BRAKES
DATA AND SPECIFICATIONS

Models		P-30 LP-1 P-31 LP-2
SERVICE BRAKES		
Type		Hydraulic Total Contact Internal Expanding
Drum Diameter	Front Rear	11 in. 11 in.
Lining — Type		Molded asbestos (Bonded)
Lining — Width		2 in.
Lining — Thickness		20 in.
Lining — Special Replacement Thickness		.030 in. oversize
Brake Shoe Return Spring Force at Master Cylinder Push Rod		40 to 45 ft. lbs.
Diameter of Wheel Cylinder Bore		1⅛ in.
Diameter of Master Cylinder Bore		1⅛ in.
Desirable Piston Cylinder Clearance		.003 to .0065 in.
Brake Pedal Return Spring Tension	Manual Brakes Power Brakes	9 to 11 lbs. @ 11 1/16 in. 29 to 32 lbs. @ 4.97 in.
Brake Pedal Free Play at Pedal	Manual Brakes Power Brakes	⅛ to ¼ in. 1/16 to ⅛ in.

HAND BRAKE

Type	Internal Expanding—PowerFlite—TorqueFlite External Contracting—3-Speed Transmission
Location	Propeller shaft at rear of transmission
Drum Diameter	External—6 in.—Internal—7 in.
Lining Type	Woven asbestos
Width	2 in.
Thickness	5/32 in.
Clearance	Internal—.010 in. External—.015 to .020 in.

TORQUE SPECIFICATIONS

Rear Brake Support to Axle Housing Flange Bolts and Nuts	35 ft. lbs.
Brake Support to Wheel Cylinder Cap Screws—Rear	15 ft. lbs.
Master Cylinder Cover Bolt	50 in. lbs.
Power Brake Adjusting Nut	15 ft. lbs.

PART ONE—CHASSIS

SECTION III—BRAKES

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1. GENERAL INFORMATION

The service brake used on the Plymouth models is known as the Total Contact Brake. The main features of this brake are: less pedal effort for a given stop; more pedal reserve; less brake fade; longer lining life; smoother operation; less frequent adjustment and, when needed, simple servicing operations.

The brake shoe design and method of support are shown in Figures 1, 2, 3, and 4. Full floating shoes, rather than fixed anchor shoes; uniform pressure shoes, that have been designed to match drum deflection; a center plane support of these shoes are between two steel plates are some of the major improvements.

The total contact brake shoes have contoured webs, (see Figure 1) which allow greater flexibility of the shoes to match the drum shoe rigidity to give similar deflections at any section. This eliminates high pressures at the toe and heel of the shoe, when the drum becomes more oval shaped than the shoes during hard or heavy braking effort. This action allows uniform pressure distribution over the full length of the shoe lining arc and results in less pedal effort for a given stop and have no high pressure points on lining which will heat rapidly and fade.

The braking action is centralized between the two support plates, as shown in Figure 2. These plates align the shoes and hold the anchors and wheel cylinders. The applying force from the piston and the shoe return

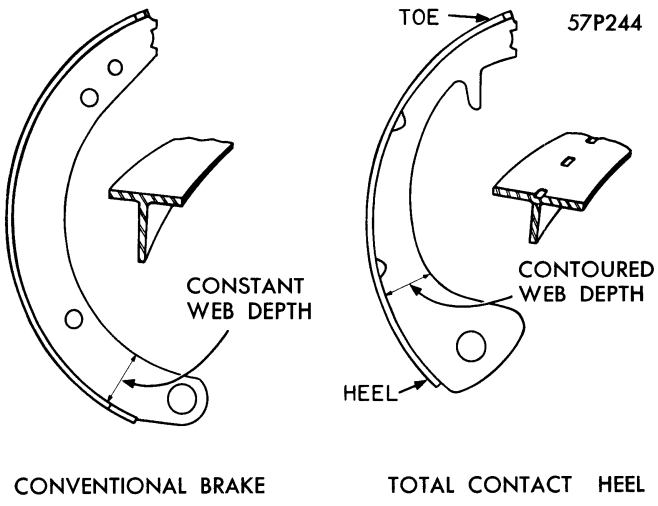

Figure 1—Total Contact and Conventional Brake Shoes

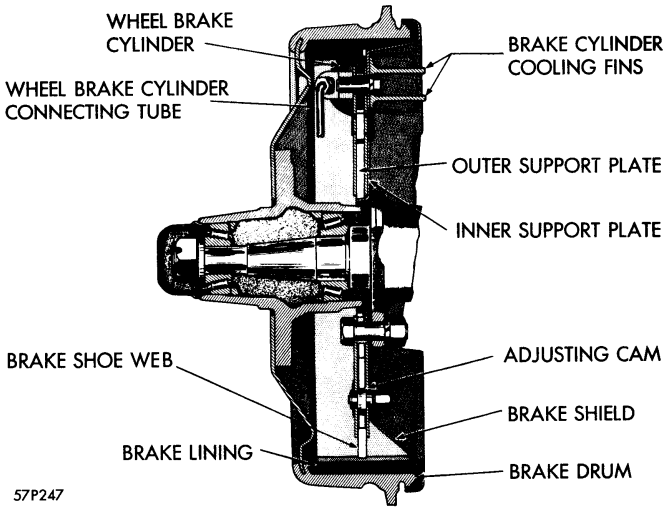

Figure 2—Total Contact Brake (Sectional View)

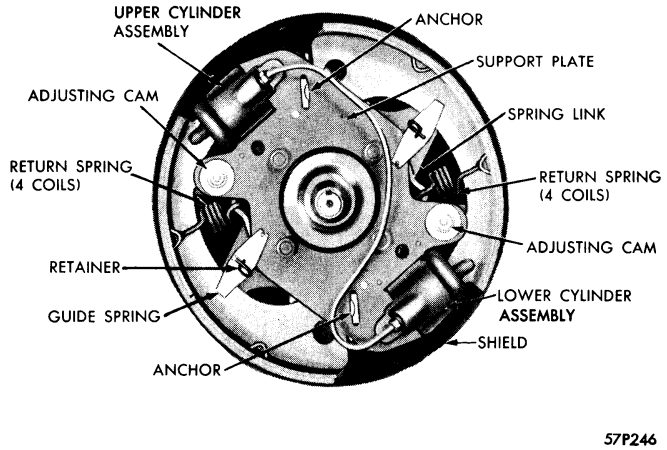

Figure 3—Total Contact Brake Assembly (Left Front)

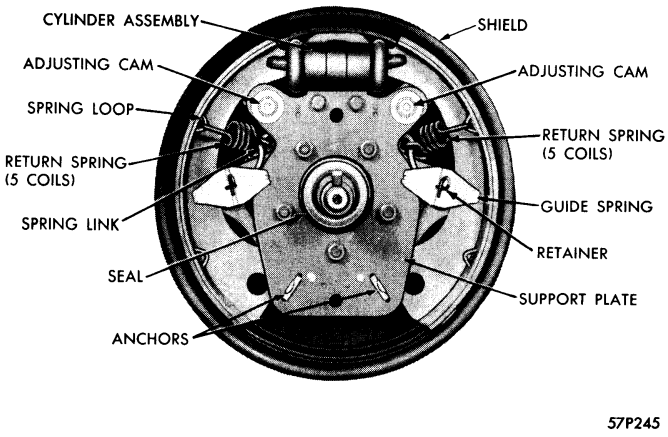

Figure 4—Total Contact Brake Assembly (Rear)

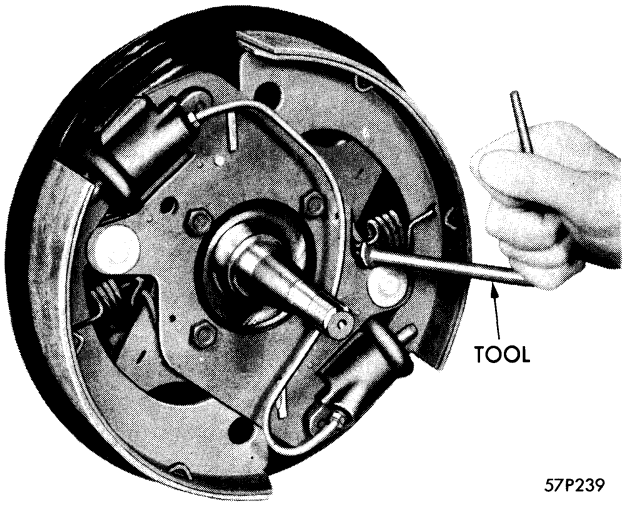

Figure 5—Removing Brake Shoe Return Spring

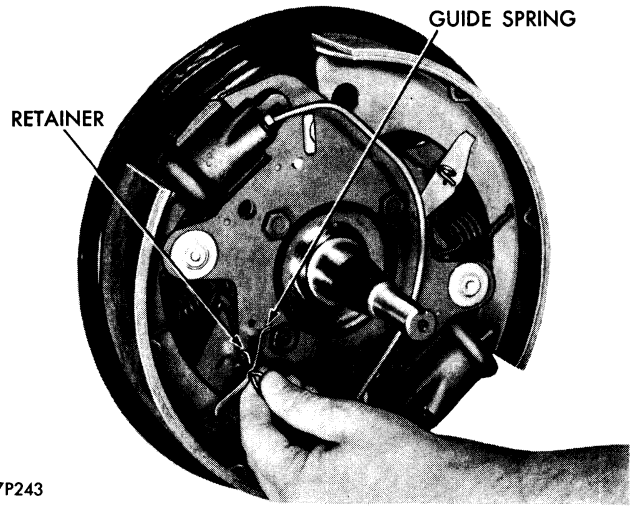

Figure 6—Removing Shoe Return Spring (Front Wheel)

springs are all in a center plane. Thus, the shoes do not tend to twist, (resulting in uneven contact) but are aligned in a single, centrally located plane.

Side movement of the shoes is controlled by guides, as shown in Figures 3 and 4. The guides maintain constant pressure against the web of the shoes.

The wheel cylinders operate in the same manner as the conventional cylinders but, are mounted on the brake support plate.

Self energizing action is effective on all front brake shoes and the rear brake front shoe, when the vehicle is traveling forward; and self energizing action on the rear shoe of the rear brakes, when the vehicle is traveling in reverse.

2. BRAKE SHOES

REMOVAL

To remove the brake shoes for relining or complete replacement, block the brake pedal to prevent any downward movement of the pedal. Remove the front wheel and drum as an assembly, after backing off the adjusting cams. See Figures 3 and 4.

To remove rear brake shoes back off the adjusting cams then remove the rear wheel as an assembly. Using puller, Tool C-845, remove the rear wheel drum.

Using Tool C-3462, remove the shoe return springs, as shown in Figures 5 and 6. The end of the Tool should be inserted between the spring link and the support plate. With the tool cam slot engaging the spring hook, turn handle of the tool to disengage the spring.

CAUTION

Do not use brake spring pliers, or damage to the lining will result.

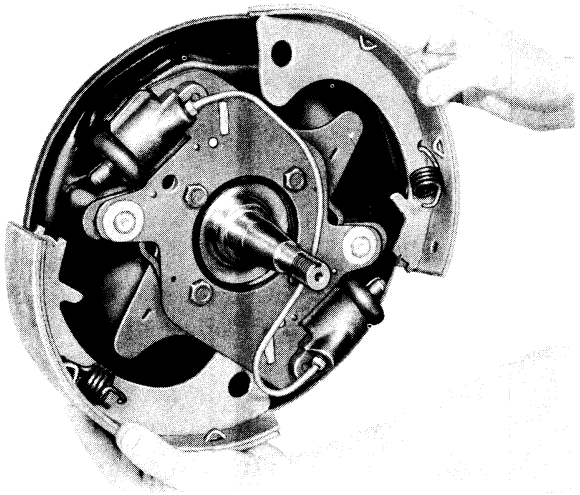

Figure 7—Removing or Installing Shoe Guides

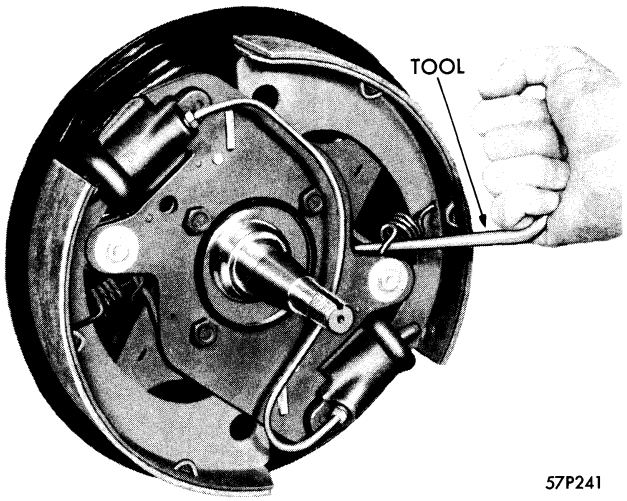

Figure 9—Attaching Shoe Return Spring to Spring Link

Turn the brake shoe guide retainer ¼ turn, then remove the retainer and guide as shown in Figure 7. The lip on the end of guide, is used for positioning the guide on the outer support plate. Slide the shoes from between the support plates, as shown in Figure 8.

