

SECTION 5

BRAKES

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CORVAIR 500, 700 AND 900 SERIES

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GENERAL DESCRIPTION

The brakes used (fig. 5-1) on both front and rear of all models are the Duo-Servo single anchor type which utilize the momentum of the vehicle to assist in the brake application. This self-energizing or self-actuating force is applied to both brake shoes at each wheel in both forward or reverse motion. The brake shoe facings are bonded to the shoes and have a total area of 120 square inches. The cast iron brake drums have a contact area of 9" in diameter by 1 $\frac{3}{4}$ " in width.

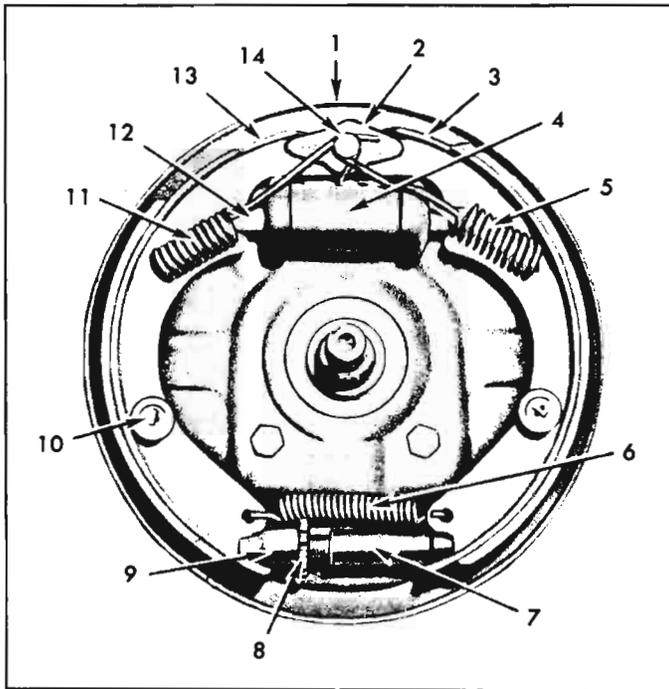


Fig. 5-1—Duo-Servo Brakes

- | | |
|---------------------------------|--------------------------------|
| 1. Flange Plate | 8. Adjusting Screw |
| 2. Shoe Guide Plate | 9. Adjusting Screw Socket |
| 3. Secondary Shoe | 10. Shoe Hold Down Assembly |
| 4. Wheel Cylinder | 11. Primary Shoe Return Spring |
| 5. Secondary Shoe Return Spring | 12. Wheel Cylinder Push Rod |
| 6. Adjusting Screw Spring | 13. Primary Shoe |
| 7. Adjusting Screw Nut | 14. Anchor Pin |

Wheel cylinders (fig. 5-2) are the double piston type permitting even distribution of pressure to each brake shoe. To keep out dust and moisture, both ends of each wheel cylinder are sealed with a rubber boot. The wheel cylinders have no adjustments.

The main cylinder (fig. 5-3) consists of a piston which receives mechanical pressure from the brake pedal and transmits it through the brake lines as hydraulic pressure to the wheel cylinders. The filler cap is accessible from inside the trunk compartment.

The parking brake lever is located to the left of the steering column. A cable type linkage, directed over three pulleys and routed through the tunnel, connects

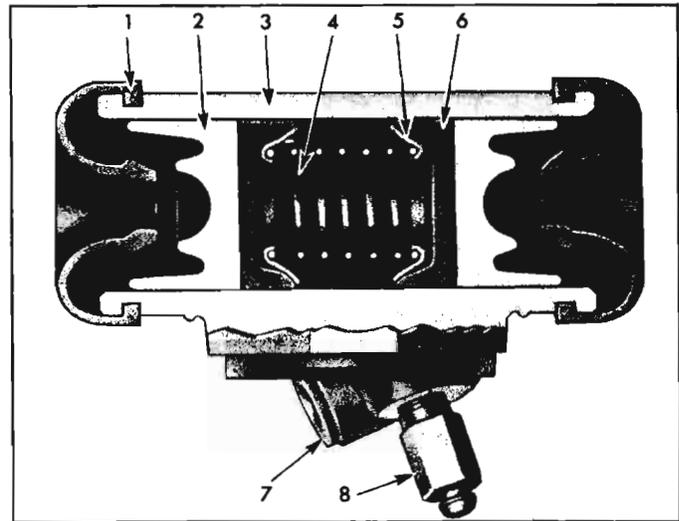


Fig. 5-2—Wheel Cylinder

- | | |
|------------------|------------------------|
| 1. Push Rod Boot | 5. Piston Cup Expander |
| 2. Piston | 6. Piston Cup |
| 3. Housing | 7. Fluid Inlet |
| 4. Spring | 8. Bleeder Valve |

this lever to an equalizer at the under body forward of the transmission.

Force applied at the parking brake lever is transmitted to both right and left rear brakes by means of a single actuating cable which passes through the equalizer and is connected at each end to an actuating lever within the brake assembly (fig. 5-4).

The parking brake lever is of the single stroke ratchet type and incorporates a trigger release which is located in the lever grip. For correct adjustment procedure of service and parking brakes consult *Maintenance and Adjustments* in this section.

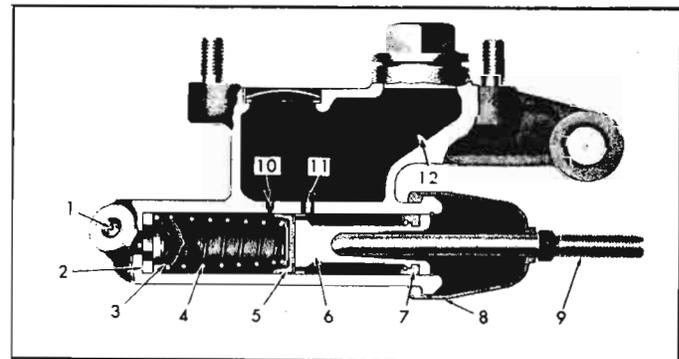


Fig. 5-3—Main Cylinder

- | | |
|----------------|-----------------------|
| 1. Outlet | 7. Secondary Cup |
| 2. Valve Seat | 8. Push Rod Boot |
| 3. Valve | 9. Push Rod |
| 4. Spring | 10. Compensating Port |
| 5. Primary Cup | 11. Fluid Inlet |
| 6. Piston | 12. Fluid Level Rib |

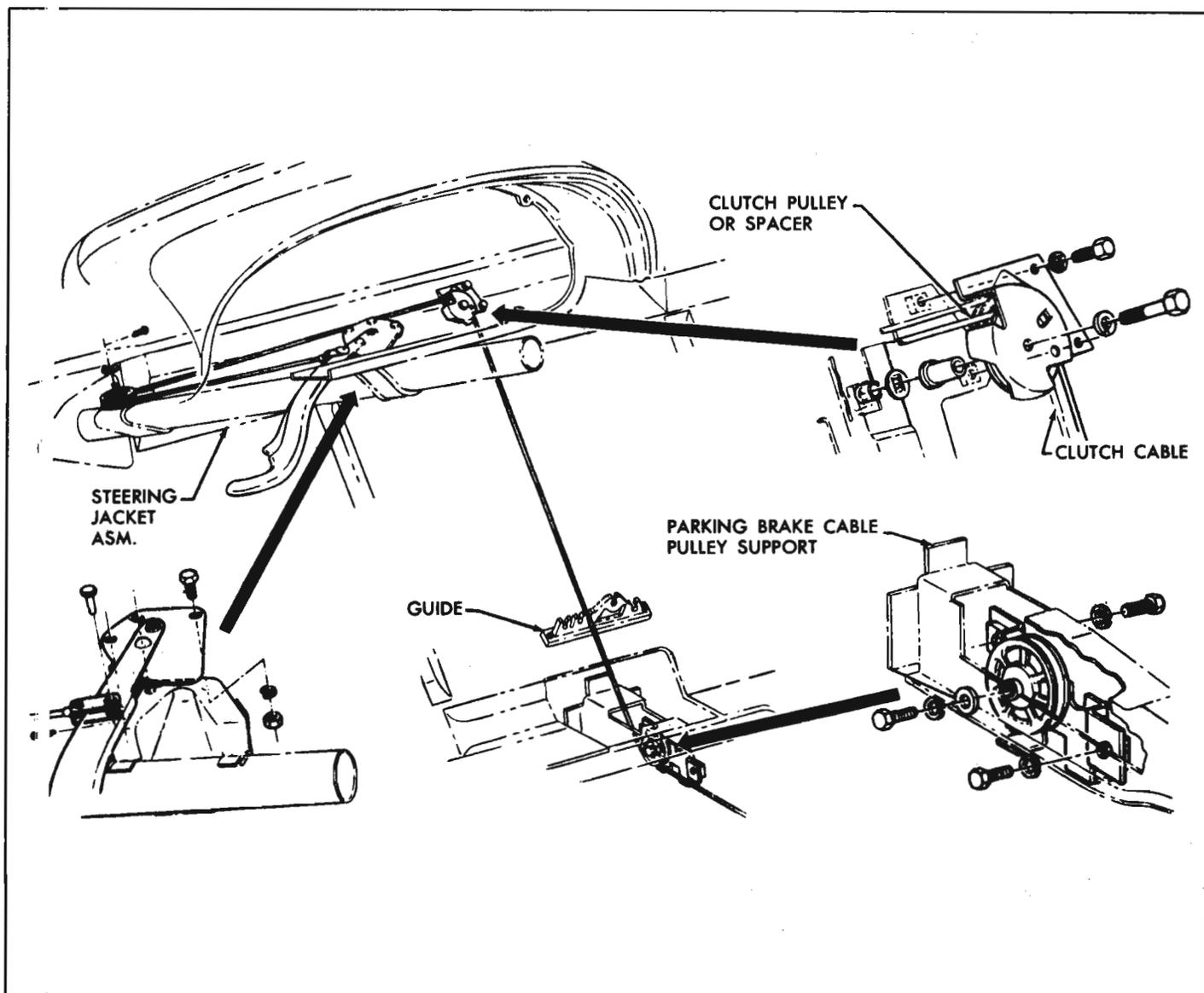


Fig. 5-4—Parking Brake System

MAINTENANCE AND ADJUSTMENTS

In any service operation it is extremely important that absolute cleanliness be observed. Any foreign matter in the hydraulic system will tend to clog the lines, ruin the rubber cups of the main and wheel cylinders and cause inefficient operation or even failure of the braking system. Dirt or grease on a brake lining may cause that brake to grab first on brake application and fade out on heavy brake application.

HYDRAULIC BRAKE FLUID

Only G. M. Hydraulic Brake Fluid Super No. 11 should be used when servicing brakes. This brake fluid is satisfactory for any climate and has all the qualities necessary for satisfactory operation, such as a high

boiling point to prevent vapor lock and the ability to remain fluid at low temperatures.

In the event that improper fluid has entered the system, it will be necessary to:

1. Drain the entire system.
2. Thoroughly flush the system with clean alcohol, 188 proof, or a hydraulic system cleaning fluid, such as "Declene."
3. Replace all rubber parts of the system including brake hoses.
4. Refill the system with G. M. Hydraulic Brake Fluid Super No. 11.

BLEEDING HYDRAULIC SYSTEM

The hydraulic brake system must be bled whenever any line has been disconnected or air has in some way entered the system. The system must be absolutely free of air at all times. Bleeding should be done on the longest line first and the proper sequence to follow is left rear, right rear, right front and left front. Bleeding of brake line may be accomplished by one of two methods: either pressure or manual.

NOTE: Fill main cylinder reservoir only up to rib which is cast into reservoir wall (fig. 3).

Pressure Bleeding

1. Clean all dirt from top of main cylinder and remove filler plug.
2. Connect hose from bleeder tank to main cylinder filler opening and open valve.

NOTE: Make sure fluid in pressure bleeder is up to operating level and that the equipment is able to exert at least 30 to 50 lbs. hydraulic pressure on the brake system.

3. Remove bleeder valve dust cover. Install Tool J-7647 on bleeder hose. Position one end of hose on bleeder valve, placing other end of hose in a transparent container holding sufficient fluid to cover end of hose (fig. 5-5).

