

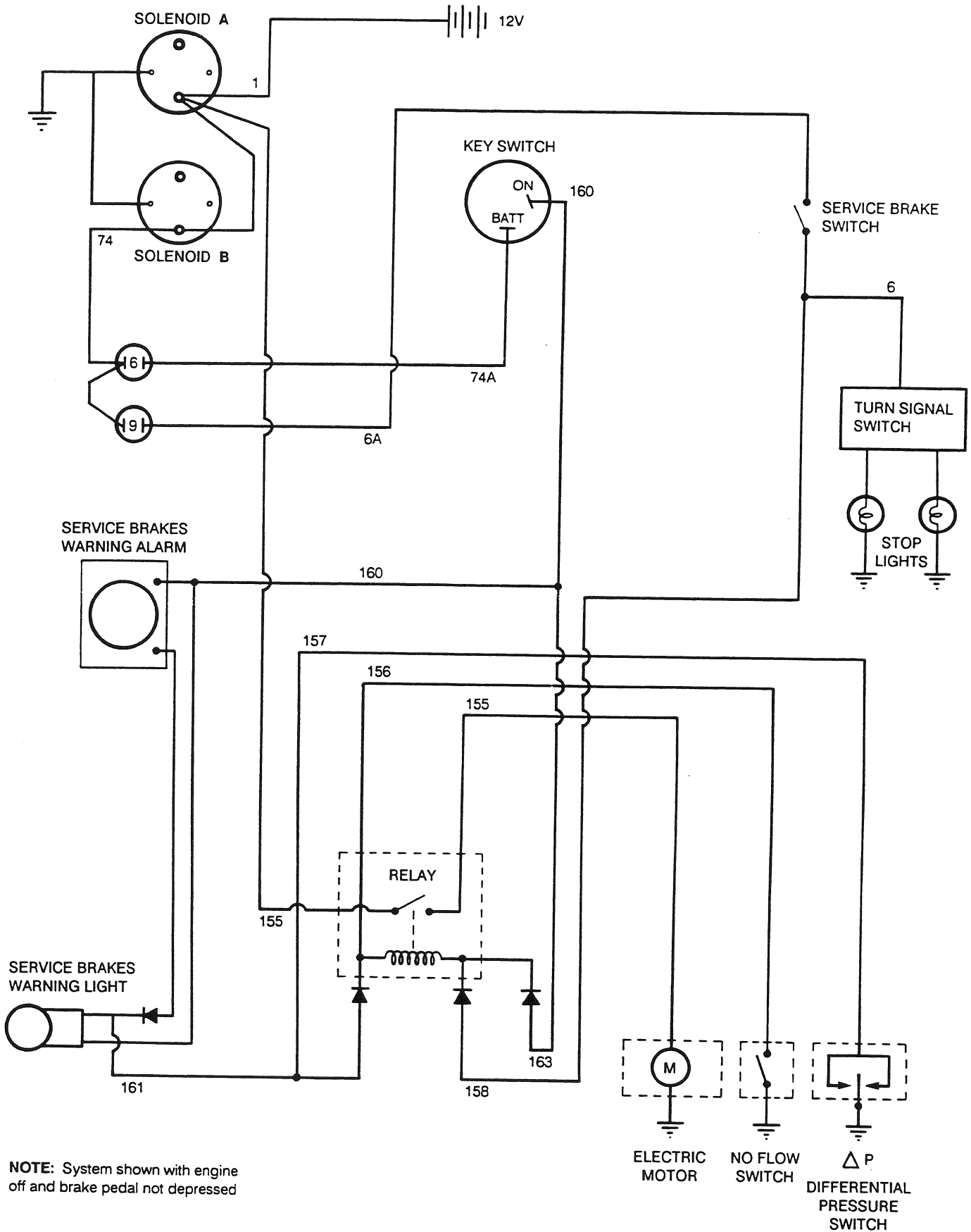
# SECTION 16

## SERVICE BRAKES MASTER CYLINDER

Applicable to graders S/N 19431, 19458, 19565, 19566, 19568 to 19578, 19580 to 19589, 19591, 19592, 19594 to 19610, 19612 to 19614, 19616, 19618 and up.

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# 700 SERIES SHOP MANUAL



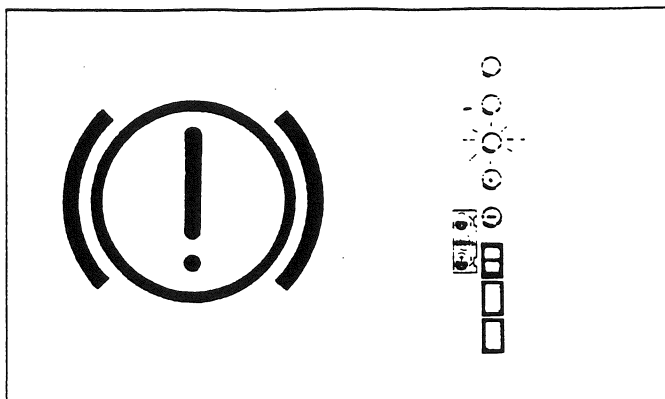
**NOTE:** System shown with engine off and brake pedal not depressed

Service Brakes Electrical Schematic - S/N 20830 and up

## 700 SERIES SHOP MANUAL

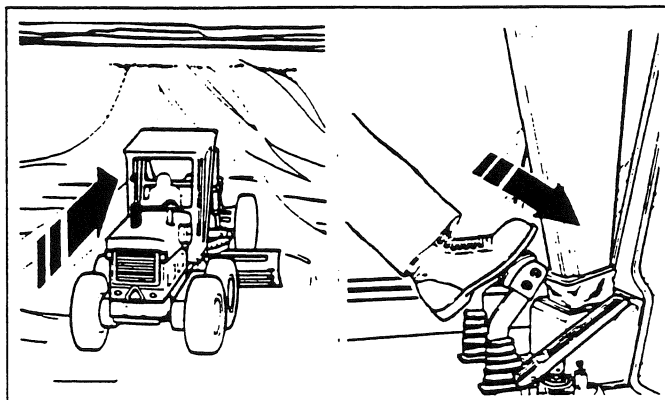
### Service Brakes - General Operation for Graders S/N 20830 and up

- Graders equipped with either drum or oil disc service brakes have an electric motor pump that automatically supplies hydraulic power assist in the event of an engine failure or any situation where hydraulic oil flow is interrupted to the service brake booster.
- This reserve system provides power assisted braking capability at a reduced level and automatically resets when hydraulic flow is restored.
- The brake warning light and alarm energize when there is a loss of hydraulic oil flow.
- The service brake system has two brake circuits. The system provides reduced braking capability in the event of a brake line rupture or other failure in one circuit.
- Each of the two circuits function on one front and opposite rear tandem wheel. Should one circuit fail, braking remains effective on all tandem wheels through the tandem chains.
- If only one of the brake circuits is working in the system, the brake warning light and alarm energize when you depress the brake pedal.
- If the brake warning light and alarm energize, the brake system is faulty and must be repaired by a qualified service technician. Do not drive the grader.



### Service Brakes - Brake Function Check for Graders S/N 20830 and up

- Perform this brake function check once every week.
- Check the hand brake operation. Refer to your 700 Series, Series III Operator's Manual.
- Make a visual check around the machine. Ensure all personnel are away from the area. Signal your intention to start the engine. Start the engine when it is safe to do so.
- Back the grader up a slight incline where it is safe to allow the machine to roll forward without power.
- Stop the grader, place the transmission in neutral and apply the hand brake (this should require approximately 60 pounds [27 kg] of effort). Shut down the engine and keep the ignition key in the OFF position.
- Release the hand brake when it is safe to do so. Allow the grader to roll ahead at about 2 to 3 mph (3 to 5 km/h). Apply the service brakes. The grader must stop abruptly.
- If the grader does not stop, use the hand brake to stop the machine. Immediately have the brake system repaired by a qualified service technician.

