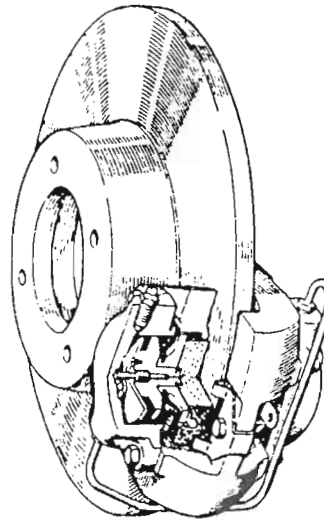


Servicing Dunlop Disc Brakes 219

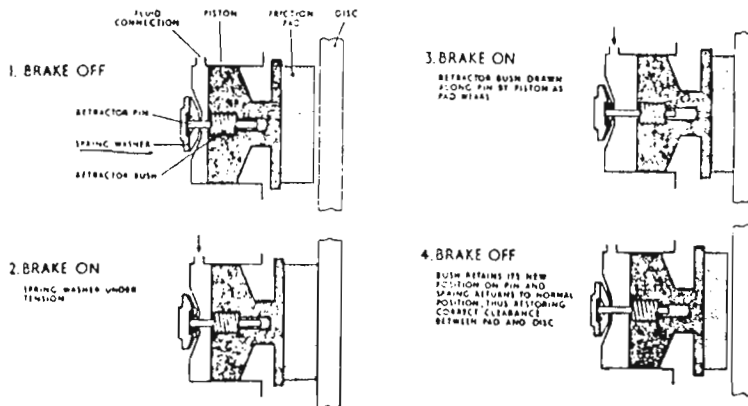
Install new pads and secure them with the new nuts supplied with the package. If there is insufficient clearance to remove the pads, the clamp lever must be released by removing the pivot pin. Extract the cotter pin and, if the pivot pin is tight in the case, insert a bolt into the tapped hole in the end of the pin. After installing new pads, reassemble all parts in the order shown. Finally, adjust as previously described to provide the correct clearance.

DUNLOP DISC BRAKES

The front wheel brake units consist of a hub mounted disc rotating with the wheel and a braking unit rigidly attached to each suspension member. The rear brake units consist of a caliper which straddles the disc and houses a pair of rectangular friction pad assemblies, each consisting of a pad and a securing plate. These assemblies locate between a keeper plate bolted to the caliper bridge and two support plates accommodated in slots in the caliper jaws. Cylinder blocks, bolted to the outer faces of the caliper, accommodate piston assemblies which are keyed to the friction pads. A dowel formed on the outer face of each piston locates in the bore of the backing plate with an integral boss grooved to accommodate the collar of a flexible rubber dust seal. The outer ring of the seal engages a groove around the block face and so protects the assembly from intrusion of moisture and foreign matter. A piston seal is located between the piston inner face and a plate secured by pen-locked screws.



Sectioned view of the Dunlop disc brake assembly.

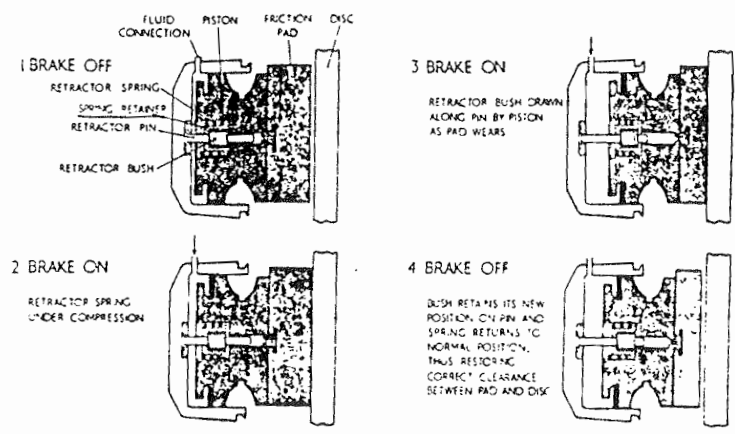


Sectioned view of the Dunlop early type brake adjuster mechanism. The operation is explained in the text.

