

MICO POWER BRAKE CYLINDER

SERVICE MANUAL,

No. 84-001-002



## FOREWORD

The Mico Power Brake Cylinder begins and ends its function toward safe dependable brakes by making it easily possible for the driver to obtain the high hydraulic pressure necessary to stop present day loads in present day traffic.

Given the same consideration in installation and care as the original equipment master cylinder, the Mico Power Brake Cylinder will give years of trouble free service.

In short, Mico Power Brake Cylinders are not a brake ailment cure-all—they will not correct mechanical defects in the braking system or renew worn out linings and drums, nor will they correct faulty adjustments.

Mico Cylinders will improve poor brakes, but they **will not** make defective brakes good!

The Mico Power Brake Cylinder employs no outside source of power and no trick leverages to develop its braking power. The plain, simple principles of hydraulics alone are utilized. A brief study of the flow diagrams will clearly show how such hydraulic principles are employed in the Mico.

An understanding of this method of employing hydraulics will greatly aid the mechanic in diagnosing trouble.



## ADJUSTMENT OF THE MICO RELIEF VALVE

It will be noted, after studying the diagrams on the back of the catalog sheet (page 4), that the Relief Valve performs an important function in the operation of the Mico Cylinder. Its action may be compared to that of an automatic adjustable transmission between the low and high pressure cylinders within the Mico Cylinder.

Improper adjustment or operation of the Relief Valve will react in various ways against the development of a satisfactory brake, both in pedal feel and performance.

### IF SET TOO HIGH—

If the adjustment screw is set unnecessarily high an unsatisfactory pedal action will develop. The brake pedal with such a valve setting will be very heavy during the first of the pedal stroke and then a very noticeable "pop" will be felt with a resulting pedal "dive." Such an action will make smooth stops impossible on a light vehicle at slow speeds.

**TO CORRECT—**Remove Filler Plug to gain access to the adjustment screw in the top of the Relief Valve Assembly. Using a screw driver, release this adjustment by turning counter-clockwise. Release one full turn at a time. After each adjustment try the brake pedal for proper "feel." (Note: The transition from low to high pressure will always be noticeable in some degree.) After adjusting Relief Valve, always check brakes carefully by depressing the brake pedal both rapidly and slowly—no pedal travel should be lost.

If adjustment by release of Relief Valve adjustment screw will not correct pedal action, remove entire Relief Valve Assembly; disassemble completely and wash all parts in alcohol to eliminate piston sticking within the body of the valve.

When such corrections as above will not correct complaint, the Relief Valve may be mechanically defective. If so replace with a new Valve.

### IF SET TOO LOW—

Too low setting of the Relief Valve may cause loss of pedal, low pedal or an inconsistent pedal action. This is caused by the Relief Valve releasing the low pressure piston before full shoe extension has been attained.

**TO CORRECT—**Set Relief Valve higher by removing the Filler Plug and turning the Relief Valve adjusting screw clockwise. Continue to adjust in this direction until pedal travel becomes constant.

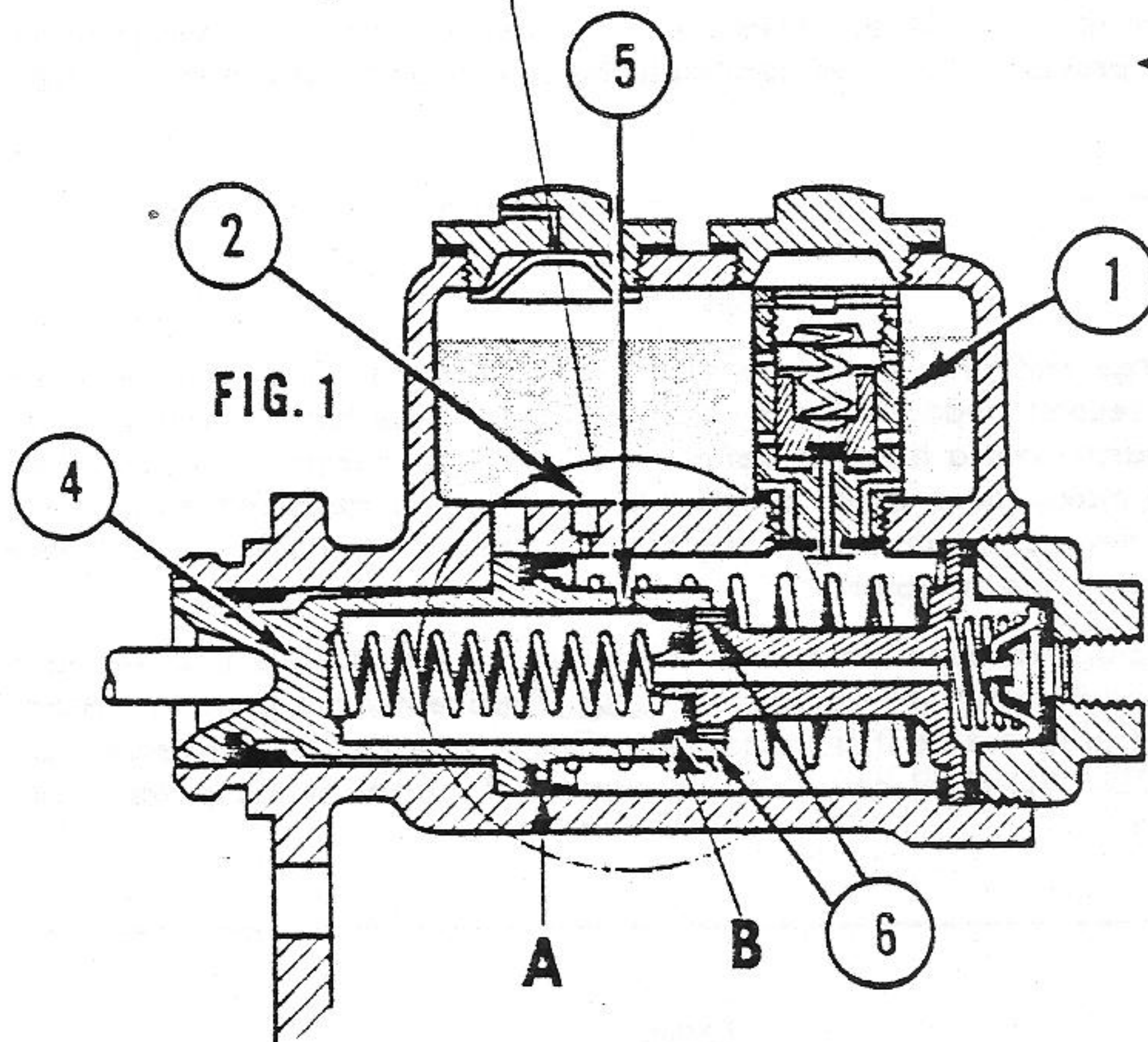


## PRINCIPLES OF OPERATION

MICO Hydraulic Power Cylinders incorporate the advantages of a large piston, for large volume, and a small piston, for high pressure.

The two pistons are designed integrally within one casting. Transfer from low pressure (large piston) to high pressure (small piston) is accomplished by means of a metered pressure relief valve.

Inset Shows Alternate  
Piston Design



HERE IS HOW IT WORKS!

