REFERENCE BOOK 67-3

MASTER TECHNICIANS SERVICE CONFERENCE

DUAL HYDRAULIC BRAKE SYSTEM

PLYMOUTH • DODGE
CHRYSLER • IMPERIAL

CHRYSLER MOTORS CORPORATION

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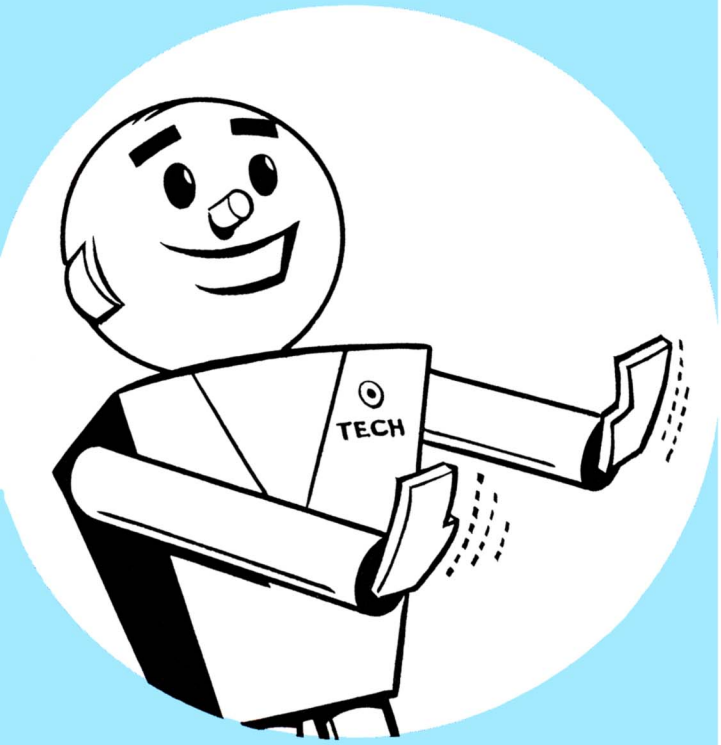

There's nothing complicated about the new dual hydraulic brake system. However, some of the components are different and there are a lot more pieces and parts than in previous systems. That's because a number of new requirements had to be taken into consideration in designing the dual hydraulic system.

Of course the primary objective was to design separate hydraulic systems for the front and rear brakes. The design had to insure that loss of pressure in one system wouldn't result in loss of pressure in the other system. Furthermore, in normal operation the new system must provide equal hydraulic pressure to the front and rear brake systems. In other words, the entire system must be hydraulically self-equalizing. As you know, this feature is one of the most important advantages of *any* hydraulic brake system.

Still another design requirement had to be satisfied. The dual brake system had to provide a signal device that would warn the driver of pressure loss in case of damage or failure in either the front or rear hydraulic system. This was accomplished with a hydraulic warning light switch and brake warning light.

It took a completely new master cylinder and a new warning light operating switch to accomplish these basic design objectives. And, it'll take an understanding of how these units work to do a good job of servicing and troubleshooting the tandem master cylinder hydraulic system. There's nothing in the new brake system that'll give you any trouble if you'll take the time to read this reference book and find out what dual brakes are all about.

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TANDEM MASTER CYLINDER HYDRAULICS

Let's get oriented to the dual hydraulic system. The master cylinder is really a tandem unit with two separate hydraulic pressure systems. The lines from the separate outlets are connected to the new brake warning light switch assembly. The switch part of the assembly controls the ground circuit for the brake warning light. The switch housing also serves as a brake line "tee" and routes pressure from the tandem master cylinder to the separate front and rear brake systems.

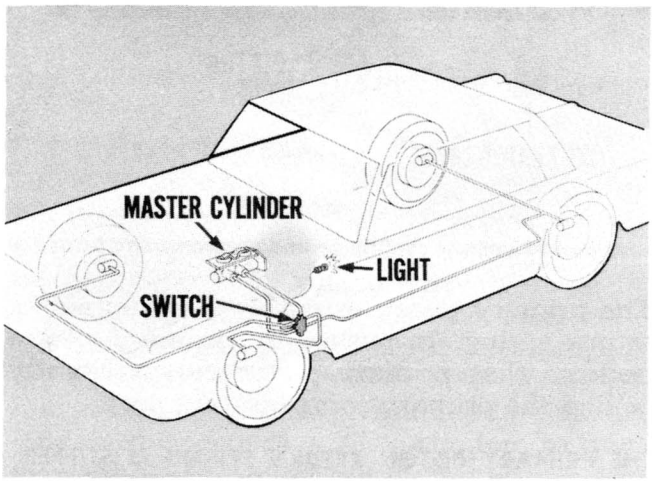

Fig. 1—Brake warning light signals loss of pressure

TWO RESERVOIRS AND ONE BORE

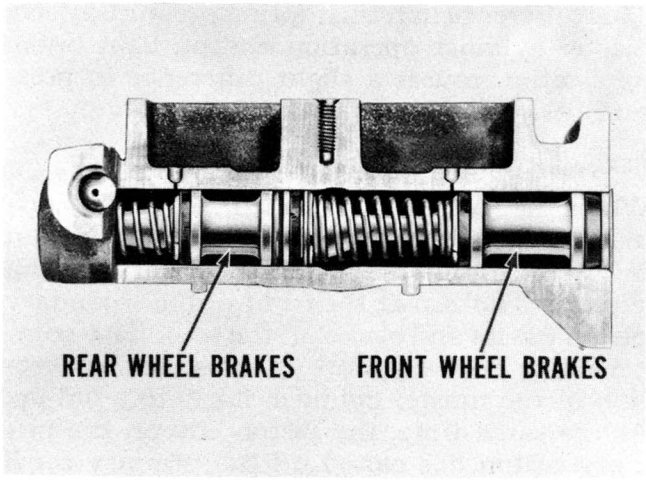

Fig. 2—The master cylinder has two separate pistons

The tandem master cylinder has two separate brake fluid reservoirs arranged one behind the other. However, a single cylinder bore is used. The master cylinder assembly has two separate pistons that operate in tandem. The front piston provides pressure to the rear wheel brake cylinders. The rear piston serves the front wheel brake cylinders.

THINK PRIMARY AND SECONDARY

Since the piston at the front of the master cylinder provides pressure to the rear wheels and the piston at the rear of the master cylinder provides pressure to the front wheels, it's easy to get mixed up when writing or reading about the dual hydraulic system. It will be a lot easier to keep things straight if we call the rear piston the *primary* piston because it is actuated directly by the brake pedal or the power booster. Besides, the primary piston supplies pressure to the front brakes where most of the braking is done.

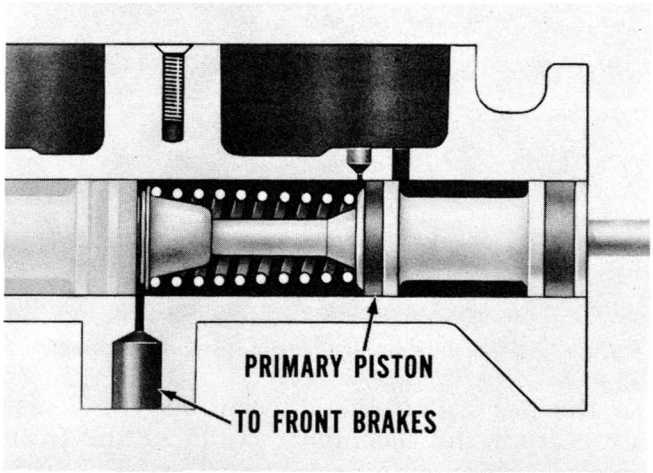

Fig. 3—The primary piston is actuated directly

We'll refer to the piston at the front of the master cylinder as the *secondary* piston. In normal operation, the secondary piston is hydraulically operated by the primary piston, so it actually is a secondary or slave piston. It supplies pressure to the rear brakes.