INSPECTING THE BRAKE SHOES

Wipe or brush clean (dry) the metal portions of the brake shoes. Examine the lining contact pattern to determine if the shoes are true. The lining should show contact across the entire width, extending from heel to toe. Shoes showing contact on only one side should be discarded. Shoes having sufficient lining but lack of contact at toe and heel, should be checked for proper under-drum diameter grind.

GRINDING RECOMMENDATIONS

New lining should be checked and ground to .010 to .024 inch under the drum diameter (if not pre-ground) on a machine having a cylindrical grinding wheel.

DRUM REFACING

Measure the drum inside diameter with an accurate gauge. Drum diameter service limit should not exceed .004 inch out of round. If the drum diameter is in excess of .004 inch, the drum should be refaced. Do not remove more than .030 inch of metal during the refacing operation. The drum diameter measurement is then transferred to the grinder and the lining ground to the required clearance of .010 to .024 inch, under drum diameter.

The grinding of brake linings need only be done if the cyclebond process is done in the dealership.

INSTALLATION

Before installing the front brake shoes, apply a very light coat of lubriplate on the shoe wherever it contacts the support plate. Slide the brake shoes into position between the support plates. Be sure the ends of the cylinder push rods engage the toe end of the shoes properly. (See Figure 7.)

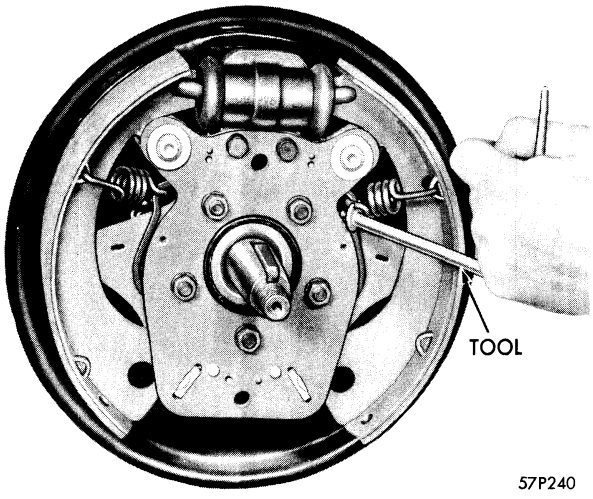

Figure 8—Removing Shoes from Support Plates

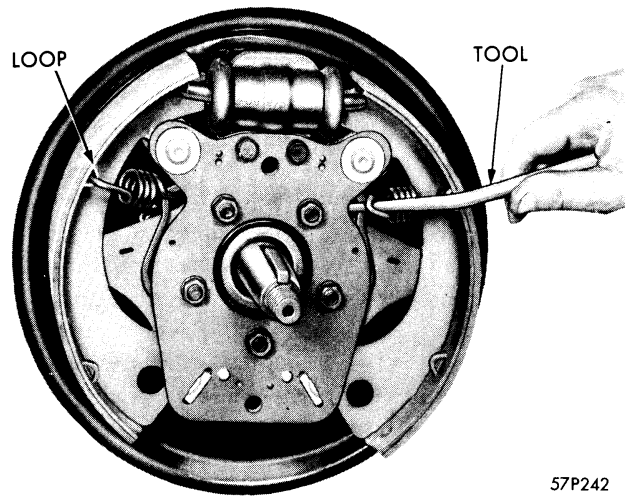

Figure 10—Attaching Shoe Return Spring to Spring Link (Rear Wheel)

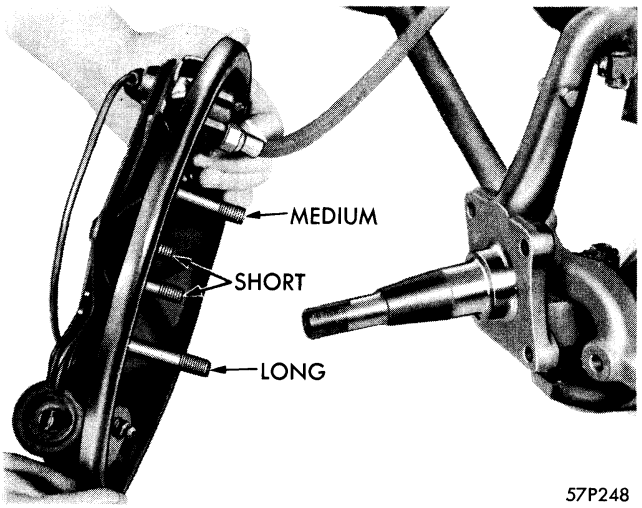

Figure 11—Removing Brake Support Plates and Wheel Cylinders (Front Wheel)

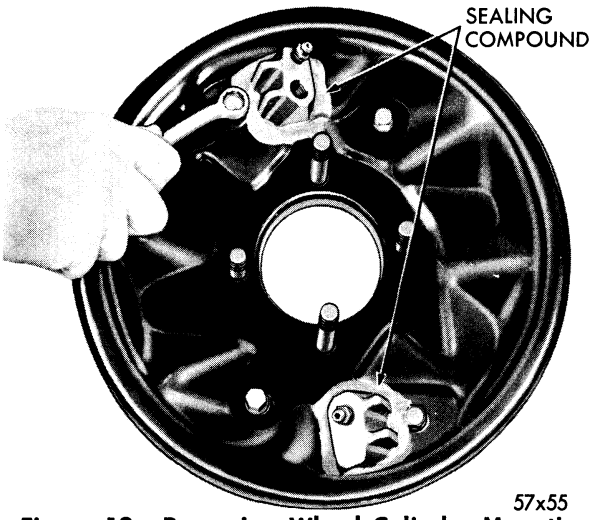

Figure 12—Removing Wheel Cylinder Mounting Bolt (Front Wheel)

Insert the four coil return springs in the hole in the front brake shoe webs. Now using the tapered end of Tool C-3462, as shown in Figure 9, attach the return springs to the links. Be sure that the long end of the spring is hooked into the web of the shoes to prevent the coil of the spring contacting the shoe.

Insert the five-coil return springs in the loop of the table of the rear shoes, as shown in Figure 10.

Check the tension of the brake shoe return springs. The spring tension can be checked by hooking a scale at the toe of the shoe and pulling in the direction of piston movement. The scale should read from 35 to 45 pounds at the instant the toe of the brake shoe moves. A dial indicator may be used to indicate movement in place of a scale.

Lubricate the brake shoe guide contacting areas on the shoes very lightly with lubriplate, then install guides and retainers (Refer to Figure 6). Be sure the positioning lip of the guide slides into the hole in support plate.

Install the drum, and wheel and tire assembly, after backing off the adjusting cams. Adjust the front wheel bearings, as described in the Front Suspension Section. Now adjust the brakes.

3. SUPPORT PLATES

REMOVAL

1. FRONT SUPPORT PLATES—Remove the wheel and tire, then the brake drum. Remove the four retaining nuts that attach the center plane support plates and dust shield to the steering knuckle. Disconnect the flexible brake hose from the frame bracket then remove the four bolts that hold the brake assembly to the steer-

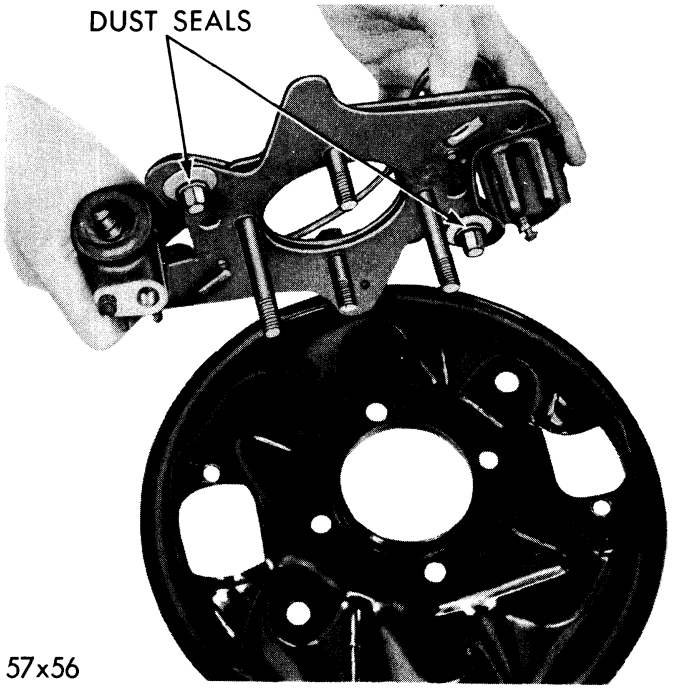

Figure 13—Removing Support Plate from Dust Shield (Front Wheel)

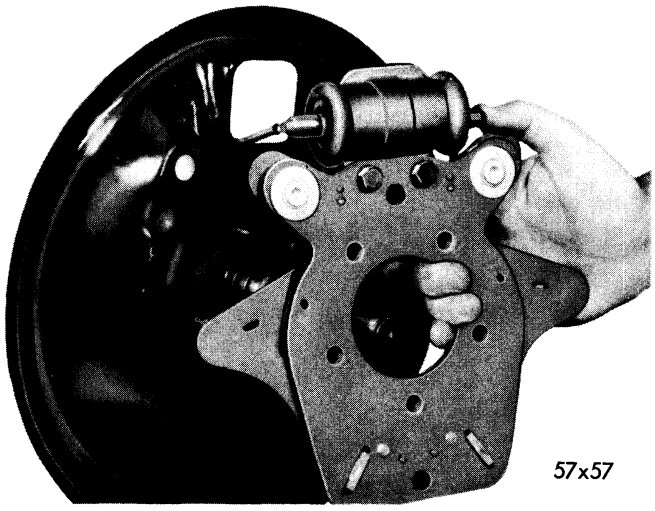

Figure 14—Removing Support Plates and Wheel Cylinder (Rear Wheel)

ing knuckle. (Refer to Figure 11 and note the location and size of bolts.) Three different lengths are used.

Remove the brake assembly (with dust shield) as shown in Figure 11. Do not allow the dust shield to strike the bearing surface of knuckle as damage may result. Remove the brake shoes and the connecting tube between the wheel cylinders. Do not distort tube.

Remove each wheel cylinder mounting bolt after removing sealer, as shown in Figure 12. Now, remove the support plate assembly from the dust shield, as shown in Figure 13 then remove the wheel cylinders.

2. *REAR SUPPORT PLATES*—Remove the rear brake shoes, then disconnect the brake tube at the wheel cylinder. Remove the nuts and lockwashers that hold the support plates and wheel cylinder to the dust shield and axle flange.

Slide the support plates out and away from the axle, as shown in Figure 14. When removing the dust shield, it is advisable to install the seal protector C-745, then slide dust shield and seal off axle.

Remove the bolts that hold the wheel cylinder to the support plates. Lift wheel cylinder away from the plates. Inspect and clean the support plates.