*THIS TYPE IS CALLED SERIES I AND IS AS NO 60 OF MY 2506TF 42/103.  
 IT FEATURES A SPEC. WASHER AS THE RETRACTOR -*

4.23.NL186-2

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Sectioned view of the Dunlop later type automatic brake adjuster mechanism. The operation is discussed in the text. TYPE TWO R2 SERIES II HAS A COIL SPRING AS THE RETRACTOR MECHANISM

**AUTOMATIC ADJUSTER MECHANISM (EARLY TYPE)**

A counterbore in the piston accommodates a retractor bushing, which tightly grips the stem of a retractor pin. This pin forms part of an assembly which is peened into the base of the cylinder bore. The assembly consists of a retractor stop bushing, two spring washers, a dished cap, and the retractor pin. It functions as a return spring and maintains a working clearance of approximately 0.005"-0.010" (0.20-0.25 mm.) between the pads and the disc throughout the life of the pads.

**AUTOMATIC ADJUSTER MECHANISM (LATER TYPE)**

The retractor unit consists of the retractor pin pressed into the cylinder block and the retractor bushing, washer, return spring, and spring retainer peened into the piston.

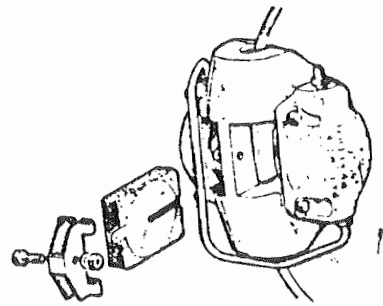
When the brakes are applied, the piston moves the friction pad towards the disc. The retractor bushing grips the pin holding the spring retainer and the return spring against the washer. The piston, in moving the distance between the pad and disc, compresses the return spring and, when the brakes are released, the return spring expands maintaining an equal clearance between the pad and disc.

When the pad wears and has not made contact with the disc by the time the washer has fully compressed the return spring, the washer will move the retractor bushing down the pin until the pad contacts the disc. The retractor bushing stops in this new position and, when the brakes are re-

leased, the return spring expands, allowing the pads to maintain the normal clearance of about 0.005"-0.010" (0.20-0.25 mm.) between the friction part and the disc.

**REPLACING THE FRICTION PADS**

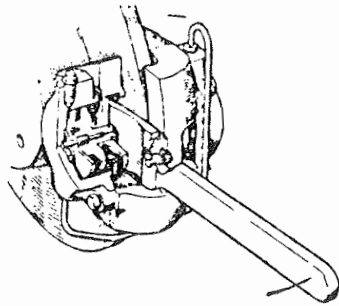
To remove the friction pads, unscrew the nut from the bolt holding the friction pad retainer to the caliper, and then take out the bolt. Withdraw the pad retainer. Insert a hooked tool through the hole in the metal tag attached to the friction pad and withdraw it by pulling on the tab.



The friction pads can be removed after taking out the friction pad retainer.

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A special pry is available to force the pistons to the bottom of the bores in order to install the thicker pads. Check the master cylinder reservoir before prying the pistons back as the fluid will overflow if the reservoir is too full.

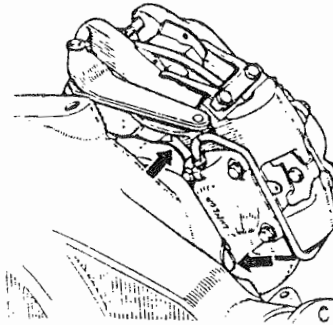
Before a new pad can be installed, the pistons must be forced back into the cylinder bores by means of the forked tool. **CAUTION:** Make sure that the master cylinder reservoir is not too full or it will overflow. Some mechanics open the bleeder valve to keep the fluid from returning to the master cylinder but it is then necessary to bleed the system if the valve is opened.

Insert the new friction pads into the caliper, ensuring that the slot in the metal plate attached to each pad engages the button in the center of the piston. Finally, reinstall the friction pad retainer and secure it with the bolt and nut. Apply the brake pedal a few times to operate the self-adjusting mechanism. When all the pads have been installed, add fluid to the master cylinder reservoir. It is not necessary to bleed the system unless the bleeder valve was opened.