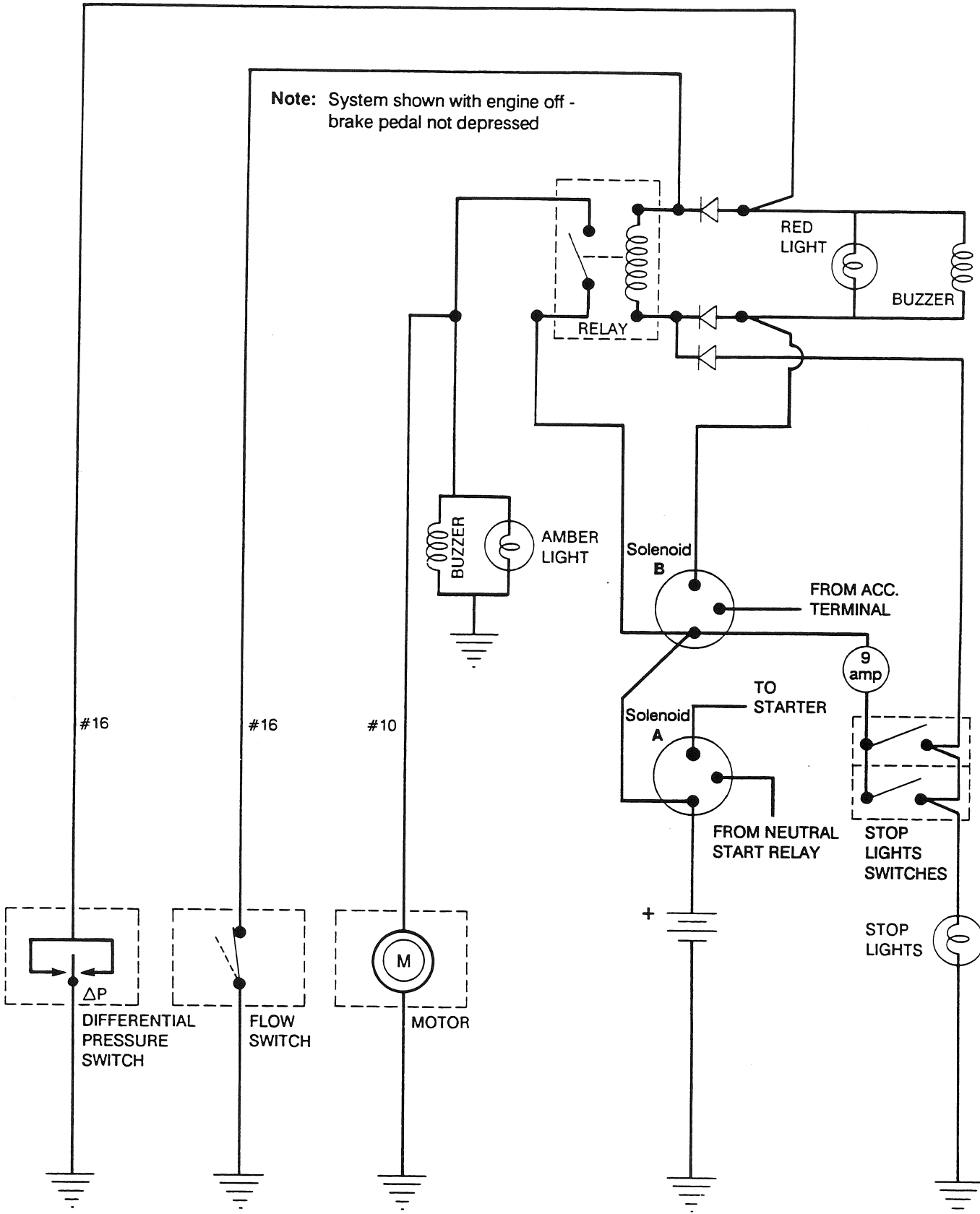


### **⚠ WARNING**

Unless you need braking action, do not depress brake pedal when ignition key is in the OFF position. The service brake electric motor pump will energize using battery power only. Subsequent loss of braking effectiveness could result in personal injury or death. Apply the hand brake before shutting down the engine.

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Note: System shown with engine off -  
brake pedal not depressed



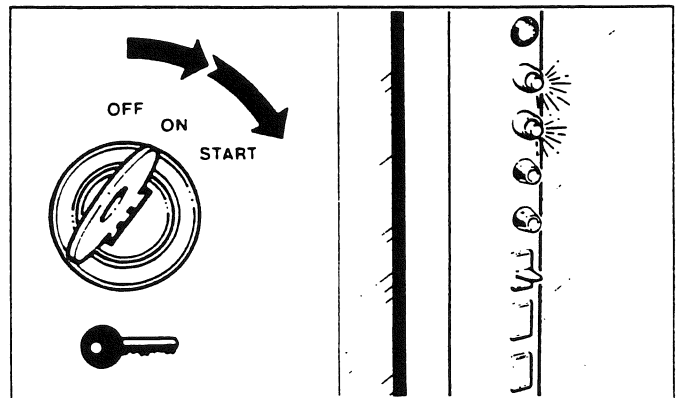
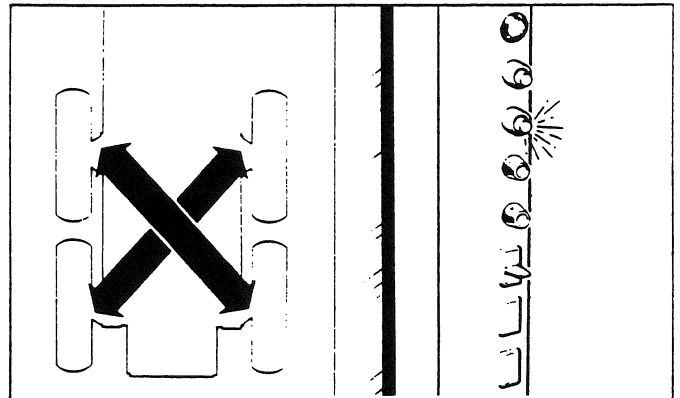
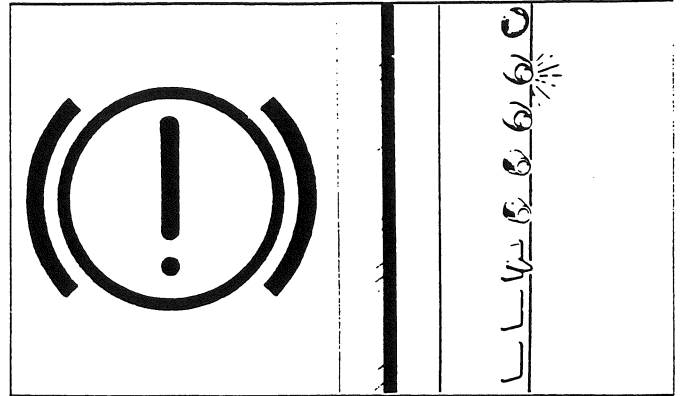
Drum Service Brakes Electrical Schematic - Up to S/N 20829



## 700 SERIES SHOP MANUAL

### Drum Service Brakes - General Operation for Graders up to S/N 20829

- Graders equipped with drum service brakes have an electric motor pump that automatically supplies hydraulic power assist in the event of an engine failure or any situation where hydraulic oil flow is interrupted to the service brake booster.
- This reserve system provides power assisted braking capability at a reduced level and automatically resets when hydraulic flow is restored.
- The amber warning buzzer light energizes when there is a loss of hydraulic oil flow.
- The drum service brake system has two brake circuits. The system provides reduced braking capability in the event of a brake line rupture or other failure in one circuit.
- Each of the two circuits function on one front and opposite rear tandem wheel. Should one circuit fail, braking remains effective on all tandem wheels through the tandem chains.
- If only one of the circuits is working in the system, the red warning buzzer light energizes when you depress the brake pedal.
- If either or both buzzer lights energize, the brake system is faulty and must be repaired by a qualified service technician. Do not drive the grader.