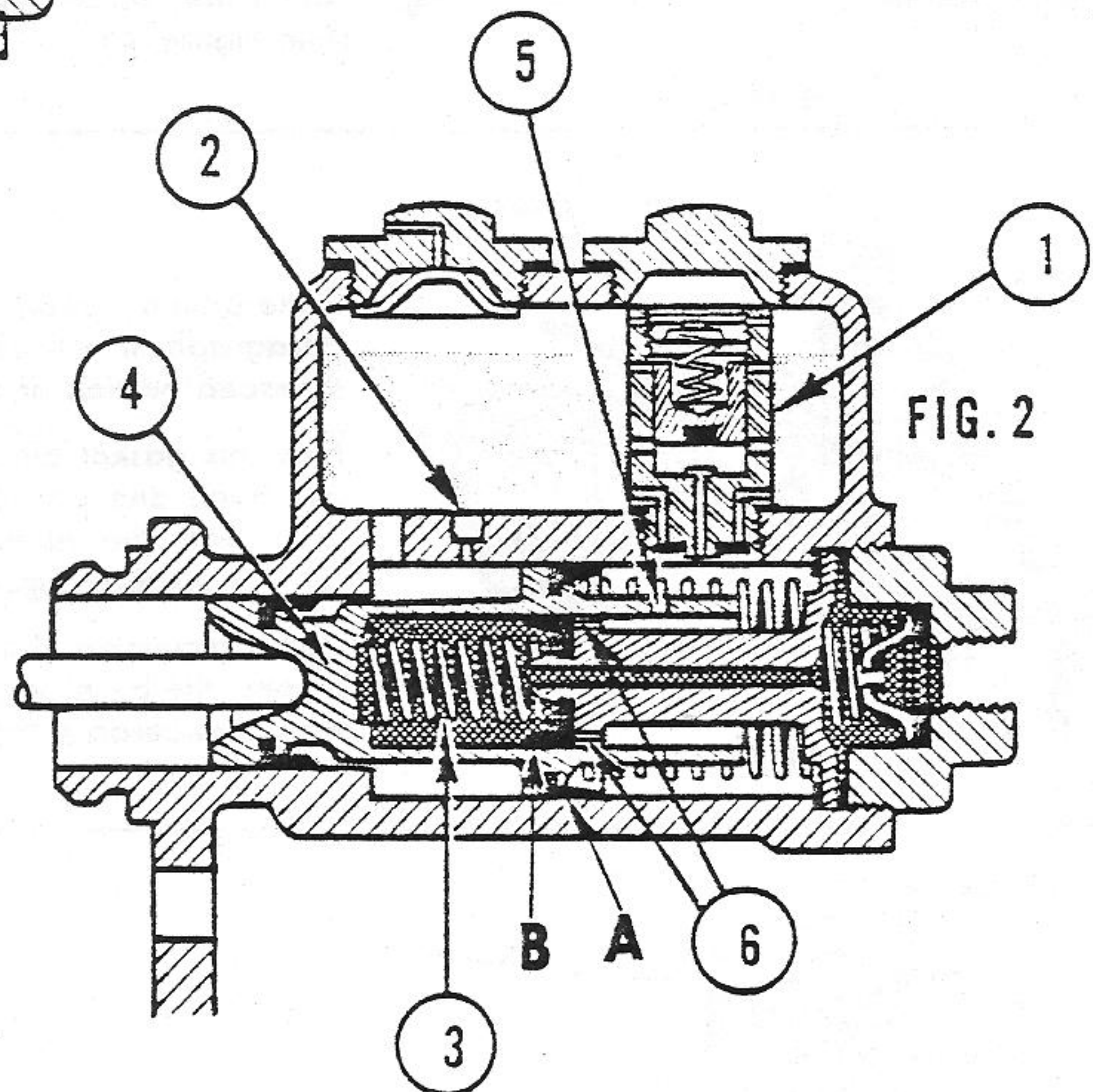
### ← BRAKES COMPLETELY RELEASED

With brakes completely released, fluid is at reservoir pressure throughout the unit. Relief valve "1" is closed and reservoir ports "2" and "5" are open allowing fluid to pass freely. (See Fig. 1)

Initial brake pedal movement carries the low pressure piston "4" forward closing reservoir ports "2" and "5". Cylinder displacement to the brake line is made up of the displacement of cup "A," in the low pressure chamber, and cup "B," in the high pressure chamber. Fluid displaced by cup "A" travels through by-pass port "6," over cup "B" and into the brake lines. Relief valve "1" remains closed during this portion of the cylinder cycle.

### BRAKES FULLY APPLIED ➔

Displacement, of this nature, continues until the braking surfaces are in contact and a line pressure build-up occurs. When the line pressure reaches the pre-determined pressure setting of the relief valve, (factory setting to suit the application), the relief valve opens allowing further displacement from cup "A" to flow directly into the reservoir (See Fig. 2). Cup "B" flares, due to the pressure drop across it, and the cylinder displacement to the brake line is made up only of the displacement of cup "B." Line pressure is developed in relation to the diameter of cup "B," input force and the pedal ratio used.





# DIS-ASSEMBLY MICO POWER BRAKE CYLINDER

## SERIES 01—ALL MODELS

(SEE PAGE 3 FOR SERIES 03, 23 & 73 FLOATING TYPE PISTONS)

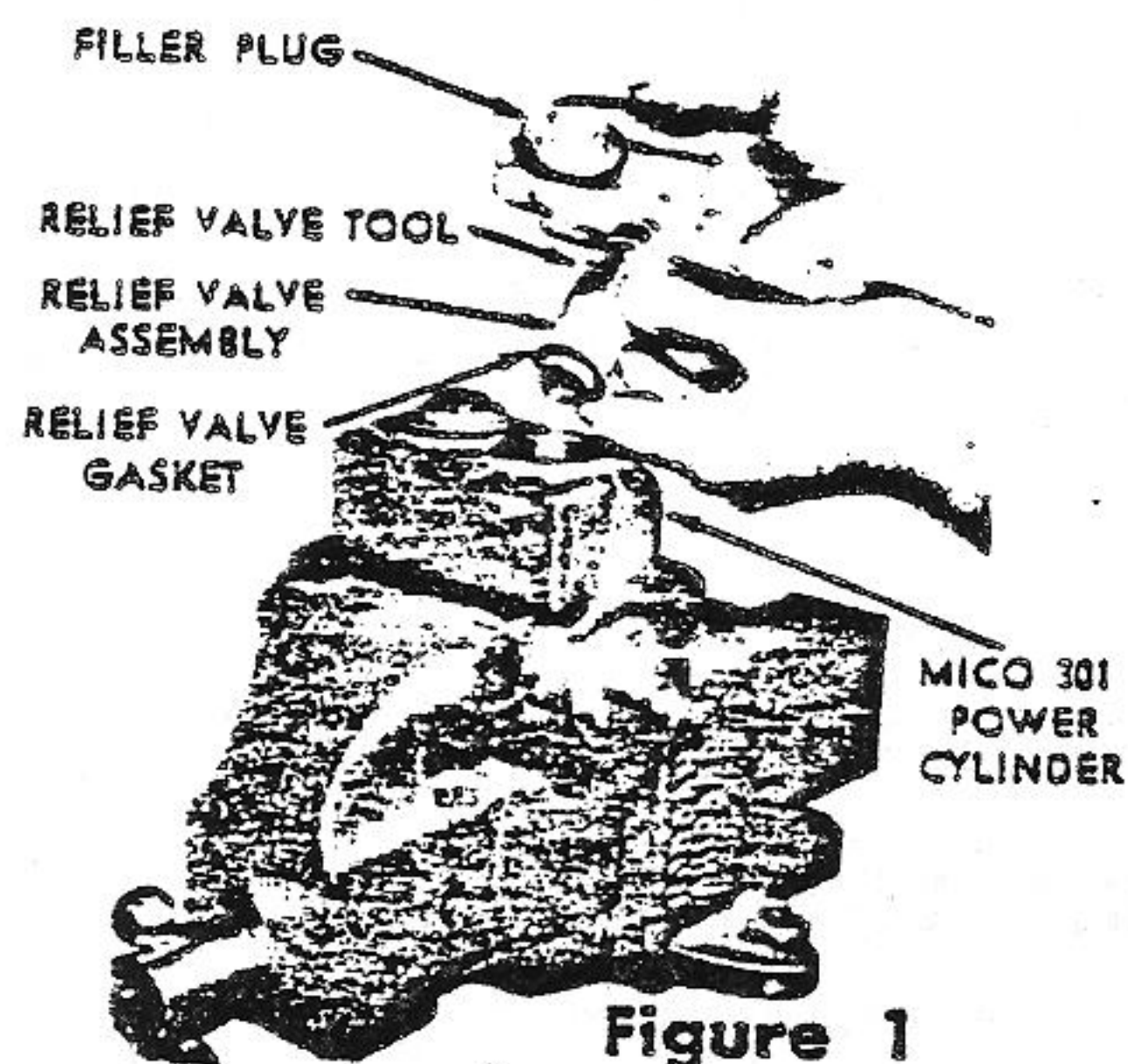


Figure 1

### Step 1

Place Mico Cylinder in horizontal position in a vise. Remove forward filler plug which will expose the slotted top of the Relief Valve Assembly. Remove the relief valve assembly by turning out, counter clock-wise. It is recommended that a Mico  $\equiv$  VT2000 Relief Valve Tool be used for this operation. It is possible, however, to accomplish this by means of a very wide bladed screw driver. If such a screw driver is used make certain that it is wide enough to fit into both notches on the Relief Valve Body. The Relief Valve Assembly cannot be removed by unscrewing the slotted center screw, as this is for adjustment purposes only.

It is necessary that this Relief Valve Assembly be removed to prevent damaging the large low pressure cup when removing the low pressure piston in a subsequent operation.