### REMOVING A FRONT CALIPER

Jack up the front end, remove the wheels, and disconnect the fluid pipe. Plug the hole in the caliper to keep out dirt. Remove the caliper, noting the number of round shims that are installed.

To install the unit, check the gap between each side of the caliper and the disc, both at the top and bottom of the caliper. The difference must not exceed 0.010" (0.25 mm), and round shims should be installed between the caliper and the mounting plate to centralize the caliper body. Use wire to lock the bolts in place. Connect the bridge pipe. **CAUTION:** It is important that the bridge pipe is installed with the sharp bend to the inboard cylinder block, the one farthest from the wheel. The bridge pipe carries a rubber identification sleeve marked "Incar Top".



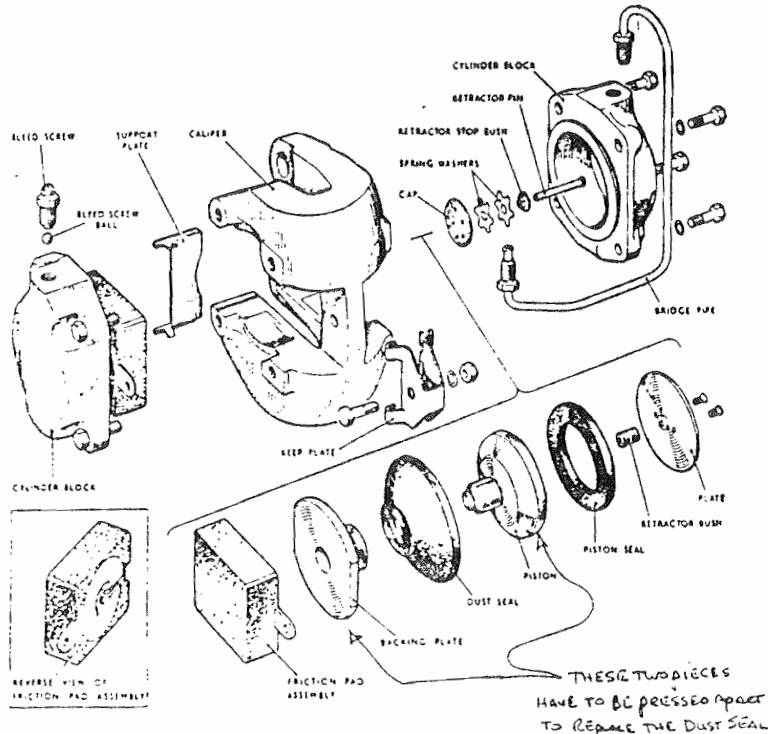
Round shims are available for centralizing the caliper over the disc. They are installed between the caliper and mounting plate as indicated by the arrows.

### REPLACING THE PISTON SEALS **EARLY TYPE**

Remove the caliper. Withdraw the friction pads, disconnect and blank off the supply pipe, and remove the bridge pipe. Remove the bolts securing the cylinder blocks to the caliper and withdraw the cylinder blocks. Disengage the dust seal from the groove around the cylinder block back face. Use air pressure to eject the piston assembly. Remove the screws holding the plate to the piston, lift off the plate and piston seal, withdraw the retractor bushing from within the piston bore. Carefully cut away the dust seal. Support the backing plate on a bushing of sufficient bore which just accommodates the piston. With a suitable tubular spacer placed against the end of the piston dowel, and located around the shouldered head, **press on the piston.** **CAUTION:** Care must be taken during this operation to avoid damaging the piston.