INSPECTING THE SUPPORT PLATES

Clean the support plates in a suitable solvent, then blow dry with compressed air. Check the freeness of the adjusting cams and return spring links. The adjusting cams should turn without binding. Check the condition of the adjusting cam dust washers. If the washers are cracked or deteriorated, new ones should be installed at assembly. Any visual distortion of the support plates indicates need for new plates. The support plates must be flat and true.

4. WHEEL CYLINDERS

Wheel cylinder pistons that are badly scored or corroded should be replaced. The old piston cups should be discarded when reconditioning the hydraulic system.

Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned up with crocus cloth, using a circular motion. However, cylinders that have deep scratches or scoring may be honed, using Tool C-3080, providing the diameter of the cylinder bore is not increased more than .002 inch. A cylinder that does not clean up at .002 inch should be discarded and a new cylinder installed. (Black stains on the cylinder walls are caused by the piston cups and will do no harm.)

Before assembling the pistons and new cups in the wheel cylinder, dip them in H.D. brake fluid. Refer to Figure 15 or 16 then assemble the brake cylinders. If the boots are deteriorated, or do not fit tightly on the brake shoe pin, as well as the wheel cylinder casting, new boots should be installed.

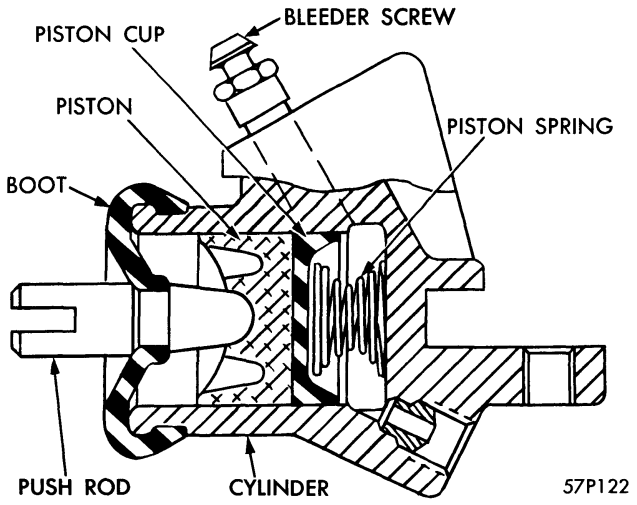

Figure 15—Front Wheel Brake Cylinder

INSTALLING THE SUPPORT PLATES AND WHEEL CYLINDERS

1. *FRONT SUPPORT PLATES*—Install the brake cylinders on the support plates, then position the support plates on the dust shield. (Be sure the dust washers are in place. Refer to Figure 13.) Now, install the wheel cylinder attaching bolts and tighten with the fingers until snug.

Lightly lubricate the brake shoes as previously described, and slide into the support plates then install the four coil spring ends in the hole in the shoe webs at the table. Using the tapered end of Tool C-3462, insert through the spring and link, slide the end of spring into link. (Refer to Figure 9.)

Install the brake shoe guides and retainers, then install the wheel cylinder connecting tube, being careful not to bend or distort.

Slide the brake assemblies over the steering knuckles. Install bolts and nuts and tighten to 55 foot-pounds. Now, tighten the wheel cylinder attaching bolts to 35 foot-pounds.

Turn the brake adjusting cams to the fully released position. Attach the flexible brake hose to the frame bracket then install the drum and wheel assembly and adjust the front wheel bearing. Bleed and adjust the brakes.

2. *REAR SUPPORT PLATES*—Place the wheel cylinder on the support plate, then install the attaching bolts. Tighten bolts to 35 foot-pounds. Lubricate the "ear" of the inner support plate with lubriplate lightly, then slide brake shoes into position between the support plates.

Install the five-coil spring ends in the loop in the shoe table. Using the tapered end of Tool C-3462, insert through the spring and link, slide the end of spring into the link. (Refer to Figure 10.)

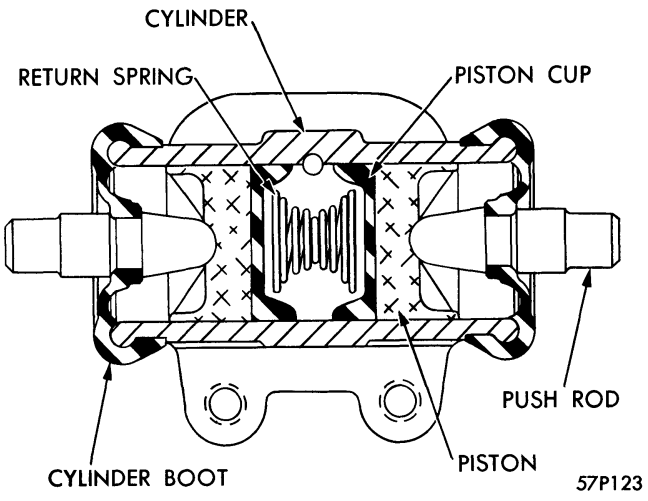

Figure 16—Rear Wheel Brake Cylinder (Sectional View)

Install the brake shoe guides and retainers. Be sure the positioning lip of the guide slides into the hole in the support plate.

Install a new seal in the dust shield (if needed), then install seal protector C-745 into seal. Install dust shield and seal over axle shaft and down against flange.

Slide the brakes and support assembly over axle shaft and down against dust shield, making sure the dust washers are positioned around adjusting cams then install the lockwashers and nuts. Tighten the nuts to 55 foot-pounds.

Turn the brake adjusting cams to the fully released position, then attach the brake tube to the wheel cylinder. Remove Tool C-745 seal protector.

Insert key on slot in axle shaft, then install drum. Install wheel and tire, then bleed and adjust the brakes.

5. BLEEDING THE BRAKE SYSTEM

Clean all dirt off from around the master cylinder reservoir cover and from the bottom of the power brake cylinder (if so equipped), so that dirt or grit will not drop into the reservoir when cover is removed.

Automatic refiller, Tool C-837B (with adaptor C-3494A) provides a convenient way for keeping the master cylinder filled while bleeding the brake system. One man bleeder tank C-3496 with adaptor C-3494A may also be used. Follow the manufacturers operating instructions.

Back off the adjusting cams to the fully released position. This allows the pistons in the wheel cylinders to move back, and permits greater movement of the piston which will expel the air faster.

Starting with the right wheel cylinder, wipe the dirt off the bleeder valve and attach bleeder hose, C-650 to the valve. Place the other end of the hose in a jar half full of brake fluid. This is to prevent air from being drawn into the system when the brake pedal is released.

Pump brake fluid by pushing the brake pedal down and let it return slowly, to avoid air being drawn into the system. Bleed intermittently, opening and closing the valve about every four seconds. This causes a whirling action in the cylinder which helps expel the air. Continue this operation until brake fluid runs out of the bleeder hose in a solid stream, without any air bubbles.

Continue bleeding by repeating this operation on the left rear wheel, the right front wheel and finally the left front wheel. (When bleeding the front wheel cylinders, bleed the lower cylinder first so as to force all air out of the connecting line.)

If necessary, repeat the bleeding operation if there is an indication of air remaining in the system. Be sure to readjust the cams after the bleeding operation.

TEST FOR FLUID CONTAMINATION

In order to determine if contamination exists in the brake fluid, as indicated by swollen, deteriorated rubber cups the following simple tests can be made.

Place a small amount of drained brake fluid in a small clear glass bottle. Separation of the fluid into two distinct layers will indicate mineral oil content. Add water to the contents and shake. If the contents become milky, oil is present. If the contents remain clear, it is not contaminated with mineral oil.

6. BRAKE ADJUSTMENT

All cams ($\frac{7}{16}$ inch hex. head) operate against the toe end of the shoe web and extend through the brake dust shield.

Since all four shoes in the front wheel brakes and the two forward shoes in the rear wheel brakes are self energized when the car is moving forward; these shoes are adjusted in one manner while the remaining two shoes in the rear wheels are adjusted differently, as shown in Figure 17.

NOTE

Whenever the brakes have been relined or new shoes have been installed, always apply pedal prior to adjusting the brakes. This action causes the brake shoes to center themselves in the brake drum and to assist in the adjustment.

FRONT BRAKE

Turn each adjusting cam on both front wheels in the direction of forward rotation, until the shoe lining is solid against the drum, (as shown in Figure 17) and wheel is locked. Turn the adjusting cam slowly in the opposite direction (each cam a little at a time) until no drag is felt.

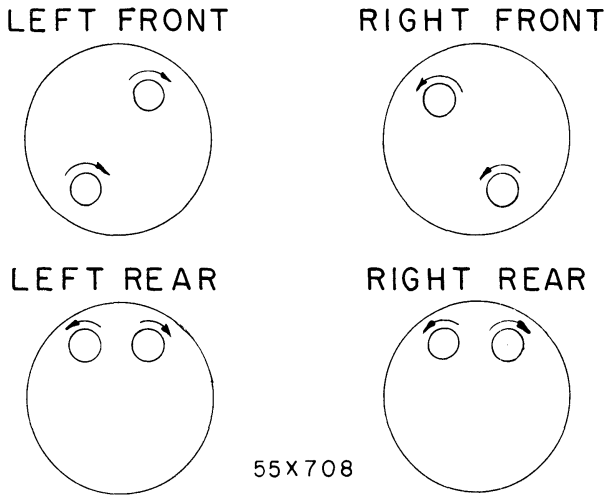

Figure 17—Brake Adjusting Diagram

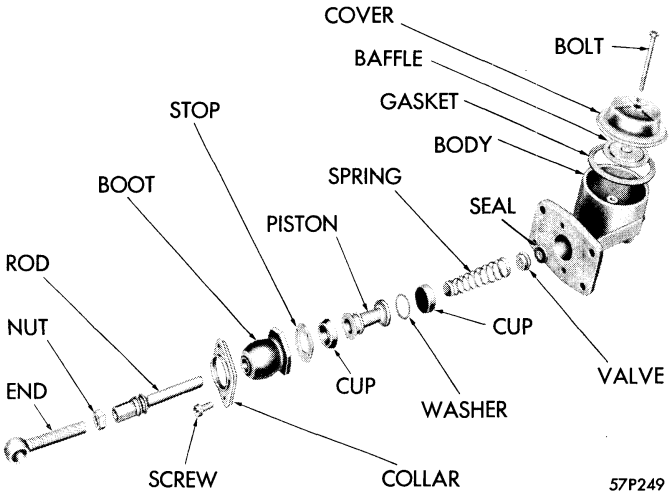

Figure 18—Master Cylinder (Exploded View)

REAR BRAKE

The forward rear wheel brake shoe adjusting cam is rotated in the direction of forward wheel rotation. The rearward rear brake shoe adjusting cam is rotated in the direction of reverse rear wheel travel.

7. MASTER CYLINDER

Remove the pedal return spring, disconnect the push rod, and brake tube at the master cylinder, disconnect the stop light switch and remove the nuts and bolts that attach the master cylinder. Slide master cylinder straight out from dash panel.

Clean the outside of the master cylinder thoroughly, then remove reservoir filler cover and drain all brake fluid. Refer to Figure 18 and disassemble master cylinder.

INSPECTION

A master cylinder piston that is badly scored or corroded should be replaced with a new one. Piston cups and valve assembly should be replaced when reconditioning master cylinder.

Master cylinder walls that have light scratches or show signs of corrosion, can usually be cleaned up with crocus cloth. However, cylinders that have deep scratches or scoring may be honed, providing the diameter of the cylinder bore is not increased more than .002 inch. A master cylinder bore that does not clean up at .002 inch should be discarded and a new cylinder used. (Black stains on the cylinder wall are caused by the piston cups and will do no harm.)

NOTE

Use extreme care in cleaning master cylinder after reconditioning. Remove all dust or grit by flushing the cylinder with alcohol; wipe dry with a clean lintless cloth and clean a second time with alcohol. Dry master cylinder with air pressure, then flush with clean brake fluid. (Be sure the relief port in the master cylinder is open.)

ASSEMBLING

Before assembling, the piston, cups and valve, assembly should be dipped in new super brake fluid. (Refer to Figure 19 for master cylinder assembly.)

INSTALLATION

Slide master cylinder in to cowl panel bracket and install nuts. Guide in pedal push rod. Install the pedal return spring. Connect brake tube to master cylinder. Replace stop light switch and connect wires. Refill master cylinder reservoir.

