wood 2" x 4" x 8" long with a 1-3/8" hole in center, clamped in a vise. Do not clamp tube in vise.

10. Use Snap Ring Pliers J-4880 to remove snap ring on air valve (fig. 5-11C).

11. Set up Power Ram and Hydraulic Pump with J-9746 Press Plate. Insert power piston, tube down, in press plate and remove air valve assembly using a 3/8" drive extension as a remover (fig. 5-12C).

12. Removal of air valve-push rod assembly disassembles the following parts from power piston: floating control valve assembly, floating valve retainer, push rod limiter washer and air filter.

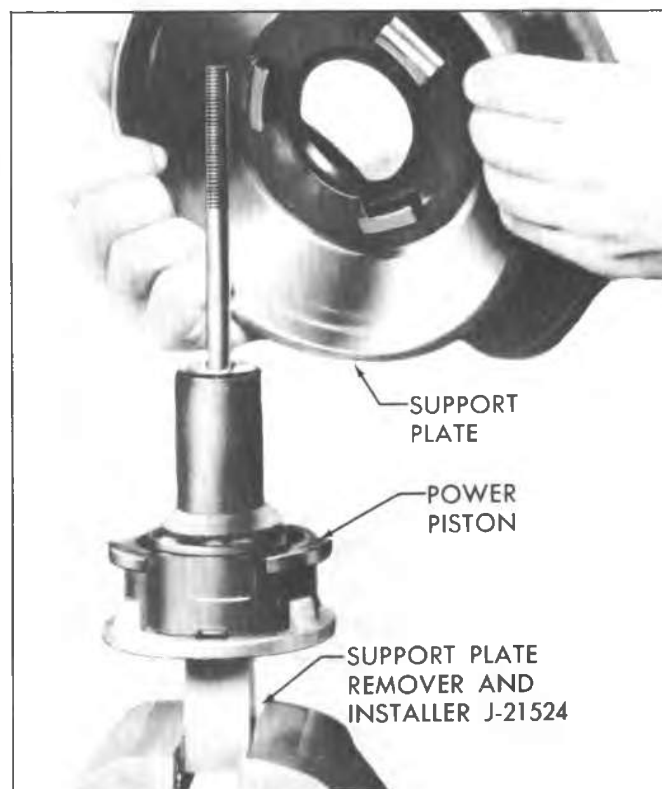


Fig. 5-10C--Removing Support Plate

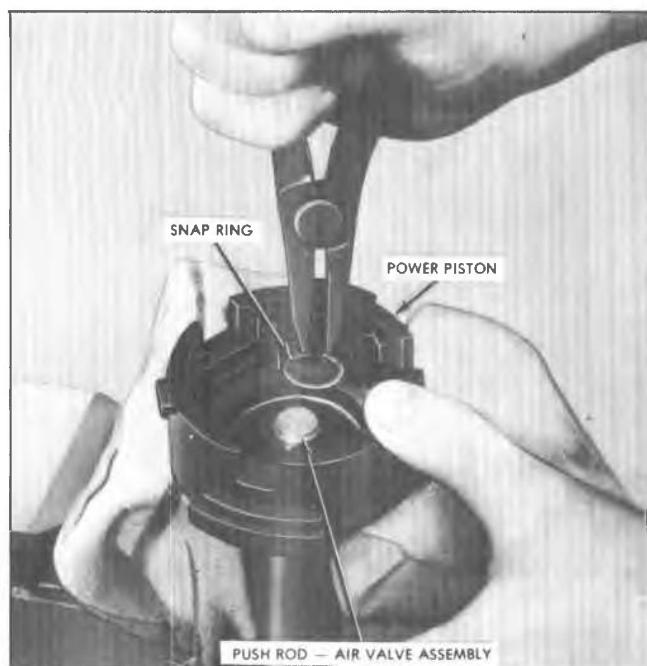


Fig. 5-11C--Removing Power Piston Snap Ring

13. Remove floating control valve assembly from push rod as it must be replaced by a new floating control valve assembly at rebuild.

14. The master cylinder push rod can now be pushed from center of reaction retainer. Remove "O" ring from groove in master cylinder piston rod.

Cleaning of Parts

1. Use denatured alcohol to clean thoroughly all metal brake parts. Immerse in cleaning fluid and brush with hair brush to remove foreign matter. Blow out all passages, orifices and valve holes. Air dry and place cleaned parts on clean paper or lint free clean cloth.

2. If slight rust is found inside either front or rear housing assemblies, polish clean with crocus cloth or fine emery paper, washing clean afterwards with specified cleaning fluid.

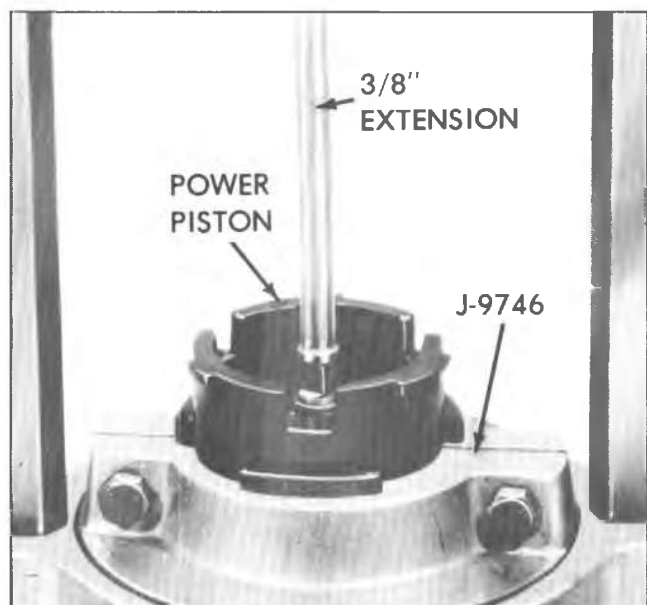


Fig. 5-12C--Removing Air Valve Assembly

CAUTION: If there is any suspicion of contamination or any evidence of corrosion, completely flush hydraulic brake system. Failure to clean hydraulic brake system can result in early repetition of trouble. Use of gasoline, kerosene, anti-freeze alcohol or any other cleaner with even a trace of mineral oil will damage rubber parts.

Dirt is the major cause of trouble and wear in service. Be sure to keep parts clean. Rewash at reassembly if there is any occasion to doubt cleanliness--such as parts dropped or left exposed for eight hours or longer.

Inspection and Replacement of Parts

1. Inspect all rubber parts. Wipe free of fluid and carefully inspect each rubber part for cuts, nicks or other damage. These parts are the key to control of fluid or air flow and should account for the majority of troubles traceable to leakage. Re-use rubber parts only if a fairly new unit is disassembled for some particular trouble and only then if there is no doubt that the parts are in equal-to-new condition. Badly damaged items or those which would take extensive work or time to repair should be replaced. In case of doubt, install new parts for safety.

2. Inspect in accordance with Inspection Table: (The table is organized by power brake unit groups.)

Assembly

Be certain that all rubber parts are clean at reassembly. Rewash in specified cleaning fluid if there is any doubt of cleanliness. Be careful during rebuild process that no grease or mineral oil comes in contact with rubber parts of power brake unit. Lubricate rubber parts with Delco approved lubricant or equivalent.

Front Housing Group

1. Install a new vacuum check valve using a new grommet.

2. Place new front housing seal in housing so flat surface of cup lies against bottom of depression in housing.

Power Piston Group

1. Place new "O" ring in groove on the master cylinder piston rod. Wipe a thin film of Power Brake Lube or equivalent on "O" ring.

2. Master cylinder piston rod is now inserted through the reaction retainer so round end of piston rod protrudes from end of the tube on reaction retainer.