### Drum Service Brakes - Brake Function Check for Graders up to S/N 20829

- Turn the battery isolation switch(es) to the ON position.
- Push the brake pedal.
- The amber warning buzzer light should energize. This indicates the master cylinder booster electric motor pump is working.
- Insert the ignition key and turn to the ON position. The red and amber brake warning buzzer lights should energize. If they do not energize, the system is faulty and must be repaired by a qualified service technician. Do not drive the grader.
- Turn the key to the START position. The red and amber brake warning buzzer lights should de-energize when the engine starts. If the brake warning buzzer lights stay energized, the system is faulty and must be repaired by a qualified service technician. Do not drive the grader.

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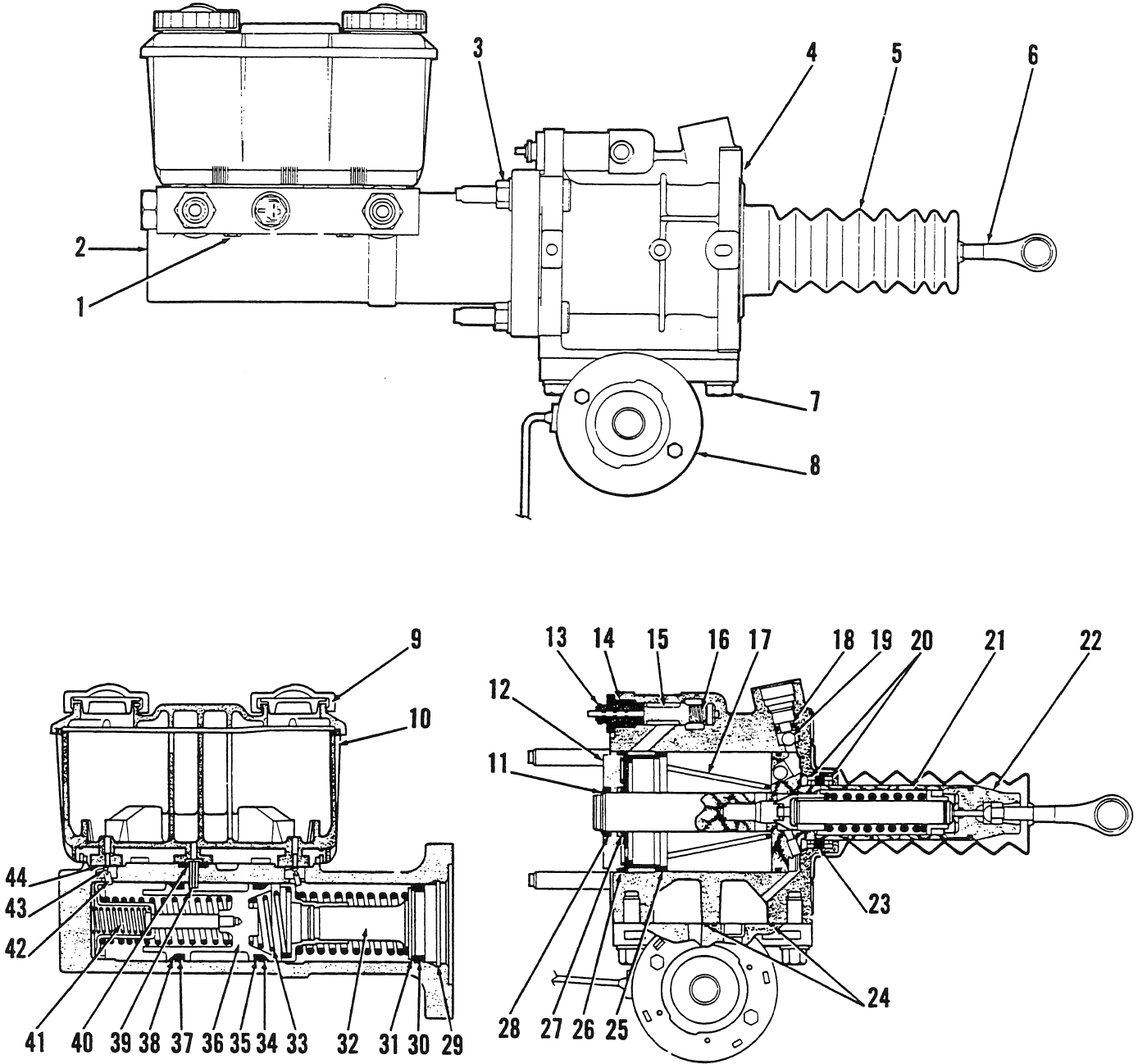


Fig. 1

## 700 SERIES SHOP MANUAL

Item	Description	Item	Description	Item	Description
1	Capscrew	15	Flow switch piston	31	O-ring
2	Brake master cylinder	16	Spring	32	Primary piston assembly
3	Nut	17	Piston return spring	33	Primary piston return spring
4	Power booster	18	Inlet check valve	34	O-ring
5	Boot	19	Inlet check ball	35	Back-up ring
6	Threaded push rod, adjustable clevis and nut	20	Oil seal	36	Secondary piston assembly
7	Capscrew	21	Power piston shaft	37	Back-up ring
8	Electric motor pump	22	Input plug	38	O-ring
9	Reservoir cap	23	Spacer	39	Piston stop pin
10	Reservoir	24	O-ring	40	O-ring
11	Snap ring	25	O-ring (thin)	41	Secondary piston return spring
12	Filter and end cap assembly	26	O-ring (thick)	42	Compensating valve spring
13	Flow switch contact	27	Oil seal	43	Compensating valve
14	O-ring	28	O-ring	44	Compensating valve seal
		29	Snap ring		
		30	Back-up ring		

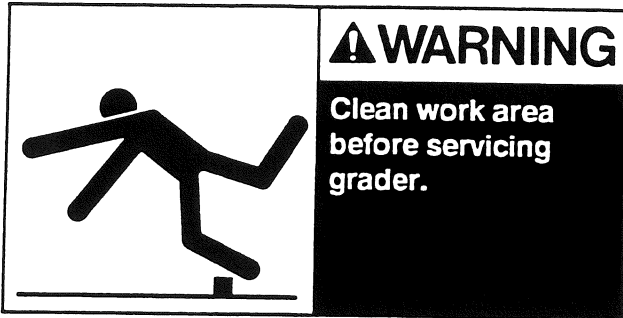
**Key to Fig. 1**

### Torque Guide

Fig. No.	Application	Torque Value		
		lbf.in./lbf.ft	N.m	kgf.m
25	Flow switch contact to booster housing	20 - 40 lbf.in.	2,0 - 4,5	0,2 - 0,5
29	Capscrews retaining electric motor pump to booster	18 - 25 lbf.ft	24 - 34	2,5 - 3,5
47	Capscrews retaining reservoir to cylinder body	170 - 210 lbf.in.	21 - 26	1,9 - 2,4
48	Nuts retaining booster housing to cylinder body	25 - 30 lbf.ft	34 - 41	3,5 - 4,1
49	Bolts retaining master cylinder assembly to frame	16 - 25 lbf.ft	22 - 34	2,2 - 3,5
51	Nut retaining push rod adjustable clevis	90 lbf.ft	122	12

# 700 SERIES SHOP MANUAL

## General



Make sure proper shop tools are available and in good working order. The brake master cylinder and power booster assembly should be serviced on a clean workbench.

Refer to the 700 Series Parts Manual P/N L-3008 or P/N L-3015 for spare parts information. Champion recommends installing parts contained in the repair kits listed in the Parts Manual.

## Service Position Precaution

**NOTE:** Always place the grader in the SERVICE POSITION before attempting any overhaul, maintenance or inspection procedure.

Refer to the SERVICE POSITION procedure on page (ii) in the front of this Shop Manual.

## Cleaning and Inspection

### **Cleaning**

For graders equipped with oil disc brakes, thoroughly clean parts with petroleum base fluid (PBF). For graders equipped with drum service brakes, thoroughly clean parts using clean brake fluid. Agitate the parts to remove all foreign matter. Use moisture-free compressed air or lint-free rags to remove dirt and brake fluid.