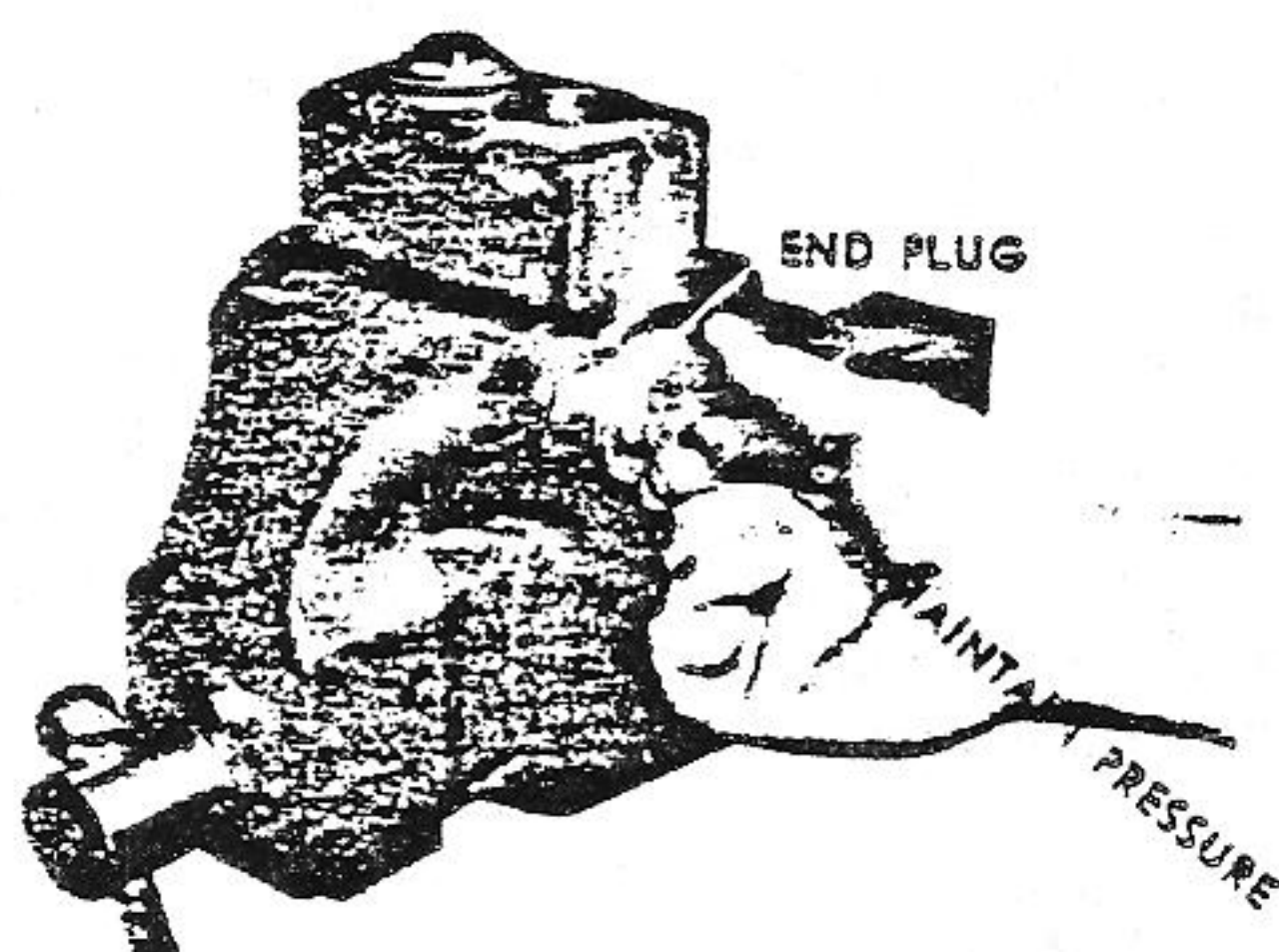


Figure 2

### Step 2

Loosen the large end plug by means of a 1-5/16 wrench. This plug will be very tight and it is recommended that the machined face of the hex portion of this plug be tapped smartly with a hammer before attempting to loosen it. In doing this be careful not to make sharp dents or impressions near the threaded outlet hole. If this surface is dented, it will make it difficult to obtain a tight seal when later connecting the brake line adaptor.

After the end plug has been loosened, unscrew by hand and while unscrewing keep a reasonably heavy pressure against the plug. Frequently the primary piston will follow the end plug out as it is unscrewed. This is due to the two return springs within the MICO CYLINDER being seated against the base of the primary piston. (See Figure 4.)

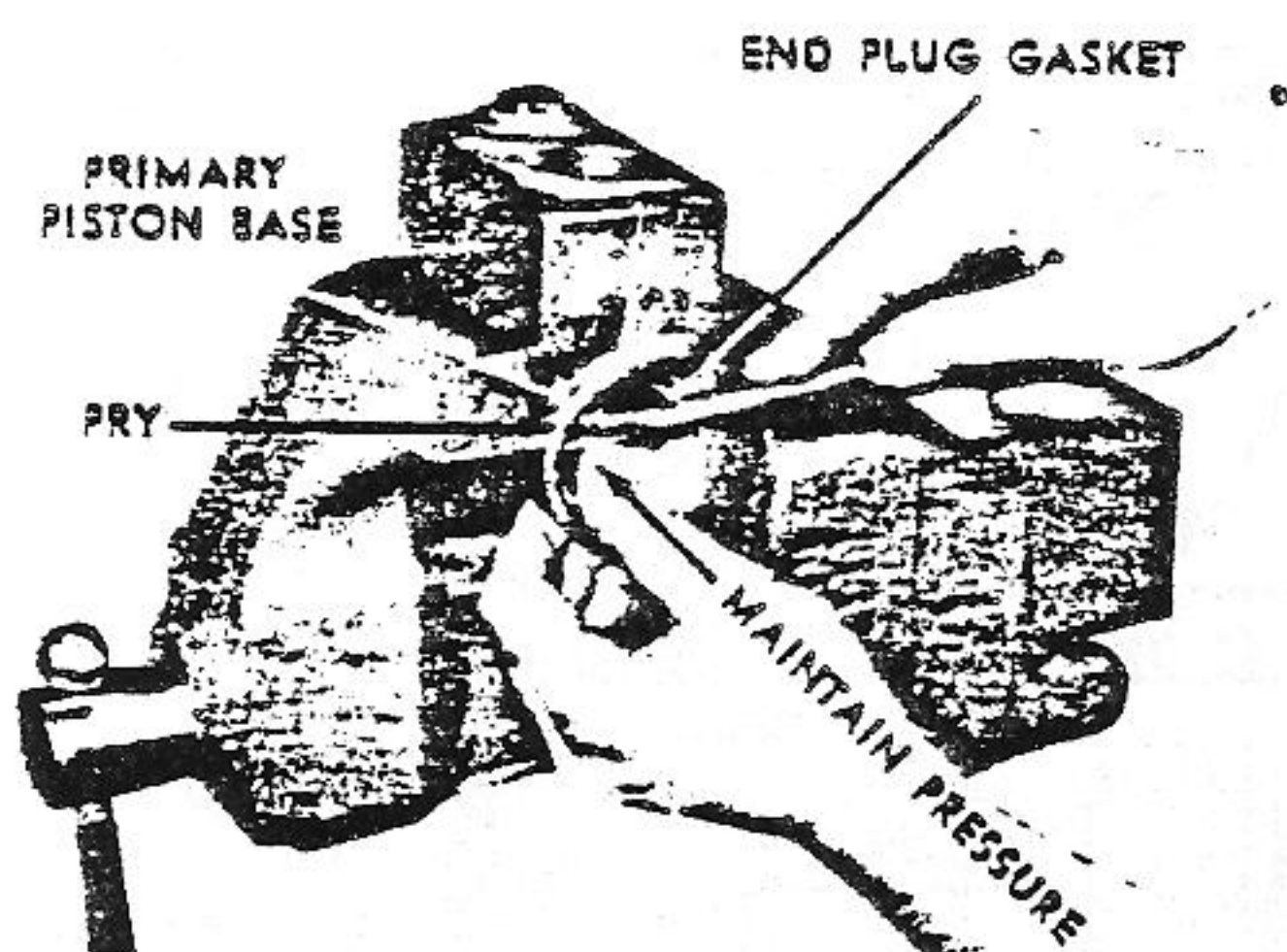


Figure 3

### Step 3

If the primary piston does not follow the end plug out as described in the previous paragraph, it will be necessary to free the end plug gasket from hanging in the threaded portion of the cylinder housing.

Free this gasket by pushing securely against the base of the primary piston with one hand and prying out the end plug gasket by means of a thin bladed screw driver with the other. While performing this, remember to keep as heavy a pressure as possible against the base of the primary piston.

Again remember that the internal return springs of the MICO cylinder are seated against the base of the primary piston and it is possible that this piston may fly out with considerable force if released suddenly.