To assemble, engage the collar of a new dust seal with the lip on the backing plate, but do not overstretch. Locate the backing plate on the piston dowel and, with the piston properly supported, **press the backing plate fully into place.** Insert the retractor bushing into the bore of the piston. Lightly lubricate a new piston seal with brake fluid and position it on the face of the piston. Secure the plate andpeen-lock the screws. Locate the piston assembly on the end of the retractor pin. With the aid of a hand press, slowly apply even pressure to the backing plate and press the assembly into the cylinder bore. During this operation, be sure that the piston assembly is in correct alignment in relation to the cylinder bore and that the piston seal does not become twisted or caught as it enters. Arrange the outer end of the dust seal

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Exploded view of a Dunlop front wheel caliper assembly.

in the groove around the cylinder block face. Be sure that the two support plates are in position. Reconnect the cylinder blocks to the caliper. Install the bridge pipe, making sure that they are correctly positioned, and then reconnect the supply pipe. **CAUTION:** It is essential that the bridge pipe is installed with the sharp bend end to the inboard cylinder block, the one farthest from the wheel. The bridge pipe carries a rubber identification sleeve marked "Inner Top." Bleed the hydraulic system.

REPLACING THE PISTON SEALS (LATER TYPE)

The later type cylinder blocks can be distinguished by the letter "C" cast into the block body at the inlet union bore. Remove the caliper. Withdraw the brake friction pads, disconnect the supply

pipe, and remove the bridge pipe. Remove the nuts holding the cylinder blocks to the caliper and withdraw the cylinder blocks. Thoroughly clean the blocks externally before proceeding. Disengage the dust seal from the groove around the cylinder block face. Use air pressure to eject the piston assembly. Using a blunt screwdriver, carefully push out and remove the piston and dust seals. **NOTE:** This is as far as the piston can be stopped.

To replace the piston and dust seals, lightly lubricate the parts with brake fluid, and then, using only the fingers, place them on the piston. Locate the retractor pin in the retractor bushing in the piston, and then, with even pressure, press the piston assembly into the cylinder bore. During this operation, make sure that the piston assembly is in correct alignment with the cylinder bore and

## Servicing Dunlop Disc Brakes 243

that the piston seal does not become twisted or caught as it enters. Engage the outer rim of the dust seal in the groove around the cylinder block face. Make sure that the two support plates are in position. Reassemble the cylinder blocks to the caliper. Install the bridge pipe. **CAUTION:** It is essential that the bridge pipe is installed with the hairpin bend end to the inboard cylinder block, the one farthest from the wheel. The bridge pipe carries a rubber identification sleeve marked "Inner Top." Connect the supply pipe and bleed the brake system.

### Disc Run-Out

Disc run-out must not exceed 0.006" (0.15 mm.). The disc end play must be 0.003"-0.005" (0.07-0.13 mm.), which must not be exceeded; if exceeded, the brakes may drag.

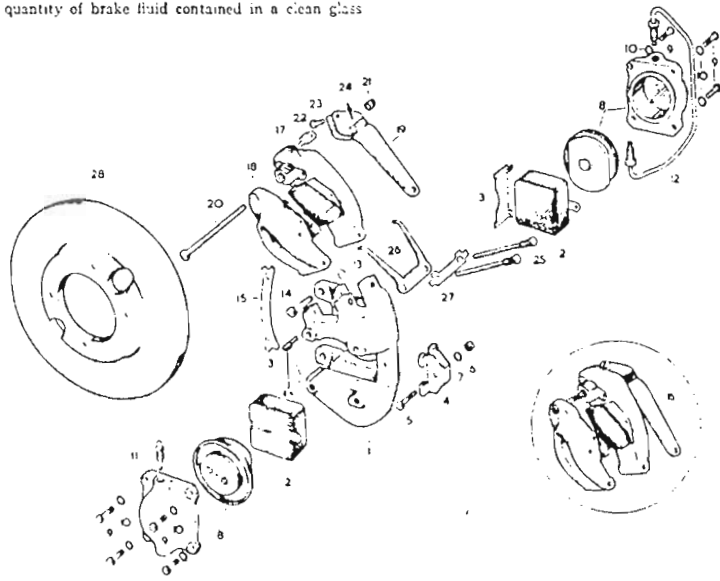
### BLEEDING THE SYSTEM

Fill the reservoir with brake fluid. Attach a bleeder tube to the screw on the left rear brake and immerse the open end of the tube in a small quantity of brake fluid contained in a clean glass

jar. Loosen the bleeder screw and operate the brake pedal slowly through full strokes until the fluid pumped into the jar is free of air bubbles. Keeping the pedal depressed, close the bleeder screw. Release the pedal. Repeat for the right rear brake and then the front brake units. **CAUTION:** The reservoir must be filled periodically to keep it from running out of fluid which would allow air to enter the system.