### **Inspection**

A careful and thorough inspection of all parts is extremely important. Replace all parts showing indications of wear or damage.

## Description and Operation

The following description is written with permission from Ford Motor Company of Canada, Limited.

### **Master Cylinder (Fig. 2)**

The master cylinder and power booster assembly is installed under the cab on the right-hand side of the grader.

In the released position, both primary and secondary piston actuators contact compensating valve stems that project into the master cylinder bore. This keeps the valves open and allows system fluid in the reservoir to replenish any fluid displaced from the master cylinder.

Initial forward travel of the primary piston moves the primary actuator away from its compensating valve. The valve closes and shuts off the passage between the reservoir section and primary pressure chamber.

Further movement of the primary piston creates a pressure in the primary pressure chamber causing the secondary piston and actuator to move. The secondary actuator moves away from its compensating valve, which closes and shuts off the passage between the reservoir section and secondary pressure chamber. Further movement of the primary piston causes both chambers to build pressure.

When the load on the primary piston is removed, the combined return spring force and fluid pressure in each chamber cause the primary and secondary pistons to return to their original positions. The actuators contact both compensating valve stems and open the passages between the reservoir sections and pressure chambers.

Should the rate of release be great enough to cause a partial vacuum in a pressure chamber, the open compensating valve allows system fluid replenishment in the cylinder bore.

# 700 SERIES SHOP MANUAL

## Description and Operation Master Cylinder (Fig. 2) continued

Any excess system fluid remaining at the end of the stroke due to 'pumping' and/or volume change due to temperature fluctuation is released as the compensating valve ports open.

## Power Booster (Fig. 2)

The power booster receives hydraulic fluid pressure through the inlet port. This pressure forces the power piston to move the output push rod against the primary piston and actuator in the master cylinder.

Under normal conditions, depressing the brake pedal forces the input pedal rod against the valve rod and reaction piston. The reaction piston moves forward and closes the pressure valve. Closing the pressure valve reduces the fluid flow into the area in front of the power piston (low pressure chamber). The pressure acting on the large diameter power piston increases and forces the power piston and output push rod forward.

The area between the output push rod O-ring and the primary piston O-ring is vented to the atmosphere. This venting prevents hydraulic fluid mixing with petroleum base fluid (PBF) (oil disc brakes) or brake fluid (drum service brakes) should either or both O-rings start leaking.

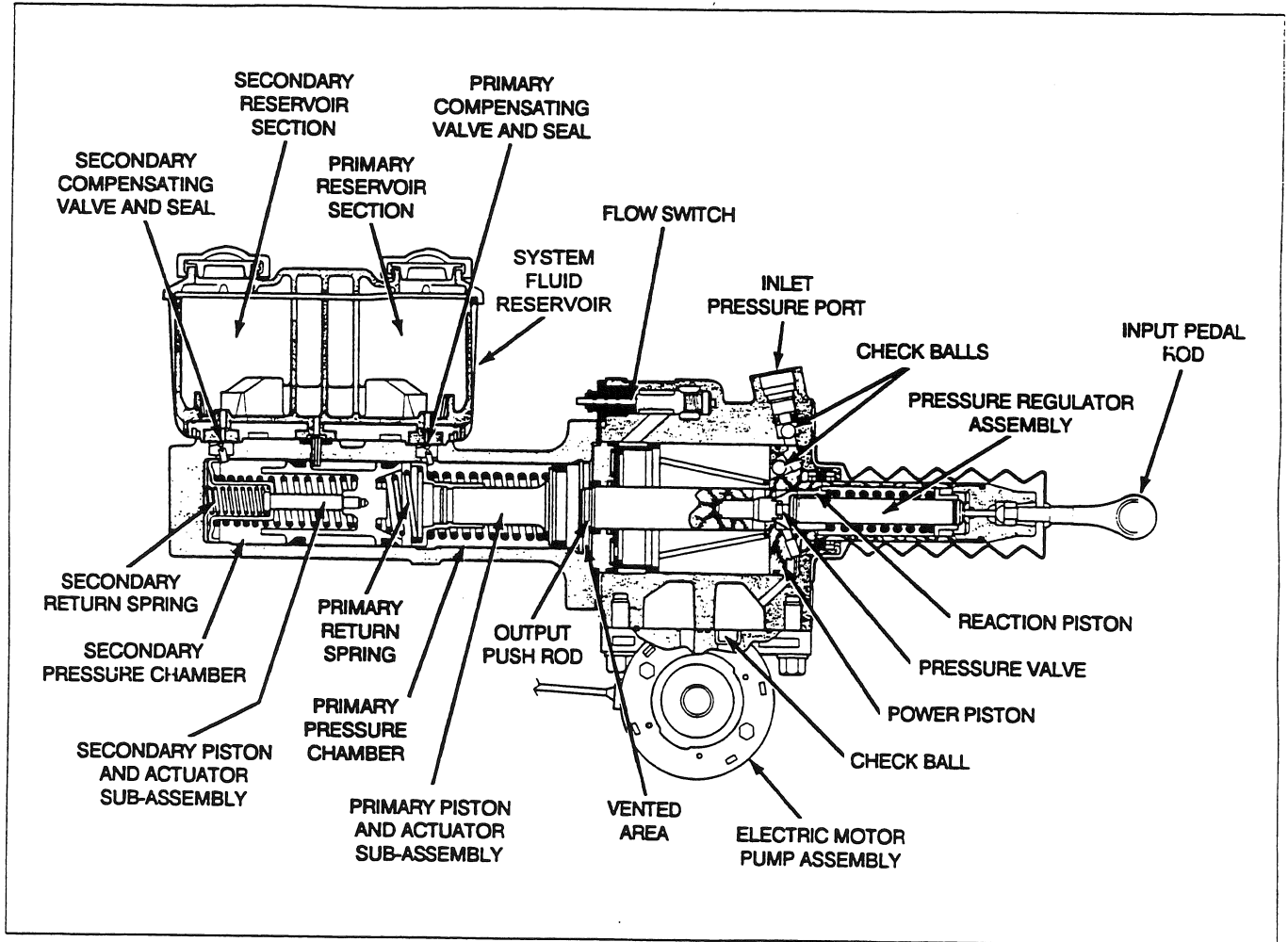


Fig. 2

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### Description and Operation Engine Running - No Brake Application (Fig. 3)

System function when hydraulic fluid is supplied to the master cylinder and power booster assembly:

1. Hydraulic fluid flow pressure holds the booster inlet check valve open.
2. Hydraulic fluid passes freely through the pressure valve and into the low pressure chamber.
3. Hydraulic fluid returning to tank holds the flow switch open. Electric motor pump is not energized.
4. No pressure is applied to the power piston and the output push rod is at rest.
5. No action takes place in the master cylinder and no brake application is experienced.