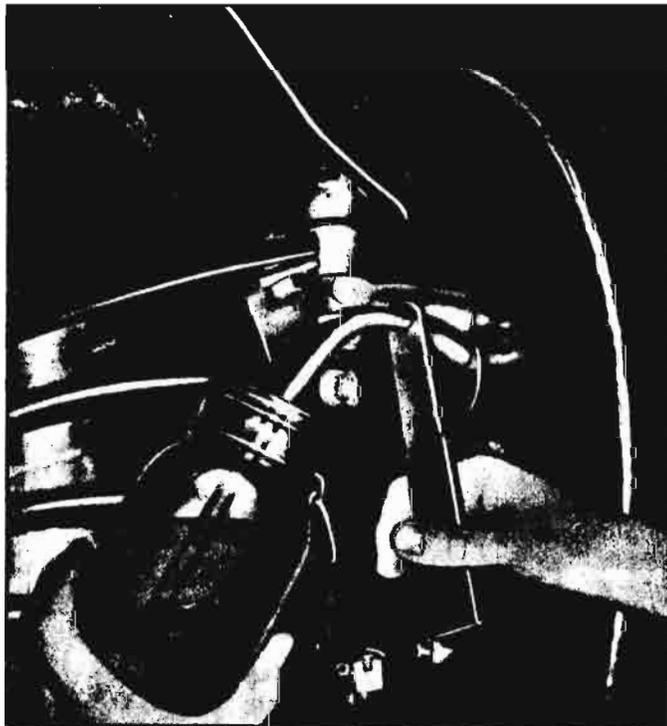


Fig. 5-5—Bleeding Brakes Using Tool J-7647

4. Open bleeder valve by turning $\frac{3}{4}$ of a turn in a counterclockwise direction and observe flow of fluid at end of bleeder hose.
5. Close bleeder valve tightly as soon as bubbles stop and fluid flows in a solid stream.

6. Remove bleeder hose and Tool J-7647.
7. Repeat operations 2 thru 6 at each wheel.

Manual Bleeding

1. Clean all dirt from top of main cylinder and remove filler plug.
2. Fill main cylinder reservoir.
3. Remove bleeder valve dust cover. Install Tool J-7647 on bleeder hose and position one end of hose on bleeder valve, placing other end of hose in a transparent container holding sufficient fluid to cover end of hose (fig. 5-5).
4. Open bleeder valve by turning $\frac{3}{4}$ of a turn in a counterclockwise direction. Depress foot pedal. When pedal reaches floor close bleeder valve. Return pedal to brake released position with valve closed. Repeat this operation until air bubbles no longer appear in discharging fluid.
5. Close bleeder valve tightly as soon as fluid flows in a solid stream.
6. Remove bleeder hose and Tool J-7647.
7. Repeat operations 2 thru 6 at each wheel.

NOTE: Fill main cylinder reservoir only up to rib which is cast into reservoir wall (fig. 3).

PUSH ROD TO MAIN CYLINDER CLEARANCE

Early Models

The brake pedal has a definite stop which is permanent and not adjustable. This stop consists of a rubber bumper at the release end of pedal travel. Before adjusting push rod to main cylinder clearance, make sure pedal returns to the fully released position freely and that the pedal retracting spring has not lost its tension, then proceed as follows:

1. Loosen check nut on the swivel.



Fig. 5-6—Brake Pedal Free Movement

2. Turn push rod in proper direction to secure correct adjustment. Movement of pedal pad before the push rod end contacts the main cylinder piston must be $\frac{1}{8}$ " to $\frac{3}{8}$ " (fig. 5-6).
3. Tighten check nut against swivel.

LATER MODELS

Later models are equipped with a nonadjustable push-rod which is set at proper clearance at factory.

HYDRAULIC BRAKE LINES

Hydraulic Brake Hose

The flexible hoses which carry the hydraulic pressure from the steel lines to the wheel cylinders are carefully designed and constructed to withstand all conditions of stress and twist which they encounter during normal vehicle usage.

The hoses require no service other than periodic inspection for damage from road hazards or other like sources. Should damage occur and replacement become necessary, the following procedure is to be followed.

Removal

1. Separate hose from steel line by turning double flare connector out of hose fitting.
2. Remove "U" shaped retainer from hose fitting and withdraw hose from support bracket.
3. Turn hose fitting out of wheel cylinder inlet.

Replacement

1. Install new copper gasket on cylinder end of hose (male end).
2. Moisten threads with brake fluid and install hose in wheel cylinder inlet.

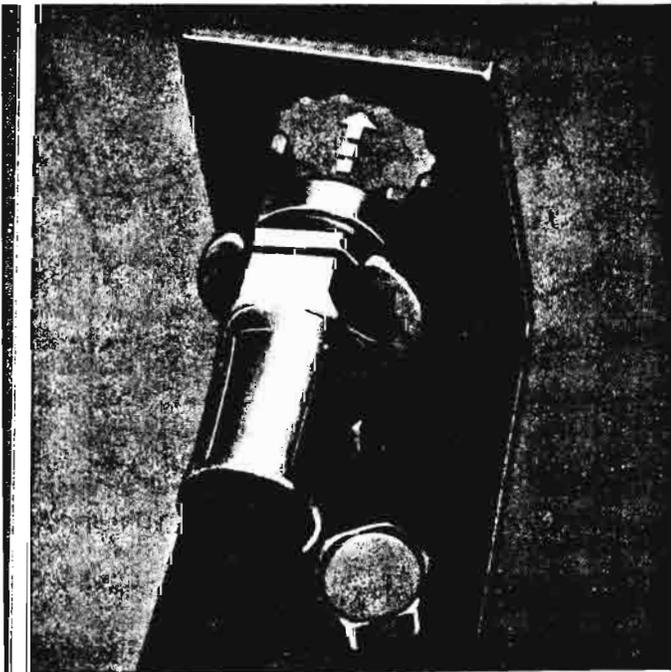


Fig. 5-7—Brake Line Support Bracket

3. With weight of car on wheel and suspension in normal position (front wheels straight ahead) pass female end of hose through support bracket, allowing hose to seek its own position. Insert hex of hose fitting into the 12 point hole in support bracket in position which induces least twist to hose (fig. 5-7).

NOTE: Do not twist hose unduly during this operation as its natural curvature is absolutely necessary to maintain proper hose-to-suspension clearance through full movement of the suspension and steering parts.

4. Install "U" shaped retainer to secure hose in support bracket.
5. Inspect by removing weight completely from wheel; if working at front wheels turn steering geometry from lock to lock while observing hose position. Be sure that hose does not touch other parts at any time during suspension or geometry travel. If contact does occur remove hose retainer and rotate the female hose end in the support bracket one or two points in appropriate direction, replace retainer, and re-inspect as outlined in this paragraph.
6. Place steel tube connector in hose fitting and tighten securely
7. Bleed all brakes as outlined in this section.

Hydraulic Brake Tubing

Hydraulic brake tubing is a double layer annealed steel, copper coated and tin plated $\frac{3}{16}$ " tubing which resists corrosion and has the physical strength to stand up under the high pressures which are developed when applying the brakes. In making up hydraulic brake pipes, it is important that the proper flaring tool be used to flare the ends of the tubing for the compression couplings. Unless the tubing is properly flared, the connections will leak and the brakes will become ineffective.

CAUTION: When necessary to replace brake tubing, always use special metal tubing which is designed to withstand high pressure and resist corrosion. Ordinary copper tubing is not satisfactory and should not be used.

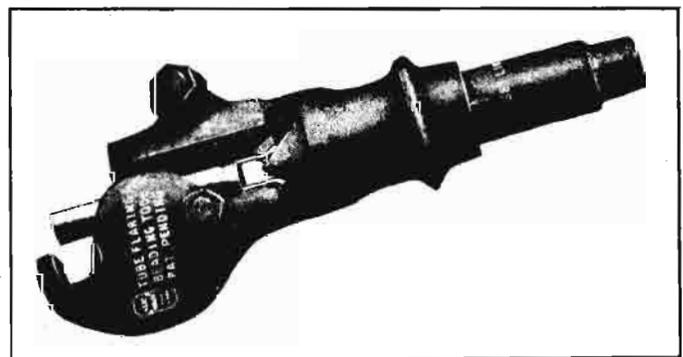


Fig. 5-8—Hydraulic Brake Tube Double Flaring Tool

This safety steel tubing must be double-lap flared at the ends in order to produce a strong leak-proof joint.

The brake tube flaring Tool J-8051 (fig. 5-8) is used to form the double-lap flare.

Figure 5-9 shows two pieces of tubing, one with single-lap flare "A" and the other with double-lap flare "B." It will be noted that the single-lap flare in "A" split the tubing while the one shown in "B" is well-formed and unbroken due to the reinforcement of the double wall.

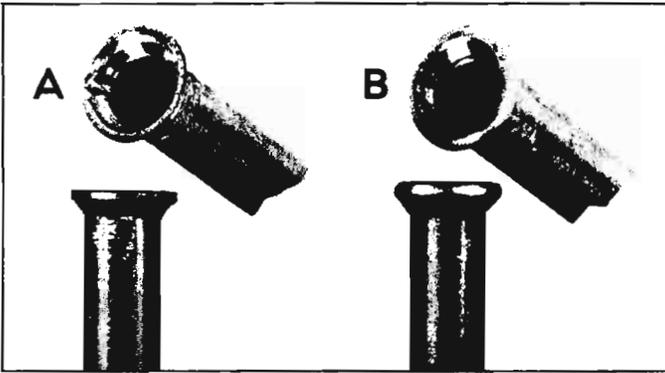


Fig. 5-9—Single and Double Lap Flaring

The following procedure should be followed in making up hydraulic brake pipes.

Double Lap Flaring

1. Clamp the tubing in the proper size die blocks with the flat ends of the blocks toward the end of the tubing to be cut off. Cut the end of the tubing flush and square. Using a mill file, dress tubing and square ends.
2. Remove the tubing from the die block and deburr the inside and outside edges.
3. Install compression couplings on tubing and dip end of tubing to be flared in hydraulic fluid. This lubrication results in better formation of the flare.
4. Place one-half of the die blocks in the tool body with the counterbored ends toward the ram guide. Now lay the tubing in the block with approximately 1/2" protruding beyond the end. Fit the other half of the block into the tool body, close the latch plate and tighten the nuts "finger-tight."
5. Select the correct size upset flare punch. One end of this punch is counterbored or hollowed out to

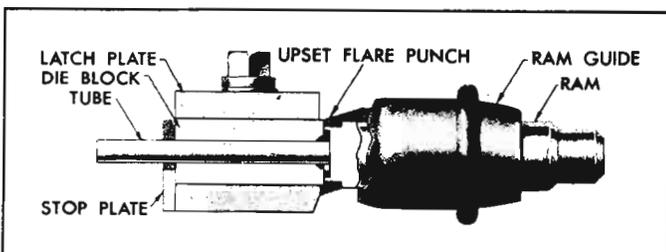


Fig. 5-10—Flaring Operation—Positioning Tubing

gauge the amount of tubing necessary to form a double lap flare. Slip the punch into the tool body with the gauge end toward the die blocks. Install the ram; then tap lightly until the punch meets the die blocks and they are forced securely against the stop plate (fig. 5-10).

6. Using the supplied wrench, draw the latch plate nuts down tight to prevent the tube from slipping. Tightening the nuts alternately (beginning with the nut at the closed hole in the plate) will prevent distortion of the plate. Remove the punch and the ram. Now reverse the punch and put it back into the tool body. Install the ram and tap it lightly until the face of the upset flare punch contacts the face of the die blocks (fig. 5-11). This completes the first operation. Remove the ram and the punch.

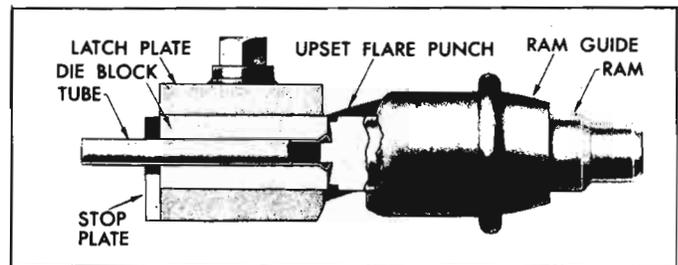


Fig. 5-11—Flaring Operation—First Flare

7. To complete the flare, insert the pointed finish flare punch and the ram into the tool body. Tap the ram until a good seat is formed (fig. 5-12).