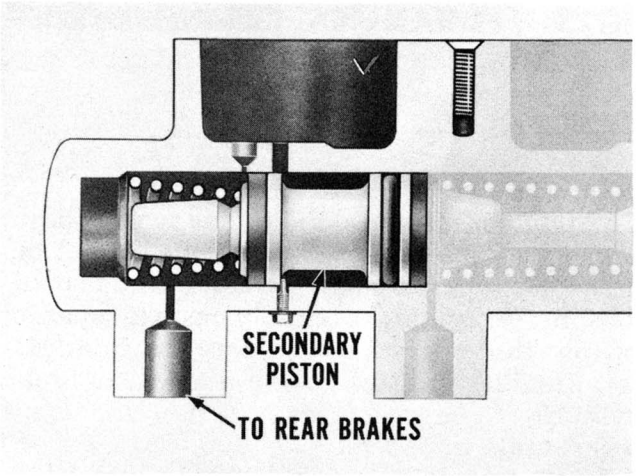

Fig. 4—The secondary is actually a slave piston

YOU REALLY CAN'T GO WRONG!

The first time you work on one of the 1967 model master cylinders you'll notice that the front and rear brake line tube nuts are not the same size. This was done on purpose so that there would be no chance of connecting the lines to the wrong master cylinder outlets.

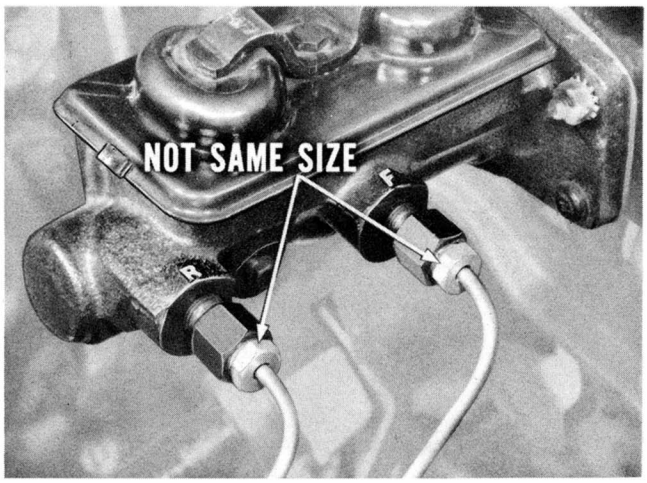

Fig. 5—Different tube nut sizes eliminate wrong connections

In the accompanying illustration you'll also notice that the secondary outlet at the front of the master cylinder is marked "R". This means that this front outlet serves the rear brakes. The primary outlet at the rear of the master cylinder is designated "F" because it serves the front brakes.

RETURN SPRINGS AND PORTS

So far we've left out some of the master cylinder details in order to simplify things. Now, in a simplified sectional drawing we'll start adding functional parts and tell you what they do.

A piston return spring at the front of the master cylinder pushes the secondary piston back against a piston stop screw. This positions the secondary piston cup slightly to the rear of the compensating port so that the compensating port is open to the secondary reservoir.

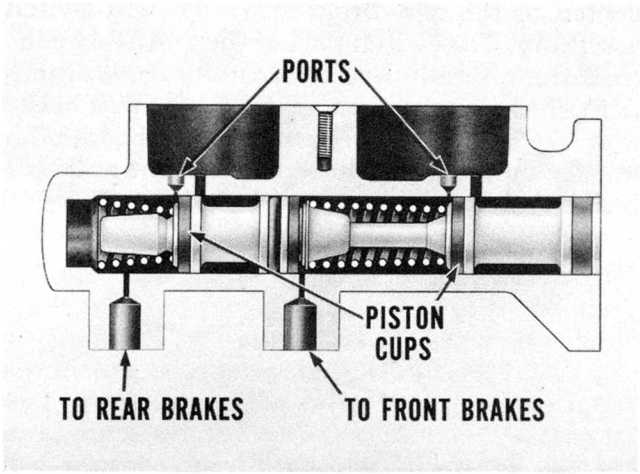

Fig. 6—Cups are slightly behind compensating ports

The primary piston assembly also contains a return spring. It pushes the primary piston back so that primary piston cup is slightly behind the primary compensating port.

THE PRIMARY PISTON RETURN SPRING IS STIFFER

The primary piston return spring is slightly stiffer than the secondary return spring. That means that the secondary return spring is more easily compressed than the primary spring. This difference in return spring pressure affects master cylinder operation and on light brake application causes a slight difference in pressure between the two brake systems.

HERE'S HOW THE MASTER CYLINDER WORKS

When the brakes are applied, the stiffer primary spring pushes the secondary piston forward, compressing the secondary spring slightly. The cup at the front of the secondary piston passes and closes off the secondary compensating port. Pressure in the secondary section of the master cylinder starts to build up. At the same time, the piston cup on the primary piston has closed off the primary compensating port. Fluid is now trapped in front of

each piston. Further pedal movement produces increased pressure in the primary as well as the secondary chamber.

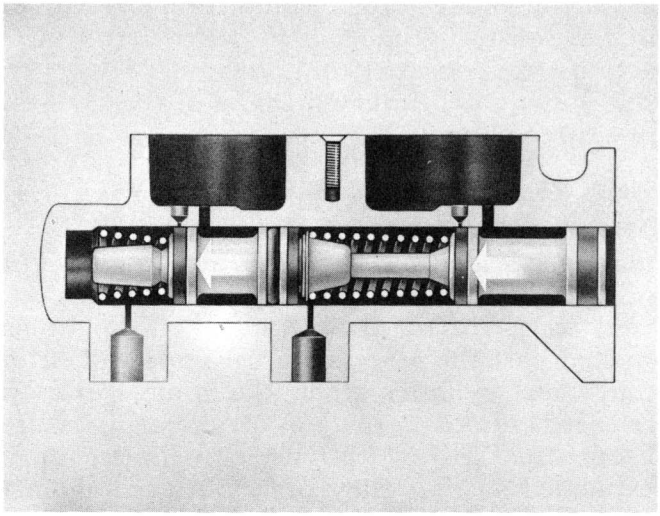

Fig. 7—Pedal movement closes both compensating ports

PRESSURES ARE ALMOST EQUAL

In normal operation, there is a hydraulic link between the primary and the secondary pistons. The secondary piston is actually a slave piston operated by pressure developed in the primary piston chamber. On the other hand, the piston cup at the rear of the secondary piston functions as the "closed end" of the primary chamber and no pressure is developed as long as the secondary piston is free to move forward. As a result of this hydraulic link principle, primary and secondary operating pressures are almost equal—but not quite!

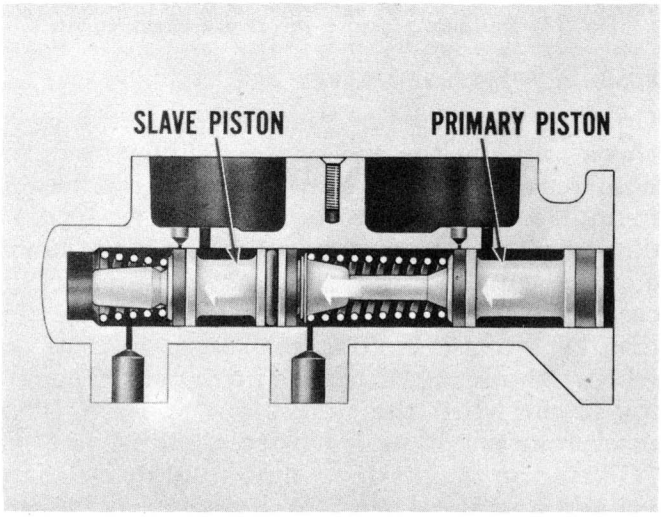

Fig. 8—There is a hydraulic link between the two pistons

SECONDARY PRESSURE'S SLIGHTLY HIGHER

In actual operation, effective hydraulic pressure is proportional to the push rod apply pressure . . . minus the resistance offered by the piston return springs. Since the slightly stiffer primary spring holds its piston back more than the secondary return spring does, secondary pressure is slightly higher than primary pressure. However, the pressure difference is very small compared to the total hydraulic pressure developed when the brakes are applied.

Remember, the primary purpose of the return springs is to return the pistons so that the compensating ports are uncovered when the brake pedal is released. We also depend on these springs to return the brake pedal, since an external pedal return spring is no longer used.