PEDAL FREE PLAY

Check brake pedal free play at pedal. Free play should be ⅛ inch to ¼ inch, this will give the correct clearance of .015 to .030 inch clearance between push

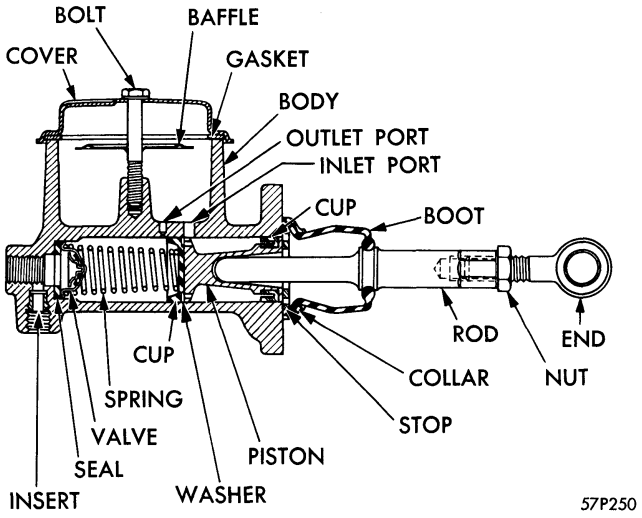

Figure 19—Master Cylinder (Sectional View)

rod and piston. If adjusted so that it is shorter than normal length, the piston in the master cylinder will not have enough travel and pedal may go to floor board before pressure is built up. If made too long, brakes will not release.

8. HAND BRAKE

EXTERNAL TYPE

REMOVAL AND INSTALLATION—Remove adjusting bolt, nut and guide bolt, adjusting bolt nuts (3 and 1, Figure 20.) Remove anchor adjusting screw. Pull band assembly away from transmission and off propeller shaft.

Relining Hand Brake Band—When band is removed, remove old lining, cut the new lining ¼ inch longer than the required length so that there will be a slight bulge at the center when it is first installed on the band, drill and counter-bore (at least one-half the thickness of the lining) four rivet holes (two at each end) to coincide with the holes at the extreme ends of the band.

Rivet the two extreme ends of the lining to the band. Due to the ¼ inch excess length, the lining will now bulge slightly at the center of the band. Snap this lining in against the band to make an even tight fit. Install the remaining rivets, starting from each end and work alternately toward the center.

End-chamfer the two open ends of the lining to reduce noise and grabbing effect. Reinstall brake band.

CABLE ADJUSTMENT

Sometimes, after long service, the cable will stretch to such an extent that pulling back on the hand brake lever will not apply band to drum. Loosen lock nut (4, Figure 20), remove clevis pin from yoke and turn yoke until cable slack is taken up. Make certain that lock nut is tightened after assembly. **(This is not a substitute for hand brake adjustment.)**

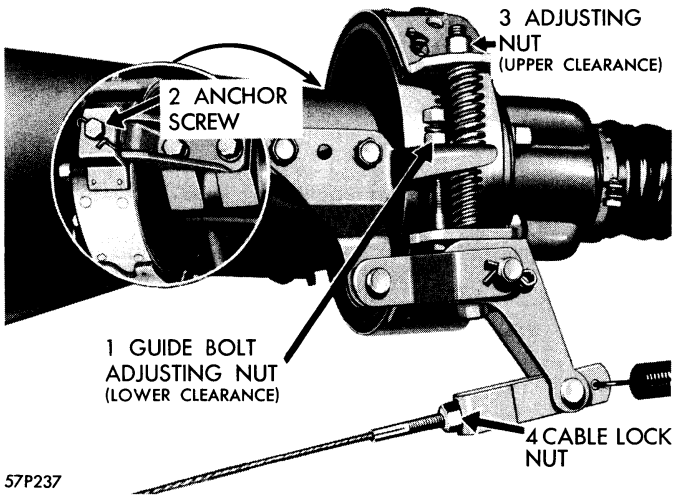

Figure 20—External Contracting Hand Brake

ADJUSTMENT
(External Type)

Adjust the anchor screw (Figure 22) so the clearance between the drum and the lining at the anchor bracket is .015 inch. Lock anchor screw. Turn guide bolt adjusting nut (1) until the clerance between band and bottom of drum is .015 inch. Then lock the guide bolt securely. Turn the adjusting bolt nut (3) until the clearance between the upper half of band and drum is .015 inch.

The lock wire which retains the anchor bolt must not be drawn up tight. Otherwise, it will cause excessive anchor bolt restriction and the result will be uneven wear on the linings and poor braking action.

Adjust the hand brake cable by loosening the lock nut (4, Figure 22) and removing the clevis pin from the yoke. Turn yoke until the cable slack is removed with the actuating cam flat against the end bracket on the band. Do not substitute a cable adjustment for a hand brake adjustment.

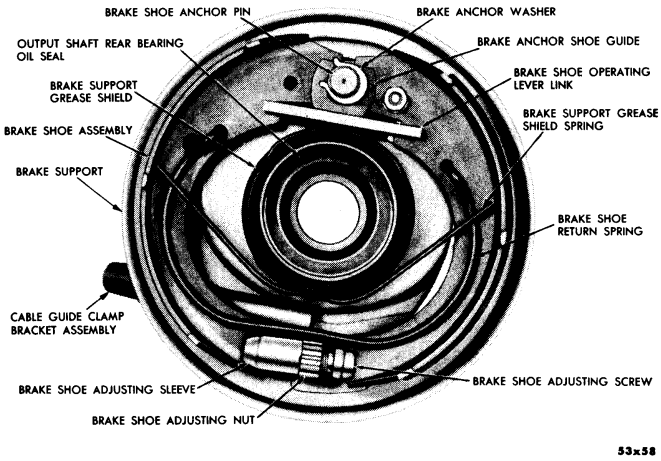

Figure 21—Internal Expanding Hand Brake

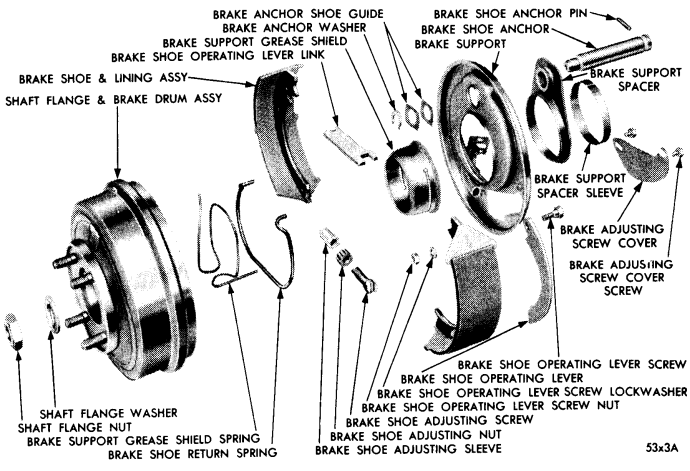

Figure 22—Internal Expanding Hand Brake (Exploded View)

When the clearance has been adjusted properly, the hand brake should lock when the lever is pulled back from four to six notches.

HAND BRAKE INTERNAL TYPE

The hand brake shown in Figure 21, is the internal expanding type and is used only on cars equipped with PowerFlite or TorqueFlite Transmissions.

The brake is fully enclosed to keep out dirt and oil and requires very little servicing. Longer lining life is assured by protection against dirt and the use of Cyclebond linings. The adjustments, when needed, are very simple for both the steel control cable and the shoes.

DISASSEMBLY

To service the internal expanding hand brake, refer to Figures 21 and 22, then disconnect the propeller shaft at the transmission. Engage holding Tool C-3281 with the companion flange, then loosen and remove the companion flange nut, lockwasher and flatwasher.

Install Puller Tool C-452 on the companion flange; removing flange and brake drum. Disengage the ball end of cable from the operating lever. Separate shoes at the bottom, allowing the brake shoe adjusting nut, screw and sleeve to drop out, then release the shoes. Pry the brake shoe return spring up and over the right hand brake shoe pin, then work the spring out of the assembly. Pry out the brake shoe retaining washer and remove outer guide.

Slide each shoe out from under the guide spring. (As the shoes are removed, the operating lever strut will drop out of place.) Separate the operating lever from the right hand brake shoe, by removing nut, lockwasher and bolt.

The brake now has been disassembled as far as necessary for replacement of worn or damaged parts.

ASSEMBLY

Assemble the operating lever to the right hand brake shoe. Slide the brake shoes under the guide spring and up on top of the inner anchor guide.

Spread the shoes and insert the operating lever strut with the wide slot toward the operating lever, and the stamped "top" facing up. Work the shoe return spring under the grease shield spring and secure ends in proper holes in webs of shoes, as shown in Figure 21.

Spread the bottom of both shoes apart and install the brake shoe adjusting nut screw and sleeve.

NOTE

Be sure to install the adjusting nut, screw and sleeve in the proper position, as shown in Figure 21. If installed in the reverse position, adjustment would be difficult.

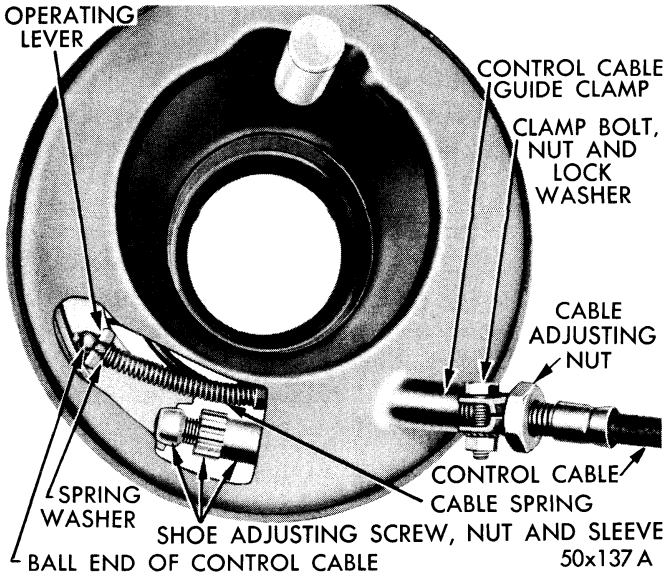

Figure 23—Rear View of Internal Expanding Brake

Place the outer anchor guide over the anchor, then secure shoes with retaining washer. Turn the brake shoe adjusting nut until the shoes are in a released position, then install the brake drum. Be sure the brake shoes are centered on the backing plate and are free to move.

ADJUSTMENT

Remove adjusting screw cover plate. Turn the brake shoe adjusting nut, as shown in Figure 23 to decrease shoe-to-drum clearance until a slight drag is felt on the drum. Back off adjusting nut at least one full notch (using Spanner Wrench C-3014) or until brake drum is free. Be sure the two raised shoulders on the adjusting nut are seated in the grooves on the adjusting sleeve.

Test the hand brake lever for travel. When properly adjusted, there should be from 1½ to 2 inches of hand brake lever rod travel. Install the adjusting screw cover plate.

CAUTION

Never substitute for a brake shoe adjustment by adjusting cable.

HAND BRAKE CABLE INTERNAL TYPE

REMOVAL—If removal of the control cable is required for replacement or repair, loosen the guide clamping bolt, as shown in Figure 23, then remove adjusting screw cover plate. Pry the ball end of the cable up and out of the operating lever slot with a screwdriver. Remove the control cable from the guide.

INSTALLATION—Slide cable into the guide, then insert Tool C-3015 between the spring retainer washer and the ball on the end of cable. Hook the cable into the slot in the operating lever, with the lever between the ball and the washer, as shown in Figure 23.

NOTE

The cable must be installed so that the cable conduit is not pulled taut between any of the fastening points. All bends in the conduit must be of a radius of not less than 6 inches. The conduit must not hang below the level of the frame.

ADJUSTMENT

Always be sure that the hand brake lever handle is in the full returned position before the cable length adjustment is made. With adjustment made as described, the hand brake should not drag nor chatter.