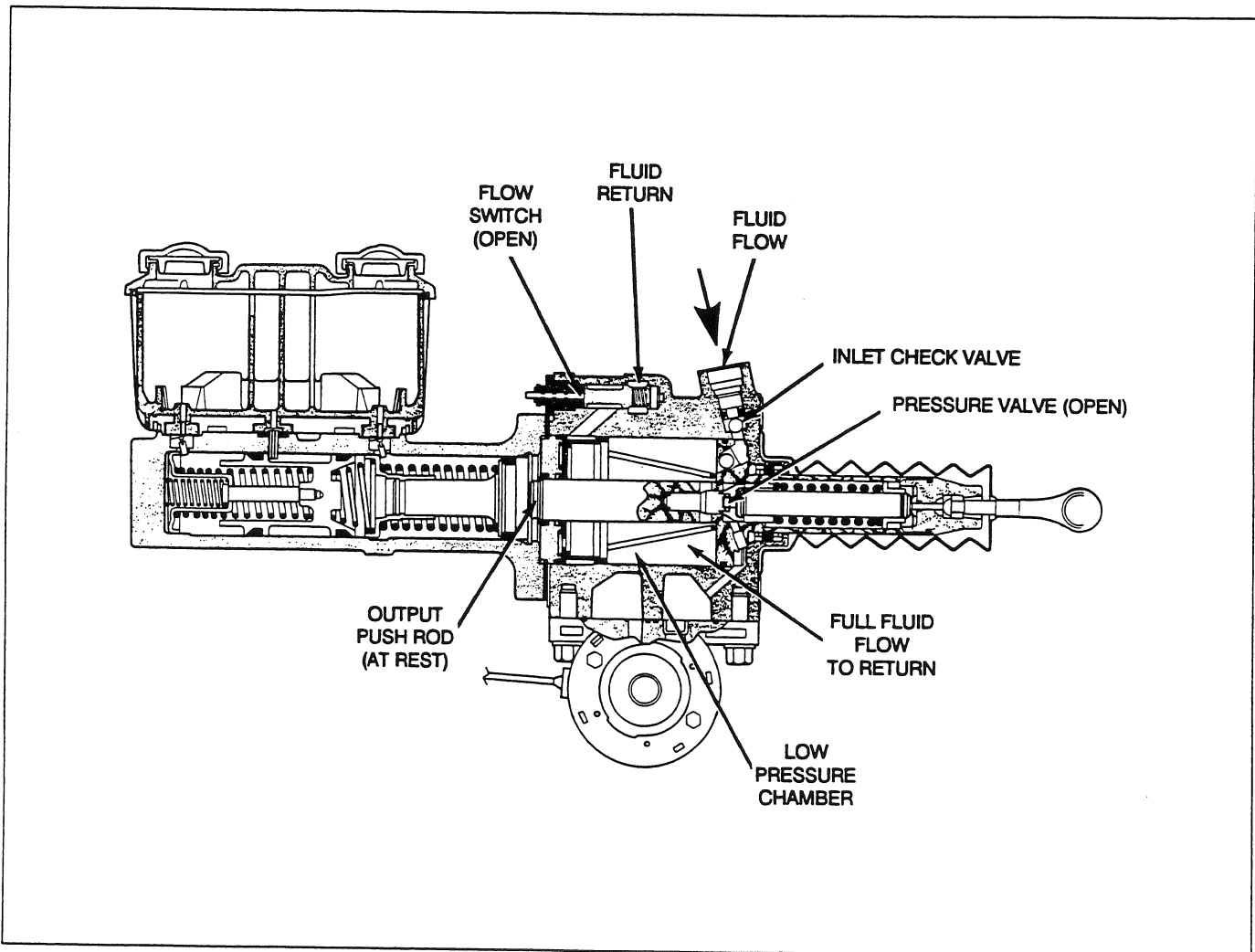


Fig. 3

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### Description and Operation Engine Running - Light Brake Application (Fig. 4)

System function when brake pedal is depressed slightly and power assist action begins:

1. Hydraulic fluid flow pressure holds the booster inlet check valve open.
2. The brake pedal push rod begins to close the pressure valve. The restricted fluid flow creates a pressure build up in the high pressure chamber. Pressure build up acting on the power piston becomes power boosted movement to the master cylinder through the output push rod.
3. Hydraulic fluid returning to tank holds the flow switch open. Electric motor pump is not energized.
4. The forward movement of the output push rod forces the primary piston and actuator away from its compensating valve.
5. Hydraulic pressure builds up in the primary braking system and the primary brakes are applied.

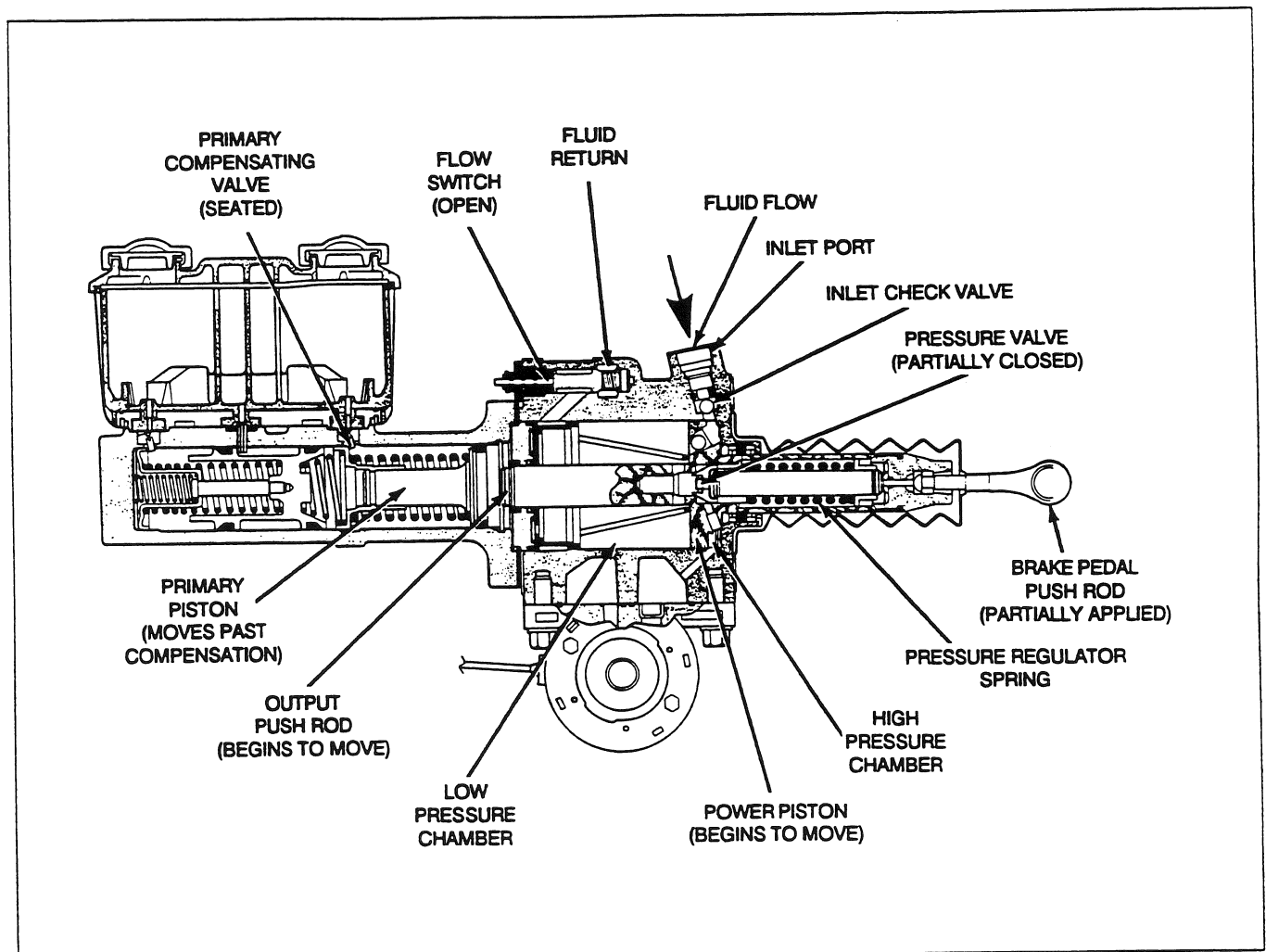


Fig. 4

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### Description and Operation Engine Running - Normal Brake Application (Fig. 5)

System function when normally applying the brakes (firm pedal, but not panic):

1. Hydraulic fluid flow pressure holds the booster inlet check valve open.
2. The brake pedal push rod continues to close the pressure valve.
3. Pressure to the power piston is high.
4. The output push rod moves further into the master cylinder.
5. Hydraulic fluid returning to tank holds the flow switch open. Electric motor pump is not energized.
6. Both primary and secondary piston and actuators move past the compensating valves. The primary and secondary braking systems are pressurized.