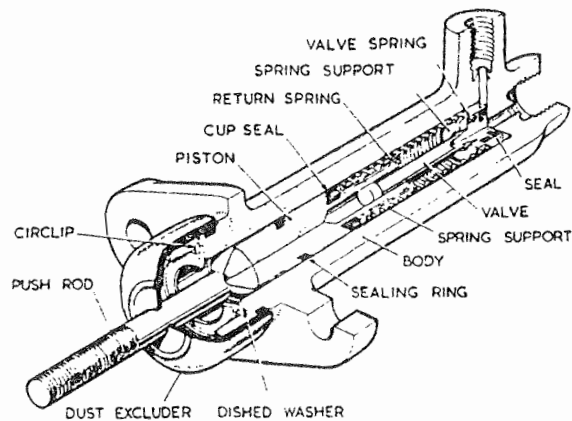
### MASTER CYLINDER

Two master cylinders are used on some installations, with one cylinder for the front wheel brakes and the other for the rear wheel brakes. When the brake pedal is in the off position, it is necessary for the pistons to return to the fully extended position; otherwise, pressure may build up in the system, causing the brakes to drag. To adjust the push rods to the correct clearance, loosen the locknut at the top master cylinder push rod and adjust the push rod for  $\frac{3}{16}$ " (1.53 mm.) free travel. Because of the balance lever, this will give  $\frac{1}{16}$ " (0.794 mm.)



Exploded view of a Dunlop rear wheel caliper assembly. (1) Caliper body, (2) friction pad, (3) support plate, (4) retaining plate, (5) bolt, (6) nut, (7) lockwasher, (8) piston and cylinder, (9) bolt, (10) lockwasher, (11) bleeder screw and ball, (12) bridge pipe, (13) shim, (14) setscrew, (15) washer, (16) handbrake assembly, (17) inner pad carrier, (18) outer pad carrier, (19) operating lever, (20) bolt, (21) self-locking nut, (22) pivot seat, (23) clevis pin, (24) cotter pin, (25) pivot bolts, (26) retractor plate, (27) washer, (28) disc.

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Sectioned view of a Dunlop master cylinder.

free travel to each master cylinder. Tighten the locknut at the top master cylinder push rod.

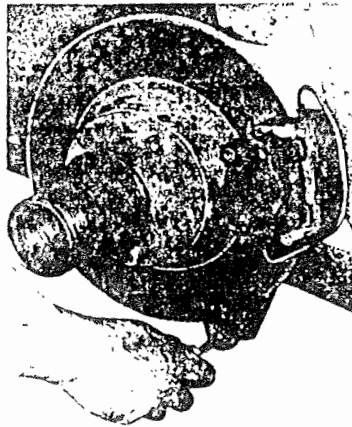
**HANDBRAKE**

A mechanical handbrake unit is mounted on and above each caliper body of the rear brakes by means of pivot bolts. Each handbrake unit consists of two carriers and friction pads, one on each side of the brake disc. The free end of the inner pad carrier is equipped with a pivot seat to which the forked end of the operating lever is attached. A trunion is also mounted within the forked end of the operating lever and it carries the threaded end of the adjuster bolt. Located on the neck of the adjuster bolt and in a counterbore in the inside face of the inner pad carrier is the operating lever return spring. The adjuster bolt passes through the outer pad carrier and its hemispherically shaped head seats in a suitable recess in the outer carrier.