With the brake shoes adjusted properly there will be free play in the brake operating lever. The hand brake cable adjusting nut should be positioned against the cable guide so that the brake operating lever is centered in its normal free play arc. To lock this adjustment, tighten the cable guide clamp and then tighten the hand brake cable lock nut against the adjusting nut. The cable adjusting nut should be held in position during this operation so that the cable length adjustment is not disturbed.

9. POWER BRAKES

OPERATION

The power brake unit is designed to reduce pedal effort by applying power directly to the pedal linkage. The entire hydraulic brake system is identical to a standard brake as no hydraulic connections are necessary.

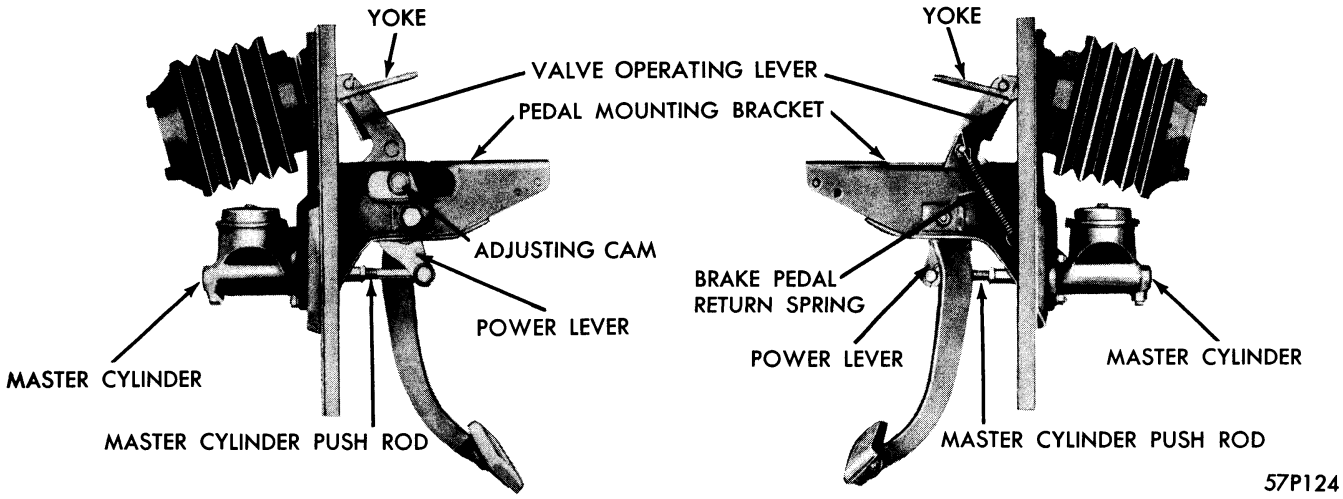

Figure 24—Power Brake Assembly

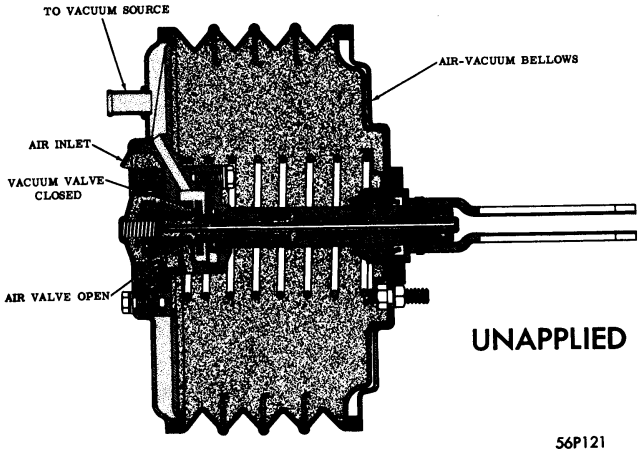

Figure 25—Power Brake—Unapplied Position

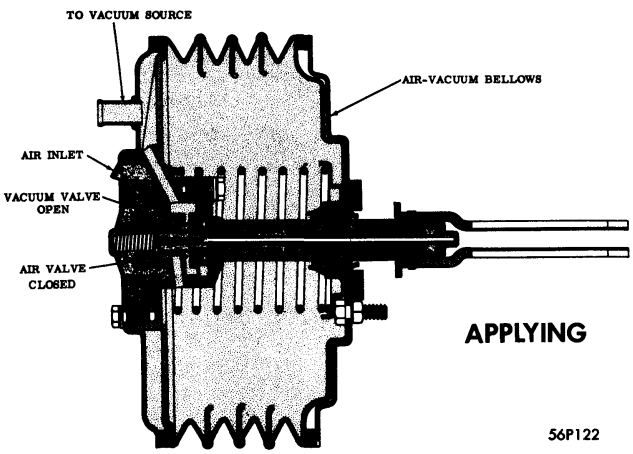

Figure 26—Power Brake—Applying Position

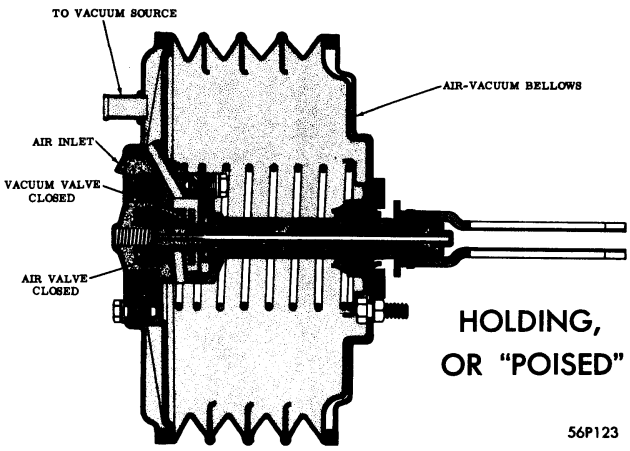

Figure 27—Power Brake—Poised Position

The unit is an oval-shaped air-vacuum bellows which is mounted on the engine side of the dash panel and connected mechanically to the brake pedal linkage. It is a vacuum operated brake booster and includes a vacuum reserve tank. The unit assembly contains the air and vacuum valves. As the foot pedal is depressed, air is evacuated from the bellows allowing atmospheric pressure to compress the bellows.

The unit is mounted in the vehicle and connected to the brake pedal, as shown in Figure 24.

The power unit assembly is mounted on the engine side of the dash panel. A yoke assembly protrudes through the dash panel and provides the connection between the power unit and the pedal linkage. When application of the brakes begins, force is applied from the booster through the yoke assembly to the pedal assembly. In this way the contraction of the bellows assists in applying the brakes. Through the yoke, mechanical contact between the unit and the brake linkage exists only when the unit is assisting in a brake application. If there should be a loss of vacuum, the brake pedal is free to move completely independent of the power unit. A loss of vacuum power simply returns the operator to conventional hydraulic brakes. The power unit is connected into the brake linkage when assisting, and completely disconnected when it is not.

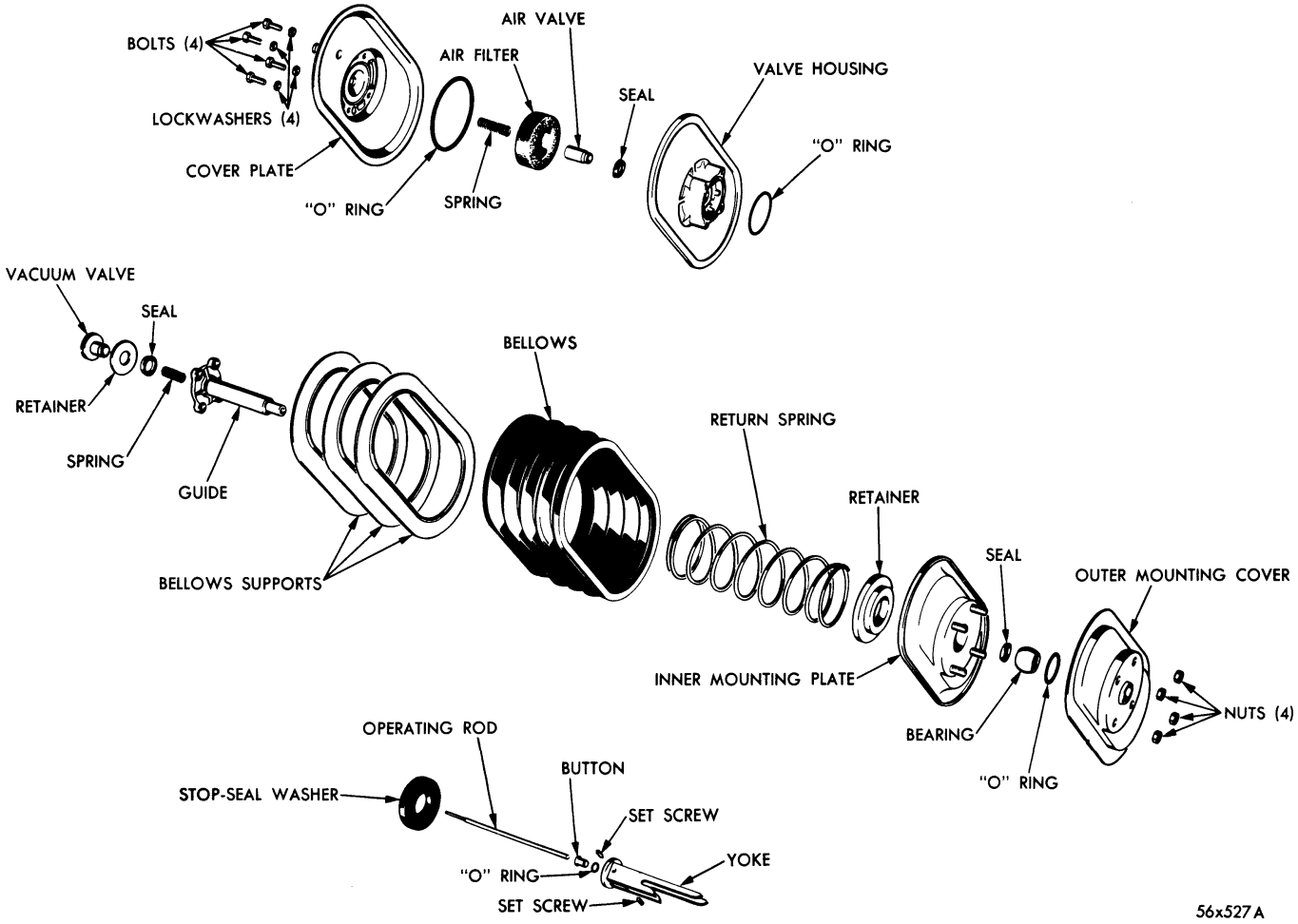

Figure 28—Power Unit—Disassembled

Vacuum from the intake manifold is applied to the unit, and air is evacuated from the air-vacuum bellows through the vacuum valve during brake application. When the brakes are released, air (atmospheric) enters the unit through the built-in air cleaner, and is regulated by the air valve. The valve operating rod, which is controlled by the pedal, overcomes the spring pressure of the air valve spring and keeps atmospheric pressure inside as well as outside the air-vacuum bellows. The return spring assures complete extension of the bellows whenever the brakes are not being applied.

As shown in Figures 25, 26, and 27 these drawings show the unit in the unapplied, applying and poised positions, respectively.

In the unapplied position, the air-vacuum bellows is filled with air (atmosphere). The power produced by the unit is developed when vacuum removes the air from the bellows and causes it to contract.

The position of the valves in Figure 25 shows the unit "unapplied." The air valve is open, so that air is freely admitted to the air-vacuum bellows. The vacuum valve is closed, thus preventing any evacuation of air from the bellows. The air valve spring bears against the air valve and would cause it to close if it were not restrained by the valve operating rod, which passes through the bumper on the end of it. The pedal linkage return spring tends to keep the air valve in the "unapplied" position. This spring load which is transmitted to the valve operating rod overcomes the air valve spring and keeps the air valve open. As soon as foot pressure is applied to the pedal, this restraint on the air valve is removed and it is allowed to close. Further movement of the air valve overcomes the vacuum valve spring and opens the vacuum valve, as shown in Figure 26. The unit is in the "applying" position. With the bellows isolated from atmosphere and vacuum applied to it, it contracts and applies force to the brake pedal linkage through the pedal-to-unit yoke. The amount of force applied to the linkage by the power unit is in direct proportion to the amount of pressure applied to the brake pedal.