3. Place J-21524 power piston wrench in a vise. Position power piston on wrench with three lugs fitting into notches in power piston.

4. Position new "O" ring on air valve in second groove from push rod end.

5. On reassembly of power piston, floating control valve assembly must be replaced with a new one since the force required to remove it distorts component parts.

6. Place floating control valve on push rod-air valve assembly so flat face of valve will seat against valve seat on air valve.

7. Wipe a thin film of Power Brake Lube (or equivalent) on large O.D. of floating control valve and on "O" ring on air valve.

8. Press air valve-push rod assembly, air valve first, onto its seat in tube of power piston.

9. Place floating control valve retainer over push rod so flat side seats on floating control valve.

10. Start floating control valve and its retainer into power piston tube. Press the floating control valve to seat in

INSPECTION CHART

Part	Inspect For	Corrective Action
Power Piston and Support Plate and Reaction Retainer	1. Cracks, distortion, chipping, damaged lever seats, pitted or rough holes.	1. Clean up or replace.
	2. Worn seal surfaces (tubes).	2. Replace
	3. Rough or uneven floating valve seat.	3. Replace
	4. Open passages and flow holes.	4. Clean
Reaction Levers or Plates	1. Cracks, distortion, tears and heavy wear.	1. Replace
Floating Control Valve	1. Deterioration of rubber or warped valve face.	1. Replace
Air Valve - Push Rod Assembly	1. Air valve: scratches, dents, distortion, or corrosion of I.D. or O.D. All seats to be smooth and free of nicks and dents.	1. Do not repair - Replace.
	2. Push rod must move freely in air valve, but must not pull out.	2. If worn, replace air valve - push rod assembly.
Front and Rear Housings	1. Scratches, scores, pits, dents, or other damage affecting rolling or sealing of diaphragm or other seals.	1. Replace, unless easily repaired
	2. Cracks, damage at ears, damaged threads on studs.	2. Replace, unless easily repaired
	3. Bent or nicked locking lugs.	3. Replace, unless easily repaired
	4. Loose studs.	4. Replace or repair.
Air Filters	1. Dirty	1. Replace



Fig. 5-13C--Installing Floating Control Valve Assembly

the tube, by placing J-21601-01 Floating Control Valve Retainer Installer on top of retainer and pushing down by hand (fig. 5-13C).

11. After floating control valve is seated, position push rod limiter washer over push rod and down onto floating control valve. Air filter element can now be stretched over end of push rod and pressed into power piston tube.

12. Assemble power piston diaphragm to diaphragm support plate from side of support plate opposite locking tangs. The raised flange of diaphragm is pressed through hole in center of support plate. Be sure that edge of center hole fits into groove in flange of diaphragm.

13. Pull diaphragm away from O.D. of support plate so that support plate can be gripped with hands.

14. With power piston still positioned on holding tool in vise, coat bead of diaphragm that contacts power piston with Power Brake Lube (or equivalent).

15. Holding support plate by metal, with locking tangs down, place support plate and diaphragm assembly over tube of power piston. The flange of diaphragm will fit into groove on power piston (fig. 5-10C).

16. Press down and rotate support plate clockwise, until lugs on power piston come against stops on support plate (fig. 5-10C).

17. This assembly can now be turned over and placed, tube down, in a tool, fabricated from a piece of wood, 2" x 4" x 8" long with a 1-3/8" hole in the center, clamped in a vise.

18. With Snap Ring Pliers J-4880, assemble snap ring into groove in air valve.

19. Place air valve spring retainer on snap ring. Assemble reaction bumper into groove in end of air valve.

20. Position air valve return spring, large end down, on spring retainer.

21. The three reaction levers are now placed into position with ears on wide end in slots in power piston. The

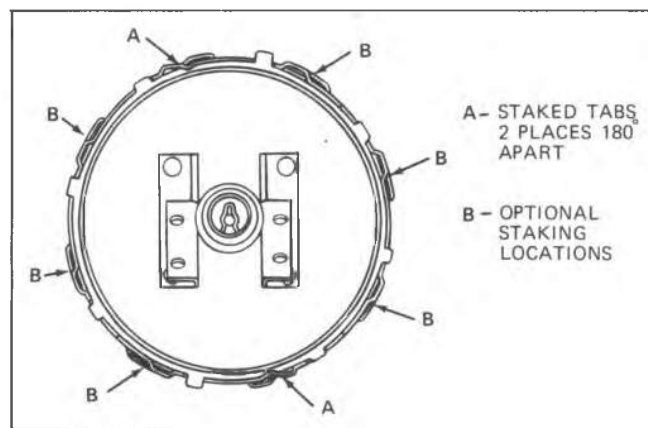


Fig. 5-14C--Housing Locking Tabs

narrow ends will rest on top of air valve return spring.

22. Position reaction plate (with numbered side up) on top of reaction levers. Press down on plate until large ends of reaction levers pop up so plate rests flat on levers. Be sure reaction plate is centered.

23. Master cylinder piston rod and reaction retainer assembly is now assembled to the power piston.

24. With round end of piston rod up, and with reaction retainer held toward top of piston rod, place small end of piston rod in hole in center of reaction plate. Line up ears on reaction retainer with notches in power piston and push reaction retainer down until ears seat in notches.

25. Maintain pressure on reaction retainer and position large lock ring down over master cylinder push rod.

26. There is a lug on the power piston which has a raised divider in the center. One end of lock ring goes under lug and on one side of divider.

27. As you work your way around power piston (either way), the lock ring goes over ear of reaction retainer, under a lug on power piston, and so forth, until other end of lock ring is seated under lug with raised divider.

Be sure both ends of lock ring are securely under large lug.

Rear Housing Group

1. Place a new power piston bearing in center of rear housing so flange on center hole of housing fits into groove of power piston bearing. The large flange on power piston bearing will be on stud side of housing.

2. Coat inside of power piston bearing with Delco Power Brake Lube (or equivalent).

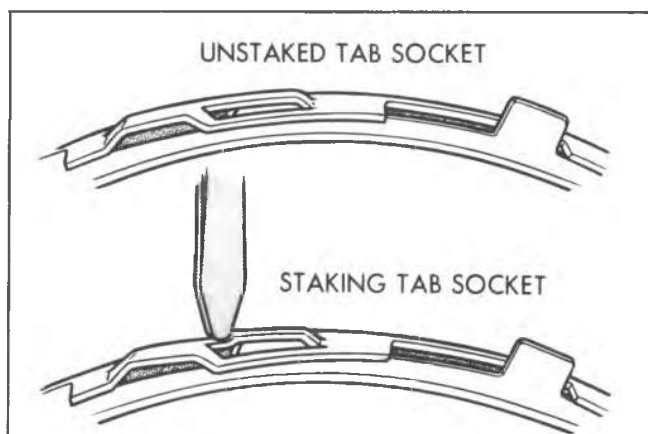


Fig. 5-15C--Staking Housing Tabs

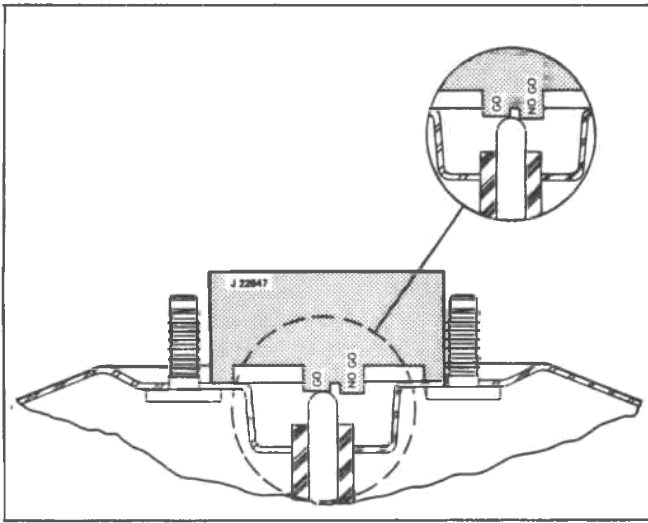


Fig. 5-16C--Gaging Master Cylinder Push Rod

Final Assembly

1. Place air silencer over holes on tube of power piston. Wipe tube of power piston with Delco Power Brake Lube (or equivalent).