ABOUT THOSE COMPENSATING PORTS

The compensating ports compensate for expansion and contraction of the brake fluid caused by temperature changes. For instance, after repeated brake applications the brake drums and wheel cylinders get pretty hot. In turn, the brake fluid gets hot and expands. If this pressure build-up were not relieved when the brake pedal is released, the brakes would drag and generate more heat and pressure. Instead, when the brake pedal is released, the compensating ports are uncovered and fluid can flow back into the reservoirs relieving excess pressure in the brake lines. When the brake fluid cools off and contracts, fluid flows from the reservoirs and back into the cylinder.

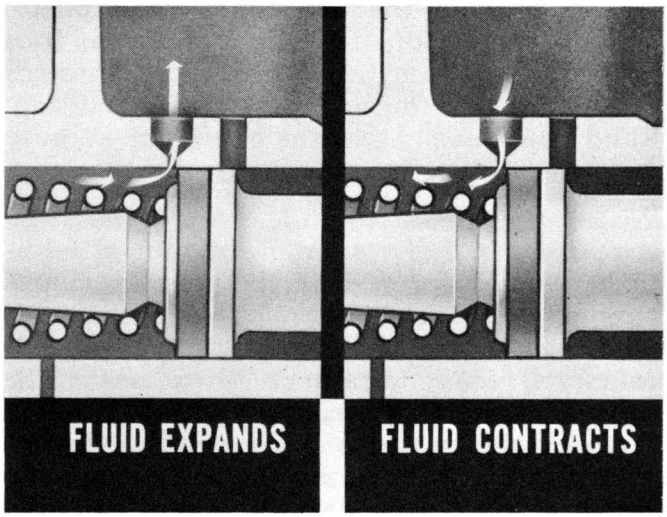

Fig. 9—Ports compensate for expansion and contraction

FILLER PORTS PERMIT PUMP-UP

The main or filler ports serve an entirely different purpose . . . they permit pumping up of the brakes if the pedal is low because of too much lining clearance. This condition could develop if the automatic adjusters aren't working. Here's what happens when you pump the brake pedal to get better pedal height. When the brake pedal is released, the master cylinder return springs return the master cylinder pistons very quickly. By comparison, the brake shoe return springs return the wheel cylinder pistons more slowly. Because of this, the flow of fluid from the wheel cylinders is relatively slow and it has trouble trying to keep up with the movement of the master cylinder pistons.

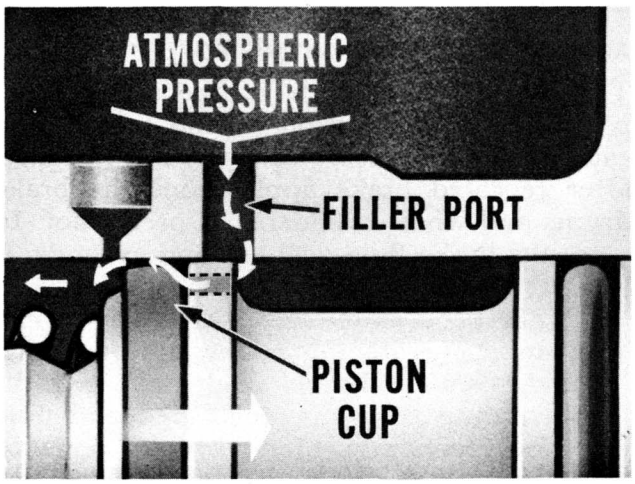

Fig. 10—Atmospheric pressure pushes fluid through ports

As a result, pressure in the master cylinder drops until it is lower than the pressure acting on the fluid in the reservoirs. Atmospheric pressure, acting on the fluid in the reservoir, pushes fluid through the filler port, through holes in the piston and past the piston cup. Fluid flows readily past the piston cup because flow in that direction unseats the lip of the cup.

When brake pedal height is low and the pedal is pumped rapidly, a small amount of additional fluid is forced into the pressure chambers on each release stroke. This increases pedal height until it is nearly normal again. Of course, if lining clearance is excessive, the wheel cylinder return springs force fluid out of the pressure chambers in the master cylinder, through the compensating ports and back into the reservoir as soon as the pumping action stops and the brake pedal is released. Incidentally, we need those filler ports because the compensating ports are too small to handle the flow needed for pumping up the pedal.

On drum brake jobs, residual pressure valves in the master cylinder also contribute to the action that permits pedal pump up. However, this is not the primary purpose of the residual pressure valves.

WHY WE USE RESIDUAL PRESSURE VALVES

The residual pressure valves are located in the master cylinder outlets. They maintain a light pressure in the lines and in the wheel cylinders. If it were not for these valves, air might be sucked past the wheel cylinder cups and enter the wheel cylinder when the brake pedal is released rapidly. Instead, residual pressure keeps the lips of the wheel cylinder cups expanded so that they press outward against the wheel cylinder bore.

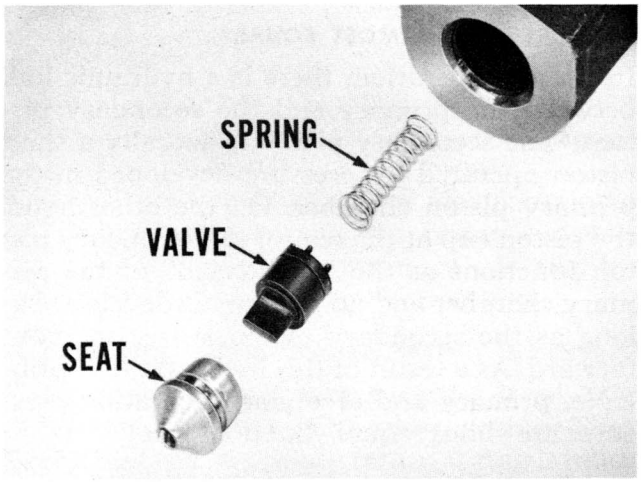

Fig. 11—Residual pressure valves are check valves

RESIDUAL PRESSURE VALVES ARE CHECK VALVES

On past models, the master cylinder had a check valve in the end of the cylinder bore to hold residual pressure in the lines and wheel cylinders. You'll recall that on disc-brake-equipped cars the master cylinder did not have a check valve because residual pressure would cause the disc brake shoes to drag. Since the disc brakes use pistons with seals instead of wheel cylinder cups, there's no danger of sucking in air when the brakes are released. The disc brake piston seals work something like an "O" ring and don't depend on fluid pressure to expand and seat them. So, on past model disc brake jobs the check valve is left out of the

master cylinder and installed in the line to the drum-type brakes at the rear where residual pressure is needed.

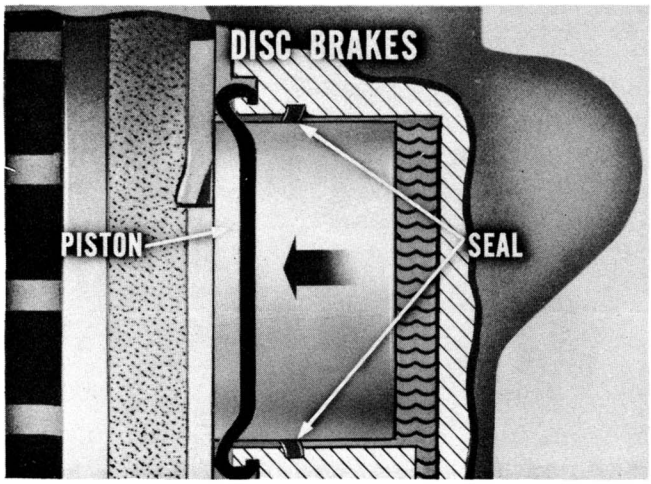

Fig. 12—Disc brakes use seals instead of cups

With the introduction of the tandem master cylinder a single check valve wouldn't work. Since the front and rear brake hydraulic systems must function independently, a separate check valve is needed for each part of the dual system. The new check valves, located in the master cylinder outlets, are now called residual pressure valves. No residual pressure valve is used in the primary outlet of the master cylinder for a disc-brake-equipped car.

THIS IS HOW THOSE RESIDUAL VALVES WORK

The working parts of the residual valve are the tube seat, the rubber valve and the spring. The rubber part of the residual valve is a one-way valve all by itself. When the brakes are applied, pressure opens a passage through the valve allowing fluid to flow into the brake lines.