As the pedal pressure is varied to suit braking requirements, the force supplied by the unit instantaneously varies in proportion. If at any point during brake application or release, a holding position is required, the unit immediately becomes "poised," ready to respond to further application or release. Valve positions when the unit is "poised" are shown in Figure 27. The air and vacuum valves are closed. Additional pedal pressure will cause further evacuation of the bellows to add force to the application; release of the pedal pressure will open the air valve to admit air to the bellows. At any point between fully released and fully applied the unit will instantly become poised whenever a constant pedal pressure is maintained.

NOTE

A service package is available that contains all "O" rings and seals that are used in the power unit. When servicing a unit use all new "O" rings and seals to insure complete satisfactory booster performance.

The "O" rings and seals in this package are pregreased with a silicone type grease for ease of installation and to prevent any twist or damage when installing. If necessary to add grease to these parts be sure and use silicone type because it does not change in consistency on the working parts during high and low temperatures.

10. POWER BRAKE DISASSEMBLY

REMOVAL

Place a wood wedge between the power brake lever and the forward edge of the triangular hole in the pedal bracket. This will prevent the trigger arm from extending beyond the bracket.

NOTE

If pedal linkage is allowed to extend through the hole in dash panel the trigger arm may be damaged.

Remove the nuts that attach the dash panel reinforcement to the unit. Slide plate off and away from unit.

DISASSEMBLY OF UNIT

Using an Allen wrench, back out the two set screws sufficiently to allow removal of yoke. Slide yoke off end of guide and away from unit, as shown in Figure 29. (Slightly compress bellows by hand for clearance while loosening set screws.) Remove rubber stop seal washer.

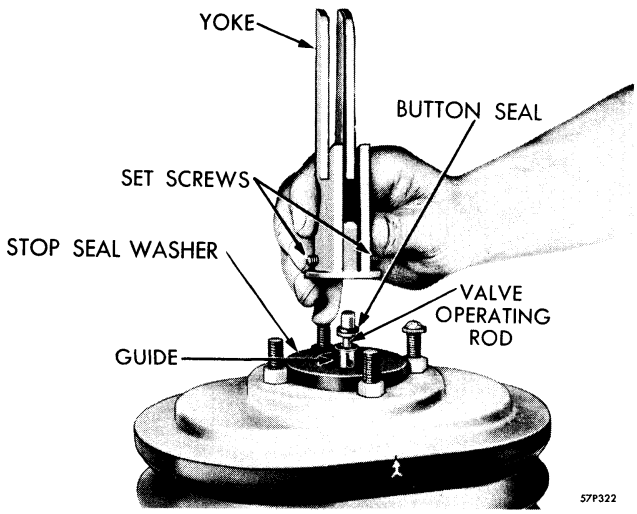

Figure 29—Yoke and Valve Operating Rod Removal

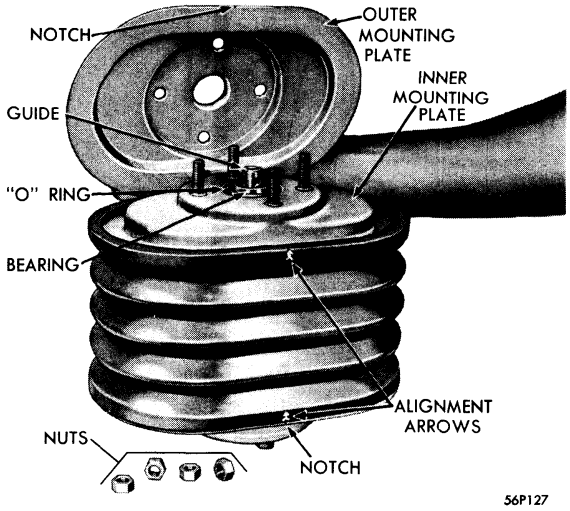

Figure 30—Removing Outer Mounting Plate

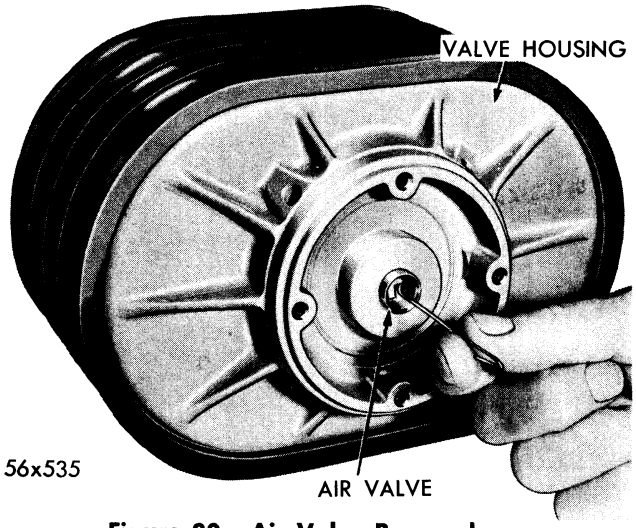

Figure 32—Air Valve Removal

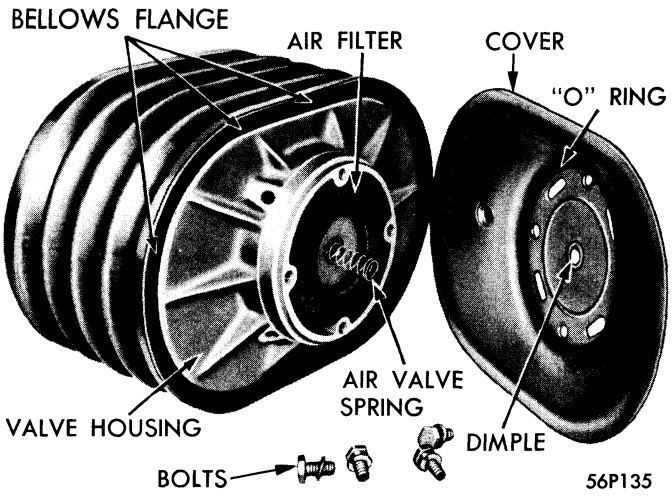

Figure 31—Valve Cover Removed

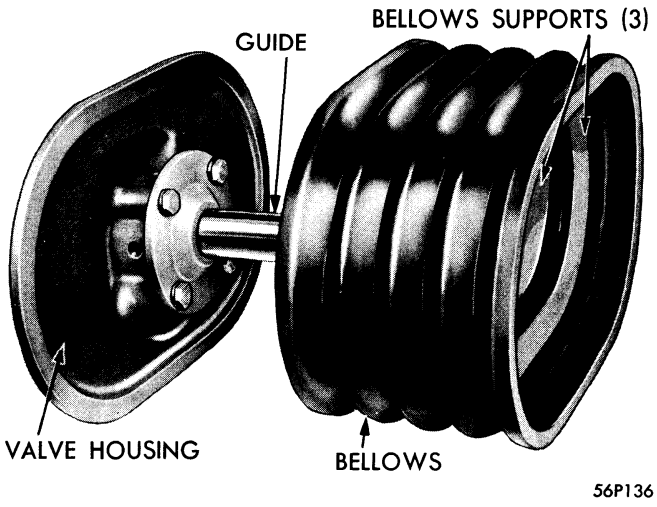

Figure 33—Bellows Supports

Lift the valve operating rod out of the unit. Remove and discard the valve operating button seal, as shown in Figure 29.

Remove the nuts that attach the outer mounting plate and using a screwdriver, gently pry up on plate to loosen. Lift plate straight up and away from unit.

Compress the bellows by hand sufficiently to expose the guide sleeve bearing. Slide bearing off end of guide. Remove and discard the bearing seal from inside of bearing.

Peel back the outer lip of bellows completely around the inner mounting plate. Exercise care in removing the inner plate as the bellows return spring may force the mounting plate upward. Remove plate and lift out the return spring and spring retainer.

DISASSEMBLY OF VALVES

Place unit on its side. Remove the bolts and lockwashers that attach the valve cover to valve. Lift off valve cover, as shown in Figure 31. (If necessary, use a flat blade to separate cover plate from the bellows flange.) Extreme care should be used to avoid marking or scratching inner face of plate where it clamps to bellow flange. A scratch on this surface could cause a leak. Remove the "O" ring from valve cover and discard.

Remove the air valve spring from center of valve. Remove the air filter. Slide the air valve out of the valve housing, as shown in Figure 32. It may be necessary to use a hooked wire to remove valve.

Place the valve housing end up on bench. Remove the bellows from valve by peeling back the outer lip of bellows. Lift bellows up and away from valve. If a new bellows is to be installed, remove the three bellows supports, as shown in Figure 33.

Remove the bolts and lockwashers that attach the guide to the valve housing and lift off guide to expose the vacuum valve, valve spring and seals, as shown in Figure 34. Remove and discard seals.

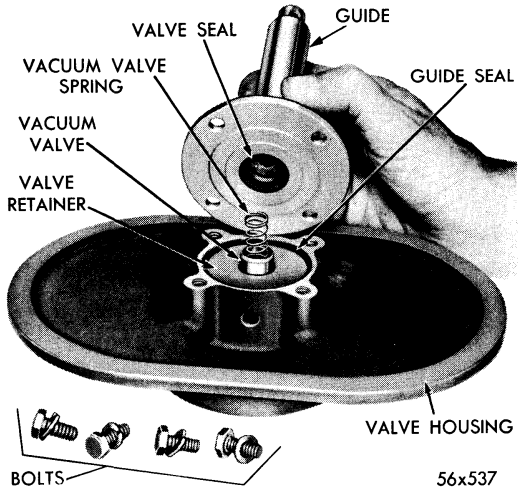

Figure 34—Valve Housing Guide Removed

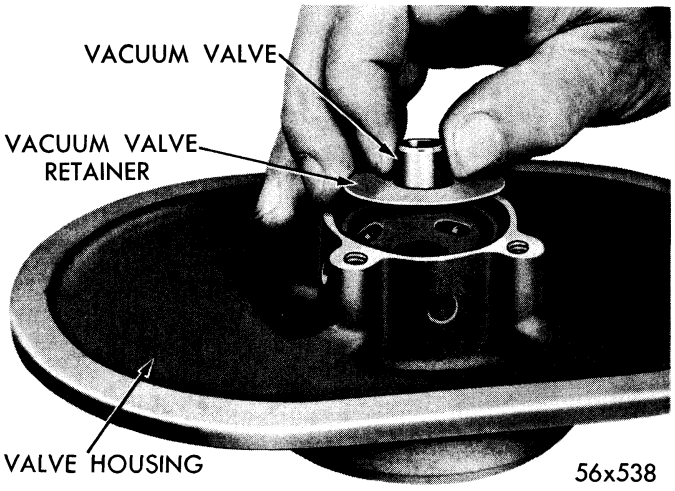

Figure 35—Removal of Vacuum Valve and Retainer

Lift out the vacuum valve and retainer, as shown in Figure 35. Remove and discard valve housing-to-guide seal.

Invert the valve housing, and remove the air valve seal from its groove in valve body. See Figure 36.

CAUTION

If a sharp instrument or pointed pliers is used during the air valve seal removal, be very careful not to mark or scratch the inside diameter bore of valve housing as it might result in an air leak.

INSPECTION

Clean all parts (except bellows and air filter) in a suitable solvent and blow dry with compressed air. If necessary, the bellows can be cleaned with a mild soap and water solution. The filter if extremely dirty should be replaced. After parts are cleaned, place on clean paper for reassembly.