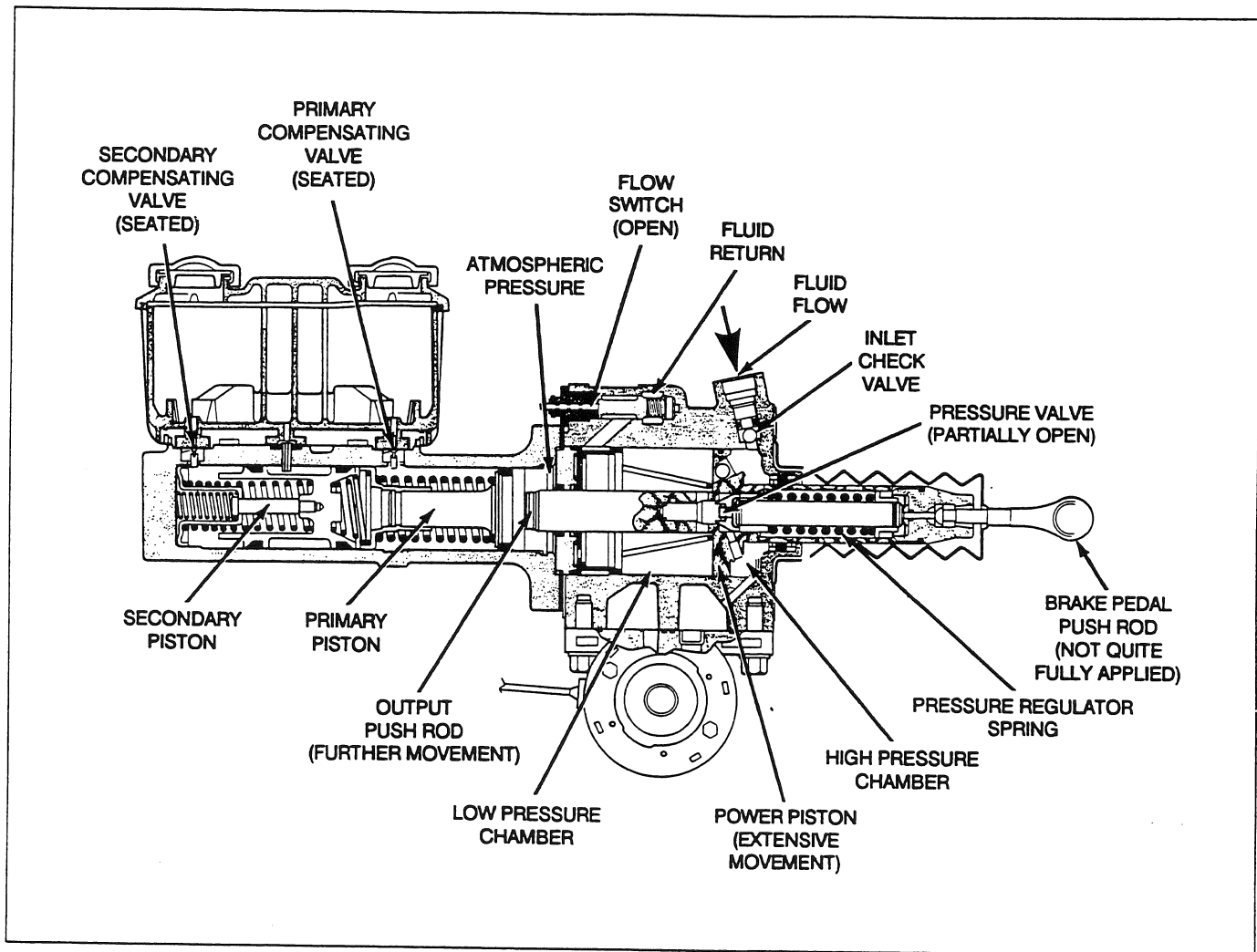


Fig. 5



# 700 SERIES SHOP MANUAL

## Description and Operation Engine Running - Maximum Brake Application (Fig. 6)

System function when brake pedal is fully depressed during an emergency stop:

1. Hydraulic fluid flow pressure holds the booster inlet check valve open.
2. The brake pedal push rod moves inward to virtually fully restrict fluid flow through the pressure valve. Maximum rated pressure build up now acts on the power piston and the movement is transferred to the master cylinder through the output push rod.
3. When the maximum rated pressure is exceeded, the pressure regulator spring compresses. This allows the pressure valve to open

slightly and by-pass hydraulic fluid through the pressure valve orifice.

4. Hydraulic fluid returning to tank holds the flow switch open. Electric motor pump is not energized.
5. Both the primary and secondary piston and actuators move to the maximum braking position.

**NOTE:** *Graders up to S/N 20829 only. Should hard turning and hard braking occur simultaneously, the combined demand of the steering unit and power booster may exceed the capacity of the hydraulic pump to maintain flow. In this situation, the amber warning buzzer light energizes to signify electric motor pump operation. This warning should exist only as long as the above conditions apply.*

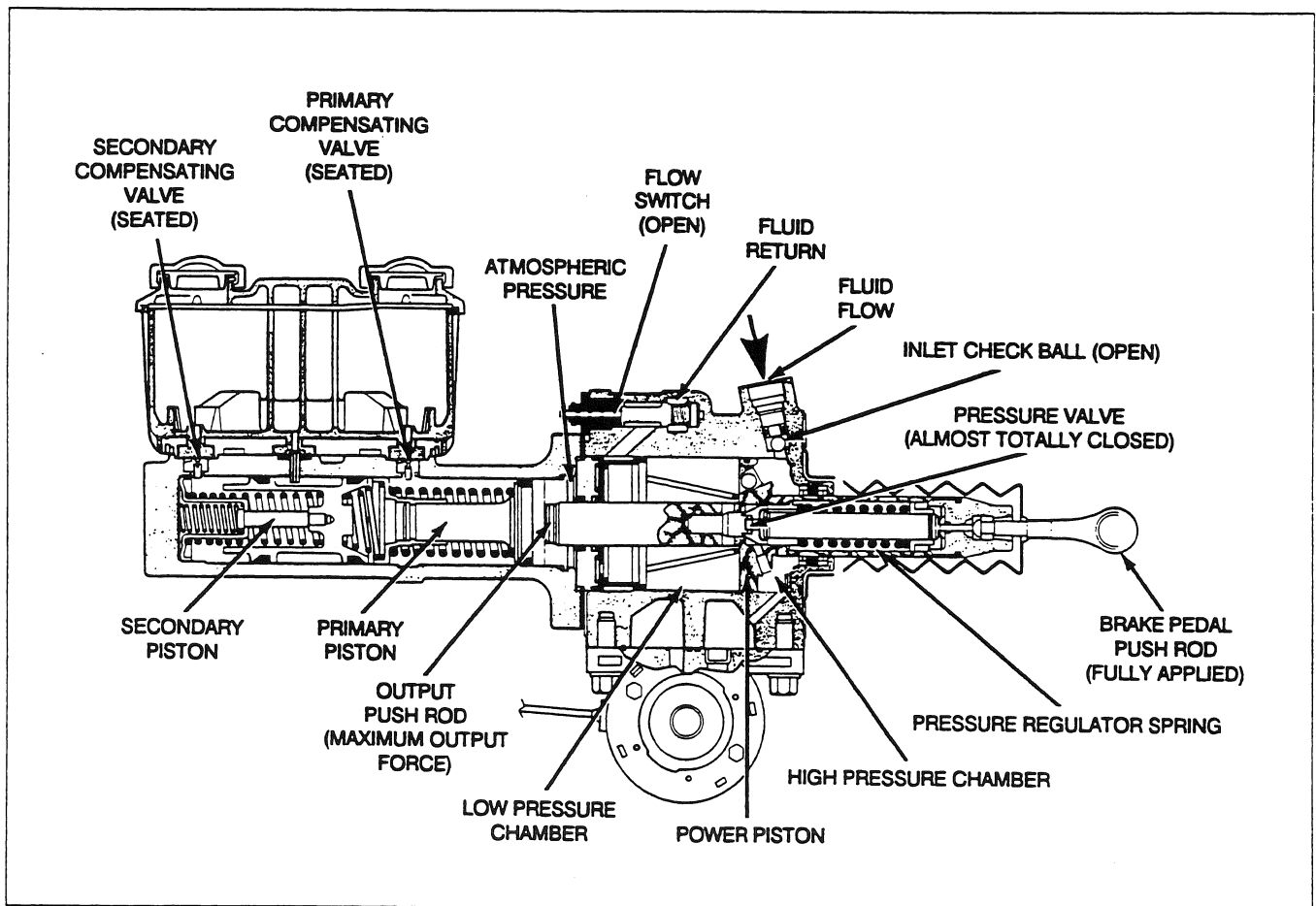


Fig. 6

## 700 SERIES SHOP MANUAL

### Description and Operation Hydraulic Boost Malfunction - Normal Brake Application (Fig. 7)

System function when brake boost is demanded and there is no hydraulic fluid flow due to engine shut down or some other condition which interrupts fluid flow.