2. Assemble power piston to rear housing.

3. Wipe tube of reaction retainer with Delco Power Brake Lube (or equivalent) and lay assembly aside.

4. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damaging of studs. Clamp base in a vise. Place power piston return spring over the insert in the front housing.

5. Lubricate the I.D. of the support plate seal, the reaction retainer tube and the beaded edge of the diaphragm with Power Brake Lube (or equivalent).

6. Place the rear housing assembly over the front housing assembly and align the scribe marks of the two housings so they will match when in locked position.

7. Assemble front and rear housings as follows:

a. **Straight Mounting Bracket** - Place Spanner Wrench J-9504 over studs on rear housing, and attach with nuts and washers--draw nuts down tight to eliminate bending or damaging of studs.

b. **Tilt Mounting Bracket (Chevelle)** - Secure Spanner Wrench J-9504 to bracket with three bolts and nuts. Draw nuts down tight to eliminate damage to the bracket.

c. **Tilt Mounting Bracket (Except Chevelle)** - Position Tool J-22893 inside tilted mounting bracket. Place Spanner Wrench J-9504 on top of J-22893 and tighten nuts and washers to bolts provided, securing Spanner Wrench.

d. Press down on spanner wrench and twist rear housing clockwise in relation to front housing until fully locked. Do not break studs loose in rear housing or put pressure on power piston tube when locking housings.

8. Remove Spanner Wrench J-9504. Remove unit from vise and remove Holding Fixture J-22805 from the front housing.

9. Push felt silencer over push rod to seat against end of power piston tube. Snap ring retainer is now placed on push rod so it can hold silencer against power piston tube. Plastic boot is now pushed to seat against rear housing. Raised tabs on side of boot will locate in holes in center of brackets.

10. Using a 1/8" diameter rod (or similar tool), stake the front and rear housing in two places 180° apart (figs. 5-14C and 5-15C).

CAUTION: The interlock tabs should not be used for staking a second time. Stake two of the remaining tabs. When all tabs have been staked once, the housing **must** be replaced.

Gaging of Power Brake Unit

The following gaging operation is necessary only when a major structural part such as front or rear housing, power piston assembly, master cylinder piston or master cylinder assembly is replaced with a new part. The gage measures how far the master cylinder push-rod projects from front housing. This dimension must be correct to insure proper clearance in master cylinder between primary cup and compensating port.

Make check as follows:

1. Place gage over piston rod in a position which will allow gage to be slipped to left or right without contacting studs.

The center section of gage has two levels. The piston rod end should always touch the longer section of gage which extends into front housing. The piston rod end should **never** touch the shorter section of gage (fig. 5-16C).

2. Any variation beyond these two limits must be compensated for by obtaining the service adjustable piston rod, and adjusting the screw in end to match height of gage.

BENDIX SINGLE DIAPHRAGM POWER BRAKE UNIT UNIT REPAIR

Disassembly (Figs. 5-1D and 5-2D)

1. Scribe a line across front and rear housings to facilitate reassembly.

2. Remove the front housing seal (fig. 5-2D); pulling the piston rod from the front housing will also remove the seal assembly. Remove the piston rod.

3. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damage to studs. Clamp base in bench vise with power section up (fig. 5-2A).

CAUTION: Be sure to align tool so that the check valve in the front housing is not damaged.

4. Loosen locknut and remove push rod clevis and locknut, if so equipped.

5. Remove the mounting bracket from the rear housing, if so equipped.

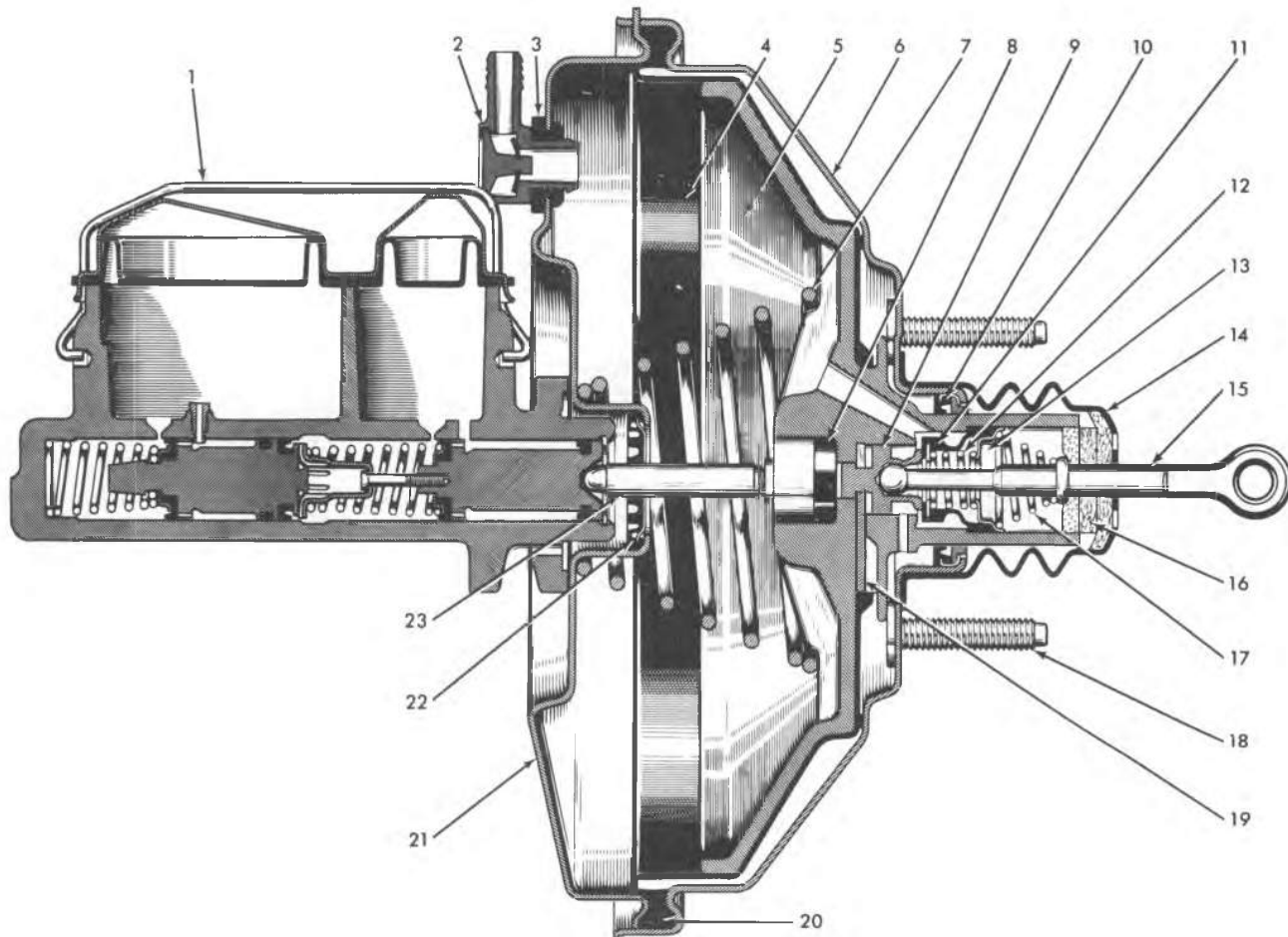
6. Remove the dust boot retainer, dust boot and silencer from the diaphragm plate extension.