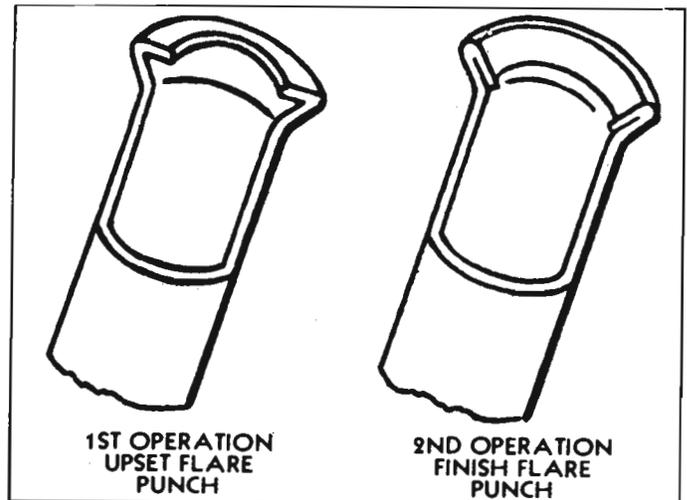


Fig. 5-12—Flaring Operation—First and Second Flare

NOTE: The seat should be inspected at intervals during the finishing operation to avoid over-seating.

HYDRAULIC BRAKE ADJUSTMENT

Hydraulic brake adjustment is confined to a single operation on each brake assembly. A spring snap cover plate is pried from the back of the flange plate,

exposing a hole through which Tool J-8363 is inserted to engage the spur wheel and thus turn the single adjusting screw (fig. 5-13).

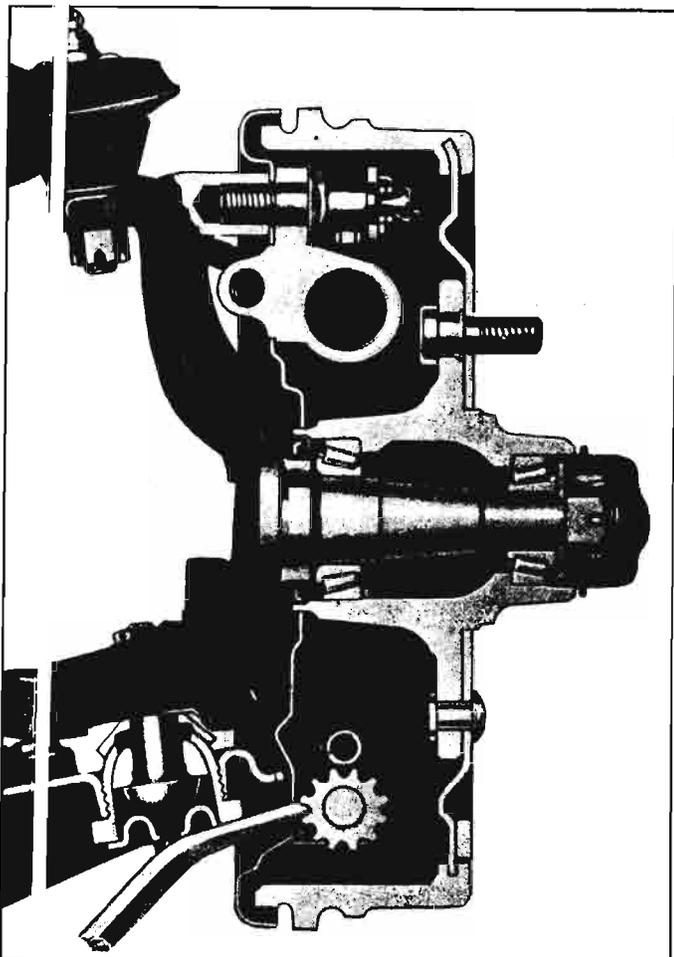


Fig. 5-13—Turning Adjusting Screw Spur Wheel with Tool J-8363

Adjustment (Front or Rear)

1. Jack all wheels clear of floor.
2. On rear brakes loosen the check nut at the parking brake cable equalizer to remove tension from brake cable.

NOTE: If cable has been adjusted too short, the rear brake shoes will be forced away from the anchor pins in brake release position, making correct shoe adjustment impossible.

3. Remove adjusting hole cover from brake flange plate. Expand brake shoes by turning adjusting screw with Tool J-8363 until a heavy uniform drag is felt on the brake drum (fig. 5-14).

NOTE: Moving the outer end of tool upwards expands the shoes.

Turn adjusting screw back (to retract brake shoes) 12 notches on front brakes and 15 notches on rear. This will provide adequate running clearance between shoes and drums.

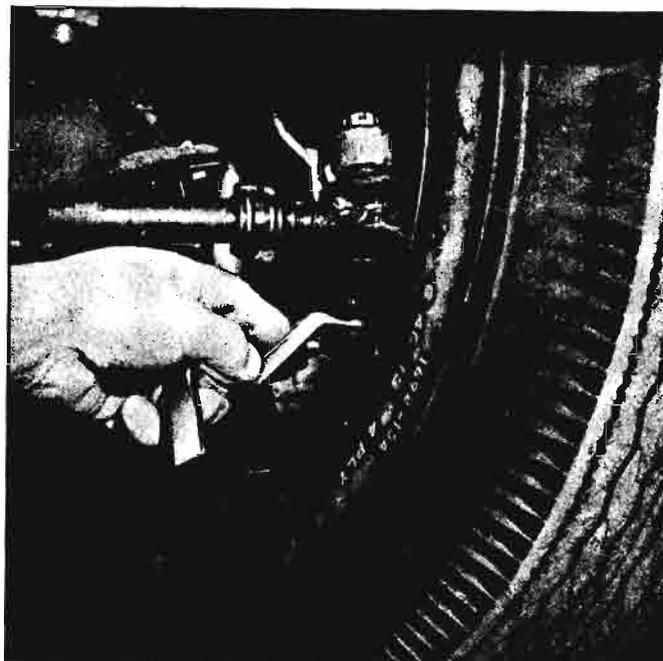


Fig. 5-14—Adjusting Brakes

5. Repeat operations 3 and 4 at each wheel and replace hole covers.
6. After the hydraulic brakes are adjusted, adjust the parking brakes as outlined under "Parking Brake Adjustment."

PARKING BRAKE

The service brake must be properly adjusted first as a base for the parking brake adjustment.

Adjustment

1. Jack up both rear wheels.
2. Pull parking brake lever up 4 notches from fully released position.
3. Loosen the forward check nut on the equalizer and tighten the rear one until a heavy drag is felt when rear wheels are rotated.
4. Tighten check nuts securely.
5. Fully release parking brake and rotate rear wheels; no drag should be present.

Inspection

If complete release of the parking brake is not obtained when release handle is pulled, or if application effort is high, check parking brake lever assembly for free operation. If operation is sticky or a bind is experienced, correct as follows:

1. Clean and lubricate brake cables and pulleys.
NOTE: These pulleys must be lubricated, as outlined in Section 2, every 10,000 miles.
2. Inspect brake lever assembly for straightness and alignment (replace if necessary).
3. Clean and lubricate parking brake lever assembly, which must operate freely.
4. Check condition and installation of return spring.

SERVICE OPERATIONS

FORWARD PARKING BRAKE CABLE

Removal

NOTE: Remove positive cable from battery to eliminate possibility of creating short circuits under dash.

1. Release parking brake.
2. Remove equalizer check nuts and separate cable stud from equalizer.
3. Remove underbody tunnel cover.
4. Remove toe pan tunnel cover.
5. Remove cable pulley from upper toe board bracket.

NOTE: On cars equipped with manual clutch, clutch cable must be disconnected to relieve tension on pulley.

6. Remove cable ball from hand lever clevis and withdraw cable from car.

Installation

1. Thread cable through all pulley brackets, guides, and rear tunnel wall.
2. Lubricate cable ball and position in hand lever clevis.
3. Lubricate and reinstall pulley, carefully positioning cable(s) in pulley grooves. Connect clutch cable, if so equipped.
4. Place one check nut on cable stud and insert into equalizer, then place second nut on stud.
5. Replace toe pan tunnel cover and underbody tunnel cover.

NOTE: Attach toe pan cover with original length screws only; longer screws may puncture fuel tank.

6. Replace positive battery cable.
7. Continue as outlined under *Parking Brake—Adjustment*.

REAR PARKING BRAKE CABLE ASSEMBLY

Removal

1. Release parking brake.
2. Remove return spring.
3. Remove rear equalizer check nut and separate forward cable stud from equalizer.
4. Extract "U" clips from support brackets which are bolted to control arm pivot bars.
5. Snap conduit out of spring clip at shock absorber lower mount.
6. Remove rear wheels, brake drums and axle bearing retainer bolts and pull axle flange away from brake assembly.
7. Pry actuating lever from behind secondary brake shoe with screwdriver, then separate cable tip

from actuating lever by compressing retaining spring and lifting cable tip up and out of "U" shaped junction in lever (fig. 5-15).

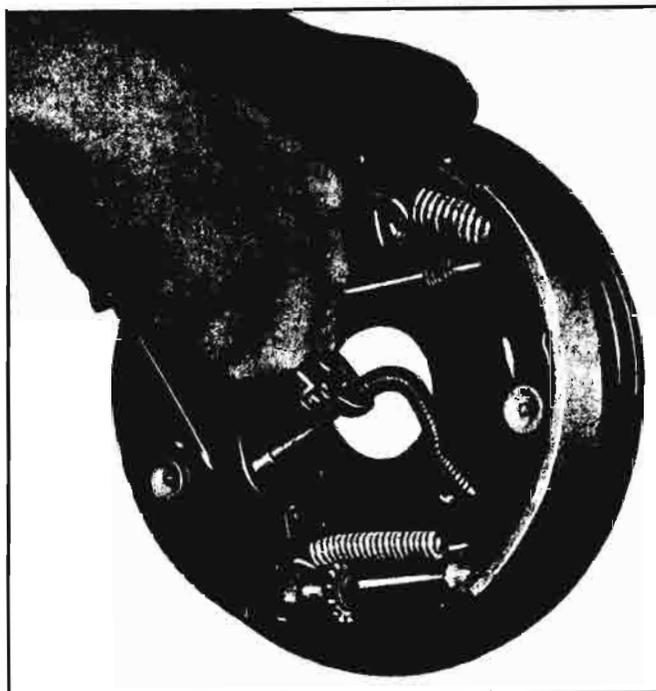


Fig. 5-15—Removing Parking Brake Cable (Axle Removed for Clarity)

8. Compress expanded conduit locking fingers at the flange plate entry hole and withdraw cable.

Installation

1. Pass end of cable and conduit tip through flange plate entry hole, making sure that conduit locking fingers all expand fully.
2. Compress retaining spring and position cable in "U" shaped actuating lever junction.
3. Replace bearing retainer, retainer bolts, universal joint "U" bolts, brake drum and wheel.
4. Snap conduit into spring clip under shock absorber.
5. Pass die cast conduit tip through support bracket and secure with "U" clip.
6. Position rubber boot over conduit tip, carefully indexing bead of boot in groove provided in tip casting.
7. Place equalizer on cable and insert forward cable stud. Install check nut and return spring.

NOTE: To perform its intended function, equalizer must be free to slide on rear cable. Lubricate with chassis grease on assembly and every 5000 miles thereafter.

8. Proceed as outlined under *Parking Brake—Adjustment*.

BRAKE PEDAL

Removal

1. Disconnect return spring from pedal lever.
2. Remove cotter pin and washer from main cylinder push rod swivel.
3. Remove retaining ring from pedal shaft and separate pedal from cylinder casting.
4. Extract nylon bushings from pedal support boss.

Inspection

1. Clean all metal parts with an effective non-toxic degreasing solvent.
2. Wipe the nylon bushings clean with a clean cloth.

CAUTION: Nylon bushings should not be treated with cleansing agents of any nature.

3. Inspect all parts for wear or damage. Replace if necessary.

Installation

1. Insert nylon bushings into pedal support boss.
2. Lightly coat pedal shaft with lubriplate and insert into support boss bushings.
3. Securely place retaining ring on exposed end of shaft.
4. Lightly coat push rod swivel pin with lubriplate and insert into hole in pedal lever.
5. Place flat washer over protruding end of swivel pin and secure with a new cotter pin.
6. Connect pedal return spring.

NOTE: Adjust stop light switch, if necessary, as outlined in Section 12.

BRAKE SHOES

In all cases of brake complaints denoting actual brake lining or shoe failure, the brake drum should be removed. Before disassembly of the shoes from the flange plate, all linings should be inspected for wear, improper alignment causing uneven wear, and oil and grease on the linings. If any of these conditions exist, it will be necessary to replace the shoes. If, on checking the linings it is noted that they have the appearance of being glazed, this is a normal condition with the hard type lining used. Do not use a wire brush or an abrasive on the lining to destroy this glazed surface as it is essential for proper operation. When brake lining replacement is necessary, all shoes and linings should be replaced. In no case should a single lining and shoe be replaced. However, in exceptional cases, it may be satisfactory to replace the shoes and linings on both front or both rear wheels.