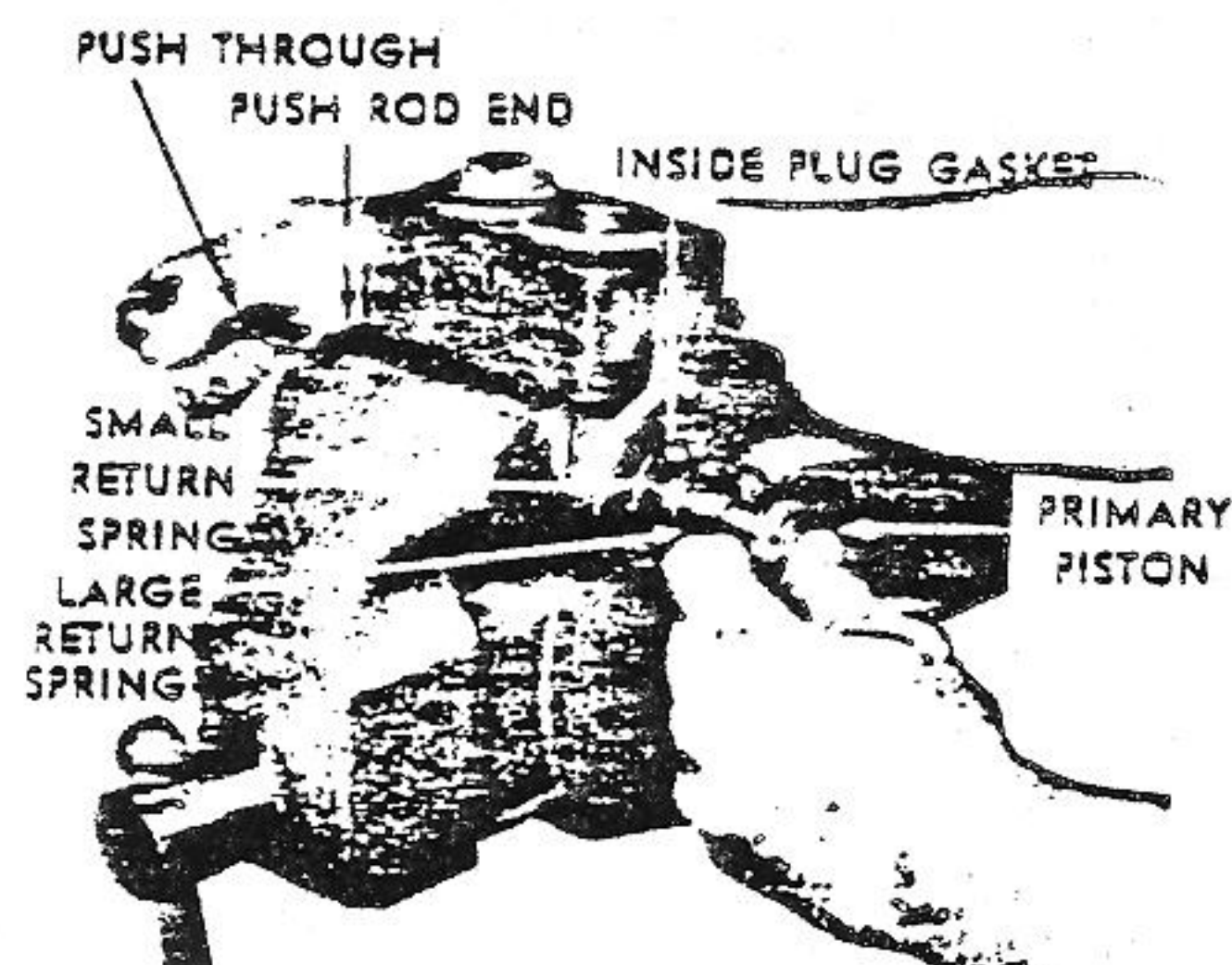


Figure 4

### Step 4

Removal of the remaining internal parts of the MICO cylinder after the end plug has been removed is very simple. As previously described, the primary piston upon being freed will expel itself. The large and small return springs may then be pulled from within the cylinder as they are free at both ends. Next remove the inside plug gasket. After this gasket has been taken out, the secondary piston may be removed by forcing through with a screw driver or rod from the push rod end.



## ASSEMBLY MICO POWER BRAKE CYLINDER—SERIES 01

### Step 1

Place cylinder housing, threaded end up, in a vertical position in a vise. Set a socket (about  $\frac{3}{8}$  size) on the vise beam so that it will project into the smaller bore of the cylinder housing. This socket will hold the secondary piston up so that the high pressure piston may be entered in a later step.

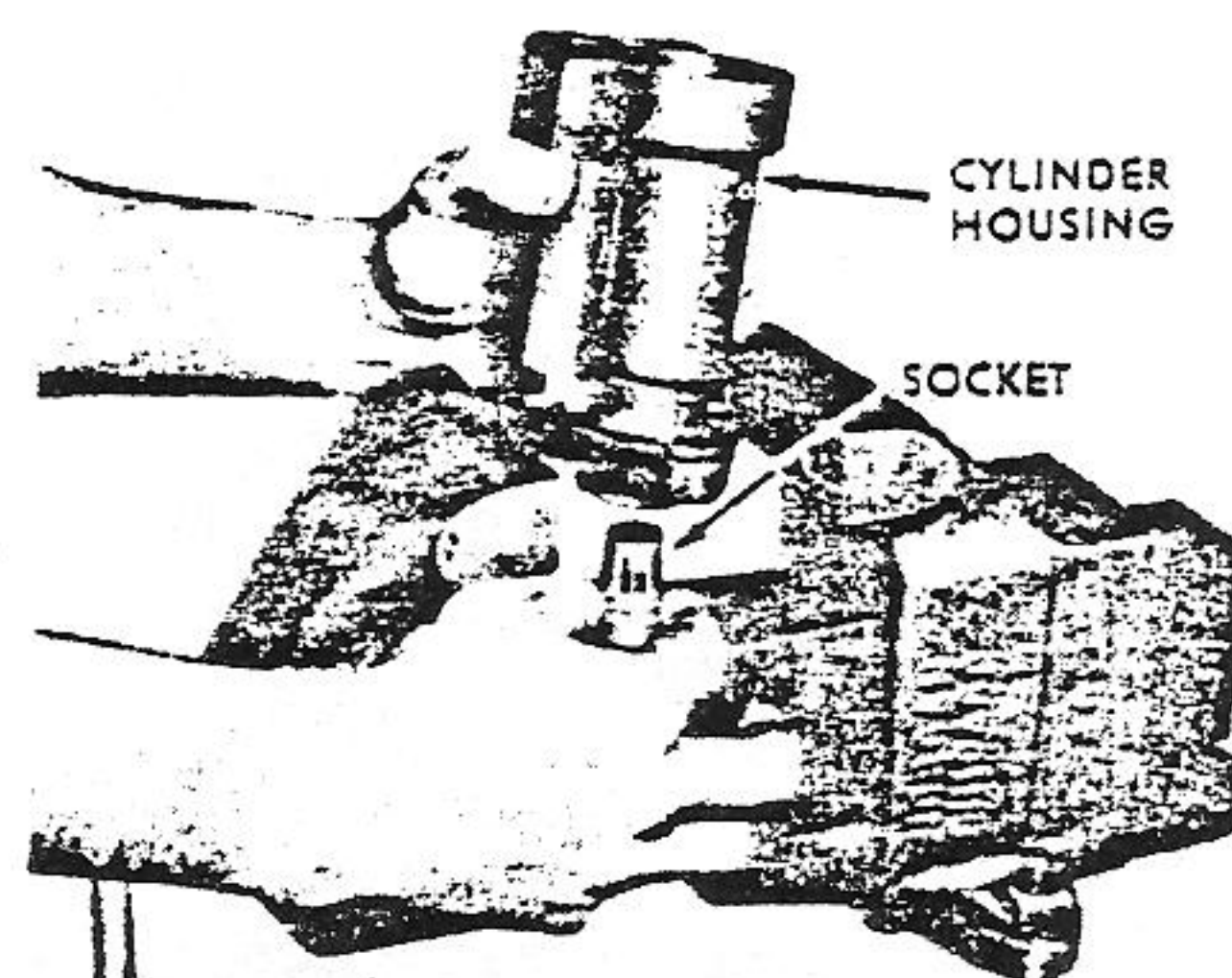


Figure 5

### Step 2

Tighten vise securely with cylinder housing resting on the vise beam. Next insert low pressure piston. When doing this make certain that the two cups are on correctly. The open or forward side of these cups must be in the same direction as the open or cylinder end of the low pressure piston. Push low pressure piston down until it stops against the socket standing in the small bore. Insert inside plug gasket, being certain that this gasket is up square and snug to its shoulder within the cylinder housing.