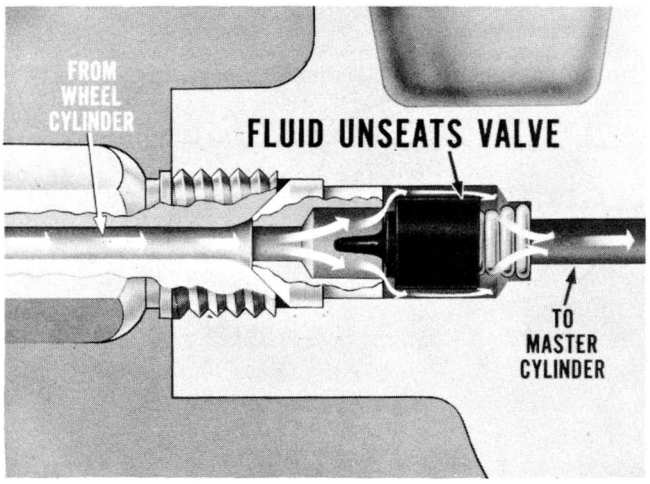

Fig. 13—Flow from wheel cylinders unseats residual valve

When the brakes are released, fluid is pushed out of the wheel cylinders and back toward the master cylinder. This unseats the residual pressure valve and allows fluid to return to the master cylinder. When the pressure in the wheel cylinders and lines drops to about fifteen pounds, the valve is seated by the spring and this residual pressure is maintained until the brakes are again applied.

PRESSURE LOSS IN THE FRONT BRAKE SYSTEM

So far we have concerned ourselves with normal master cylinder and hydraulic system operation. Now, let's see what would happen in case of pressure loss in the front brakes.

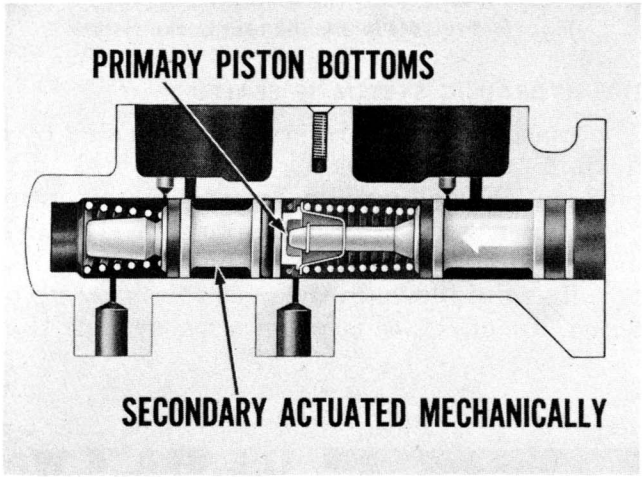

Fig. 14—Pressure loss in the front brake system

If for any reason the front brake hydraulic system fails, there will be no hydraulic resistance to primary piston movement. When you step on the brakes, the primary piston will move forward and compress the primary piston return spring. The projection at the front of the primary piston will bottom out against the secondary piston. The secondary piston will then be actuated mechanically instead of hydraulically to provide rear-wheel braking.

PRESSURE LOSS IN THE REAR BRAKE SYSTEM

If there is a pressure loss in the rear brake system, there is no hydraulic resistance to secondary piston movement. Hydraulic pressure in the primary pressure chamber, plus spring pressure, push the secondary piston forward

until it bottoms against the end of the master cylinder. As soon as the secondary piston bottoms, the primary piston supplies full pressure for normal operation of the front brakes.

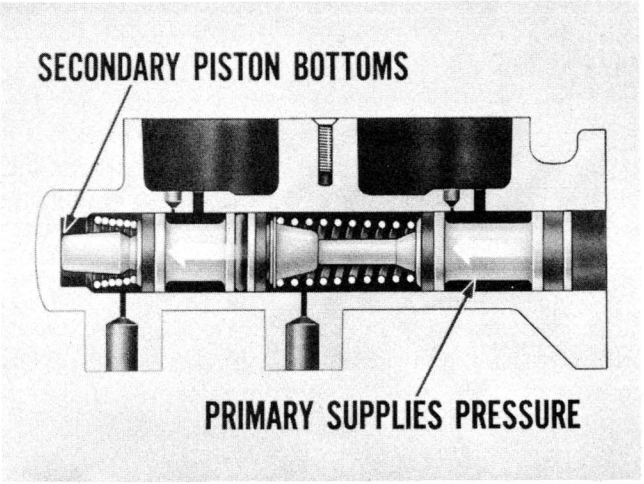

Fig. 15—Pressure loss in the rear brake system

THE HYDRAULIC SYSTEM IS SEALED

The master cylinder reservoirs are sealed by a flexible rubber gasket with integral diaphragms. For all practical purposes, the entire gasket is a very flexible diaphragm. The cylindrical diaphragm portions of the gasket rise or fall as fluid level in the reservoirs goes up or down. In effect, this provides a system that can "breathe" and is at the same time sealed against the entrance of dirt or moisture.

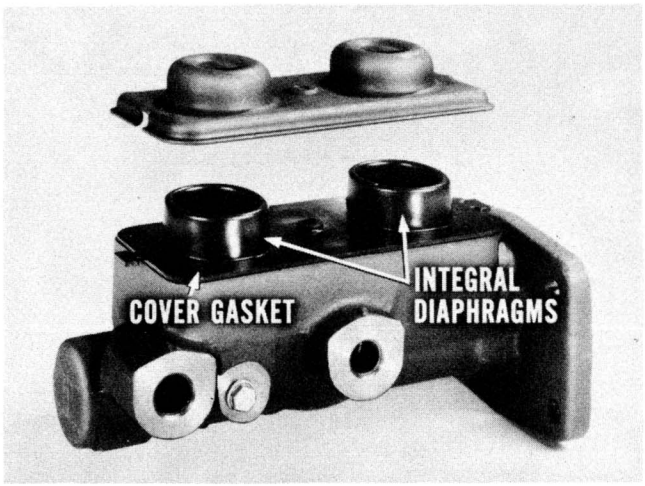

Fig. 16—The hydraulic system is effectively sealed

The space between the master cylinder cover and the diaphragms must be vented to atmosphere so that the diaphragms can react to internal pressure changes. Otherwise, the heat generated by severe stopping conditions could cause fluid expansion, pressure buildup and dragging brakes. To prevent this possibility, small vent grooves are formed in the master cylinder cover. These grooves vent the space between the diaphragm gasket and the cover.

THE BRAKE WARNING LIGHT SYSTEM

Since the front and rear brake hydraulic systems function independently, it is possible that the driver might not notice immediately if pressure and braking is lost in one of the systems. That's why a brake warning light system is required with the new tandem master cylinder and dual hydraulic brake system.

THE WARNING LIGHT DOES DOUBLE DUTY

The brake system warning light serves a dual purpose. In addition to warning the driver if pressure is lost in any part of the system, it tells him if the parking brake is applied as soon as the ignition switch is turned on. Since one light serves as both a parking brake and service brake warning light, the bulb is proofed

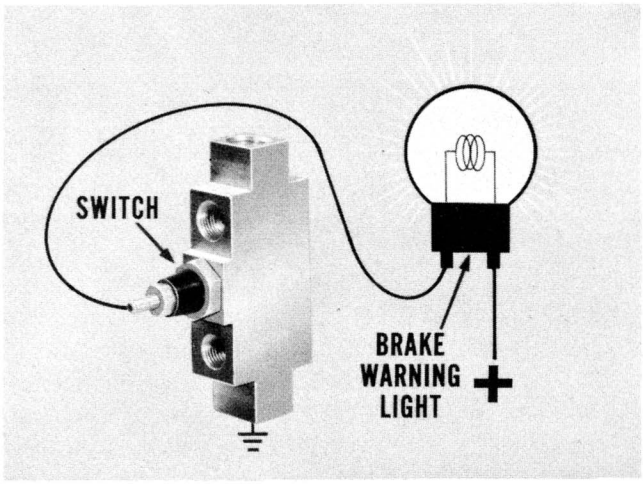

Fig. 17—The brake warning light switch ground circuit

or tested every time the parking brake is applied with the ignition switch on.