Removal

1. Raise vehicle and place on stand jacks.
2. Loosen check nut at parking brake cable equalizer sufficiently to remove all tension from brake cable.

3. Remove rear brake drums and front hub and drum assemblies.

NOTE: Front brake drums are non-dismountable and are removed with front wheel hubs. Rear brake drums may be removed by removing rear wheel retaining nuts.

4. Unhook brake shoe pull back springs from anchor pin using Tool J-8049 (fig. 5-16).

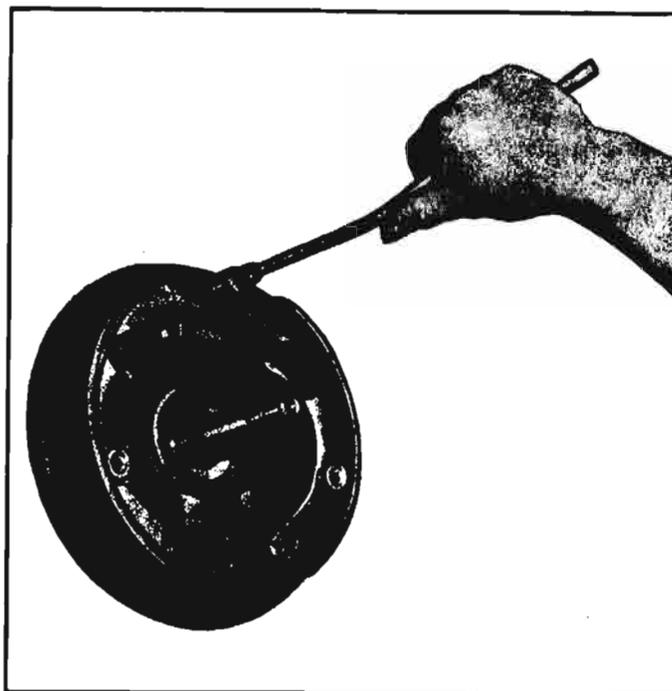


Fig. 5-16—Removing Brake Shoe Return Spring

NOTE: Since boots are recessed in grooves on wheel cylinders to prevent pistons from leaving cylinders, it is not necessary to install wheel cylinder clamps when brake shoes are removed. Brake pedal, however, must not be depressed while drums are removed.

5. Remove brake shoe hold down pins and springs.
6. Spread shoes to clear wheel cylinder connecting links and remove shoes from backing plate. Push out adjusting hole covers.
7. Separate the brake shoes by removing adjusting screw and spring.
8. Remove parking brake lever from secondary brake shoe (rear only).

Inspection

1. Clean all dirt out of brake drum using care to avoid getting dirt into front wheel bearings. Inspect drums for roughness, scoring or out-of-round. Replace or recondition drums as necessary.
2. Inspect front wheel bearings and oil seal and replace any necessary parts.
3. Carefully pull lower edges of wheel cylinder boots

away from cylinders and note whether interior is wet with brake fluid. Excessive fluid at this point indicates leakage past piston cups requiring overhaul of wheel cylinder.

NOTE: A slight amount of fluid is nearly always present and acts as lubricant for the piston.

4. Check all brake flange plate attaching bolts to make sure they are tight. Clean all rust and dirt from shoe contact faces on flange plate, using fine emery cloth (fig. 5-17).

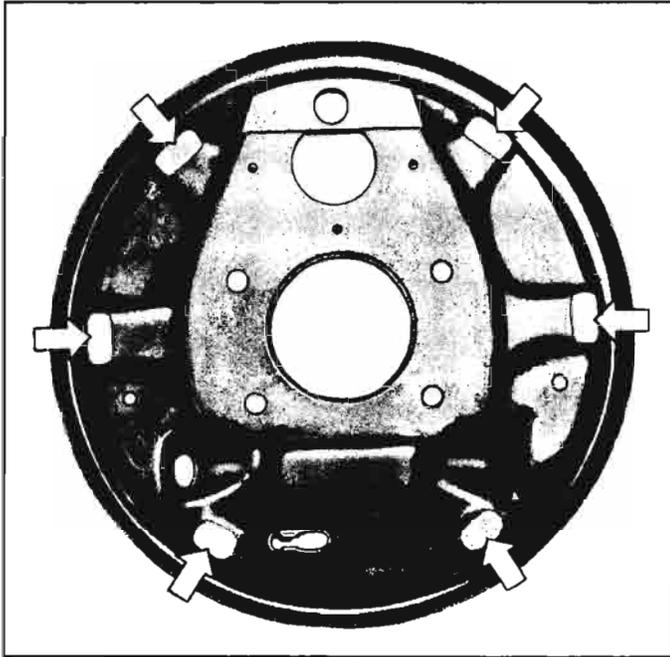


Fig. 5-17—Shoe Contact Surfaces on Flange Plate

Installation

1. Inspect new linings and make sure there are no nicks, burrs or bonding material on shoe edge where contact is made with brake flange plate.

NOTE: Keep hands clean while handling brake shoes. Do not permit oil or grease to come in contact with linings.

2. If working on rear brakes, lubricate parking brake cable.
3. On rear brakes only, lubricate fulcrum end of parking brake lever and the pin with Bendix or Delco brake lube or Lubriplate, then attach lever to secondary shoe with pivot pin, wave washer, and tru-arc retainer ring. Make sure that lever moves freely.
4. Lubricate threads and socket end of adjusting screw with Bendix or Delco brake lube or Lubriplate.
5. Connect brake shoes together with adjusting screw spring, then place adjusting screw, socket and nut in position.

CAUTION: The socket and adjusting screw must be adjacent to the primary shoe (front) on the left side and adjacent to the secondary shoe (rear) on the right side.

6. Attach brake shoes to brake flange plate with the hold down pin-spring-washer assemblies; at the same time engage shoes with wheel cylinder connecting links. The primary shoe (short lining) goes forward.
7. On rear brakes, connect parking brake lever to secondary shoe and install strut between lever and primary shoe as installation is made. The small extended loop on the strut anti-rattle spring is installed as illustrated in Figure 5-18.

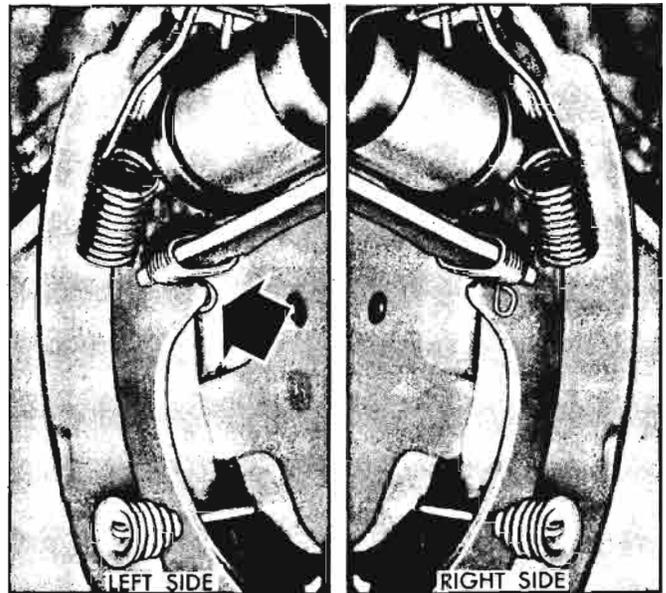


Fig. 5-18—Parking Brake Strut Anti-Rattle Spring

8. Install guide plate over anchor pin. Install springs on shoes and, using Tool J-8049 (fig. 5-19), position spring hooks over anchor pin. Springs should be replaced if they appear distorted or if strength is doubtful.

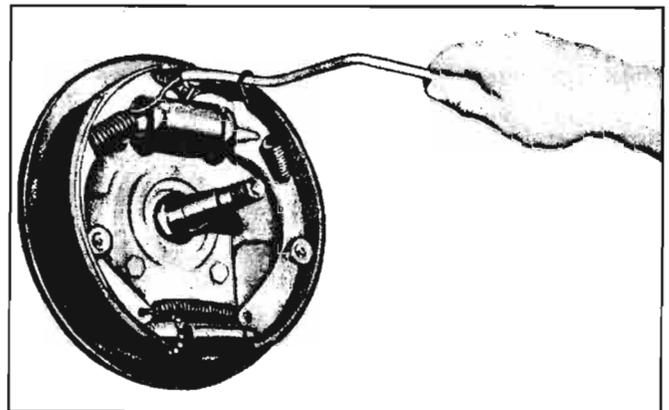


Fig. 5-19—Installing Brake Shoe Return Spring

9. Pry shoes away from backing plate and lubricate shoe contact surfaces with a thin coating of Bendix or Delco brake lube or Lubriplate. On rear wheels, sparingly apply this same lubricant where brake cable contacts flange plate.

CAUTION: Be careful to keep lubricant off facings.

10. Install brake drums. Whenever working on front brakes, lubricate and adjust wheel bearings. Install front and rear wheel and tire assemblies.
11. Adjust all brakes and brake cables as outlined under "Maintenance and Adjustments."
12. Thoroughly test operation of brakes.

MAIN CYLINDER

Removal (fig. 5-20)

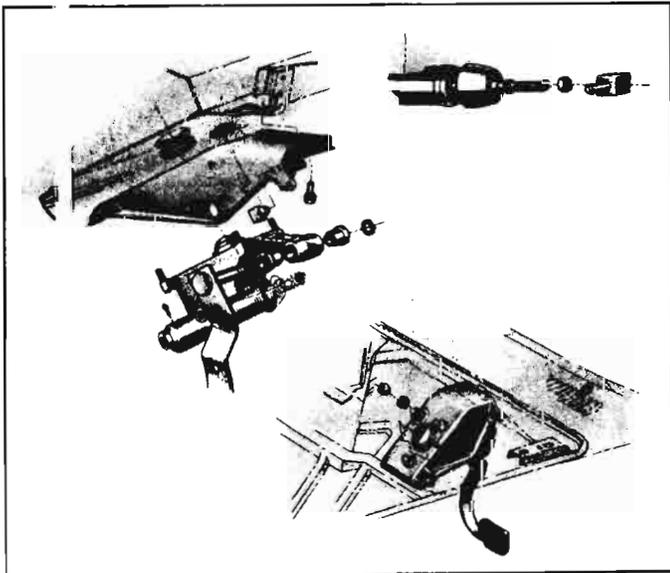


Fig. 5-20—Main Cylinder Assembly Removal

1. Disconnect hydraulic lines from outlet end of cylinder.
2. Remove pedal return spring.
3. Remove the three retaining nuts and lockwashers holding main cylinder to dash wall.
4. Remove cylinder-pedal assembly from car.

NOTE: Considerable caution will be required at this point to prevent staining the car interior with brake fluid. Protect floor mat, seats, etc., with suitable cover. It is further suggested that the lines removed from the main cylinder be capped if the wheel cylinders are to be disturbed.

Disassembly

1. Remove push rod assembly from boot end of main cylinder.
2. Remove boot from end of main cylinder.

3. Remove piston stop snap ring, secondary cup and piston from main cylinder.
4. Remove the primary cup, spring, valve assembly and valve seat.
5. Remove filler plug from top of main cylinder.

Inspection

1. Wash all parts in clean alcohol. Make sure that compensating port in main cylinder body and bleeder holes in piston are clean and open.

NOTE: Before washing parts, hands must be clean. Do not wash hands in gasoline or fuel oil before cleaning parts. Use soap and water to clean hands.

2. Inspect cylinder bore to make sure it is smooth.
3. Inspect primary and secondary cups, valve and valve seat for damage or swelling. Swelling of rubber parts is due to the use of improper brake fluid or washing parts in gasoline or kerosene.

NOTE: The primary cup has a brass support ring vulcanized in its base to prevent it from imbedding in the bleeder holes during braking action.

4. Check piston fit in cylinder bore (fig. 5-21). The clearance between piston and wall of the cylinder should be from .001"-.005".