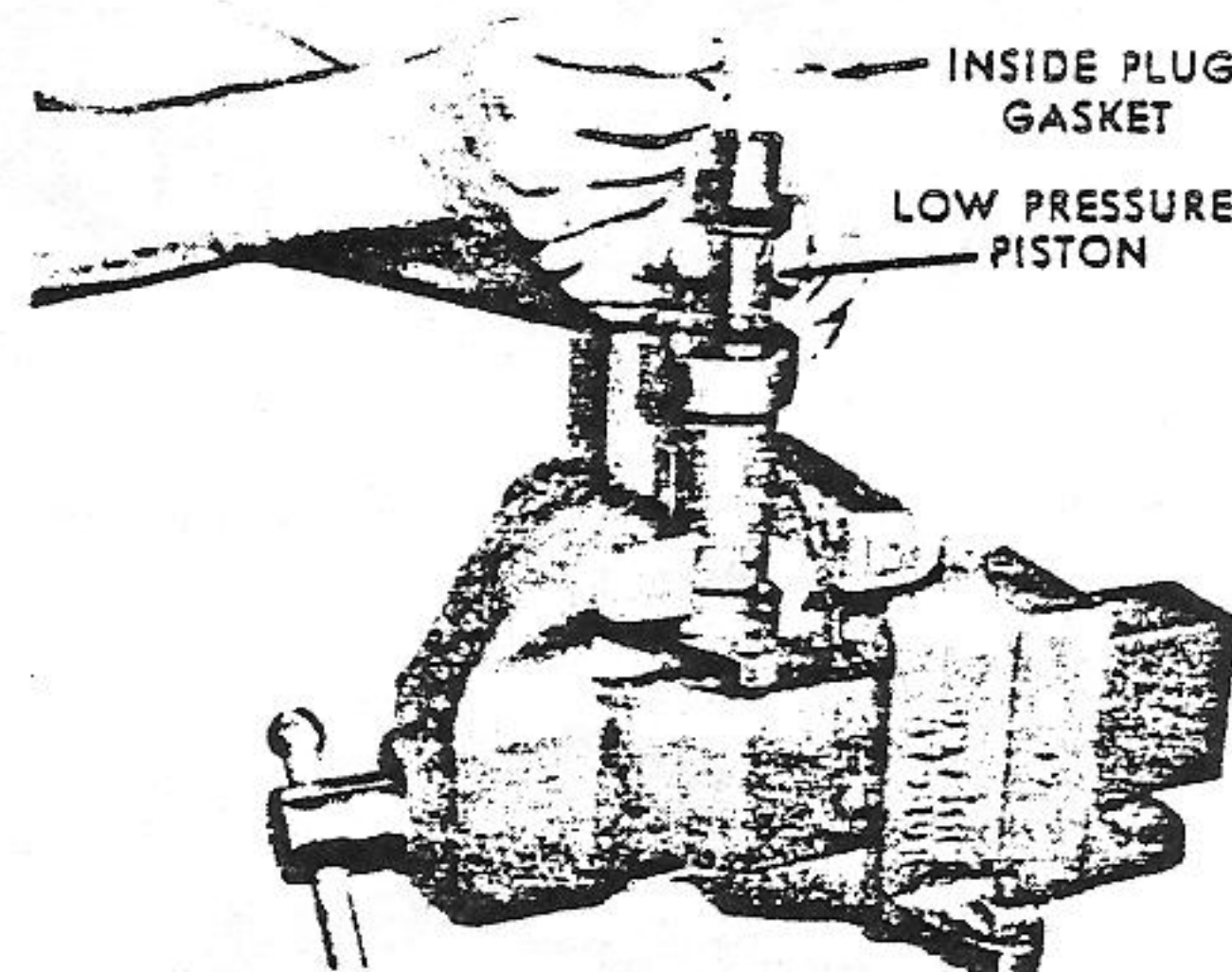


Figure 6

### Step 3

Insert the small return spring into the high pressure cylinder of the low-pressure piston. Next insert the large return spring.

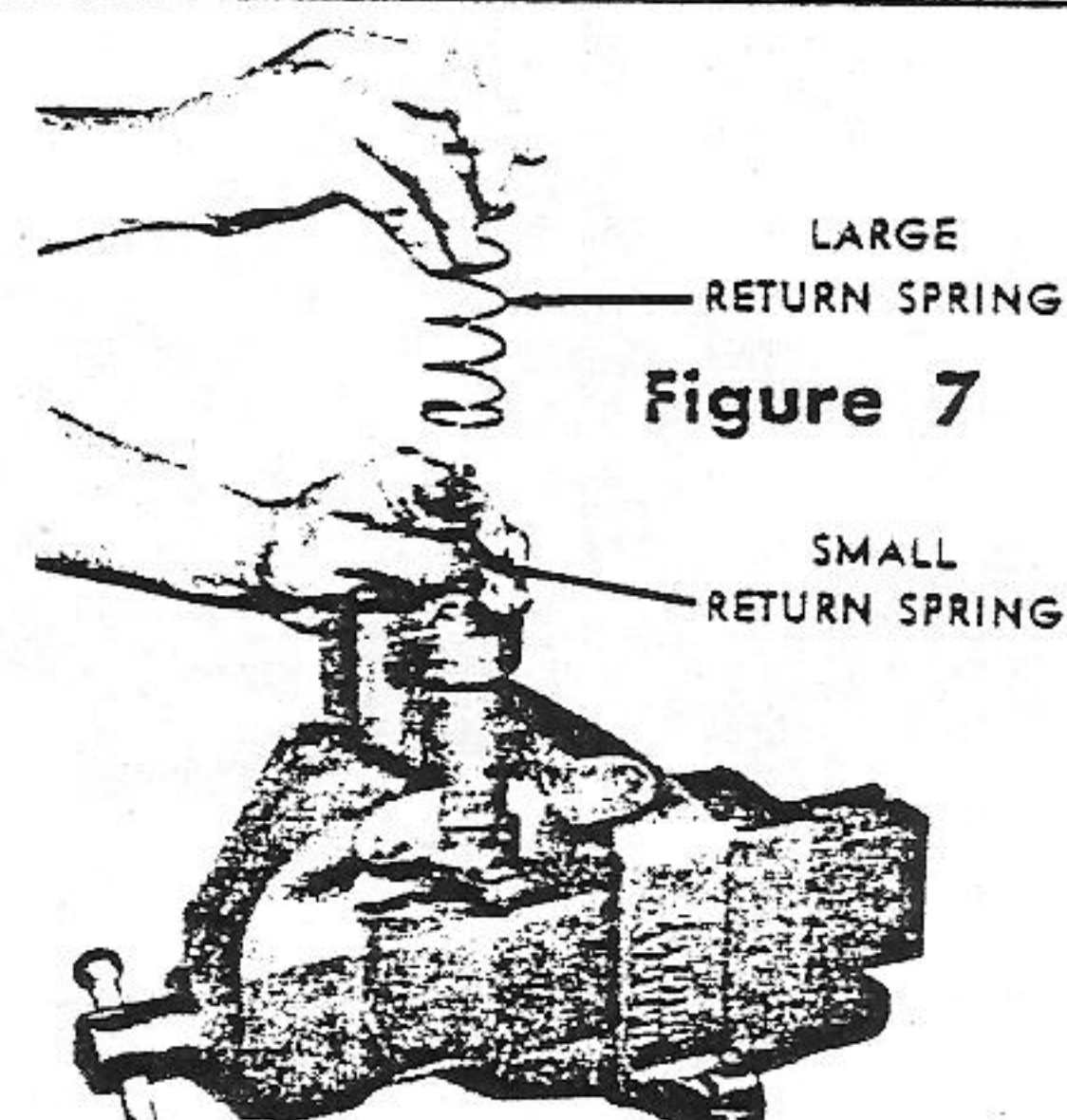


Figure 7

### Step 4

Pre-assemble the high pressure piston, check valve, check valve seat, check valve spring, and plug gasket, and end plug in position shown.

Refer to exploded view on page 12 for correct position of check valve parts, etc.