The lead wire to the brake warning light is always "hot" when the ignition is turned on. Both the parking brake switch and service brake warning switch are ground circuit switches. Either of these switches can turn the light on by completing the ground circuit. You are already familiar with the mechanically operated parking brake warning light switch, so let's have a closer look at the hydraulically operated service brake warning light switch.

THE BRAKE LINE TEE IS A JUNCTION

The brake line tee or junction between the master cylinder and the front and rear brake lines is no longer a simple tee fitting like it was on past models. It is both a junction and a switch. The front brake system line from the master cylinder primary outlet is connected to one end of the tee fitting. Separate lines to the two front brakes are connected to outlets at the same end of the tee.

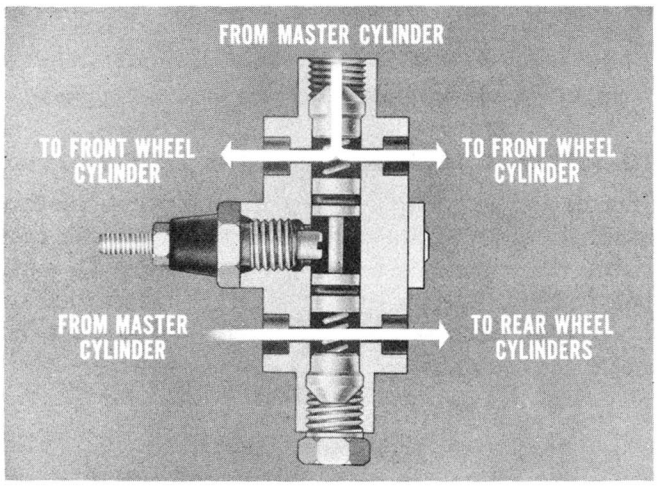

Fig. 18—Brake warning light switch line connections

The rear brake system line from the secondary outlet of the master cylinder is connected into the other end of the tee fitting. The brake line to the rear brakes is also connected to this same end of the tee fitting. Incidentally, different size tube connectors are used for the front and rear brake lines here as well as at the master cylinder. This prevents incorrect brake line connections.

THE TEE IS ALSO A SWITCH

A bar-bell shaped double piston, with an "O" ring on each end, separates the front and rear brake hydraulic systems. Two small coil springs keep the piston centered as long as pressure is the same in both systems.

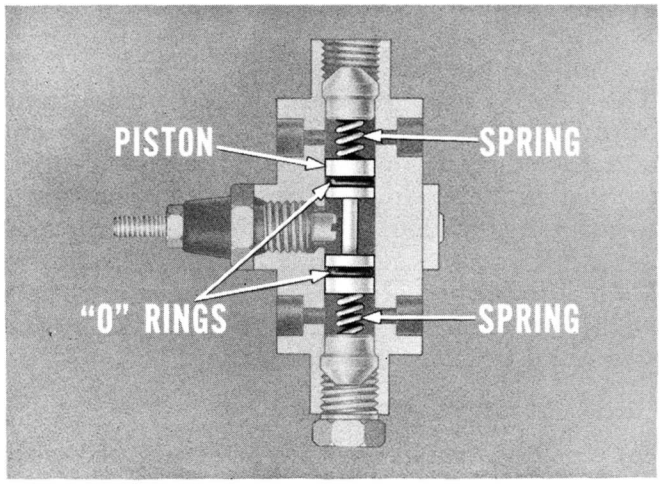

Fig. 19—Springs keep the piston centered

If pressure is lost in one system, for example to the front brakes, pressure in the rear brake system pushes the piston off center. As soon as the piston moves far enough to touch the insulated electrical contact, the ground circuit is completed and the warning light comes on.

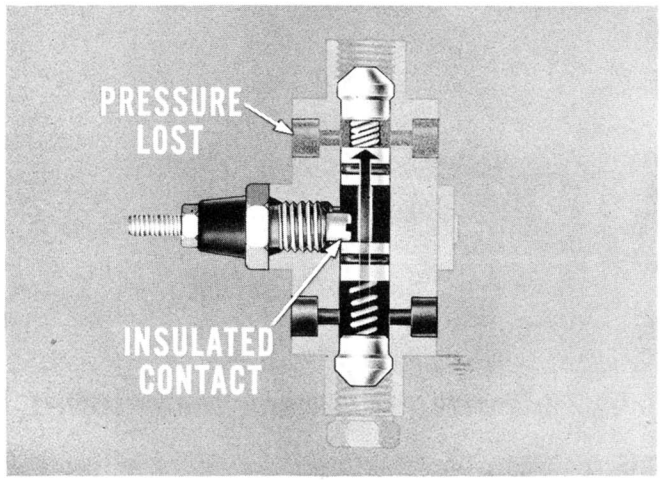

Fig. 20—Pressure pushes the piston off center

The springs in the brake warning light switch are quite stiff so minor variations in pressure will not cause the piston to move far enough to touch the insulated contact. For example, in a disc brake model, residual pressure in the secondary system will not cause the light to come on even though there is no pressure in the primary system.

The same general procedures and precautions apply to servicing the dual hydraulic system and the tandem master cylinder that applied to past models. And, your 1967 Service Manuals have complete removal, disassembly and assembly instructions. However, there are some special precautions and suggestions that will help you do a better job of servicing the new dual hydraulic system.

THIS PUSH ROD'S ATTACHED

On cars and trucks that are not equipped with power brakes, the pedal push rod is retained in the primary piston of the master cylinder. To service this type master cylinder, disconnect the push rod from the pedal and remove it with the master cylinder as an assembly.

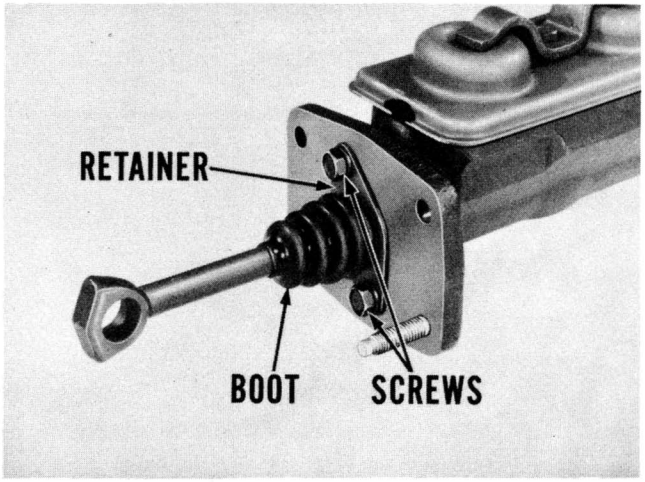

Fig. 21—The push rod is retained in the primary piston

To disassemble this non-power-type master cylinder, remove the piston and boot retainer screws. This will let you remove the piston and the push rod as an assembly.

THE PUSH ROD RETAINER IS RUBBER

By looking at the push rod and piston assembly you can't tell what holds the push rod in place. The accompanying sectional view explains it. The outside diameter of the rubber retainer locks into an internal groove in the master cylinder piston. The inside diameter of the retainer fits into a groove near the end of the push rod.

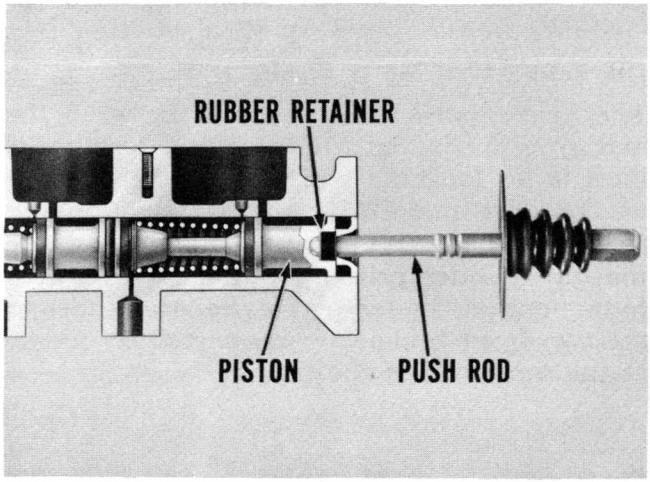

Fig. 22—A rubber retainer locks the push rod in place

TO SEPARATE THE ROD FROM THE PISTON

If you are going to replace the primary piston assembly, you'll have to separate the push rod from the piston. Here's an easy way to pull the rod out of the piston. Use an open vise to hold the piston and a heavy screwdriver to exert leverage on the rod.