7. The edge of the rear housing contains twelve lances. Four of these lances (one in each quadrant) are deeper than

the other lances (fig. 5-3D). The metal that forms the four deep lances must be partially straightened so that the lances will clear the cutouts in the front housing. If the metal tabs that form the deep lances crack or break during straightening, the housing must be replaced.

8. Place Spanner Wrench J-9504 over studs on rear housing and attach with nuts and washers. Draw nuts down tight to eliminate bending or damaging of studs (fig. 5-2A).

9. Press down on Spanner Wrench J-9504 and rotate the rear housing clockwise to separate the two housings. If the



1. Master Cylinder
2. Vacuum Check Valve
3. Grommet
4. Diaphragm
5. Diaphragm Plate
6. Rear Housing
7. Diaphragm Spring
8. Reaction Disc

9. Air Valve
10. Front Housing Seal
11. Poppet Valve
12. Poppet Valve Spring
13. Poppet Retainer
14. Dust Boot
15. Valve Push Rod
16. Filter and Silencers

17. Valve Return Spring
18. Mounting Stud
19. Air Valve Lock Plate
20. Diaphragm Lip
21. Front Housing
22. Front Housing Seal
23. Piston Rod

Fig. 5-1D--Bendix Single Diaphragm Unit (Typical)

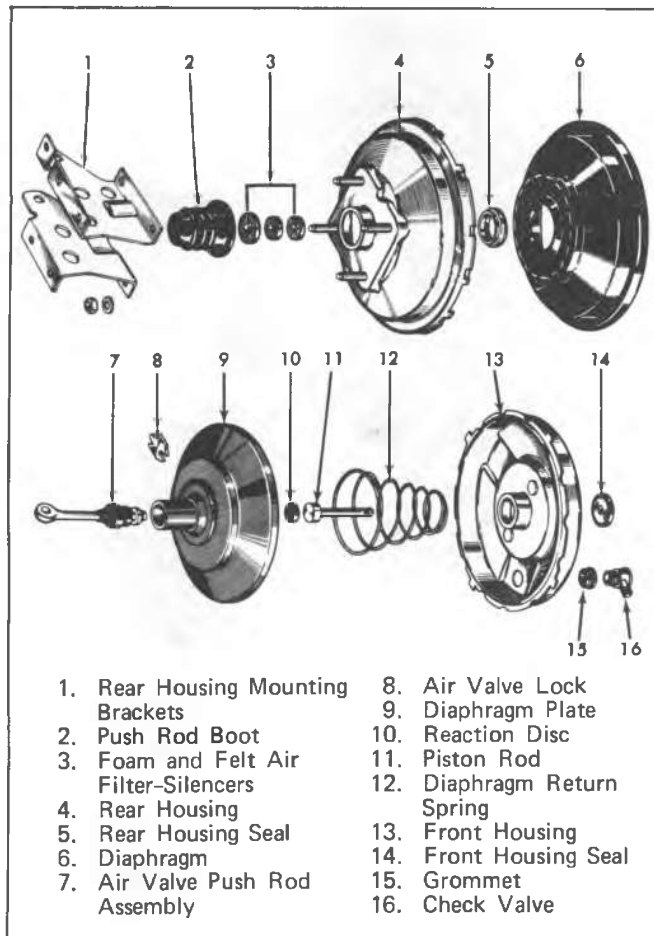


Fig. 5-2D--Bendix Power Booster Components (Typical)

rear housing cannot be readily loosened, tap the rear housing lightly with plastic hammer.

10. Remove Tool J-9504 from the rear housing.

CAUTION: Care must be exercised not to damage or loosen studs in the rear housing. Also, take care that no pressure is brought to bear on plastic

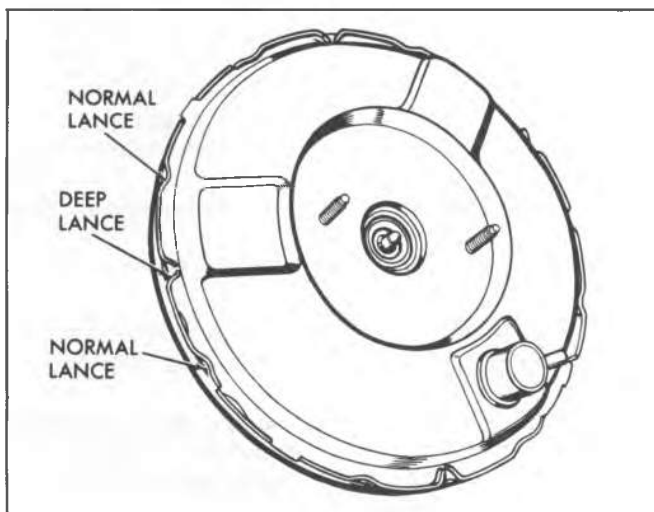


Fig. 5-3D--Lances in Rear Housing

diaphragm plate tension.

11. Lift the rear housing assembly from the unit.

Rear Housing Group

1. Remove the air filter element from location within the diaphragm plate extension.

CAUTION: To prevent chipping of the plastic diaphragm plate, exercise extreme caution when removing the air filter retainer. Use a small screwdriver or other suitable tool, and pry at several peripheral locations until the retainer is freed.

2. Separate the diaphragm plate assembly from the rear housing and lay the rear housing aside.

3. Disassemble diaphragm plate assembly (fig. 5-2D).

a. Remove rolling diaphragm from the groove in the diaphragm plate hub.

CAUTION: Care should be used in handling the diaphragm of the diaphragm plate assembly. The diaphragm should be protected from grease, oil, foreign matter and from nicks, scratches and gouges.

b. Hold the diaphragm plate so that the push rod is in its normal (horizontal) installed position, depress the push rod slightly (approximately 1/16 inch), and rotate piston so the air valve lock will fall from its location in the diaphragm plate hub. Remove the air valve-push rod assembly from the diaphragm plate. Remove the reaction disc from its location in the diaphragm plate bore (insert the piston rod or other suitable tool through diaphragm plate extension and push disc from its seat). Exercise care so as not to chip surface of passages in the diaphragm plate.

NOTE: Perform Step 4 only if seal is defective and a new seal is available. Do not reuse seal once it has been removed from the unit.

4. Support outer surface of rear housing on blocks of wood or other suitable material (stud side up) and drive out seal with a punch or a thin blade screwdriver. Discard seal.

Front Housing Group

1. Remove check valve from grommet and then remove grommet from front housing; discard valve and grommet.

2. Remove front housing and holding fixture from vise; then remove holding fixture from front housing.

Cleaning

Use clean brake fluid to thoroughly clean all reusable brake parts. Immerse in the cleaning fluid and brush metal parts with hair brush to remove foreign matter. Blow out all passages, orifices and valve holes. Air dry and place cleaned parts on clean paper or lint free clean cloth. If slight rust is found inside either the front or rear half housing assemblies, polish clean with crocus cloth or fine emery paper, washing clean afterwards. Dirt is the major cause of trouble and wear in service. Be sure to keep parts clean until re-assembly. Re-wash at re-assembly if there is any occasion to doubt cleanliness--such as parts dropped or left exposed for eight hours or longer.

CAUTION: If there is any suspicion of contamination or any evidence of corrosion, completely flush the vehicle hydraulic brake system. Failure to clean the hydraulic brake system can result in early repetition of trouble. Use of gasoline, kerosene, anti-freeze, alcohol or any other cleaner, with even a trace of mineral oil, will damage rubber parts.