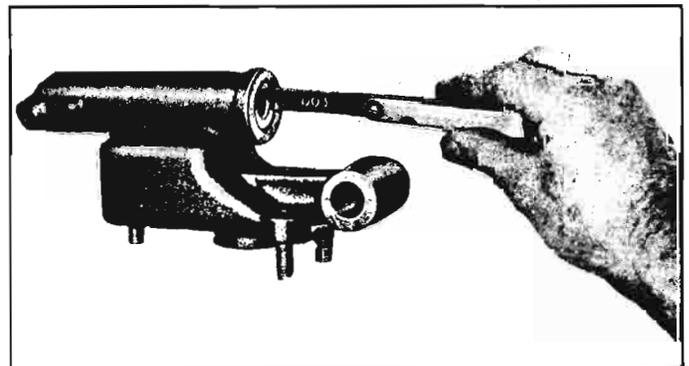


Fig. 5-21—Checking Main Cylinder Piston Fit

Assembly (fig. 5-22)

Whenever a hydraulic brake main cylinder is overhauled, care must be taken to reassemble the valve and seat correctly. Improper assembly of the check valve seat rubber washer will result in its distortion. When the check valve seat is distorted, there will be no check valve seal and there will be a loss of brake pedal travel, also, the pedal will have to be depressed or pumped one or more times before actual car braking occurs.

1. Install valve seat, valve assembly and spring into main cylinder.
2. Dip primary cup into clean brake fluid and install into main cylinder with the flat side toward push rod end. Make certain cup seats over end of spring.

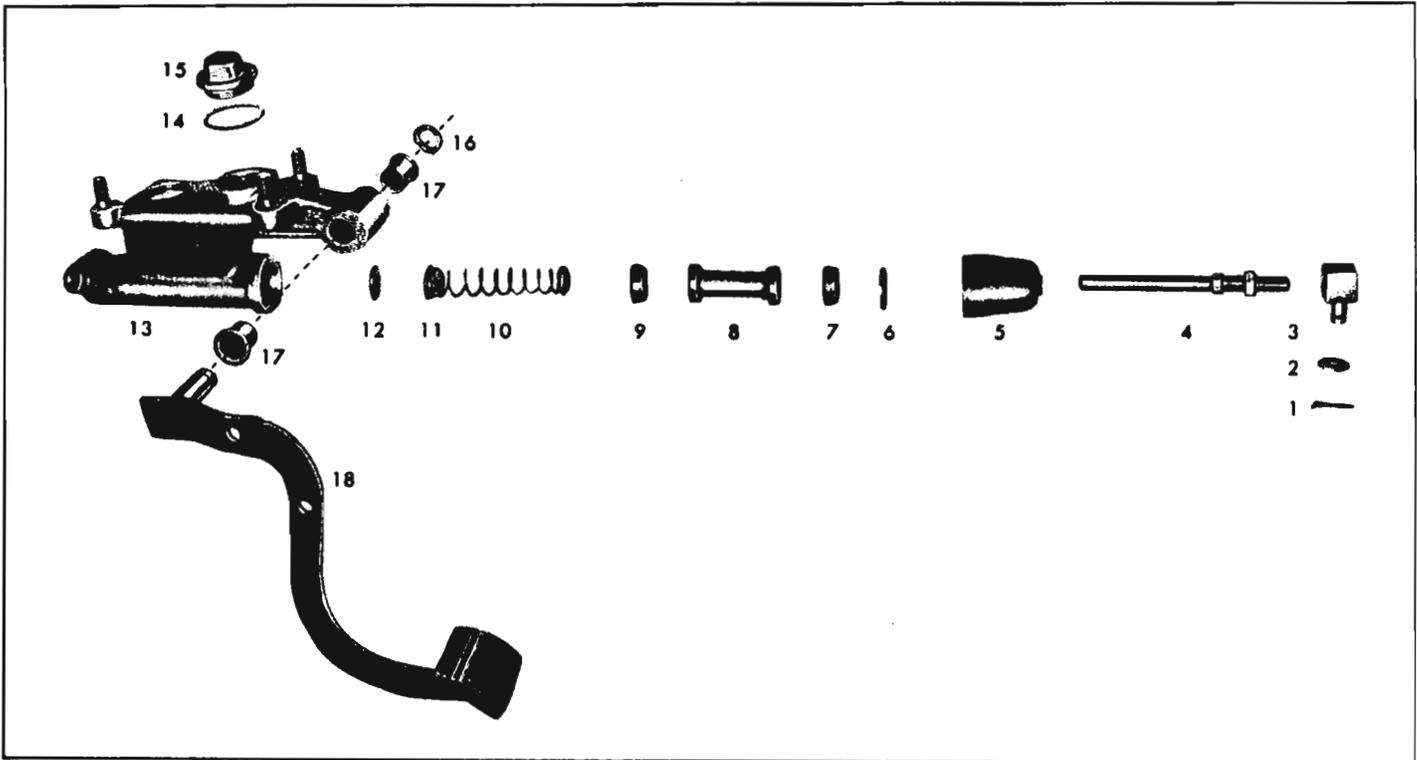


Fig. 5-22—Main Cylinder

- | | | | | | |
|----------------|--------------------------|------------------|-------------------|---------------------------|---------------------------|
| 1. Cotter Pin | 4. Push Rod | 7. Secondary Cup | 10. Return Spring | 13. Cylinder Body Casting | 16. Pedal Shaft Lock Ring |
| 2. Flat Washer | 5. Push Rod Boot | 8. Piston | 11. Valve | 14. Filler Cap Gasket | 17. Pedal Shaft Bushing |
| 3. Swivel | 6. Piston Stop Snap Ring | 9. Primary Cup | 12. Valve Seat | 15. Filler Cap | 18. Pedal Lever Assembly |

3. Dip secondary cup in clean brake fluid and install on piston.
4. Install secondary cup and piston in the body so that bleeder hole end of the piston will be toward the primary cup.
5. Install the piston stop snap ring.
6. Install the rubber push rod boot, making certain boot seals tightly on the cylinder body. This seal must be maintained to keep water and other foreign matter from entering the main cylinder.
7. Install the push rod, locknut and swivel. Connect swivel to the pedal lever and adjust as outlined under "Push Rod to Main Cylinder Clearance."

Installation

1. Install the main cylinder in place on the dash wall and tighten the mounting nuts securely.
2. Connect hydraulic brake lines to cylinder.
3. Refill main cylinder and bleed as follows:
 - a. Fill reservoir of main cylinder.
 - b. Depress brake pedal slowly to the floor and hold for 6-10 seconds.
 - c. Release slowly and wait for a period of 6-10 seconds. Repeat above two operations 4-6 times.
 - d. Replenish fluid supply in main cylinder.
 - e. Check operation of brakes.

NOTE: The preceding method is to be used when only the main cylinder lines have been disconnected.

WHEEL CYLINDER

Removal

1. Raise vehicle and place on jack stand.
2. Back off brake adjustment and remove drums.

NOTE: Front drums are non-demountable and are removed with front wheel hubs. Rear brake drums may be removed by removing rear wheel retaining nuts.
3. Disconnect wheel cylinder hose from fitting at flange plate.
4. Disconnect brake shoe retracting springs from anchor pin (fig. 5-16).
5. Remove anchor pin which holds wheel cylinder to flange plate and remove wheel cylinder.

Disassembly

1. Remove the cylinder boots.
2. Remove the pistons, rubber cups and spring.
3. Wash all parts in clean alcohol.

NOTE: Before washing parts, hands must be clean. Do not wash hands in gasoline or fuel oil before cleaning parts. Use soap and water to clean hands.

Inspection

1. Inspect cylinder bore for smoothness. A scored or damaged cylinder must be replaced.
2. Check rubber cups for damage or swelling. Replace the cups when necessary. Improper brake fluid will cause the cups to swell as much as 40 per cent.
3. Check fit of the piston in the cylinder bore, using a feeler gauge (fig. 5-23). This clearance should be from .002"-.004". If clearance exceeds .004", replace cylinder.

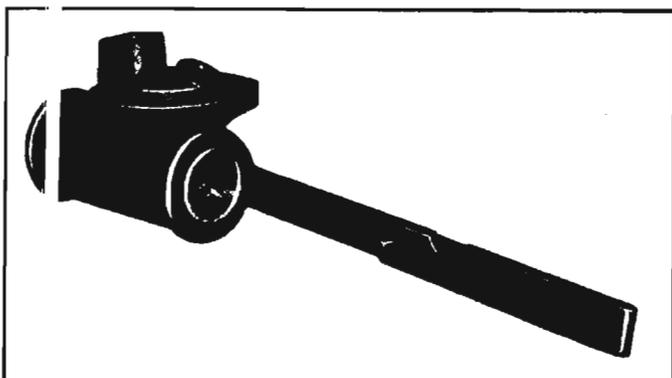


Fig. 5-23—Checking Wheel Cylinder Piston Fit

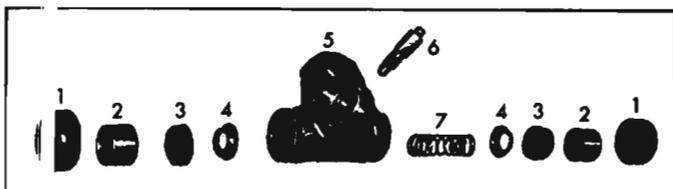


Fig. 5-24—Wheel Cylinder

- | | |
|------------------------|------------------|
| 1. Push Rod Boot | 5. Housing |
| 2. Piston | 6. Bleeder Valve |
| 3. Piston Cup | 7. Spring |
| 4. Piston Cup Expander | |

Assembly (fig. 5-24)

1. Moisten cylinder bore, pistons and rubber cups with brake fluid before assembly.
2. Place a boot over one end of cylinder.
3. Insert a piston with flat side toward open end of cylinder.
4. Insert a rubber cup with flat side against piston.
5. Insert spring with expanders securely connected and follow with remaining parts in the reverse order of foregoing assembly procedure.

Installation

1. **FRONT WHEELS**—Place lock washer on anchor pin and pass pin through hole provided in wheel cylinder casting. Position cylinder on flange plate and turn anchor pin into the tapped hole in the spindle support. Torque pin to 60-85 foot pounds (fig. 5-25) and lock by peening over washer tabs (fig. 5-26).

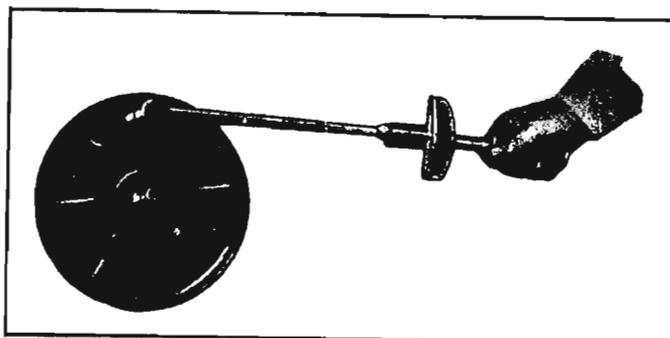


Fig. 5-25—Preparing to Torque Anchor Pin

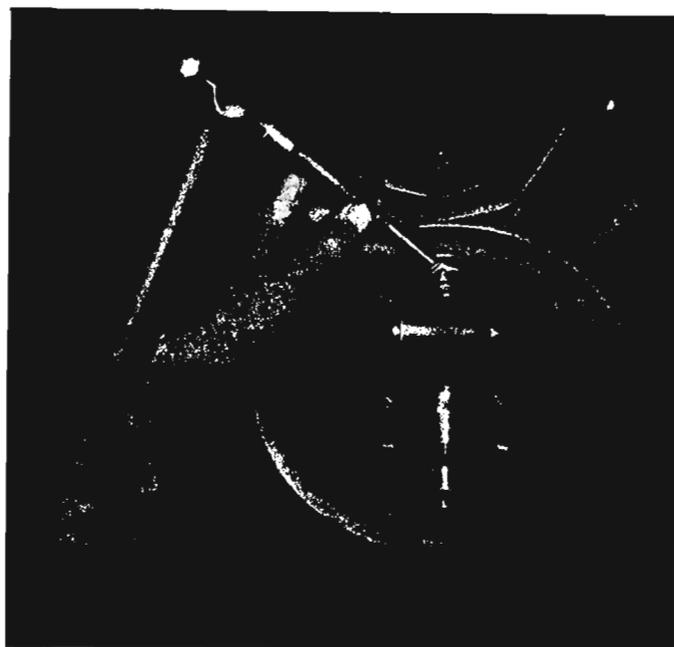


Fig. 5-26—Anchor Pin Lock

REAR WHEELS—Pass anchor pin through cylinder casting and flange plate. Secure by placing lock washer and nut on back (inboard) side of flange plate and torque to 100-125 foot pounds.