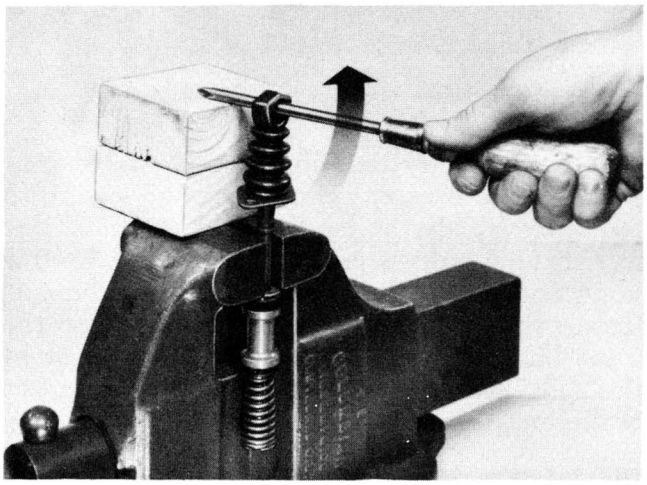

Fig. 23—Use a screwdriver to force the rod out of the piston

USE A NEW PUSH ROD RETAINER

When you reinstall a push rod in a master cylinder, you must use a new rubber retainer. The gripping edges of the old retainer get pretty well chewed up when the rod is pulled out of the piston. A little brake fluid on the rubber retainer will help it slide into the groove in the piston with a minimum of pushing. Most technicians find it easier to assemble the piston in the master cylinder and then force the pedal push rod, with retainer in place, into the piston. Don't forget the metal piston retainer and boot! Tech says he has seen more than one good man assemble the push rod and piston and then find out that the piston retainer won't slip over the "eye" end of the push rod. So, put the piston retainer and boot in place on the push rod first.

DRUM BRAKE SECONDARY PISTON

On the master cylinder for vehicles with drum-type brakes, the secondary piston is retained by a set screw in the side of the master cylinder. Remove it and tap the master cylinder on a soft-top bench to remove the secondary piston.

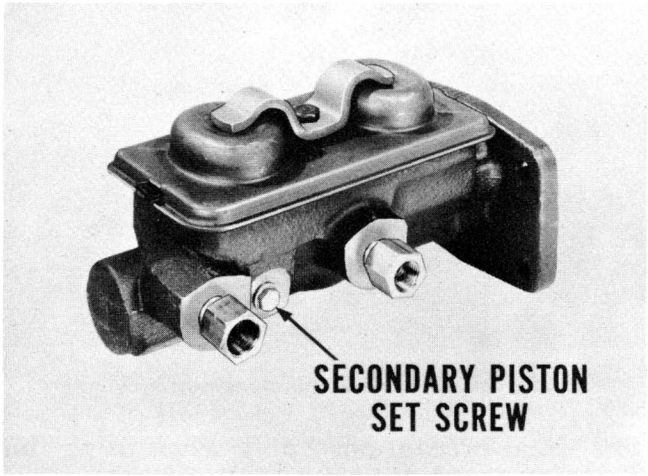

Fig. 24—A set screw retains the secondary piston

IF THE PISTON STICKS

You may find that the secondary piston is stuck in the master cylinder and refuses to be "tapped" out. If this is the case, use air to blow it out of the cylinder. Of course the air pressure will push the lips of the piston cups out and they'll be cut as they pass over the edges of the filler ports. That means they must be replaced when you rebuild the cylinder. As a matter of fact, anytime you overhaul a master cylinder, use all of the new rubber parts in the repair kit. It's mighty risky to use any of the old parts even if they do look all right.

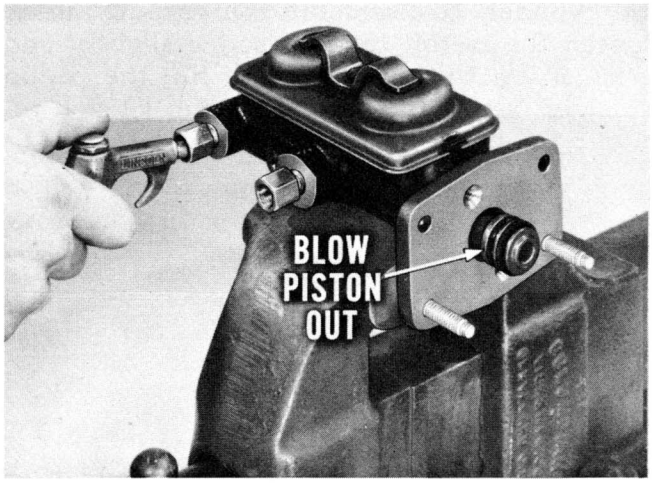

Fig. 25—Air pressure can be used to remove piston

SERVICE THE RESIDUAL PRESSURE VALVES, TOO

You should service the residual pressure valves whenever you rebuild a master cylinder . . . disc or drum type.

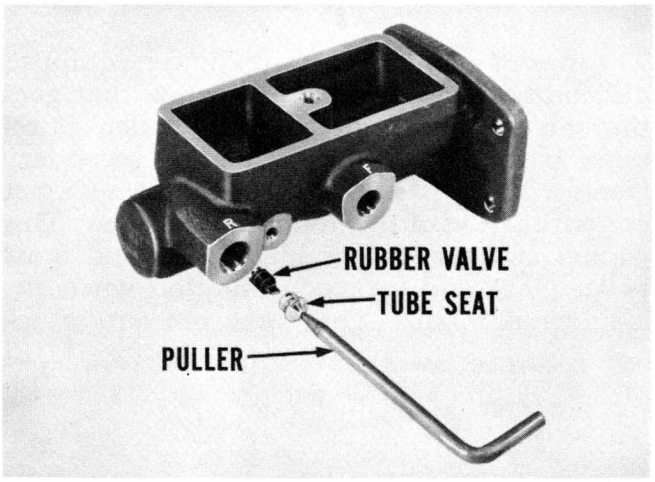

Fig. 26—An easy-out-type puller removes tube seats

Use an easy-out-type puller to remove the tube seats. Discard the tube seats and the rubber valves. Install new valves and tube seats *after* you have cleaned and rebuilt the rest of the master cylinder. Make sure you put a residual pressure valve in both outlets of a drum-type brake master cylinder. Be sure and leave the residual pressure valve out of the primary ("F") outlet of a master cylinder used with disc brakes, but install one in the secondary ("R") outlet.

SOME PISTON RETAINERS ARE DIFFERENT

The master cylinder used with drum-type power brakes is slightly different. The piston is retained by a special retainer at the rear of the cylinder. To disassemble this type cylinder, loosen the piston retainer screw slightly and push in on the piston. Then, flip the piston retainer out of the way. This will let you remove the primary piston assembly.

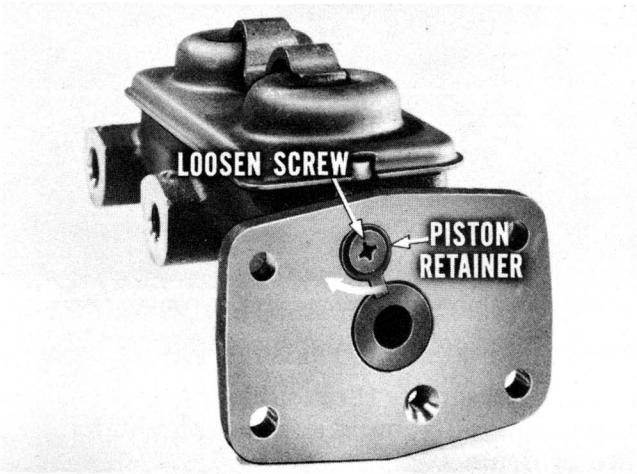

Fig. 27—Master cylinder for drum-type power brakes

The master cylinder used with power-equipped disc brakes, has a piston set screw that goes through the underside of the cylinder. It retains both the primary and the secondary pistons. You will notice that there is a washer under the head of this retaining set screw. This washer is actually a sealing gasket and must be in place and in good condition when the cylinder is rebuilt. This same precaution applies to the master cylinder set screw and gasket for drum-type brakes.