**ADJUSTING THE HANDBRAKE**

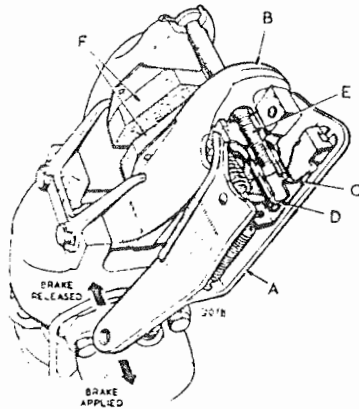
To adjust the handbrake to compensate for friction pad wear, insert a 0.004" (0.10 mm.) feeler gauge blade between the face of one pad and the disc, and then screw in the adjuster bolt until the feeler gauge blade is hard to withdraw. Withdraw the feeler gauge and check the disc for free turning. Repeat for the other side.

If, after carrying out the above adjustment,



An adjusting screw is provided to adjust the handbrake friction pads on an early type Dunlop rear wheel caliper assembly. The foot-operated brake units are self-adjusting.

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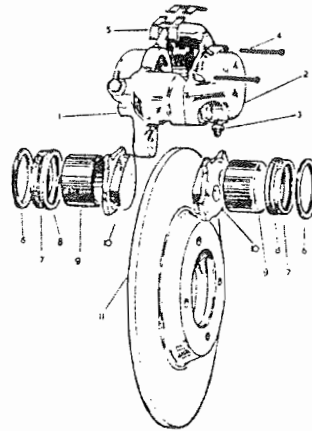
The later model handbrake assembly is self-adjusting. When operated, lever "A" is moved away from pad carrier "B" and draws the friction pads "E" together. In the event of wear, pawl "C" will ratchet up "D" on the bolt thread, drawing the adjuster up "E" inwards and bringing the friction pads closer to the disc. When installing the unit, screw off "E" in or out until there is a space of  $7/16"$  (11.1 mm.) between the friction pads, or the thickness of the disc plus  $1/16"$  (1.5 mm.).

If satisfactory travel of the handbrake lever is not obtained, the cable must be adjusted by screwing in the adjuster bolt at each rear brake until the pads are in firm contact with the disc. Fully release the handbrake lever. Loosen the locknut holding the threaded adapter to the compensator at the rear end of the handbrake cable. Screw out the adapter until there is no slack in the cable. **CAUTION:** It is important that the cable is not over-tensioned. Tighten the locknut and reset the handbrake pad clearance to 0.001" (0.10 mm.) as described above.

## REPLACING THE HANDBRAKE FRICTION PADS

To remove the pad carriers, disconnect the handbrake compensator linkage from the operating lever. Lift the locking tabs and remove the pivot bolts and retraction plate. Remove the friction pad carriers from the caliper bridge by moving them upwards around the disc and withdrawing them from the rear.

To replace a friction pad, loosen the nuts in the outer face of each carrier and use a hooked tool to pull out the pad. Insert two new friction pads into the friction pad carriers, short faces upwards, taking care that the securing plate of each pad seats on the head of the retaining bolt protruding through the inside face of the pad carriers. Secure



Exploded view of the Lockheed disc brake assembly. (1) Caliper, (2) rim side of caliper, (3) bleeder screw, (4) cotter pins, (5) steady springs, (6) seal ring, (7) dust seal retainer, (9) piston, (10) friction pad.

them by tightening the nuts on the outside faces. Reinstall the assemblies.