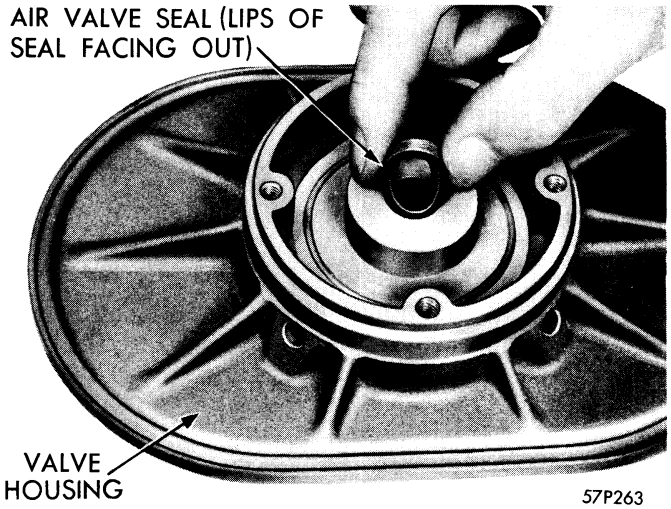

Figure 36—Air Valve Seal Removal and Installation

Inspect all parts for wear or damage. Check the air valve for signs of scoring or wear. If valve body or valve is scored or worn, install new parts as required. At assembly, use new "O" rings and seal rings throughout.

Be sure all seal and "O" rings are suitably covered with silicone grease. (Rings and seals are pre-coated in parts kits.)

11. ASSEMBLY OF POWER BRAKE

ASSEMBLY OF VALVE

Carefully position a new vacuum valve in the retainer. Invert valve housing and install vacuum valve and retainer in housing, as shown in Figure 37.

Install a new valve housing-to-guide seal in the groove provided in the bore of guide, with the lips of seal toward bottom of bore, as shown in Figure 38.

ASSEMBLY OF BODY

Install the vacuum valve spring in the smallest end of the valve. Position the guide over the vacuum valve, lining up bolt holes in guide with the bolt holes in the valve body. (Refer to Figure 34.) Carefully lower guide down against valve body, making sure the tapered portion of the vacuum valve enters seal evenly. Press down on guide to seat. Install bolts and lockwashers. Tighten evenly and securely.

If a new bellows is being installed, position the supports in bellows. Supports must be centered in the three center accordion folds and aligned with bellows and each other.

Using holding fixture, (fixture can be made from a piece of 4" pipe high enough to support the guide and valve assembly) install the bellows, as shown in Figure 39. Be sure the arrows on edge of bellows and housing are aligned to conform the bellows contour to the housing.

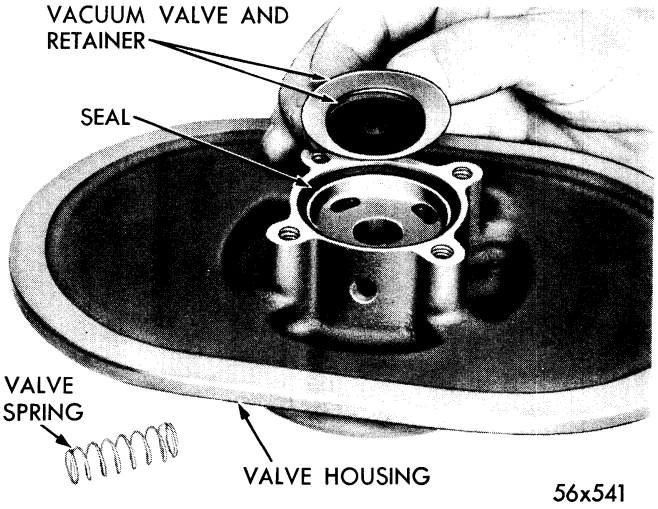

Figure 37—Assembling Vacuum Valve and Retainer

Insert a new air valve seal into the bore of the valve housing, as shown in Figure 36. Then install the air valve seal retainer over seal retainer in valve housing.

With the assembly in the holding fixture, lightly coat the outside surface of the air valve with silicone grease (do not use any other kind); then insert air valve (small end first) into the bore of valve housing, as shown in Figure 39. Use finger pressure to test for free movement of valve against vacuum valve spring.

Install air valve spring in recess in air valve. (Refer to Figure 31). Install air filter. Install a new air valve housing cover "O" ring on the shoulder provided on the valve housing hub. Position the valve housing cover over the valve housing, with notch in the edge of cover matching the arrow on bellows.

Be sure that the air valve spring nestles on the dimple in the center of the cover. Press cover down evenly over valve housing to seat cover "O" ring. Install bolts and tighten securely.

Remove assembly from holding fixture and invert unit. Coat the guide lightly with silicone grease and install return spring, as shown in Figure 40. Position the spring evenly around hub of valve housing and guide.

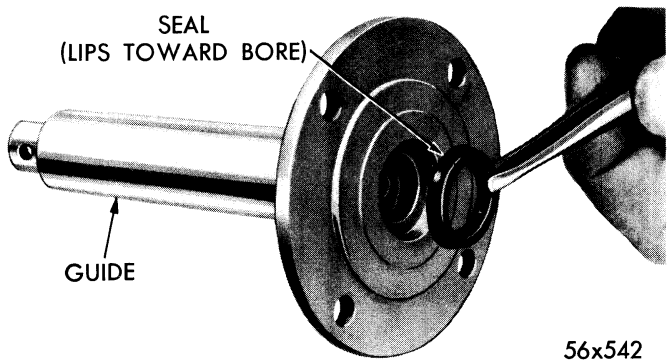

Figure 38—Assembling Valve Housing to Guide Seal

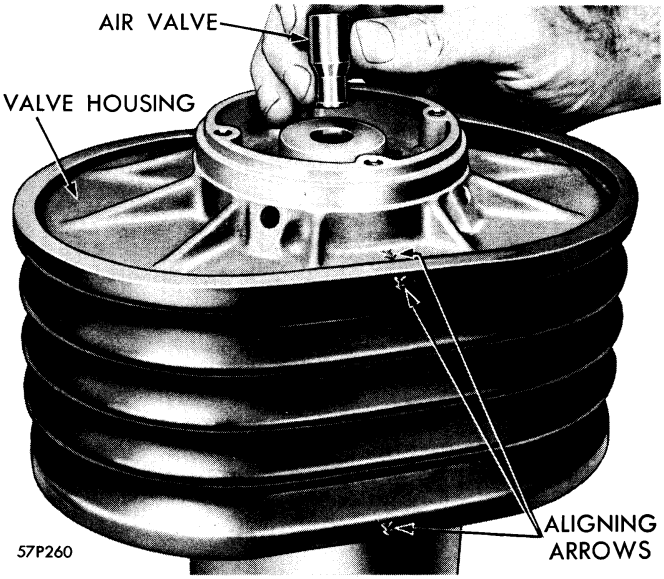

Figure 39—Air Valve Assembly

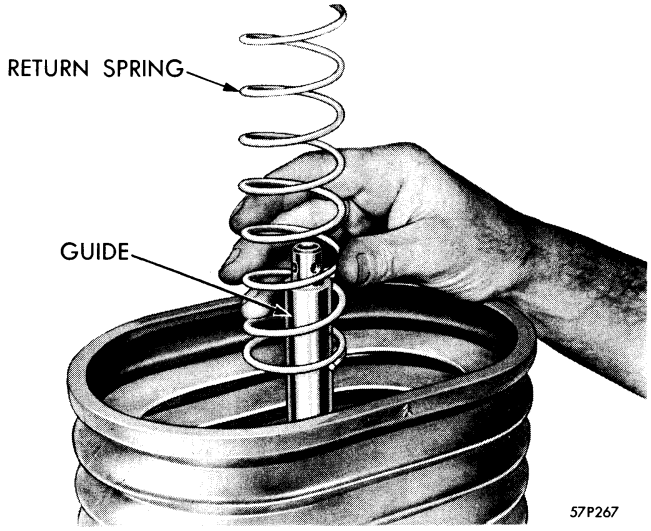

Figure 40—Assembling Return Spring

Place the spring retainer and inner mounting plate over spring, being sure that the arrow stamped on plate is in line with arrow on edge of bellows. Compress return spring, then fold bellows lip over edge of plate. See Figure 42.

Install a new guide bearing sleeve seal in groove inside bearing bore. The seal must nest snugly in bearing with the lips pointing outward.

Using silicone grease, lubricate the inside of bearing and slide over guide while compressing bellows.

Install the bearing-to-mounting plate "O" ring. Lower outer mounting plate on assembly. The notch on edge of plate must be in line with arrow on bellows.

Slide a new valve operating rod "O" ring over nylon bumper on end of rod and into groove. Install rod in the

center guide. Press on end of rod to test for free operation or movement of the air and vacuum valves. A "two step" movement should be felt when the rod is depressed and released fully.

Place a new stop-seal washer in position and install yoke on end of guide. Compress the bellows slightly and alternately tighten set screws. The hub of yoke must be down snug against shoulder of guide, with set screws aligned with the tapered holes in guide.

Place the reinforcement with the long center line of the bracket at a right angle to the long center line of the power unit. The off-set of the bracket must be so located that, when installed in car, the axis of the unit will be inclined downward toward the front of the car. Install lockwashers and nuts and tighten securely.

INSTALLATION OF UNIT

Before installing unit make sure the two nylon bushings on the power lever pin are in place with the flanged end against the power lever.

NOTE

Be sure wedge is installed between power brake lever and forward edge of triangular hole in pedal bracket.

Position the unit so that its axis inclines down toward front of car and that the vacuum inlet connection is toward the engine.

PEDAL LINKAGE ADJUSTMENTS

If it becomes necessary to disassemble or replace the pedal linkage, the following bench tests and adjustments must be made prior to installation of linkage assembly of vehicle:

1. PEDAL TRIGGER ADJUSTMENT—Install gauge, Tool C-3508, on power lever cross pin, positioning center lines, on gauge, as shown in Figure 44.

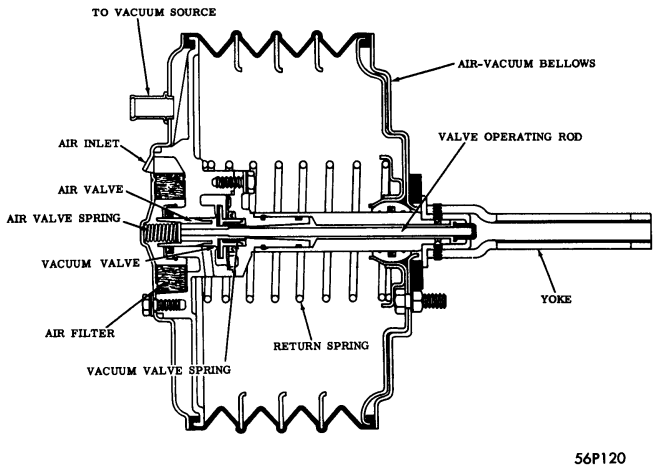

Figure 41—Unit Identifying Parts

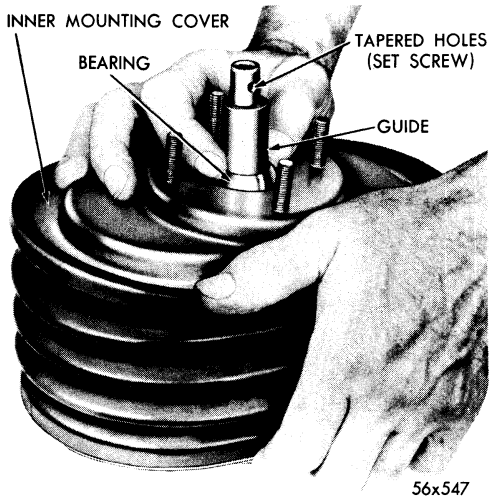

Figure 42—Assembling Inner Mounting Plate Into Bellows

Position power brake adjusting screw (illustrated in "A" Fig. 44). Using a screwdriver, wedge the power brake pedal pivot to the rear side of hole in power lever until the power brake adjusting screw collar is completely compressed and metal-to-metal contact is made.

With gauge installed and adjusting screw collar compressed, the outer curved surface of the trigger arm must contact the inner circle of the gauge, that is, the distance between the center line of the power brake lever cross pin and the outer curved surface of the power brake pedal trigger arm must be .640 inch, plus or minus .005 inch.

If the position of trigger arm does not conform to this specification, adjustment is made by turning power brake adjusting screw until trigger arm outer surface is in alignment with inner circle of gauge, as shown in Figure 44 (Illustration "A"). After correct setting has been made, tighten adjusting screw securely.