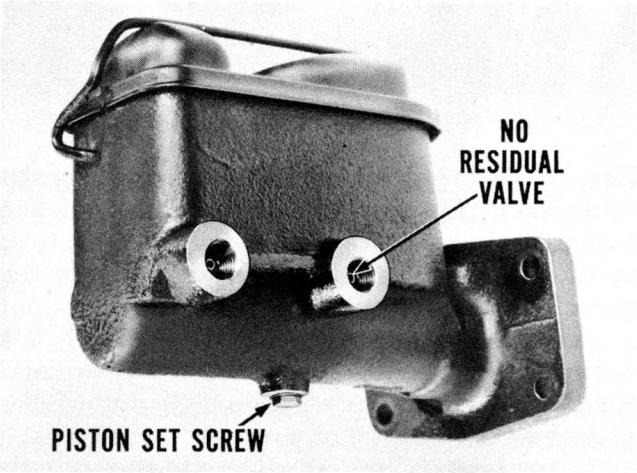

Fig. 28—Master cylinder used with power-type disc brakes

CLEANING AND INSPECTION

The master cylinder must be cleaned thoroughly before inspection. Use a suitable solvent and then dry with compressed air. Then, wash the cylinder bore with clean brake fluid to remove all traces of the cleaning solvent.

Inspect the bore for pitting or scoring. Minor scratches or corrosion can usually be polished out using crocus cloth. However, if the bore does not clean up it must be honed.

YOU'LL NEED A SPECIAL HONE

Chances are that the master cylinder hone you've been using won't reach the end of the bore on a tandem master cylinder. A special hone has been released for the new master cylinder. It will be available under special tool number C-3080-A.

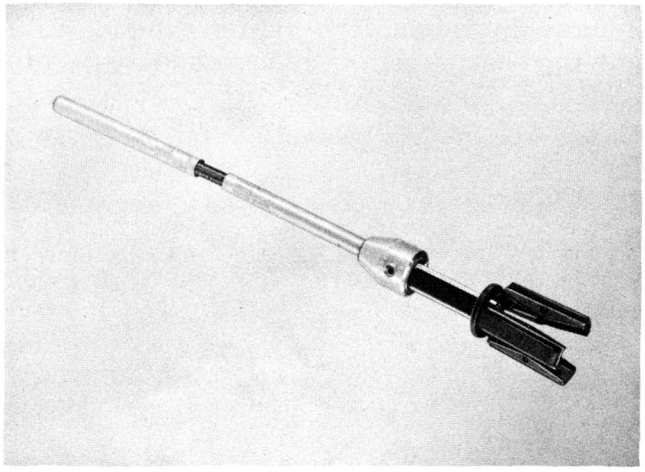

Fig. 29—Special hone for tandem master cylinders

The usual precautions apply when using this hone. The bore diameter of the cylinder must not be increased more than .002 inch. The cylinder must be thoroughly cleaned and inspected after honing. It is very important to make sure the filler ports and the compensating ports are open. Make sure that the honing operation has not raised any burrs or sharp edges at the filler ports that might cut the piston cups.

LUBRICATE WITH BRAKE FLUID

When you are sure the cylinder bore is clean and in good condition, lubricate it with brake

fluid. Dip each rubber part, the piston cups and the "O" ring seal, in clean brake fluid before assembly. This will facilitate assembly and prevent damaging the rubber parts. A dry piston cup is easily cut in passing the filler and compensating ports.

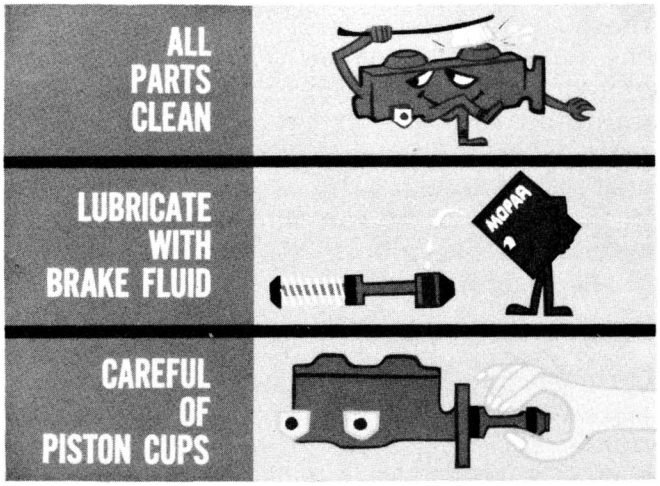

Fig. 30—Master cylinder service precautions

Be especially careful when working the lips of the piston cups into the cylinder or you'll damage them and have a leaker. Keep them well lubricated with brake fluid and make sure the lips of the cups enter the bore evenly.

BENCH BLEEDING IS VERY IMPORTANT

There are many extra parts in the dual hydraulic brake system and more places for air to be trapped. This combination of factors makes it somewhat more difficult to bleed air out of the dual hydraulic system.

Before installing the master cylinder on the vehicle, it should be bench bled. Clamp the master cylinder in a vise and attach bleeding tubes, Tool C-4029, to the master cylinder.

NOTE: When bench bleeding a master cylinder for a vehicle equipped with disc brakes, be sure and attach an external residual pressure valve to the reservoir end of the bleeder tube used at the rear of the master cylinder. If this is not done, the fluid will simply be pumped back and forth through the bleeder tube and trapped air may not be removed. Also, the fluid will be syphoned out of the reservoir when you loosen the bleeder tube nut.

As a matter of fact, the residual valve might as well be left on the rear bleeder tube, even when bleeding a drum-type master cylinder, because it does not interfere in any way with that operation.

Fill both reservoirs with approved brake fluid, then, pump the primary piston full stroke until no more bubbles come out of the bleeder tubes. This may take twenty or thirty strokes, so don't stop pumping until all of the air is bled from the master cylinder.

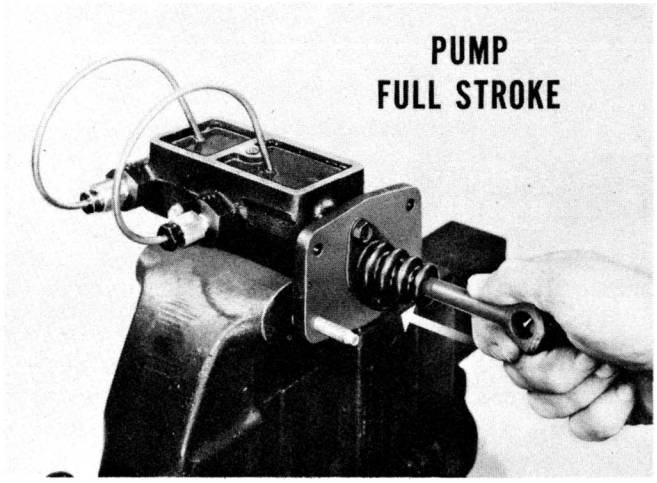

Fig. 31—Bench-bleeding the tandem master cylinder

Leave the fluid in the bench-bled master cylinder until you install and connect it. The residual pressure valves will prevent the fluid from leaking out of the outlets. However, since there is no residual pressure valve in the primary outlet of a disc brake master cylinder, insert a plug in this outlet or leave the bleeder tube in place until you have installed the master cylinder on the vehicle and are ready to connect the brake lines.

BRAKE LINE BLEEDING SUGGESTIONS

When bleeding air out of the brake lines, the wheel cylinder bleed screws must be fully open. If you crack a bleed screw less than one full turn, an orifice is formed that restricts the flow of fluid. Air trapped in the wheel cylinders, lines or frame tee tends to compress and form tiny bubbles which are difficult to remove.

DON'T DEPEND ON PEDAL FEEL

If the bleeder screws are not opened fully, the brake pedal may feel firm even though all of the air hasn't been bled out of the system. As

a result, the pedal may go almost to the floor after the car has been parked overnight or for several hours. After one or two brake applications, the pedal may again feel firm until the car has been parked for several hours again.