Inspecting Rubber Parts

Wipe fluid from the rubber parts and carefully inspect each rubber part for cuts, nicks or other damage. These parts are the key to the control of fluid or air flow, if the unit is in for overhaul, or if there is any question as to the serviceability of rubber parts, **REPLACE** them.

Inspecting Metal Parts

BADLY DAMAGED ITEMS, OR THOSE WHICH WOULD TAKE EXTENSIVE WORK OR TIME TO REPAIR, SHOULD BE REPLACED. In case of doubt, install new parts. Do not rely on the brake unit being overhauled at an early or proper interval. New parts will provide more satisfactory service, even if the brake unit is allowed to go beyond the desired overhaul period.

Assembly (Figs. 5-1D and 5-2D)

1. Be careful during the rebuild procedure that no grease or mineral oil comes in contact with the rubber parts of the power brake unit.

2. Lubricate power head parts, as outlined below, with silicone lubricant provided in the service repair kit.

Front Housing Group

1. Install new check valve grommet in front housing with beveled edge of grommet inside of housing. Dip new check valve in clean denatured alcohol and install in grommet--check valve stem is to be outside of housing.

2. Position and secure Holding Fixture J-22805 to mounting studs, and place tool and front housing in a vise. Be sure to align tool so that check valve is not damaged.

NOTE: If either or both of the housings are replaced, make sure alignment marks are transferred to the new housing.

Rear Housing Group

1. Place rear housing on a block of wood, stud side down, and position housing seal in center hole. Use Tool J-22677 (fig. 5-4D) to seat seal in recess of rear housing. Tool bottoms against housing when seal is in place.

2. Assemble diaphragm plate assembly (see fig. 5-2D).

a. Apply silicone lubricant to outside diameter of diaphragm plate and extension, to bearing surfaces of air valve and to outer edge of valve poppet. Insert air valve and push rod assembly in extension of diaphragm plate.

NOTE: The air valve, poppet valve and push rod are serviced as an assembly; a complete unit must be installed if there is damage to any of the component parts.

b. Depress the push rod slightly and install the air valve lock. Make sure the lock indexes and retains the air valve.

c. Install the rolling diaphragm in the groove of diaphragm plate.

d. Apply silicone lubricant to surface of reaction disc and position disc in center bore of diaphragm plate. Use piston rod to seat disc in bore. Make sure disc is fully seated before removing piston rod.

NOTE: If reaction disc is not fully seated, it will result in an erroneous push rod height adjustment.

3. Apply silicone lubricant to I.D. of rear housing seal and diaphragm bead contact surface of rear housing. Install diaphragm plate assembly in rear housing.

4. Place air filter element over push rod and into diaphragm plate extension. Install filter retainer.



Fig. 5-4D--Installing Rear Housing Seal

Final Assembly

1. Attach base of Holding Fixture J-22805 to front housing with nuts and washers and draw down tight to eliminate bending or damage to studs. Clamp base in bench vise with power section up (fig. 5-2A).

CAUTION: Be sure to align tool so that the check valve in the front housing is not damaged.

2. Place Spanner Wrench J-9504 over studs on rear housing and attach with nuts and washers. Draw nuts down tight to eliminate bending or damaging of studs.

3. Place diaphragm plate return spring in front housing and position rear housing assembly on front housing (small end of spring downward). Position rear housing so that when housings are locked, scribe marks on front and rear housings will be in alignment.

4. Press down on Spanner Wrench J-9504 and rotate the rear housing counterclockwise to assemble the two housings.

CAUTION: Bend lances in on the rear housing. If the tangs crack or break during this operation it will be necessary to replace that half of the housing.

5. Remove Tool J-9504 from the rear shell.

6. Install air silencers over push rod end and then install push rod boot. Install boot retainer.

7. **Clevis Type Push Rod** - Install locknut and push rod clevis.

8. Install mounting bracket to the rear shell, if so equipped.

CAUTION: See "Caution" on Page 1 of this section.

9. Remove power cylinder from vise and remove Holding Fixture J-22805.

10. Apply silicone lubricant sparingly to the piston rod, keeping lubricant away from rounded end of rod. Guide piston rod into center bore of the diaphragm plate until it is fully seated against reaction disc.

11. Install front housing seal. Press seal into front housing until seal is bottomed in recess of housing.

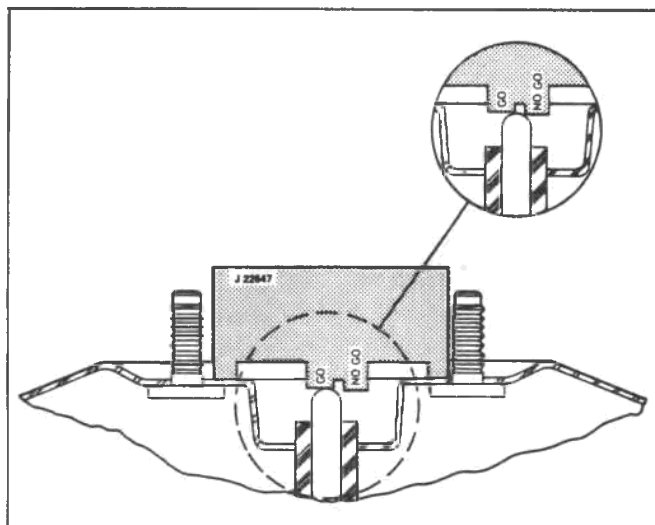


Fig. 5-5D-Gauging Piston Rod

Gaging

1. Place the power head assembly in a padded vise (front housing up). *Do not clamp tight!*

2. Remove the front housing seal to assure that no vacuum is in the power head while gaging.

3. Insert the master cylinder piston rod, flat end first, into the piston rod retainer.

4. Press down on the master cylinder piston rod (with approximately a 40-50 pound load) to be sure it is properly seated.

5. Place Gage J-22647 over the piston rod in a position which will allow the gage to be slipped to the left or right without contacting the studs (fig. 5-5D).

6. The center section of the gage has two levels. The piston rod should always contact the longer section (lower level) of the gage. The piston rod should never contact the shorter section (higher level) of the gage. Move gage from side to side to check piston rod height.

7. Any variation beyond these two limits must be compensated for by obtaining the service adjustable piston rod and adjusting the self-locking screw to meet the gaging specifications.

8. Wipe a thin film of silicone lubricant on the I.D. of the front housing seal and position seal in the depression in the housing.

BENDIX HYDRAULIC BRAKE BOOSTER (HYDRO-BOOST) UNIT REPAIR

The Bendix Hydraulic Brake Booster utilizes the hydraulic pressure supplied by the power steering pump to provide power assist for brake applications (fig. 5-1E). The dual master cylinder is mounted to the output push rod end of the booster.

The procedures below include removal of the mounting bracket even though it is not necessary to remove the bracket for overhaul of the internal assembly.

Disassembly (Fig. 5-2E)

1. Secure the booster in a vise (bracket end up) and use a hammer and chisel to cut the bracket nut that secures the

mounting bracket to the power section (cut the nut at the open slot in the threaded portion of the housing). Be careful to avoid damage to the threads on the booster hub. Spread the nut and remove it from the power section. Then remove the mounting bracket.

2. Remove the pedal rod boot (if equipped) by pulling it off over the pedal rod eyelet.

3. Place Tool J-24569 around the pedal rod and resting on the input rod end as shown in Figure 5-3E.

4. Place a punch (or similar tool) through the pedal rod from the lower side of Tool J-24569. Push the punch on through to rest on the higher side of the tool. Lift up on the punch to shear the pedal rod retainer; remove the pedal rod.