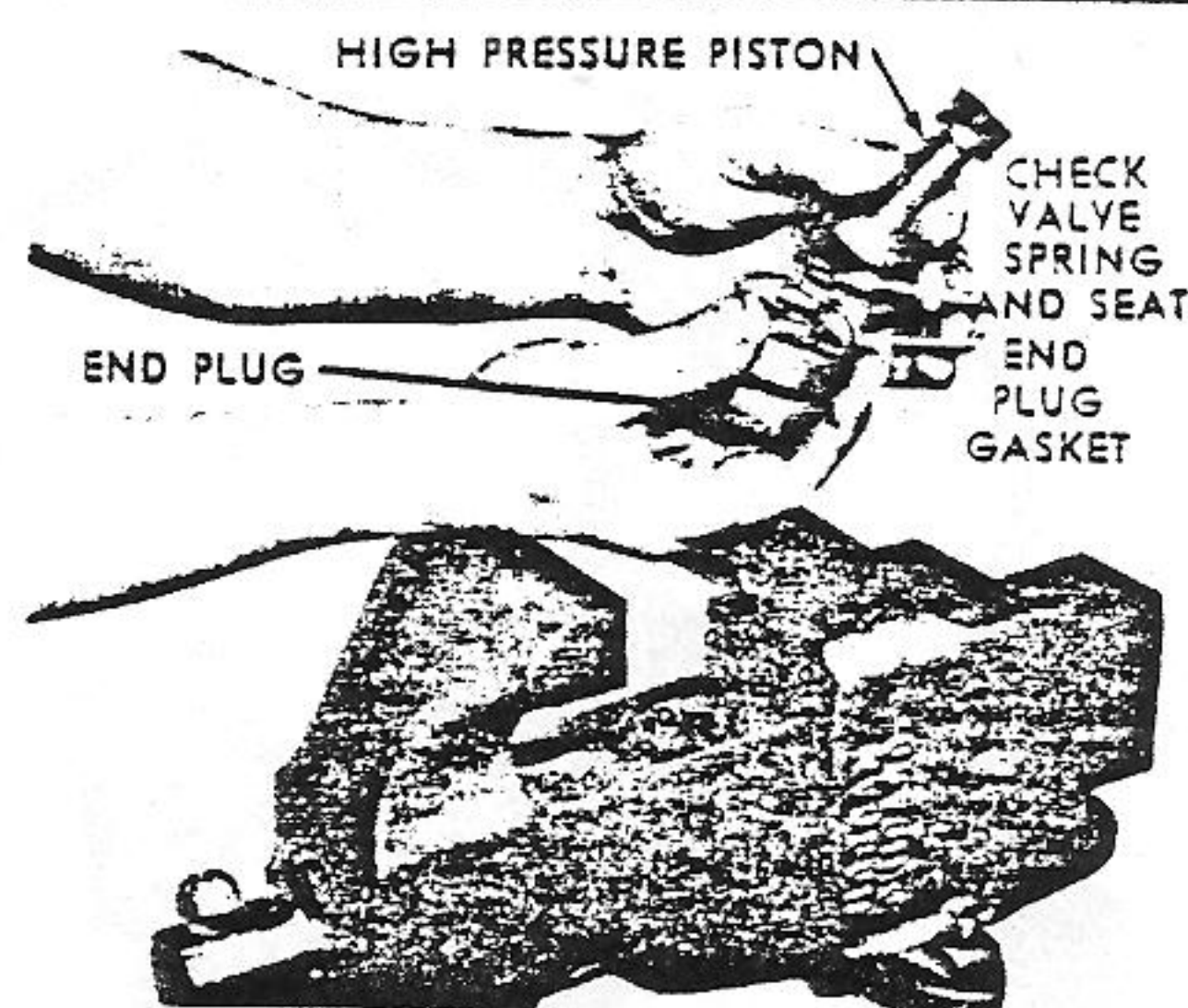


Figure 8



## ASSEMBLY MICO POWER BRAKE CYLINDER

### SERIES 01

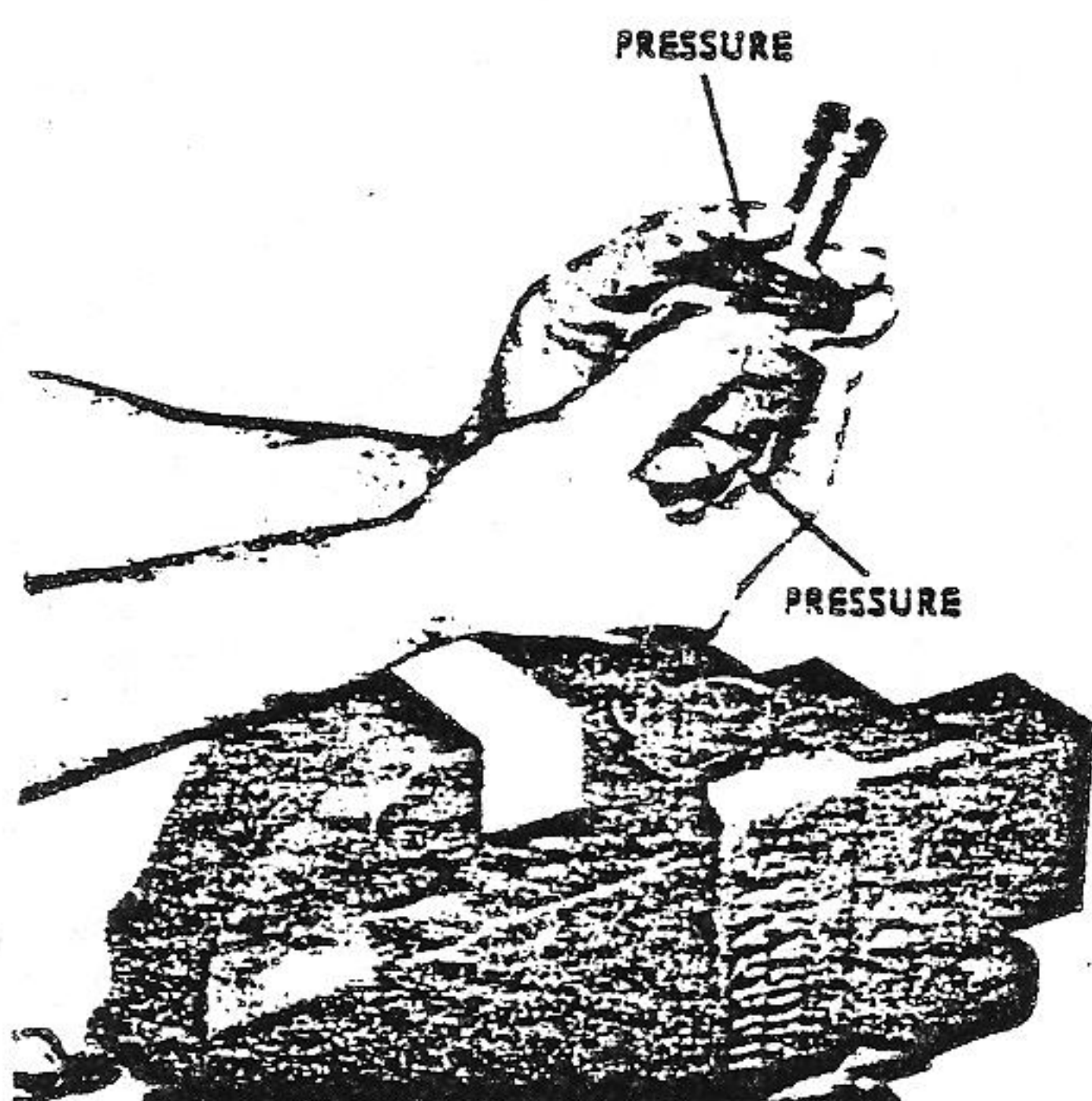


Figure 9

#### Step 5

Using both hands compress check valve spring until the base of the high pressure piston seats against the gasket and the gasket seats to the end plug. Make certain to hold enough pressure on this assembly to keep high pressure piston base, end plug gasket, and end plug in good alignment.

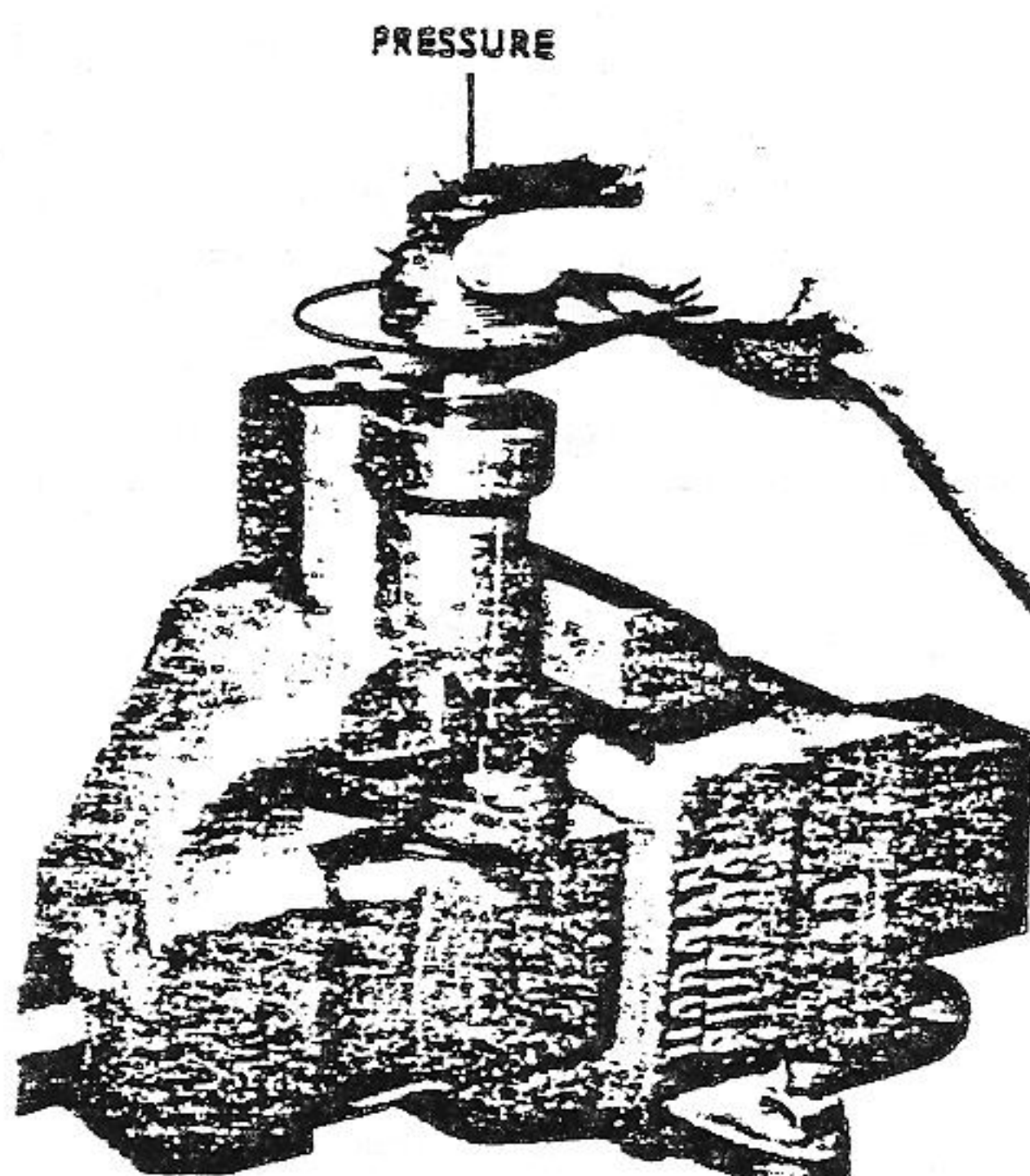


Figure 10

#### Step 6

While securely holding parts in alignment insert assembly and by constant downward pressure and through a slight rotating motion enter high pressure piston into its cylinder. When entering this piston use extreme caution to prevent damaging or folding back of high pressure cup.