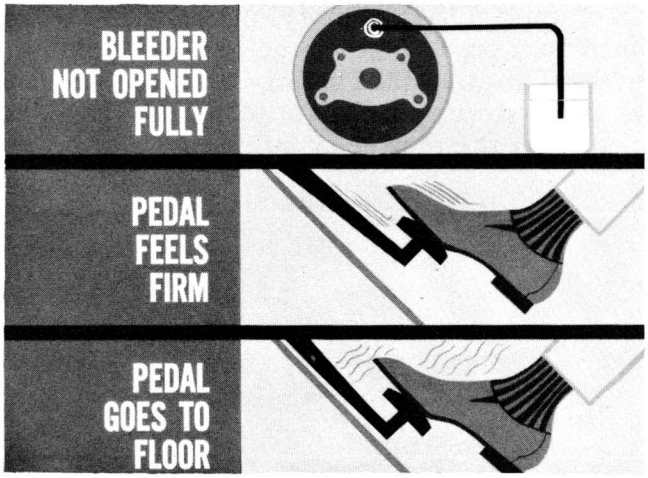

Fig. 32—Partly open bleeder screws cause problems

NOTE: Air in a dual hydraulic brake system doesn't necessarily produce a spongy pedal, so you can't depend on pedal feel to detect air.

GET RID OF THAT AIR

If you run into a case of unexplained loss of pedal after the vehicle has been parked several hours, the best solution is to bleed the master cylinder and lines completely and correctly. Be sure and bleed the master cylinder before you attempt to bleed the rest of the system. If there is air in the master cylinder there's no point in trying to pump it through the entire system and out through the wheel cylinder bleeder screws.

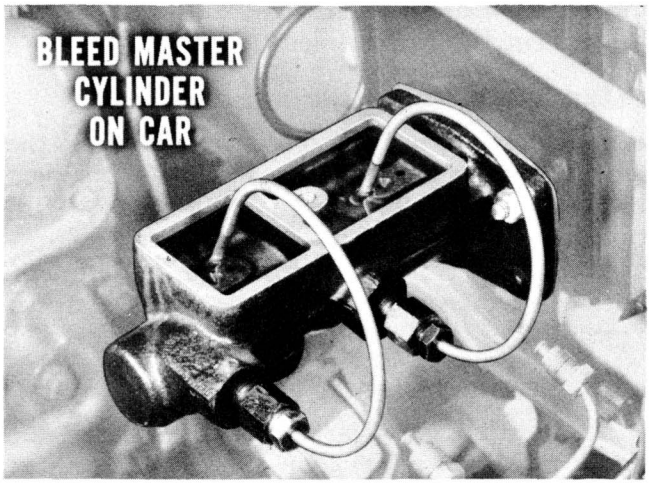

Fig. 33—You can bleed the master cylinder on the car

It's easy to bleed the master cylinder without removing it from the car. Just disconnect the brake lines, install the bleeder tubes and pump the brake pedal until all air is purged from the master cylinder. Be especially careful to keep the fluid level up when bleeding the master cylinder or lines. If the level gets low, you'll pump air into the system and make a lot of extra work for yourself. Incidentally, if you ever get a job with a dry or very low fluid level in the reservoir, be sure and bleed the master cylinder before you attempt to bleed the rest of the system.

ABOUT THOSE COMPENSATING PORTS

On past models you could easily check compensating port operation by looking into the reservoir to see if fluid squirted out of the port when the brakes were applied. There are two compensating ports to check on the new tandem master cylinder and you'll have to use a slightly different technique to check the rear or primary port.

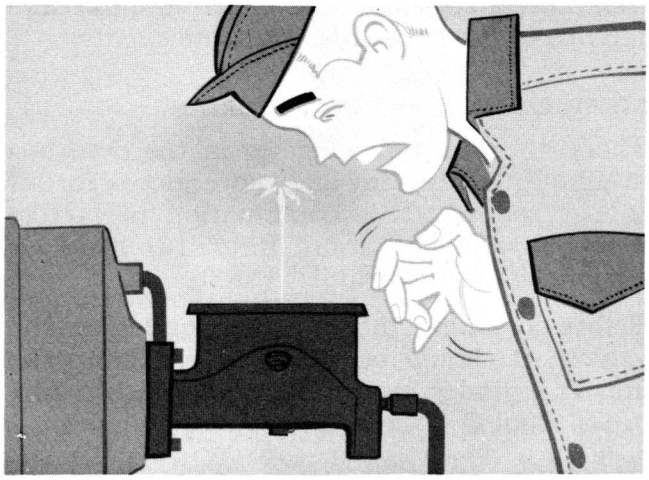

Fig. 34—Past model compensating ports were easy to check

You'll remember that the secondary piston return spring isn't quite as stiff as the primary piston return spring. As a result, the primary piston spring will compress the secondary piston spring slightly when the brakes are applied. The secondary piston and the primary piston will move forward together. As a result, no pressure will be developed in the primary chamber before the compensating port is closed

off by the primary piston cup. Consequently, fluid will not squirt from the primary compensating port when the brakes are applied. However, if the secondary port is open, you should be able to observe the characteristic squirt of fluid from this port as the brakes are applied.

TO CHECK THE PRIMARY COMPENSATING PORT

To check the compensating ports of tandem master cylinder, have someone pump the brakes rapidly and then hold the pedal down hard to maintain pressure in the master cylinder. Then, watch closely while the pedal is released very slowly. If the ports are open you'll see a light spurt or swirl of fluid from the ports as they are uncovered.

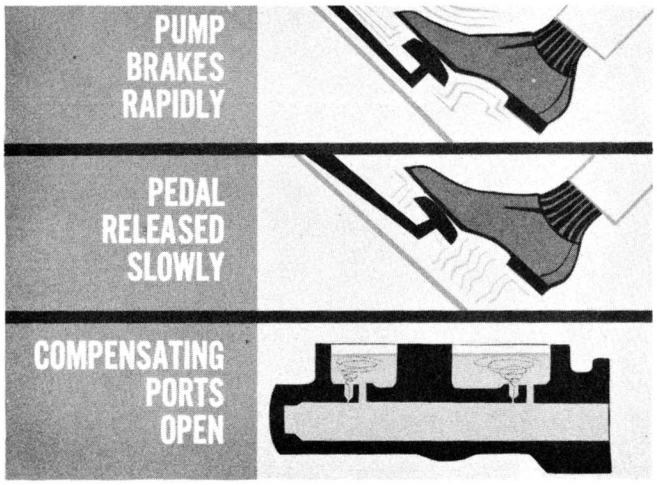

Fig. 35—Test tandem master cylinder compensating ports

If you don't see fluid swirling out of the ports, repeat the test several times to make sure the ports are not compensating before you attempt any corrective measures. Remember, you will have to watch quite closely to observe the swirl from the primary port. The spurt from the secondary port is more readily seen and will occur both when the brakes are applied and when they are released after "pumping up".

A PARTING WORD OF CAUTION

It was not the intent of the foregoing discussion of compensating ports to imply that compensating port troubles might be more common on the tandem master cylinder than they were with the single piston master cylinder. On the contrary, there is no reason to believe that failure of the compensating ports to compensate should be a common occurrence. The purpose of this discussion was merely to point out that you shouldn't jump to the conclusion that the primary port isn't compensating just because you don't see a squirt of fluid when the brakes are applied.

As a matter of practical logic, incorrect push rod travel is the condition most apt to hold the master cylinder pistons back so that the compensating ports are not uncovered when the pedal is released. On vehicles without power brakes, the pedal push rod length is not adjustable and will not interfere with compensating port operation if it and the master cylinder are correctly installed.

The power brake push rod is adjustable but will be the correct length and *will not* cause problems unless it has been tampered with. However, if someone has overhauled the power booster unit and then discovers that the compensating ports are not opening, you should be strongly suspicious that someone has slipped up when reassembling the power booster unit. If someone has failed to install a snap ring correctly, for example, this condition should be corrected rather than misadjusting the push rod so that the ports will open.

Litho in U.S.A.