2. **FRONT AND REAR**—Replace the push rods and the brake shoe retracting springs.
3. Connect the hose to the wheel cylinder.
4. Install the rear brake drum and wheel.
5. Install front hub and drum and adjust wheel bearings as outlined in Section 3.
6. Bleed all brake lines.
7. Adjust and test brakes as outlined previously in this section.

BRAKE DRUMS

Front brake drums are the non-demountable type; that is, they cannot be removed without removing the hub. Whenever this type drum is removed, wheel bearings must be adjusted as outlined in Section 3.

Rear brake drums are demountable, and may be removed without removing the axle shaft.

Removal

1. Jack up vehicle, remove wheels and relieve or "back off" brake shoe running clearance. (See "Hydraulic Brake Adjustment.")
2. Remove front hub and brake drum assembly.
3. Remove brake drum from hub, as outlined in Section 3.
4. Remove rear brake drum from flange of axle shaft.

Inspecting and Reconditioning

Whenever brake drums are removed they should be thoroughly cleaned and inspected for cracks, scores, deep grooves, and roundness. Any of these conditions must be corrected since they can impair the efficiency of brake operation and also can cause premature failure of other parts.

Smooth up any slight scores by polishing with fine emery cloth. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to rebores in order to true up the braking surface.

An out-of-round drum makes accurate brake shoe adjustment impossible and is likely to cause excessive wear of other parts of brake mechanism due to its eccentric action.

A drum that is more than .010" out-of-round on the diameter is unfit for service and should be rebored. Out-of-round, as well as taper and wear can be accurately measured with an inside micrometer fitted with proper extension rods.

If drum is to be rebored for use with standard size brake facings which are worn very little, only enough metal should be removed to obtain a true smooth braking surface.

If drum has to be rebored more than .010" over the standard diameter, it should be rebored to .060" oversize and the brake facing should be replaced with .030" oversize facings.

A brake drum must not be rebored more than .060" over the maximum standard diameter, since removal of more metal will affect dissipation of heat and may cause distortion of drum. Chevrolet brake facing is not furnished larger than .030" oversize and this will not work efficiently in drums bored to more than .060" oversize.

Brake drums may be refinished either by turning or grinding. Best brake performance is obtained by turning drums with a very fine feed. To insure maximum lining life, the refinished braking surface must be smooth and free from chatter or tool marks, and run-out must not exceed .005" total indicator reading.

Cleaning

New brake drums in parts stock are given a light coating of rust proofing oil to prevent the formation of rust on the critical braking surfaces during the time that the drums are in storage.

This rust proofing oil must be carefully removed before the drum is placed in service to prevent any of this oil from getting on the brake shoe facings, which might cause an extreme brake grab condition.

It is recommended that a suitable volatile, non-toxic, greaseless type solvent be used to clean the oil from the braking surface of the new brake drums before they are placed in service to insure the cleanest possible surface.

Gasoline or Kerosene should not be used as there is danger that a portion of the diluted oily substance may be left on the braking surface and later cause difficulty.

Installation

1. Make sure mating surfaces of hub and drum are clean and smooth and assemble front drum as outlined in Section 3.
2. On front, install drum and hub assembly to wheel spindle and adjust bearings as outlined in Section 3.
3. On rear, assemble drum over axle shaft studs.
4. Replace wheel assembly, adjust brakes and lower vehicle to floor.

SPECIFICATIONS

For Brake Specifications, see Section 12.

CORVAIR 95 AND GREENBRIER—1200 SERIES

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GENERAL DESCRIPTION

The braking system used on the Corvaire 1200 series vehicles is basically of the same type as that used on the 500, 700 and 900 models in that both are duo-servo and hydraulically operated with cable operated parking brakes actuating both rear service brakes.

The size and capacity of the components used on the 1200 series vehicles are, in most cases increased over like parts used in 500, 700 and 900 cars in order

to meet the duty requirements of the Commercial and Sportswagon.

The brakes are eleven inches in diameter with a lining width of two inches, resulting in a total area of 167 square inches of braking surface.

Service operations are generally the same for the 1200 series as for the 500, 700 and 900 series, except as noted in the following pages.

MAINTENANCE AND ADJUSTMENTS

MAINTENANCE

The maintenance information for the 500, 700 and 900 may be applied to the Greenbrier and Corvaire 95 as well.

ADJUSTMENTS

Hydraulic Brake Adjustment

The same procedure used for 500, 700 and 900 may be used except that running clearance for the Greenbrier and Corvaire 95 is obtained by backing off adjustment seven notches on all wheels.

Parking Brake

With service brakes properly adjusted as outlined in this section, adjust parking brake as described under Parking Brake Adjustment—Corvaire 500, 700 and 900.

Push Rod to Main Cylinder Piston Clearance

For proper operation of brakes, a definite clearance must exist between the pedal push rod and the main cylinder piston. This clearance is obtained by rotating the eccentric push rod pivot bolt and may be adjusted as follows:

1. Loosen push rod pivot bolt retaining nut.
2. Turn pivot bolt until the projection on bolt head is at either top or bottom position (fig. 5-27).

3. Turn pivot bolt in either direction until a pedal lever free play of $\frac{1}{8}$ " is obtained. Free play may

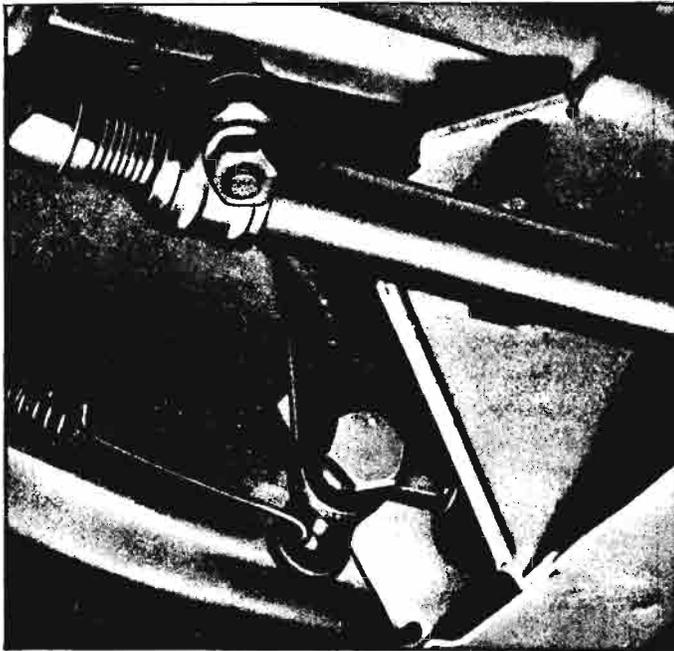


Fig. 5-27—Position of Bolt Head Projection

- be measured at bottom of pedal post (fig. 5-28).
4. Tighten pivot bolt lock nut securely.

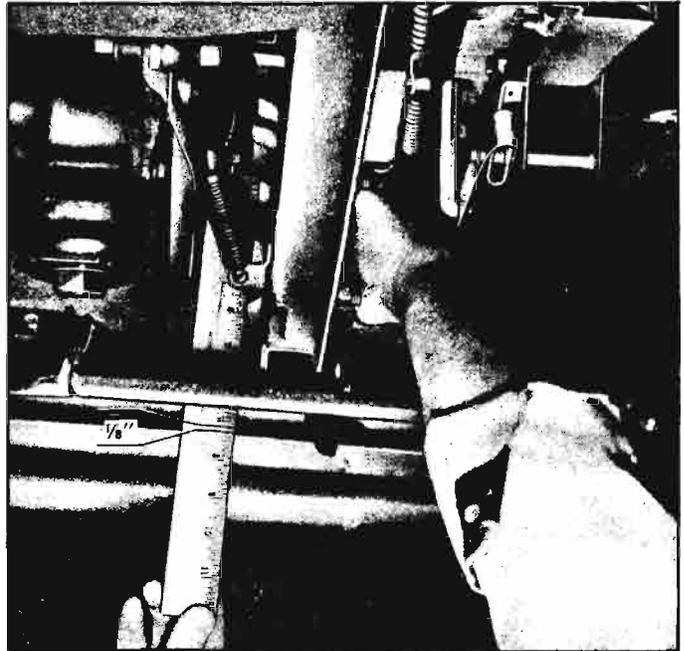


Fig. 5-28—Measuring Pedal Free Play

SERVICE OPERATIONS

PARKING BRAKE LEVER

Removal (fig. 5-29)

1. With brake released, separate cable from lever by removing cable clevis pin.
2. Remove bolts retaining lever assembly to mounting bracket and remove assembly from vehicle.

Installation

1. Position lever assembly on mounting bracket and install bolts and lock washers.
2. Lubricate clevis inner surfaces and cable ball with lubriplate and position over lever.
3. Lightly coat clevis pin with lubriplate and install through clevis and lever; secure with cotter pin.

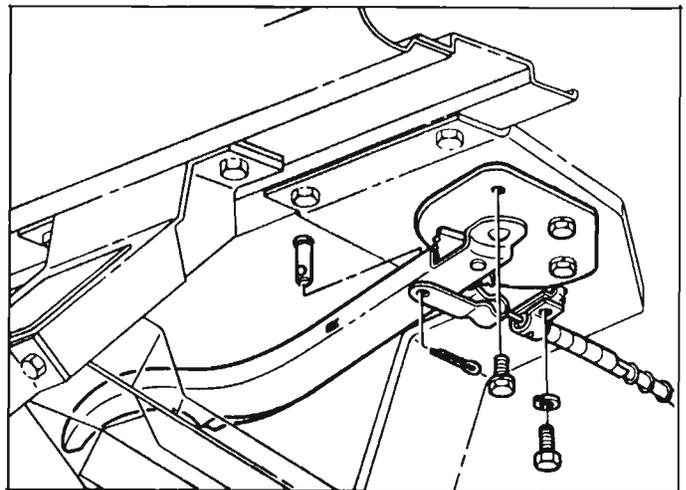


Fig. 5-29—Parking Brake Lever

FORWARD CABLE

Removal

1. With brake released, separate cable from lever by removing cable clevis pin. Remove screw from clamp located on lever bracket.
2. Raise vehicle and remove screws holding four retaining clamps to inboard side of left underbody rail.
3. Remove anti-rattle spring and idler linkage return

spring. Separate cable from idler linkage by removing rear nut from cable stud.

4. Withdraw cable from vehicle.
5. Remove retaining clamps from cable conduit.

Installation

1. Install retaining clamps on cable conduit. Note that clamps with protrusion or "lug" are used at

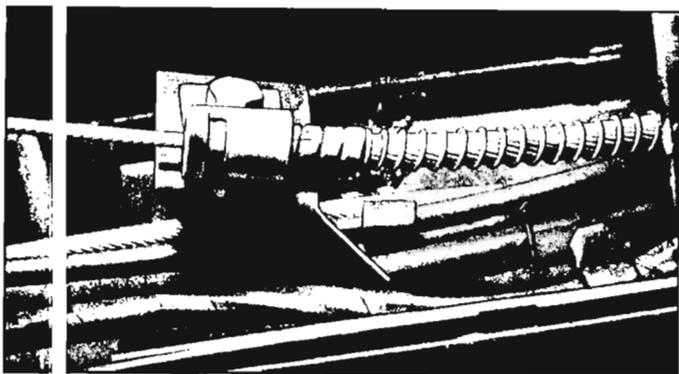


Fig. 5-30—Cable End Clamp

each end of cable conduit and must be installed with indented portion engaged in depression in conduit end (Fig. 5-30).

2. Position rear clamp on mounting bracket with clamp lug engaged in provided hole. Install screw and washer; torque to 45-60 inch lbs.
3. Position and install three intermediate clamps.
4. Thread forward end of cable assembly up through shoe pan opening.
5. Thread check nut on cable end stud and insert stud in idler linkage clevis. Install retaining nut on end stud. Adjust position of nuts so that distance between end of stud and center of idler linkage clevis pin is approximately 1½". Leave nuts "finger tight" (Fig. 5-31).