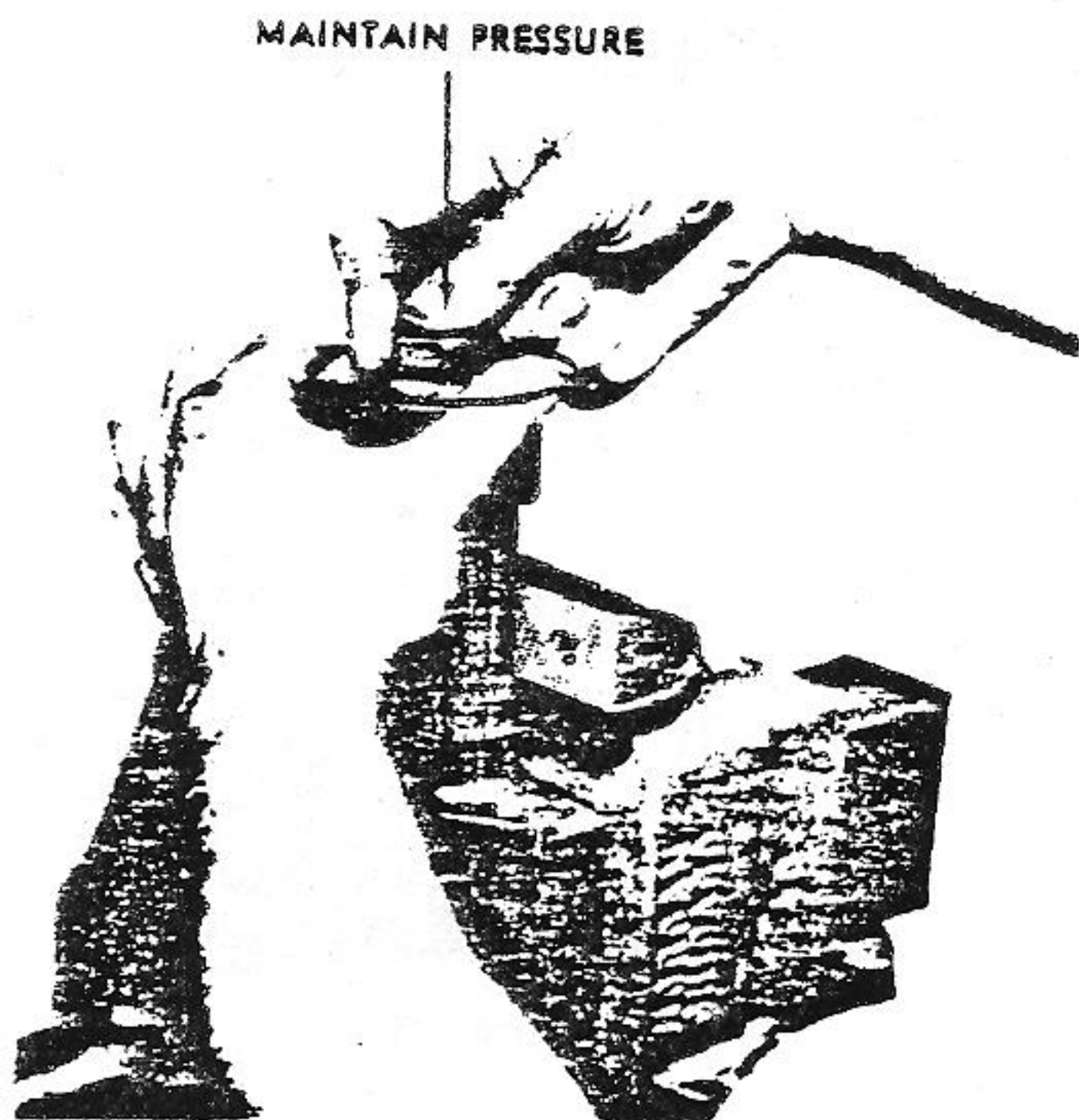


Figure 11

#### Step 7

While maintaining downward pressure with one hand, screw the end plug in. Watch the end plug gasket carefully during this operation to insure against its misalignment which will make it difficult to start threads.

Tighten end plug very tightly. It is recommended that a heavy wrench be used and struck smartly several times to insure proper sealing of the end plug gaskets.



**DIS-ASSEMBLY MICO POWER CYLINDER**  
**SERIES 03, 23 AND 73, FLOATING TYPE PISTON, - ALL MODELS**

**Step 1**

(Same as Step 1, Page 5.)

Note that the primary piston is retained within the secondary piston internal bore by means of an internal lock ring, as shown in inset on page 4.

**Step 2**

(Same as Step 2, Page 5.)

As the end plug is removed the check valve components, end plug gasket, piston rod, backing plate assembly, inside plug gasket and large spring are released for dis-assembly.

**Step 3**

(Same as Step 3, Page 5.)

**Step 4**

(Same as Step 4, Page 5.)

**Step 5**

Place the secondary piston, lock ring end up, on the vise beam and close the jaws very lightly only on the piston area between the large and small cups. Using a screwdriver, depress the floating piston slightly and remove the lock ring by means of internal lock ring tool. Release pressure on the screwdriver slowly to allow floating piston, spring retainer and primary spring to follow.

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**ASSEMBLY MICO POWER CYLINDER**  
**SERIES 03, 23 AND 73, FLOATING TYPE PISTON, - ALL MODELS**

**Step 1**

Place the secondary piston, lock ring end up, on the vise beam and close the jaws very lightly on the area between the two cups. Insert the primary spring in the bore, place the spring retainer over the end of the spring, the piston and cup assembly on spring retainer and compress spring into cylinder bore. With a slight rotary motion, insert the cup into the bore, continuing with hand pressure until piston is in the bore. Using a screwdriver, force the piston below the internal lock ring groove and install the lock ring, with internal lock ring tool.

**Step 2**

Place the cylinder in the vise, as shown in Step 1 on page 6, (do not use socket, or plug, as piston should be allowed to bottom in casting). Proceed with assembly as shown in Steps 2-7. Note that it is only necessary to assemble the large spring in Step 3 and that step 6 is eliminated because of the floating piston configuration.



## TROUBLE SHOOTING

If the brake action gives reason to believe that the Mico Cylinder is faulty the following suggestions are offered:

By the use of a line pressure testing gauge determine whether or not sufficient line pressures are being developed. If line pressures of 1600 p.s.i. or greater are obtained there is some other deficiency in the braking system which is causing unsatisfactory brakes.

Remove line connection from the end of the Mico Cylinder. In its place tightly insert a 1/2 - 20 SAE plug with gasket. After such stoppage of the cylinder it should be impossible to depress the brake pedal. If the pedal can be depressed the Mico Cylinder is faulty and should be removed and repaired.

### PEDAL FEEL

A much softer pedal will invariably result after the installation of a Mico Power Brake Cylinder. After installation has been completed and thoroughly checked for leaks, test the vehicle for stopping under motion. Don't assume that because the pedal can be depressed farther than originally that the truck cannot be stopped more rapidly and more easily. Remember—that same amount of pressure applied to the Mico is creating almost twice the amount of stopping pressure as the original Master Cylinder—again—test the brakes with the vehicle in motion.

### SLOW PEDAL RETURN—STICKING PISTON

#### Cause No. 1—

Fluid return ports of the Relief Valve may have become plugged through entrance of foreign matter.

##### To Correct—

Remove Relief Valve, wash in alcohol and clean return ports by using a 1/16" drill—do this by hand.

#### Cause No. 2—

Poor quality brake fluid or mineral base fluid used instead of brake fluid.

##### To Correct—

Disassemble and rebuild cylinder completely—wash all parts in alcohol. (See pages 5, 6 & 7 for instructions.)

#### Cause No. 3—

Runeut in O. D. and I. D. of low pressure pistons and cylinders.

##### To Correct—

Cylinder is defective—return under guarantee.

#### Cause No. 4—

Binding pedal linkage or heavy pedal.

##### To Correct—

Free up linkage pivots—increase force on pedal return spring.

### BRAKE DRAG OR PRESSURE BUILD UP

#### Cause No. 1—

No push rod end clearance.

##### To Correct—

Adjust push rod to maintain 1/32" maximum clearance to secondary piston contact when pedal is fully retracted.

#### Cause No. 2—

Inferior fluid or oil in fluid causing cups to swell and stick.

##### To Correct—

Rebuild cylinder by replacing all gaskets and rubber parts.

### PEDAL LOSS (PEDAL TOO LOW BEFORE BRAKING ACTION STARTS)

#### Cause No. 1—

Too much clearance between push rod and piston. Free play at this point multiplies itself by the linkage of the brake pedal. This may be as much as 7 to 1. Therefore, 1/4" free play may equal 1 3/4" of free useless pedal travel. Pedal loss at the start of the stroke means loss at the end of the stroke—where it is most important.

##### To Correct—

Adjust push rod to maintain 1/32" maximum clearance to secondary piston contact when pedal is fully retracted.

#### Cause No. 2—

Brake lining badly worn—requiring shoe adjustment.

##### To Correct—

Adjust shoes, as specified by vehicle manufacturer.



### **Cause No. 3—**

Faulty check valve. (Check by opening wheel cylinder bleeder screw. Some fluid should run out when screw is loosened. Remove line fitting from end plug of Mico Cylinder, if fluid drains from cylinder, check valve is faulty.)

#### **To Correct—**

Replace check valve. (See steps 4-7 in assembly operation on pages 6 & 7; check correct position of check valve parts from exploded view, page 14.)

### **Cause No. 4—**

Worn bushings, pins and linkage in pedal linkage.

#### **To Correct—**

Rebush where possible, replace worn pins, etc.

### **Cause No. 5—**

Faulty check valve disc at bottom of relief valve. (See Exploded View, Page 14.) (If this disc has become warped or foreign material has lodged under it, it may cause a low pedal or a slow brake application and a normal pedal on a rapid application.)

#### **To Repair—**

Remove relief valve assembly as described. (Fig. 1, page 5.) Remove rubber check valve disc from bottom of relief valve and clean off any foreign matter which may be lodged beneath it. If check valve disc is warped, causing a slight gap between the rubber and the valve itself, remove the check valve disc, invert and replace it. This will create a positive seal between the check valve disc and the valve base.