## LOCKHEED DISC BRAKES

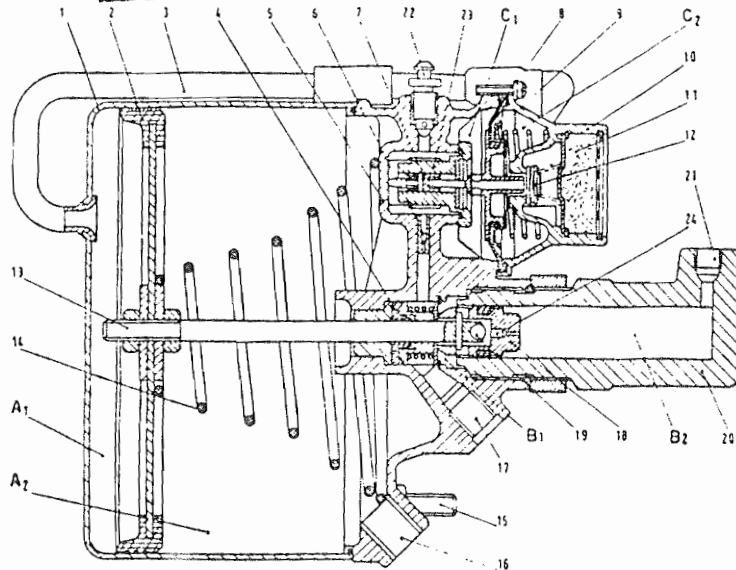
Each disc brake assembly consists of a cast iron disc attached to the front hub and a cast iron brake caliper attached to lugs on the rear of the axle carrier and straddling the disc. The caliper houses two co-axially aligned pistons and a pair of brake pads retained by two steady springs (5) and cotter pins (4). The pistons and their boots are protected from dirt by dust seals (7). An anti-squeak device is designed into each piston by machining a step in the circular face contacting the brake pad.

The designed clearance between the friction pads and the disc is obtained by distorting the seal during brake application, which then assume their normal shape after hydraulic pressure is removed, thus returning the piston the designed distance from the disc.

## INSTALLING NEW BRAKE PADS

To remove the old pads, jack up the car and remove the wheels. Remove the two steady springs (5) in the rear of the caliper (1) by depressing each spring (5) and withdrawing its cotter pin (4). Remove the two brake pads (10) from the caliper by rotating the protruding leg upward, a short distance and lifting out the pad.

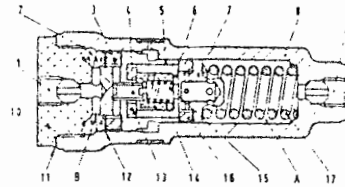
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Sectioned view through a Donaldson brake booster unit used on the Fiat. (1) Vacuum power cylinder shell, (2) piston, (3) connecting tube, (4) seal, (5) end plate, (6) fluid passage, (7) piston, (8) diaphragm assembly, (9) poppet valve, (10) cover, (11) air cleaner, (12) atmospheric poppet valve, (13) push rod, (14) return spring, (15) hook-type bolts, (16) vacuum check valve connection, (17) fluid inlet, (18) hydraulic piston, (19) ball check valve, (20) hydraulic slave cylinder tube, (21) fluid outlet, (22) air bleed screw, (23) control valve assembly, (24) fluid passageway. A<sub>1</sub>A<sub>2</sub> vacuum power cylinder chambers, B<sub>1</sub>B<sub>2</sub> hydraulic slave cylinder chambers, C<sub>1</sub>C<sub>2</sub> control valve chambers.

unit, and then remove the flexible hose and bleeder screw from opposite sides of the caliper. Pry out the dust seal and retainer from the open end of each piston bore by inserting the blade of a screwdriver between the seal and retainer. Use compressed air to eject the pistons from the bores. Lift out the seal rings by inserting a blunt screwdriver under each ring. **CAUTION.** Be careful not to damage the groove.

To assemble the units, lubricate the parts with brake fluid and install the seal rings into the groove of each piston bore so that the large side is nearest the open end of the piston bore. Work the rings into their grooves with your fingers to ensure correct seating. Position the pistons into the bores squarely, with the closed end first. **CAUTION.** The step in the piston must face the opening in the rear of the caliper as shown. Press the pistons slowly to the bottom of the bores. Install a new dust seal into a metal retainer (8) and position both squarely in the mouth of one piston bore, with



Cross-sectioned view through the hydraulic brake pressure regulating cylinder which is designed to restrict the amount of pressure to the rear wheels. (1) Outlet to rear wheels, (2) spring, (3) low pressure seal ring, (4) push rod valve, (5) differential piston, (6) valve regulator, (7) seal ring carrier, (8) body, (9) inlet from master cylinder, (10) low pressure chamber plug, (11) gasket, (12) washer, (13) valve seal, (14) valve, (15) spring, (16) high pressure chamber seal ring, (17) spring, (A) high pressure chamber, (B) low pressure chamber.