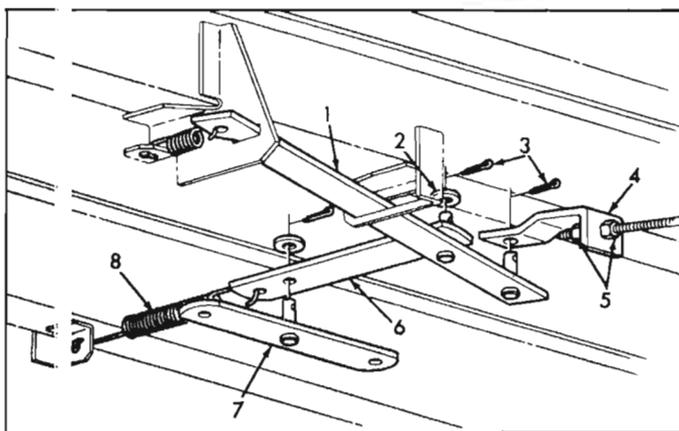


Fig. 5-31—Equalizer Assembly

- | | |
|-----------------------------|-----------------------|
| 1. Lever Assembly | 6. Link |
| 2. Washer | 7. Equalizer Assembly |
| 3. Clevis Pin | 8. Return Spring |
| 4. Clevis | 9. Anti-Rattle Spring |
| 5. Retaining and Check Nuts | |

6. Lower vehicle. Lubricate inner surfaces of clevis and cable ball with lubriplate and position clevis on hand lever.
7. Lightly coat clevis pin with lubriplate and insert through clevis and lever; secure with cotter pin.
8. Position end clamp on lever mounting bracket, engaging clamp lug in provided hole; secure with

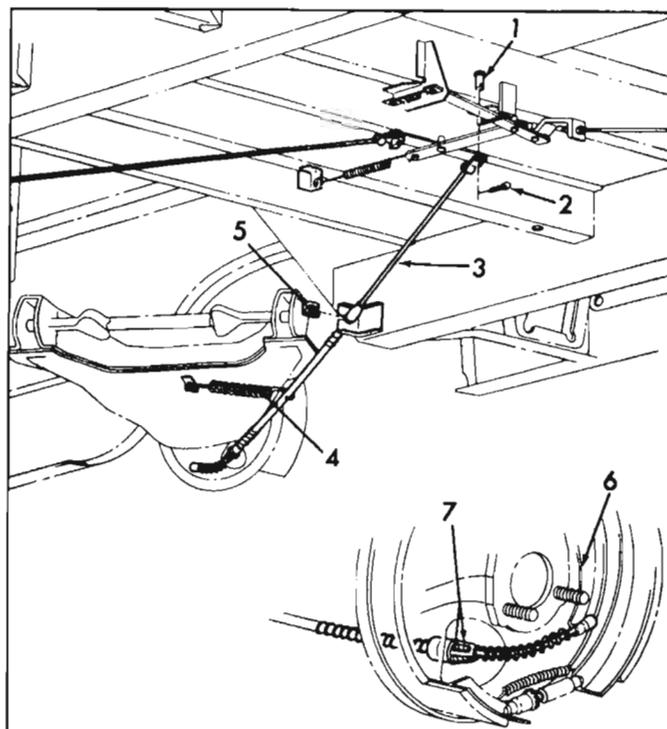


Fig. 5-32—Rear Cable Assembly

- | | |
|-------------------|----------------------------------|
| 1. Clevis Pin | 5. Retainer |
| 2. Cotter Pin | 6. Parking Brake Actuating Lever |
| 3. Cable Assembly | 7. Cable Locking Fingers |
| 4. Assist Spring | |

screw and washer. Torque screw to 45-60 inch lbs.

9. Install anti-rattle and return springs and perform *Parking Brake-Adjustment* as outlined in this section.

REAR PARKING BRAKE CABLE (Fig. 5-32)

This vehicle uses a separate rear cable for each brake. As both sides are identical, the following outline deals with the servicing of one cable only.

Removal

1. Release parking brake and raise vehicle from floor with rear wheels free to turn.
2. From under vehicle, remove assist spring and conduit retainer clip. Separate clevis from equalizer assembly by removing clevis pin.
3. Remove wheel, brake drum and axle bearing retainer bolts and pull axle flange out far enough to gain access to brake assembly.
4. Pry actuating lever from secondary brake shoe as explained under *Service Operations-Rear Brake Cable*, in the 500, 700 and 900 part of this section.
5. Compress conduit locking fingers at flange plate entry hole and withdraw cable from brake assembly.

Installation

1. Pass end of cable and conduit tip through flange plate entry hole, making sure that conduit locking fingers all expand fully.
2. Compress retaining spring and position cable in "U" shaped actuating lever junction.
3. Replace bearing retainer, retainer bolts, universal joint "U" bolts, brake drum and wheel.
4. Pass die cast conduit tip through support bracket and secure with retainer clip.
5. Position rubber boot over conduit tip, carefully indexing bead of boot in groove provided in tip casting.
6. Attach clevis to equalizer assembly with cotter pin.
7. Proceed as outlined under *Parking Brake—Adjustment*.

SERVICE BRAKES

Brake Shoes

Brake Drums

Wheel Cylinders

Although larger in size, the service brakes used on this vehicle are basically of the same design as those used on the Corvaire passenger car and are serviced in much the same manner. For disassembly, inspection and assembly procedures used for service of brake shoes, drums and wheel cylinders refer to appropriate heading under Corvaire—Service Operations.

Note however, that rear wheel cylinders are retained by two capscrews which pass through the flange plate; thus removal of anchor pin is not necessary for removal of wheel cylinder. Upon installation of rear wheel cylinders, torque retaining screws 11-19 ft. lbs. Also note that front brake drums are removed in the same way as the rear drums.

Consult specifications section for component dimensions.

MAIN CYLINDER (Fig. 5-33)

Removal

1. From under vehicle, remove hydraulic line from main cylinder outlet.
2. Remove four capscrews and washers retaining main cylinder to outrigger.
3. Remove main cylinder from vehicle.

Disassembly

1. Place main cylinder assembly in a vise; push rod end up.
2. Remove push rod boot and flange gasket.
3. Remove piston stop snap ring and piston from main cylinder.
4. Remove the primary cup, spring, valve assembly and valve seat.

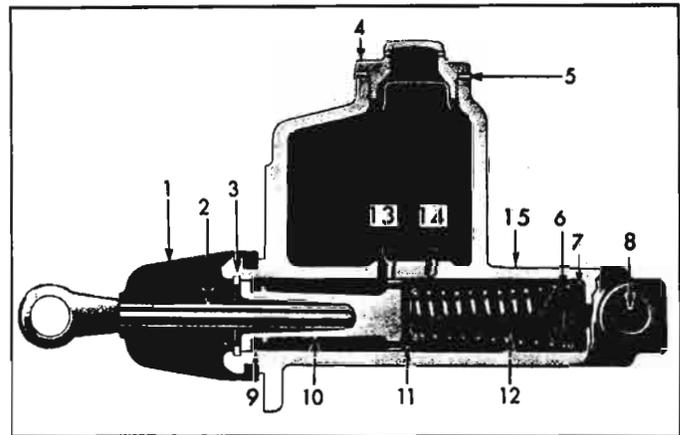


Fig. 5-33—Cross Section of Main Cylinder

- | | |
|--------------------------|--------------------------|
| 1. Push Rod Boot | 9. Secondary Piston Cup |
| 2. Push Rod | 10. Piston |
| 3. Piston Retaining Ring | 11. Primary Piston Cup |
| 4. Filler Cap | 12. Piston Return Spring |
| 5. Filler Cap Gasket | 13. Fluid Inlet |
| 6. Check Valve | 14. Compensating Port |
| 7. Check Valve Seat | 15. Cylinder Casting |
| 8. Fluid Outlet | |

5. Remove filler plug from top of main cylinder.
6. Remove secondary cup from piston.

Inspection

1. Wash all parts in clean alcohol. Make sure that compensating port in main cylinder body and bleeder holes in piston are clean and open.

NOTE: Before washing parts, hands must be clean. Do not wash hands in gasoline or fuel oil before cleaning parts. Use soap and water to clean hands.

2. Inspect cylinder bore to make sure it is smooth.
3. Inspect primary and secondary cups, valve and valve seat for damage or swelling. Swelling of rubber parts is due to the use of contaminated brake fluid or washing parts in gasoline or kerosene.

NOTE: The primary cup has a brass support ring vulcanized in its base to prevent it from imbedding in the bleeder holes during braking action.

4. Check piston fit in cylinder bore (fig. 5-21). The clearance between piston and wall of the cylinder should be from .001"-.005".

Assembly

Whenever a hydraulic brake main cylinder is overhauled, care must be taken to reassemble the valve and seat correctly. Improper assembly of the check valve seat rubber washer will result in its distortion. When the check valve seat is distorted, there will be no check valve seal and there will be a loss of brake pedal travel, also, the pedal will have to be depressed

or pumped one or more times before actual car braking occurs.

1. Install valve seat, valve assembly and spring into main cylinder.
2. Dip primary cup into clean brake fluid and install into main cylinder with the flat side toward push rod end. Make certain cup seats over end of spring.
3. Dip secondary cup in clean brake fluid and install on piston.
4. Install secondary cup and piston in the body so that bleeder hole end of the piston will be toward the primary cup.
5. Install the piston stop snap ring.
6. Replace filler plug.

Installation

1. Install the rubber push rod boot, making certain boot seals tightly on the cylinder body. This seal must be maintained to keep water and other foreign matter from entering the main cylinder.
2. Install main cylinder on outrigger. Insert push rod in boot and secure cylinder assembly with mounting screws and washers. Torque screws to 14-22 ft. lbs.
3. Connect hydraulic line to cylinder outlet.

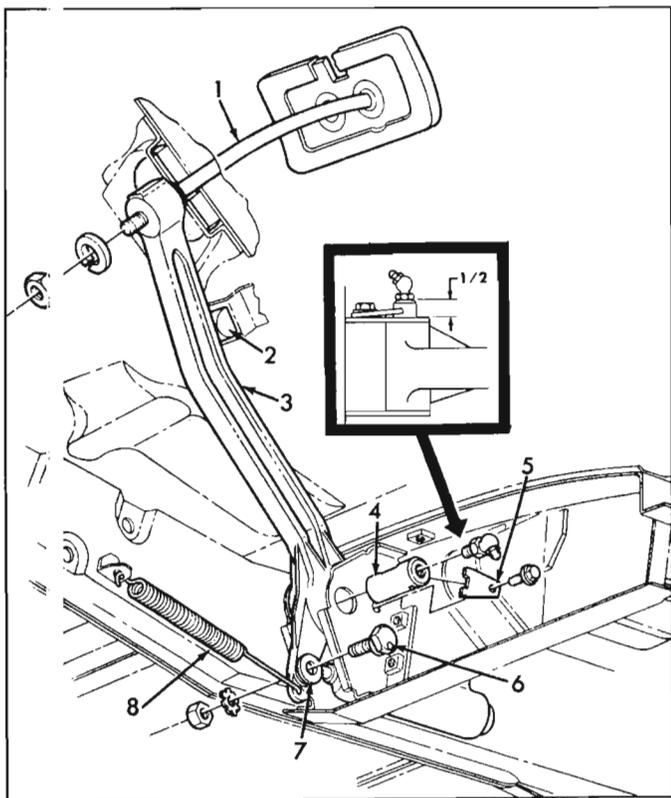


Fig. 5-34—Brake Pedal

- | | |
|-------------------------|-----------------------------|
| 1. Pedal—Upper Assembly | 5. Pivot Pin Retaining Clip |
| 2. Rebound Bumper | 6. Eccentric Adjusting Bolt |
| 3. Pedal Arm | 7. Main Cylinder Push Rod |
| 4. Pivot Pin | 8. Return Spring |

4. Refill main cylinder and bleed as follows:
 - a. Fill reservoir of main cylinder.
 - b. Depress brake pedal slowly to the floor and hold for 6-10 seconds.
 - c. Release slowly and wait for a period of 6-10 seconds. Repeat operations B and C 4-6 times.
 - d. Replenish fluid supply in main cylinder. (Fill to $\frac{1}{2}$ " below top of filler neck).
 - e. Check operation of brakes.

NOTE: The preceding method is to be used when only the main cylinder line has been disconnected.