### **Cause No. 6—**

Too low relief valve setting.

#### **To Correct—**

See page 2 for details of relief valve action and setting.

## **SPONGY PEDAL**

### **Cause No. 1—**

Air trapped in system.

#### **To Correct—**

Bleed system completely. If done manually, be sure that reservoir is kept full of fluid during bleeding processes and is filled when bleeding is completed. If done with a pressure bleeder, depress pedal 4 or 5 times, while pressure bleeder is attached, before bleeding at wheels.

### **Cause No. 2—**

High pressure leaks.

#### **To Correct—**

Check all fittings and joints for leakage while the system is under high pressure. If the End Plug on the Mico leaks, remove line connections and tighten by turning clockwise. The hex size of the End Plug is 1 5/16".

### **Cause No. 3—**

Loose wheel bearings. If wheel bearings are loose, the Relief Valve will release the low pressure piston with its large volume displacement capacity before the wheel cylinders have centralized the drums. When this occurs, the high pressure pistons falls short of the volume displacement capacity required.

#### **To Correct—**

Adjust wheel bearings, as specified by vehicle manufacturer.

### **Cause No. 4—**

Incorrect anchor adjustment. When such a condition exists, the Relief Valve will release and cause the same results as loose wheel bearings previously described.

#### **To Correct—**

Adjust anchor settings, as specified by vehicle manufacturer.

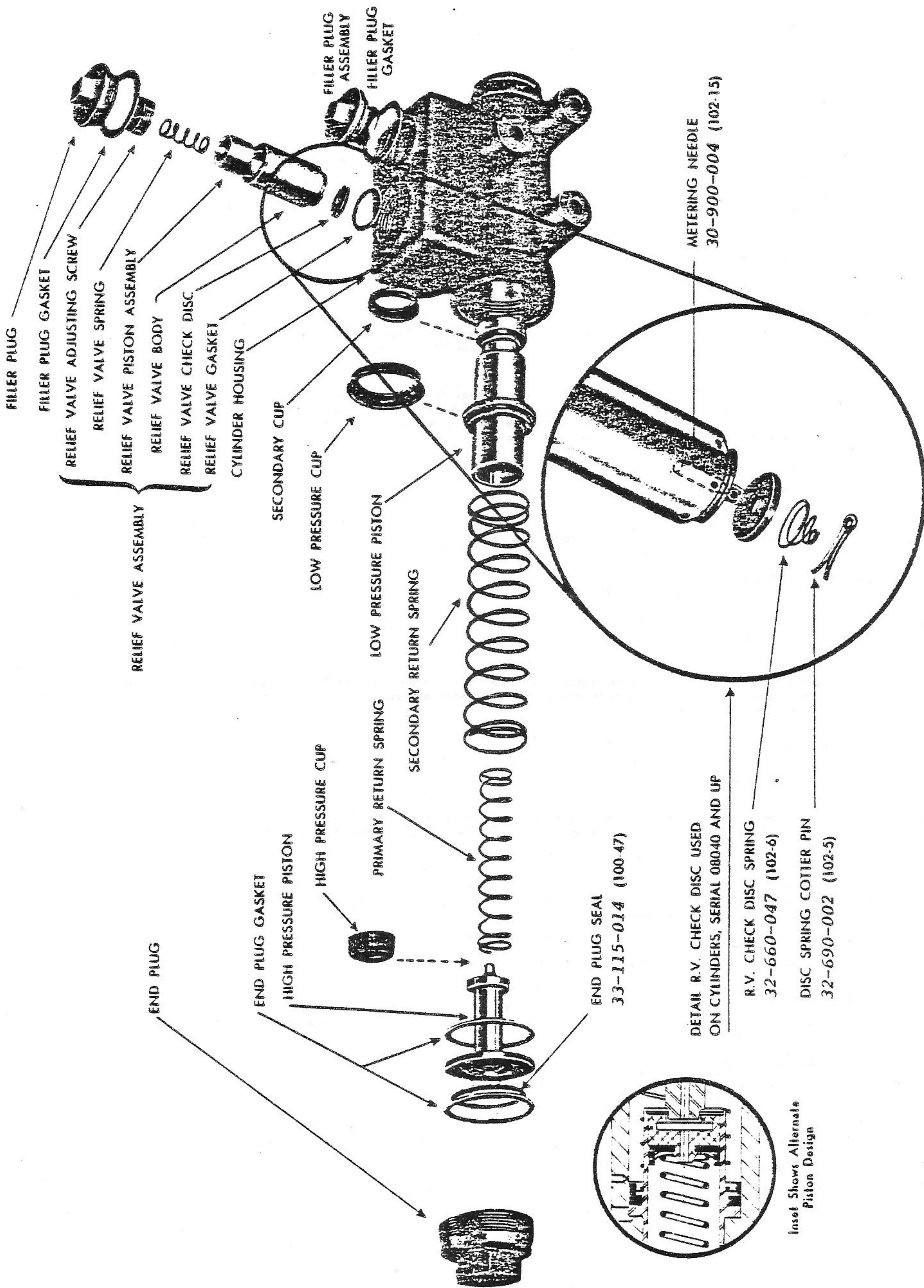
### **Cause No. 5—**

Worn or cracked brake drums.

#### **To Correct—**

Replace drums. (Lathe turning drums will not correct drum stretching.)







# MICO REPAIR KITS FOR MICO POWER CYLINDERS

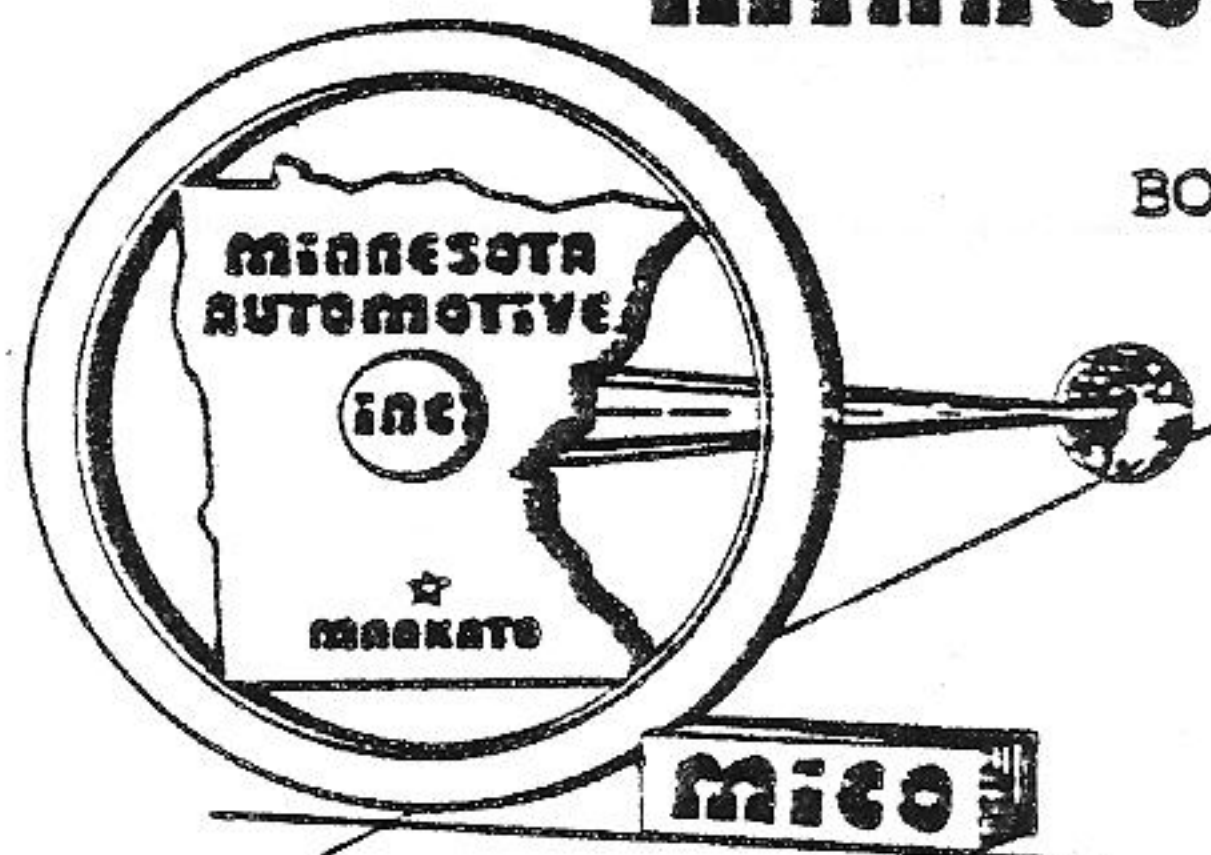
KIT NO.	POWER CYLINDER
911A64006 (MICO NO. 02-001-005)	For Power Cylinder Part Number 911M68001 (used on machines <u>below</u> Serial Number 911-0255) (MICO NO. 03-020-175)
911A68006 (03-020-009)	For Power Cylinder Part Number 911M68004 (used on machines <u>above</u> Serial Number 911-0254) (MICO NO. 03-020-035)



MICO Manual No. 84-001-002 / 10-72

*(Supersedes all previous Power Cylinder Service Manuals)*

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