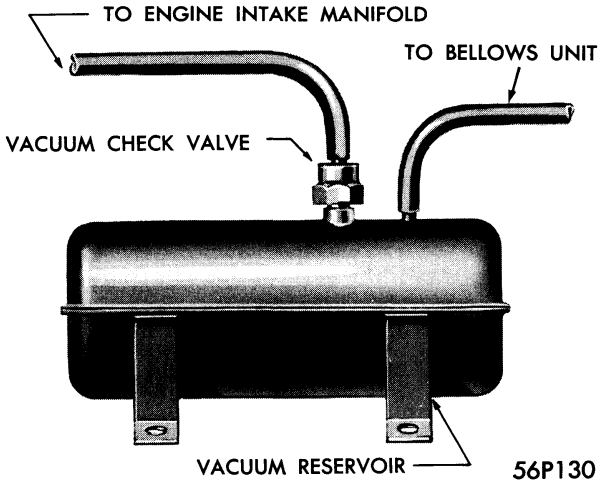

Figure 43—Vacuum Reserve Tank

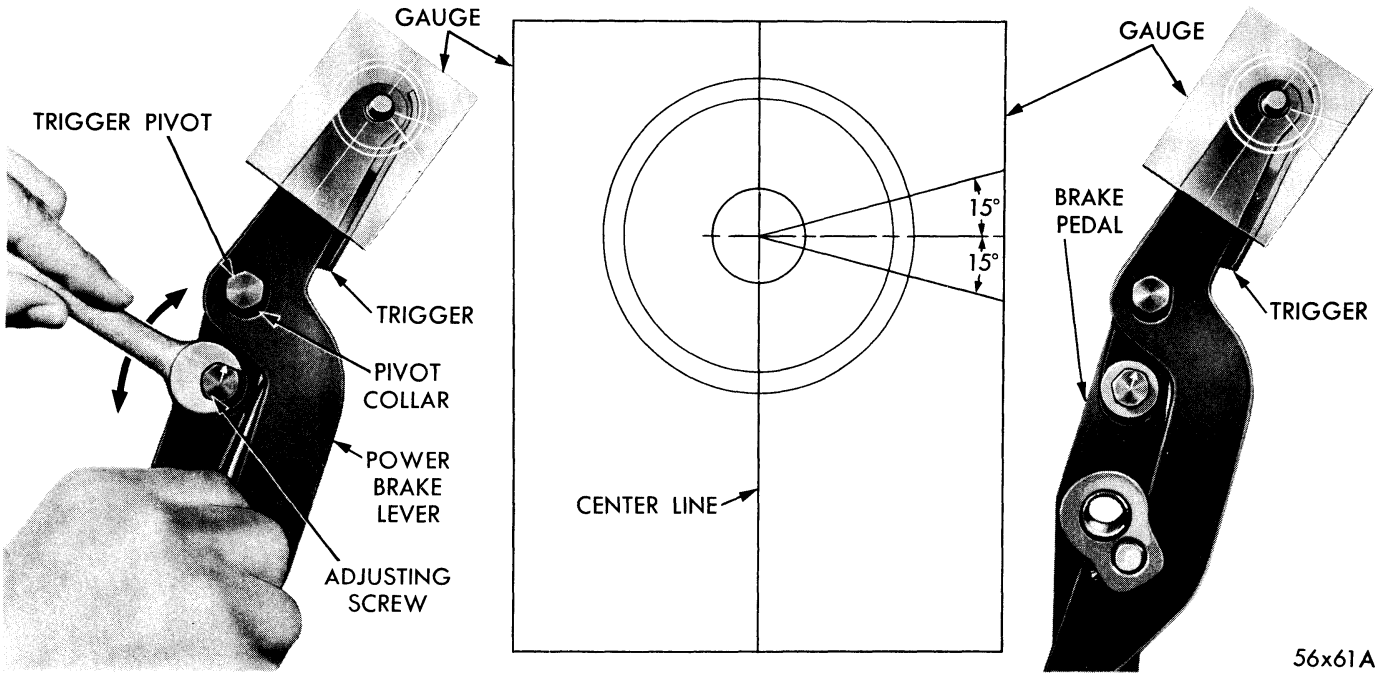

Figure 44—Power Brake Trigger Arm Adjustment

2. CHECKING ARC OF TRIGGER ARM — Install gauge, Tool C-3508, on power lever cross pin. With wedge, or screwdriver removed, and the trigger arm-to-power brake lever cross pin dimension adjusted correctly, the outer curved surface of the trigger arm must contact the outer circle of the gauge within the angle scribed on the gauge. Refer to Figure 44.

> **NOTE**
>
> ***With the pedal assembly clamped in vise, it will be necessary to move power lever (by hand) to locate trigger arm on outer circle of gauge.***

If position of trigger arm does not meet this requirement, the trigger arm can be carefully bent to specifications. In cases where trigger arm is "out" an excessive amount, the entire trigger arm assembly must be replaced. If a new trigger arm assembly is installed, dimension must be rechecked.

PEDAL ADJUSTMENT

1. FREE PLAY ADJUSTMENT—A free play adjustment check should be made at NO VACUUM. Insert a wedging tool (a long screwdriver will do) between the trigger pivot and the rear side of the hole in the power brake lever forcing the brake pedal and power lever apart. Check free play with linkage in this position by pushing lightly at the pad end of the brake pedal. This should be from $\frac{1}{16}$ to $\frac{1}{8}$ inch. Lengthening or shortening of the push rod if necessary, should be made at this time. If the trigger pivot and power brake lever are not wedged apart, a false free play setting will be measured at the pad end of the pedal.

2. ADJUSTMENT OF POWER BRAKE FOR MAXIMUM PERFORMANCE—After the pedal free play is adjusted properly a final check should be made to assure maximum performance of the booster. Slight rotation of the adjusting cam in a counter-clockwise direction will speed up a slow pedal vibration. A slight adjustment of the cam in the clockwise direction will eliminate a time delay during a fast application.

> **NOTE**
>
> ***Rotation of cam adusting screw should be 90° about original setting.***

12. DIAGNOSIS PROCEDURES

SPONGY PEDAL

When the brake pedal, while being depressed, feels like it is pushing against a "cushion," the condition is generally termed "spongy pedal."

AIR—Check for air in lines. Air can enter system through a leak when brake fluid is low in the master cylinder reservoir, or when any part of system has been disconnected. Air may be left in the system, if the bleeding operation is not properly performed; or air bubbles may develop in a tightly sealed system when an inferior type brake fluid is used.

DRAGGING BRAKES

The major causes of dragging brakes are: Too tight an adjustment of brake shoes, or the failure of brake shoes to return to their released position.

1. ADJUSTMENT—Perform a brake adjustment to be sure the brake shoe cams are correctly positioned.

2. BRAKE SHOE RETURN SPRINGS—Check for weak return springs. Make sure correct spring is used.

3. MASTER CYLINDER—Remove the filler cap and check the relief port with a tag wire to be sure it is not partially blocked. A swollen primary cup, incorrect pedal free play, scoring or rust between the piston and the piston stop, may also partially restrict the return of fluid to the master cylinder reservoir.

4. WHEEL CYLINDERS—Check for swollen cups which can slow up the return of the pistons. Check the inside of the wheel cylinders for scoring or corrosion.

5. BRAKE HOSE—Inspect for plugging or swelling which could restrict the return flow of fluid in the lines.

LOCKED BRAKES

1. MASTER CYLINDER—Check relief port with a piece of tag wire. Make sure it is free of dirt, or other foreign material. It may also be blocked by a swollen primary cup, incorrect free pedal travel, scoring or rust between the piston and piston stop.

2. FLEXIBLE HOSE—Inspect for plugging or swelling. This could restrict the return flow of fluid in the lines.

3. BRAKE SHOE RETURN SPRINGS — Check for broken return spring.

GRABBING BRAKES

1. ADJUSTMENT—Check for improper adjustment of brake shoe cams.

2. BRAKE LINING—Inspect linings. If brake fluid, oil or grease, has contacted the linings, the brake may "take hold" prematurely. If the lining has become soaked with brake fluid, oil or grease, it may slip, giving the effect of a grabbing brake on the opposite wheel.

3. BRAKE DRUM—Inspect for scoring, cracks, or an out-of-round condition. If one of these conditions exists, grabbing may occur when brakes are applied.

PEDAL GOES TO FLOOR BOARD

If no braking action results when the brake pedal is pushed all the way to the floor board and pressure cannot be built up by pumping the pedal several times, the following causes may be responsible.

1. BRAKE FLUID—Check the brake fluid level in the Master Cylinder reservoir. Loss of brake fluid due to leakage is the most likely cause of this condition. Inspect all connections and flexible hose. Check wheel cylinder rubber cups for scoring or damage.

2. FREE PLAY—Check adjustment of push rod.

3. AIR IN LINES—Check for air in system. Air can enter through a leak, when brake fluid is low in master cylinder reservoir, or any part of system is disconnected. Air may be left in system if brake bleeding is improperly performed or, air bubbles may appear in a tightly sealed system when an improper type brake fluid is used.

4. BRAKE PEDAL GOES TO FLOOR BOARD BUT CAN BE PUMPED UP—Look for the following conditions:

(a) Adjustment—Adjust the brake shoe cams.

(b) Master Cylinder—A scored or damaged primary cup will not hold pressure due to leakage of fluid past the cup, and will result in the pedal going to floor board slowly on a light brake application.

(c) External Leakage—Inspect for leaks at wheel cylinders, all brake lines and connections.

HARD PEDAL

If excessive effort is required when applying the brakes, the condition is usually referred to as "hard pedal."

1. LININGS—Inspect linings for evidence of oil, grease, brake fluid or a heavy glaze.

2. SHOE ADJUSTMENT—Check for proper shoe adjustment or uneven contact.

3. MASTER CYLINDER—The relief port may be partially restricted. To check, insert a piece of tag wire in the relief port.

BRAKE NOISE

1. BRAKE SHOE ADJUSTMENT—Adjust cams.

2. BRAKE SHOE—Check straightness of brake shoes.

3. LINING CONTACT—Inspect lining to determine if it is contacting the brake drum over entire surface.

4. BRAKE DRUMS—Inspect brake drums for evidence of heavy scoring or cracks. Determine if drums are out-of-round.

CHATTERING

The following conditions may result in brake chatter when front wheel bearings, or front suspension parts, are loose.

1. ADJUSTMENT—Check brake shoe adjustment.

2. BRAKE DRUM — Inspect for an out-of-round or cracked brake drum.

3. LININGS—Inspect for oil, grease, dirt or brake fluid on linings.

CARS EQUIPPED WITH POWER BRAKE

IMPROPER PEDAL RETURN

1. *BRAKE PEDAL HUB*—Width of the brake pedal hub plus the nylon bushing flanges may exceed the length of the pedal pivot spacer. Remove a small amount of metal from the pedal pivots freely.

2. *PEDAL PIVOT SPACER* — Nylon bushing width may exceed the length of the pedal pivot spacer.

3. *LINKAGE*—Bent or misaligned.

UNIT DOES NOT BOOST

Test to determine if unit is operating: With the engine stopped, depress brake pedal several times to eliminate all vacuum from the system. Apply the brakes, and while holding foot pressure on the brake pedal, start the engine. If the unit is operating, the brake pedal will move forward when engine vacuum power is added to the pedal pressure.

If the test shows unit is not operating:

1. *VACUUM TEST*—Check vacuum from manifold to tank and to booster unit. Vacuum should be 15 to 20 inches at engine idle speed.

2. *LEAKS*—Check for leak at hose connections, leak in reserve tank or faulty check valve.

PARTIAL LOSS OF BOOSTER

If booster follows pedal but does not give full boost, remove inspection screw at back of unit and install a vacuum gauge.

CHECKING VACUUM—Push pedal pad until pedal becomes solid. Vacuum should be at least 5 to 6 inches.

NOISE

1. *SCRAPING NOISE*—Trigger or power lever bent.

2. *CLUNK OR THUD*—Reduce pedal free play.