BRAKE PEDAL (Fig. 5-34)

Removal

1. Remove pedal return spring.
2. Remove nut washer retaining upper pedal assembly to lower pedal assembly. (Fig. 5-35). Tap end

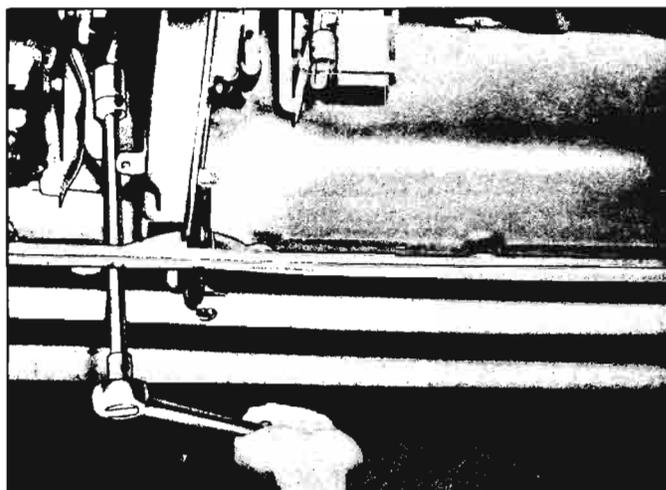


Fig. 5-35—Brake Pedal Removal

of upper pedal post with soft hammer to free it from lower pedal assembly arm.

3. Remove screw retaining pedal pivot pin clip and remove clip.
4. Tap out pedal pivot pin and remove pedal arm—main cylinder piston push rod assembly from vehicle.
5. Separate main cylinder piston push rod from pedal by removing push rod pivot eccentric bolt.

Inspection

With pedal assembly dismantled, carefully inspect all parts for damage and wear. Pay particular attention to the bearing surfaces of the pedal arm, the main cylinder push rod and the pivot eccentric bolt. If push rod or pivot bolt are worn, they should be replaced.

The pedal arm pivot bore is equipped with bushings which may be replaced, if worn excessively, as follows:

1. Clamp pedal arm in vise.
2. Remove old bushings with Tools J-5822 and J-2619 (Fig. 5-36).

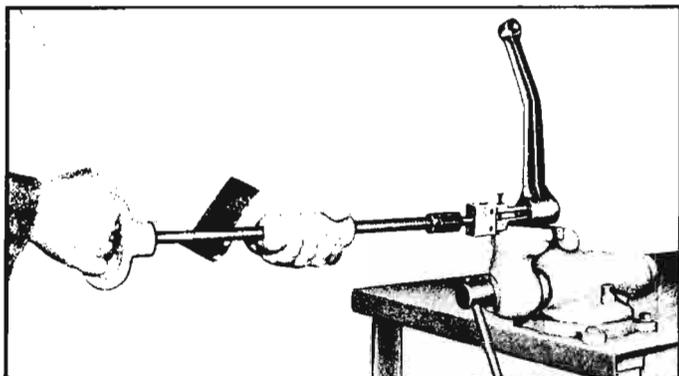


Fig. 5-36—Removing Bushings with J-5822 and J-2619

3. Lightly coat new bushings with lubriplate and press into pivot hole as far as possible with Tool J-8524-2 (Fig. 5-37), then seat bushings to depth shown in Figure 5-38 using socket or other similar

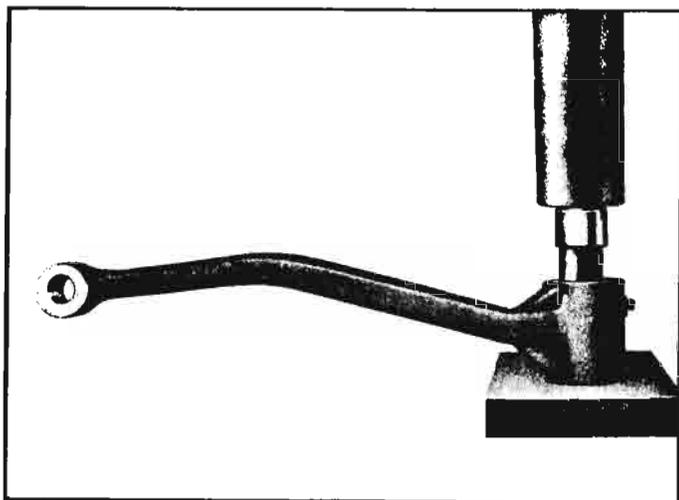


Fig. 5-37—Installing Bushings with J-8524-2

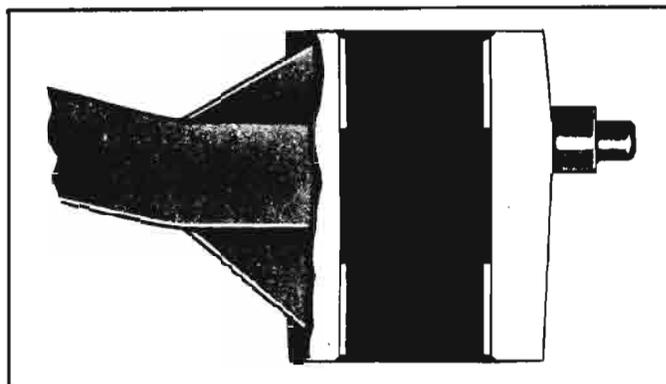


Fig. 5-38—Final Position of Pedal Bushing

tool with an outside diameter of approximately $1\frac{5}{16}$ ".

4. Remove lubrication fitting from pivot pin and clean pin in solvent. Blow out grease passages with compressed air. Replace pin if wear of outer diameter is excessive.

Installation

1. Lightly coat inside of pedal arm pivot with lubricant and position pedal arm in outrigger bracket.
2. Align pivot hole with holes in bracket and insert pivot pin with lube fitting hole pointing to left side of vehicle.
3. Engage pivot pin retaining clip in notch provided in pivot pin and secure clip by threading capscrew into tapped hole provided in bracket. Install cation fitting and lubricate pin with chassis grease.
4. Insert main cylinder piston push rod into boot and assemble to pedal arm with pivot eccentric bolt. Install washer and thread nut on eccentric bolt finger tight.
5. Install pedal return spring.
6. Insert upper pedal post into eye of lower pedal arm; align pedal pad to horizontal position and secure post to arm with washer and nut.
7. Perform pedal free play adjustment as outlined in this section under *Adjustments—Push Rod to Main Cylinder Piston Clearance*.

SPECIFICATIONS

For Corvair 95 and Greenbrier Specifications, See Section 12.

TROUBLES AND REMEDIES

BRAKE SYSTEM

Symptom and Probable Cause	Probable Remedy
Pedal Spongy	
a. Air in brake lines.	a. Bleed brakes.
All Brakes Drag	
a. Mineral oil in system.	a. Flush entire brake system and replace all rubber parts.
b. Improper push rod-to-main cylinder piston clearance.	b. Adjust clearance.
c. Compensating port in main cylinder restricted.	c. Overhaul main cylinder.
One Brake Drags	
a. Loose or damaged wheel bearings.	a. Adjust or replace wheel bearings.
b. Weak, broken or unhooked brake shoe return spring.	b. Replace retractor spring.
c. Insufficient running clearance between brake shoes and drum.	c. Correctly adjust brakes.
d. Incorrect parking brake adjustment.	d. Readjust parking brake at equalizer.
e. Damaged or frozen parking brake cable.	e. Free-up or replace brake cable assy.
Excessive Pedal Travel	
a. Normal lining wear or improper shoe adjustment.	a. Adjust brakes.
b. Fluid low in main cylinder.	b. Fill main cylinder as outlined under "Main Cylinder-Installation."
Brake Pedal Applies Brake but Pedal Gradually Goes to Floor Board	
a. External leaks.	a. Check main cylinder, lines and wheel cylinder for leaks and make necessary repairs.
b. Main cylinder leaks past primary cup.	b. Overhaul main cylinder.
Brakes Uneven	
a. Grease on linings.	a. Clean brake mechanism; replace lining and correct cause of grease getting on lining.
b. Tires improperly inflated.	b. Inflate tires to correct pressure.
c. Front suspension faulty.	c. thoroughly check and adjust all front suspension components.
Excessive Pedal Pressure Required, Poor Brakes	
a. Grease, mud or water on linings.	a. Remove drums—clean and dry linings or replace.
b. Full area of linings not contacting drums.	b. Free up shoe linkage, sand linings or replace shoes.
c. Scored brake drums.	c. Turn drums and install new linings.
Brake Pedal Hop or Chatter	
a. Brake drums warped.	a. Replace drums.

SPECIAL TOOLS

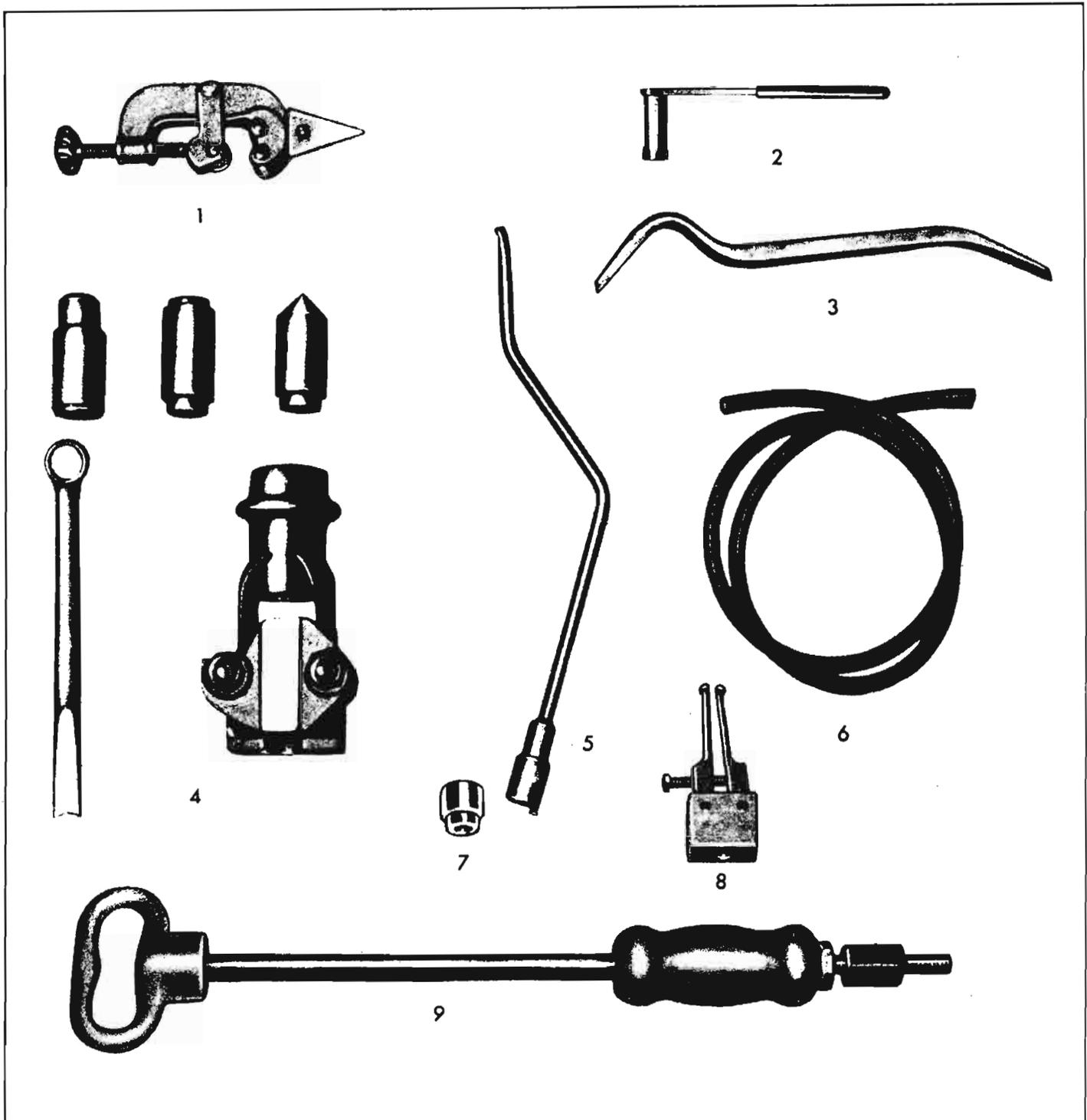


Fig. 5-39—Special Tools

- 1. J-8113 (KMO-3A) Tubing Cutter
- 2. J-7647 Bleeder Valve Wrench
- 3. J-8363 Brake Adjusting Tool

- 4. J-8051 Double Flaring Tool Set
- 5. J-8049 (KMO-526A) Brake Spring Tool
- 6. J-628 (J-747) Brake Bleeding Tube

- 7. J-8524-2 Pedal Bushing Driver
- 8. J-5822—Pedal Bushing Remover
- 9. J-2619—Slide Hammer