1. The booster inlet check valve closes as a result of no fluid flow entering the booster assembly.
2. The flow switch closes since there is no flow to keep it open. This completes the electric circuit to the electric motor pump mounted on the bottom of the power booster housing.
3. The electric motor pump supplies system fluid at a somewhat lower pressure for power braking assist. Therefore, increased pedal effort is required to stop the grader within a specified distance. The brake system is faulty if:
  - a) on graders S/N 20830 and up, the brake warning light and alarm energize.
  - b) on graders up to S/N 20829, either or both brake warning buzzer lights energize.The brake system must be repaired by a qualified service technician. Do not drive the grader.
4. The master cylinder operates as described in **Description and Operation, Engine Running - Normal Brake Application**. Refer to page 16-12.

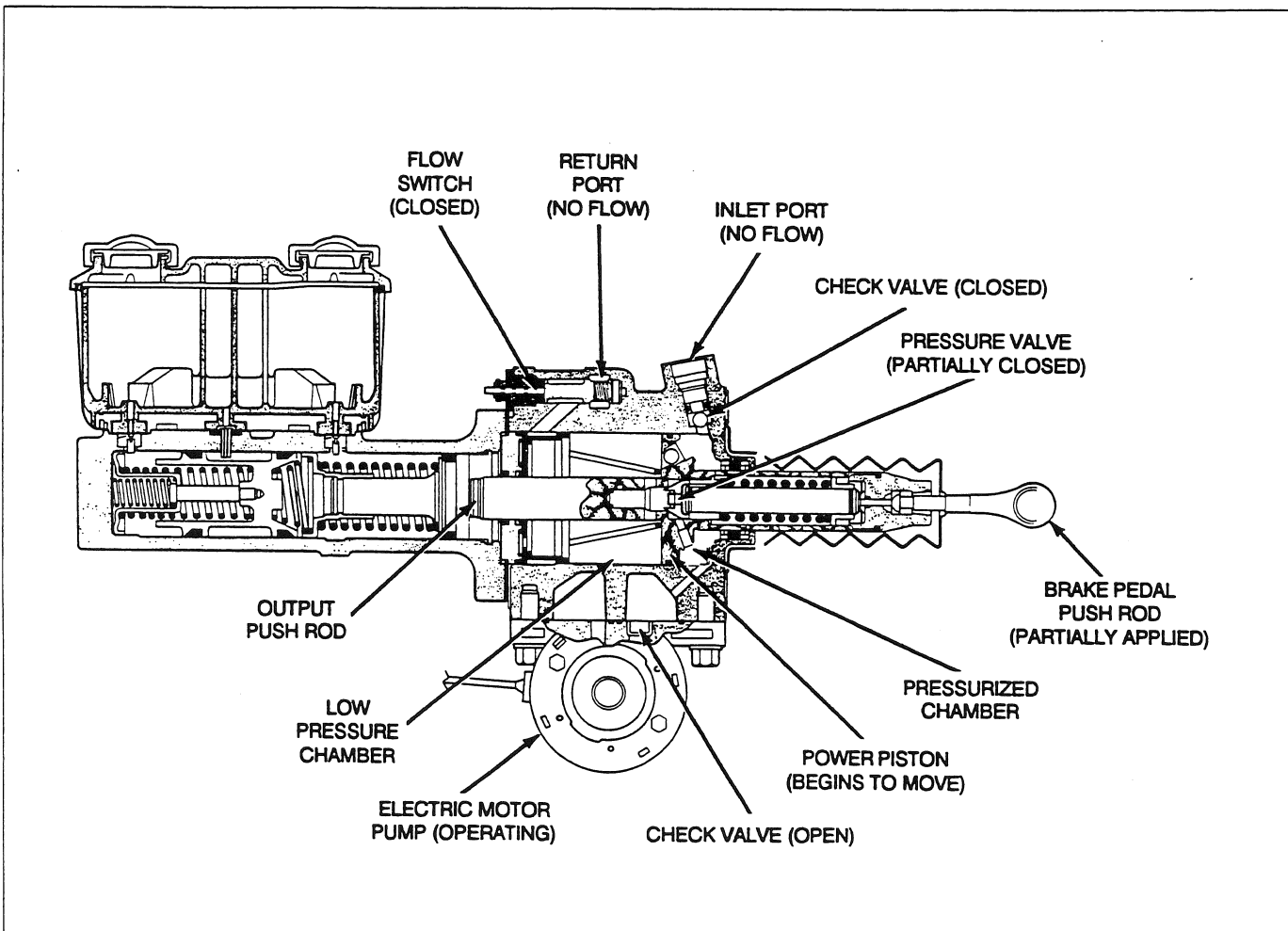


Fig. 7

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### Description and Operation Complete Boost Malfunction - Manual Brake Application (Fig. 8)

Should a complete loss of all power assist occur when operating the grader, it is still possible to bring the machine to a controlled stop by manually actuating the master cylinder pistons. However, brake pedal effort will be greatly increased and the effective stopping distance will be significantly longer.

The brake system must be repaired by a qualified service technician. Do not drive the grader.

The master cylinder operates as described in Description and Operation, Engine Running - Normal Brake Application. Refer to page 16-12.