5. Remove the remnants of the rubber grommet from the groove near the end of the pedal rod and from the groove inside the input rod end.

6. With a small screwdriver, pry the plastic guide out of the output push rod retainer. Disengage the tabs of the spring retainer from the ledge inside the opening near the master cylinder mounting flange of the booster. Remove the retainer and the piston return spring from the opening.

7. Pull straight out on the output push rod to remove the push rod and push rod retainer from inside the booster piston.

8. Press in on spool plug, and using a small screwdriver, remove the snap ring from the housing bore.

9. Use pliers to remove the spool plug from the bore. Remove the "O" ring seal from the plug; discard the "O" ring. Remove the spool spring from the bore.

10. Place the booster cover in a vise equipped with soft jawed devices. Using special socket J-25085, remove the five screws that secure the booster housing to the cover.

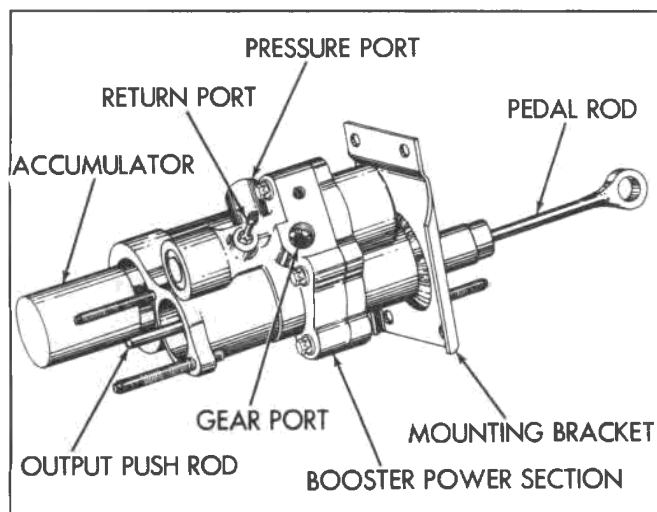


Fig. 5-1E-Bendix Hydro-Boost Brake Booster

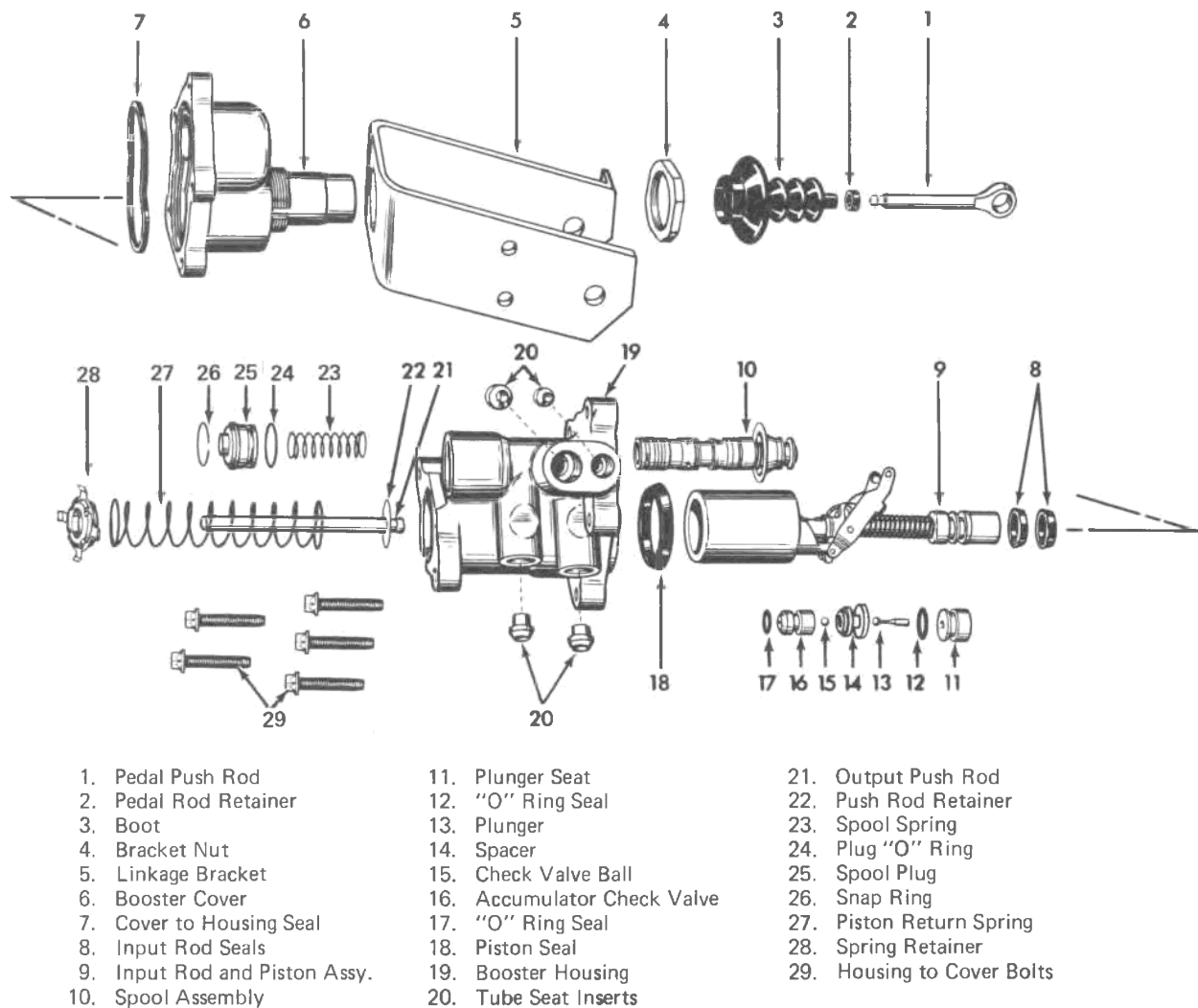


Fig. 5-2E--Power Booster Components (Typical)

11. Remove the booster assembly from the vise and while holding the unit over a pan, separate the cover from the housing. Remove the large seal ring from the groove in the cover; discard the seal.

12. Remove the input rod and piston assembly, and the spool assembly from the booster housing.

13. Remove the input rod seals from the input rod end, and the piston seal from the piston bore in the housing; discard the seals.

14. Remove the plunger, seat, spacer and ball from the accumulator valve bore in the flange of the booster housing. Remove the "O" ring from the seat; discard the "O" ring.

15. Thread a screw extractor into the opening in the check valve in the bottom of the accumulator valve bore, and remove the check valve from the bottom of the bore. Discard the check valve and "O" ring.

NOTE: Using a screw extractor damages the seat in the check valve. A new charging valve kit must be installed whenever the check valve is removed from the accumulator valve bore.

16. Use a 1/4" or a 5/16" spiral flute type screw extractor to remove the tube seats from the booster ports.

Cleaning and Inspection

1. Clean all metal parts in a suitable solvent. Be careful to avoid losing small parts.

2. Inspect the valve spool and the valve spool bore in the booster housing for corrosion, nicks, scoring or other damage. Discoloration of the spool or bore, particularly in the grooves, is not harmful and is no cause for concern.

3. If the valve spool or the valve spool bore has nicks or scoring that can be felt with a fingernail, particularly on the lands, the entire booster should be replaced as an assembly.

NOTE: The clearance between the valve spool and the spool bore of the housing assembly is important. Because of this, the valve spool and the housing assembly make up a selective assembly (the valve spool is selected to match the spool bore).

4. Inspect the input rod and piston assembly for corrosion, nicks, scoring or excessive wear. If the piston is damaged, the input rod and piston assembly should be replaced.

5. Inspect the piston bore in the booster housing for corrosion, nicks, scoring or other damage. If the bore is

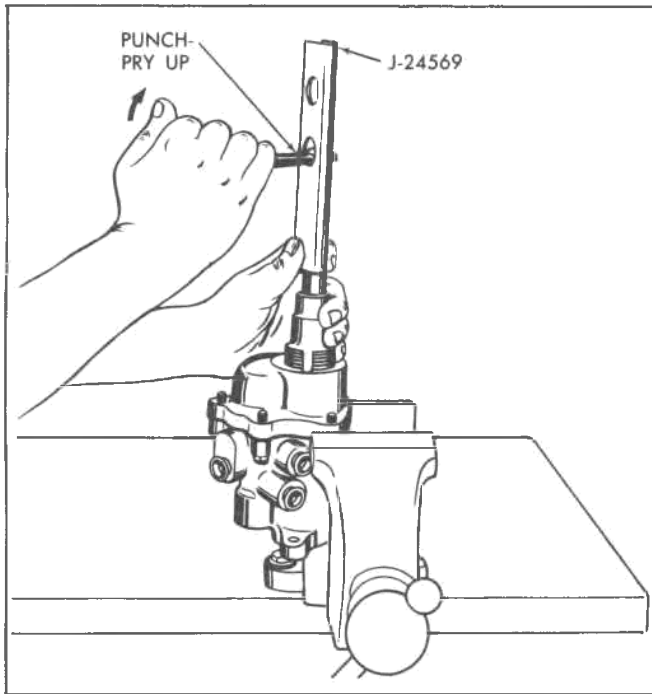


Fig. 5-3E--Removing Booster Pedal Rod (Typical)

damaged, the entire booster must be replaced as an assembly.

Assembly

CAUTION: Be sure to keep parts clean until reassembly. Re-wash at reassembly if there is any occasion to doubt cleanliness - such as parts dropped or left exposed for eight hours or longer.

Lubricate all seals and metal friction points with power steering fluid.

Whenever the booster is disassembled, all seals, tube inserts and bracket nut should be replaced. All of these parts are included in a seal kit. If any of the accumulator valve components are damaged or lost, replace all valve components (all are included in charging valve kit).

1. Position a **NEW** tube seat in each booster port and screw a spare tube nut in each port to press the seat down into the port. Do not tighten the tube nuts in the port as this may deface the seats.

2. Remove the spare tube nuts and check for aluminum chips in the ports. Be sure that any foreign matter is removed.

3. Coat the piston bore and the piston seal with clean power steering fluid, and assemble the **NEW** seal in the bore. The lip of the seal must be toward the rear (away from the master cylinder mounting flange). Be sure the seal is fully seated in the housing.

4. Lubricate the input rod end, **NEW** input rod seals and Seal Installer Tool J-24553 with clean power steering fluid. Slide the seals on the tool with the lip of the cups toward the open end of the tool (fig. 5-4E).

5. Slide the tool over the input rod end and down to the second groove; then slide the forward seal off the tool and into the groove. Assemble the other seal in the first groove. Be sure that both seals are fully seated.

6. Lubricate the piston and Piston Installing Tool J-24551 with clean power steering fluid. Insert the large end of the tool into the piston (fig. 5-5E), and slide the tool and piston into the piston bore and through the piston seal.

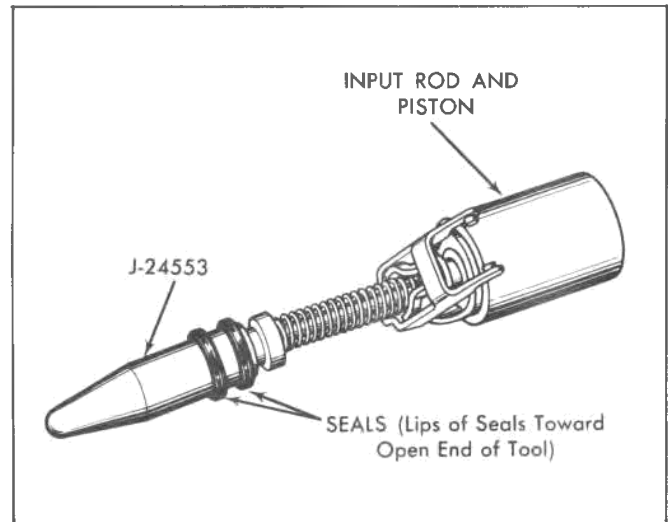


Fig. 5-4E--Installing Input Rod Seals

7. Assemble the **NEW** "O" ring onto the **NEW** accumulator check valve, and dip the assembly in clean power steering fluid. Insert the check valve into the accumulator valve recess in the housing flange.

8. Assemble the new ball and spacer in the same recess.

9. Assemble the **NEW** "O" ring onto the charging valve plunger seat and insert the plunger into the seat. Dip the assembly in clean power steering fluid, and insert it into the charging valve recess.

10. Dip the spool assembly in clean power steering fluid, and insert the assembly into the spool bore in the housing. Be sure that the pivot pins on the upper end of the input rod lever assembly are engaged in the groove in the sleeve. Remove Tool J-24551 from the piston assembly.

11. Position a **NEW** housing seal in the groove in the housing cover. Then join the booster housing and cover and secure with five screws. Tighten the screws to 18-26 ft. lbs. using Special Socket J-25085.

CAUTION: See "Caution" on Page 1 of this section.

12. Assemble a **NEW** "O" ring seal on the spool plug. Insert the spool spring and the spool plug in the forward end

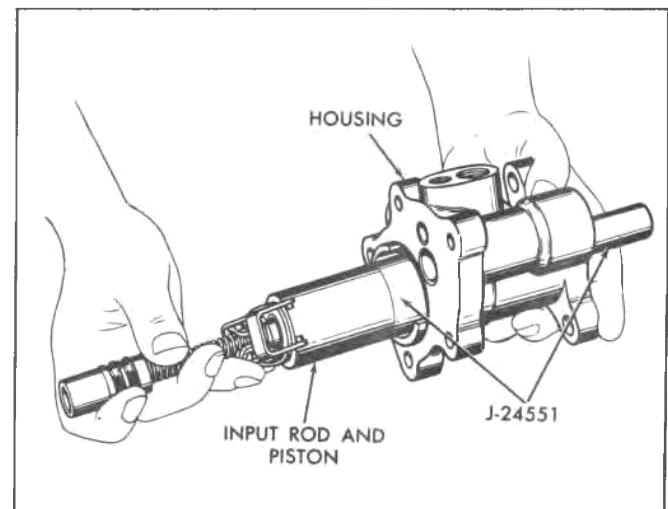


Fig. 5-5E--Installing Input Rod and Piston Assembly into Booster (Typical)

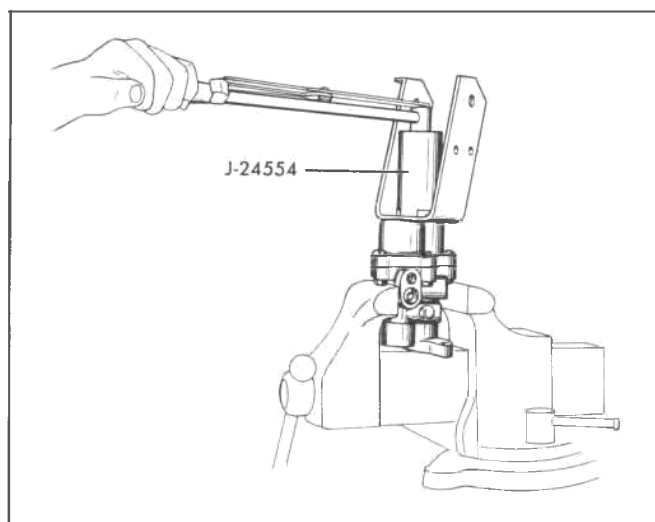


Fig. 5-6E--Installing Mounting Bracket Nut

of the spool bore. Press in on plug and assemble the plug snap ring in the groove in the bore.

13. Position the mounting bracket on the booster. The tab on the inside diameter of the large hole in the bracket should fit into a slot in the threaded portion of the booster hub.

14. Install the **NEW** bracket nut with the staking groove outward on the threaded hub of the booster. Using Tool J-24554 and a torque wrench (fig. 5-6E), tighten the nut to 95-120 ft. lbs.

CAUTION: See "Caution" on Page 1 of this section.

15. Use a hammer and a small punch inserted into the staking groove of the nut, at the slot in the booster hub (fig. 5-7E), to stake the nut in place. Be sure that the outer thread of the nut is upset.

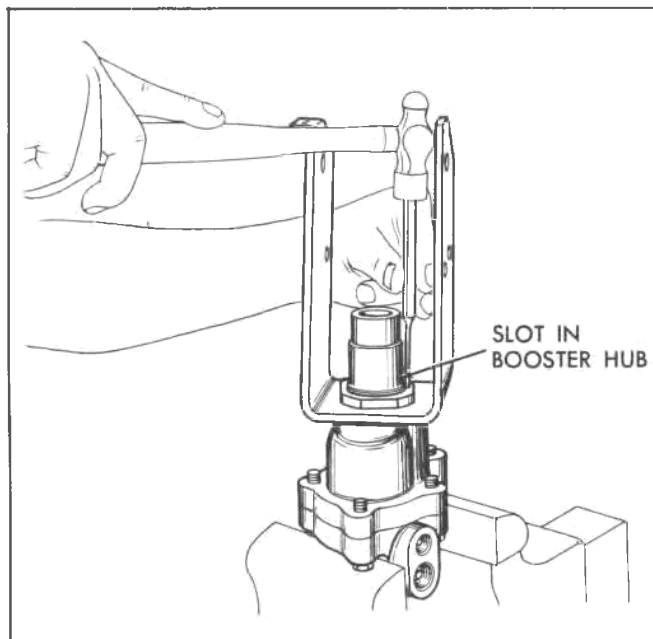


Fig. 5-7E--Staking Mounting Bracket Nut

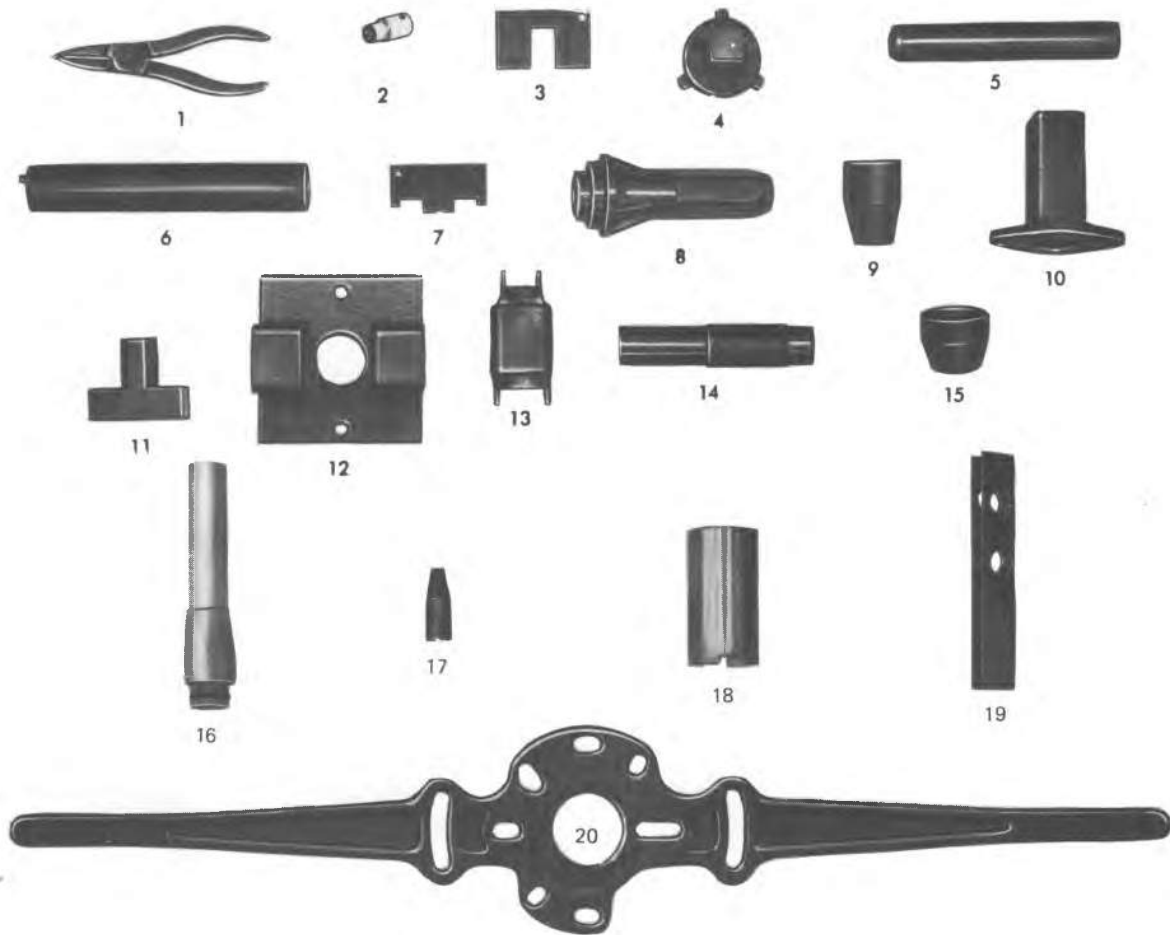
16. Assemble a **NEW** boot (if used) on the pedal rod. Then assemble a **NEW** grommet in the groove near the end of the pedal rod.

17. Moisten the grommet with water (to ease assembly), and insert the grommet end of the pedal rod into the input rod end of the booster housing. Push on the end of the pedal rod to seat the grommet in the groove inside the housing.

NOTE: When the grommet is fully seated, the pedal rod will rotate freely with no binding.

18. Slide the boot on the pedal rod and assemble the large end of the boot onto the hub of the power section.

SPECIAL TOOLS



- | | | | |
|-------------|------------------------------------|-------------|-------------------------------|
| 1. J-4880 | Snap Ring Pliers | 11. J-22839 | Front Plate Holding Fixture |
| 2. J-25085 | Special Socket | 12. J-22893 | Booster Separating Adapter |
| 3. J-21183 | Height Gauge | 13. J-23101 | Power Piston Holding Tool |
| 4. J-21524 | Power Piston Remover and Installer | 14. J-23175 | Control Valve Installer |
| 5. J-21601 | Power Brake Retainer and Installer | 15. J-23188 | Secondary Bearing Protector |
| 6. J-22657 | Bushing Retainer Socket | 16. J-24551 | Piston Installer |
| 7. J-22647 | Height Gauge | 17. J-24553 | Input Rod Seal Installer |
| 8. J-22677 | Power Cylinder Seal Installer | 18. J-24554 | Socket |
| 9. J-22733 | Seal Installer and Protector | 19. J-24569 | Pedal Push Rod Remover |
| 10. J-22805 | Power Cylinder Holding Fixture | 20. J-9504 | Power Cylinder Spanner Wrench |

Fig. 5-8E--Special Tools