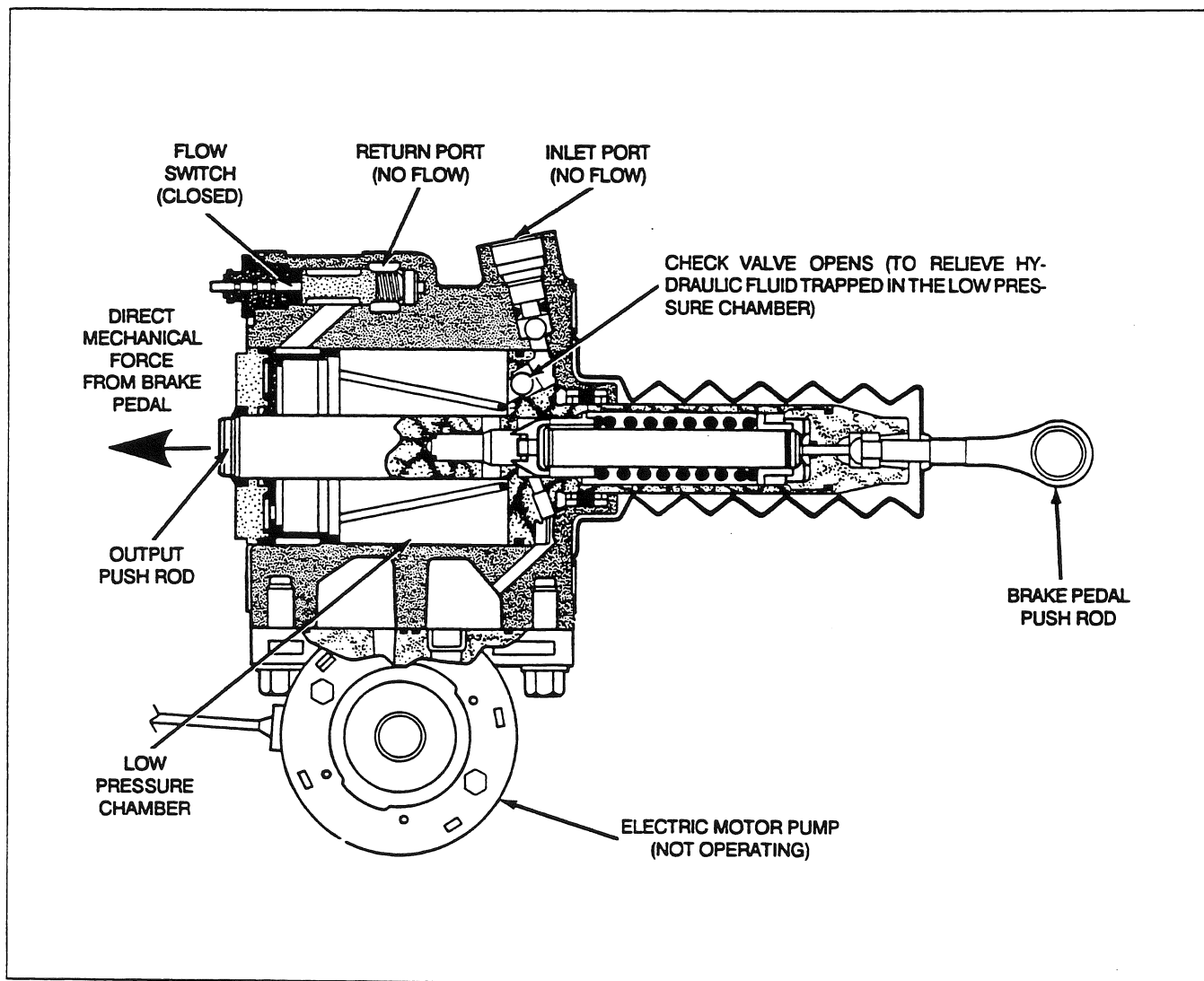


Fig. 8

# 700 SERIES SHOP MANUAL

## Master Cylinder and Power Booster Assembly - Removal from Grader

### **Fig. 9**

Shut down the engine and place the machine in the SERVICE POSITION (refer to page (ii) in the front of this Shop Manual). It is important to install chocks at the front and rear tandem wheels. Ensure that the engine cannot be started. Remove and retain the ignition key. Turn the battery isolation switch to the OFF position.

### **Fig. 10**

Remove the clevis pin retaining the push rod adjustable clevis (6) to the pivot plate. Discard the cotter pin. Disconnect the two wires from the harness to the terminal block and flow switch contact. Disconnect the wires from the harness to the terminals of both brake switches and the pressure differential switch.

### **Fig. 11**

Remove the inlet and return hoses from the power booster housing (4). The return hose is installed on a barbed fitting. After loosening the hose clamp, you may have to slit the hose lengthways to assist removal from the fitting. Remove and discard the damaged part of the hose. Plug all open ports. Remove the two brake hoses from the master cylinder (2). Plug all open ports.

### **Fig. 12**

Support the master cylinder and power booster assembly. Remove the capscrews retaining the assembly to the mounting bracket. Remove the assembly and place the master cylinder in a vise with soft jaws to prevent damage to the aluminum housing.

## Power Booster - Disassembly

### **Fig. 13**

Remove the nuts (3) retaining the power booster (4) to the master cylinder (2). Carefully remove the power booster and place on a clean workbench. Disconnect the electric motor pump wire from the terminal block.

### **Fig. 14**

Place the power booster (4), with the electric motor pump (8) uppermost, in a vise with soft jaws. Remove the capscrews (7) and the electric motor pump. Remove and discard the two oval O-rings (24). To ensure correct electrical motor positioning during assembly, use a felt-tip marker and draw an arrow showing on which side of the mounting flange the motor is installed.

**NOTE:** *Approximately three cups of oil will drain from the power booster housing when you remove the electric motor pump. Avoid damaging the mating surfaces during removal.*

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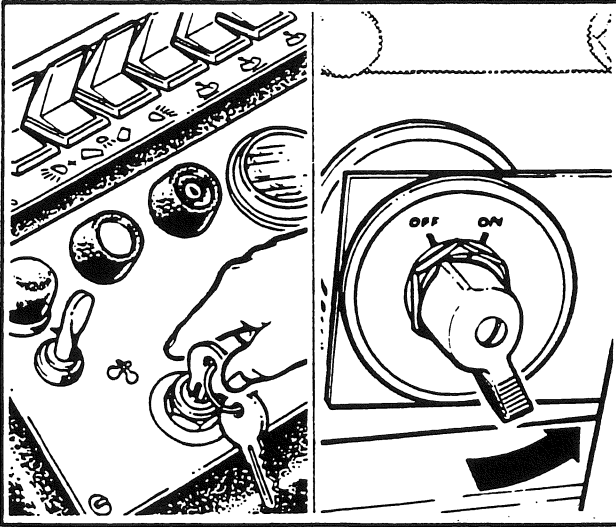


Fig. 9

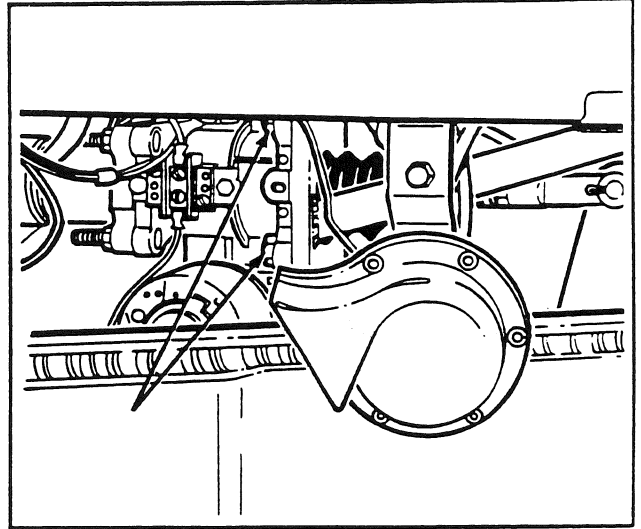


Fig. 12

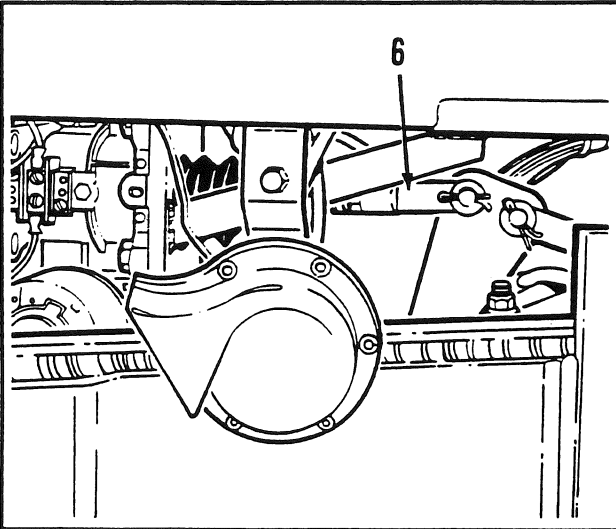


Fig. 10

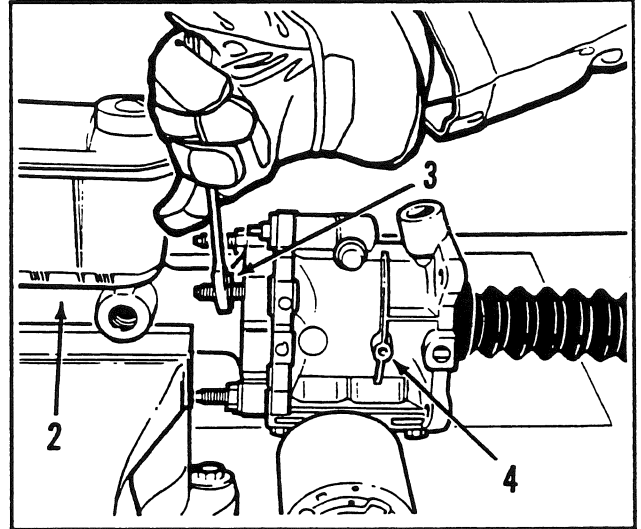


Fig. 13

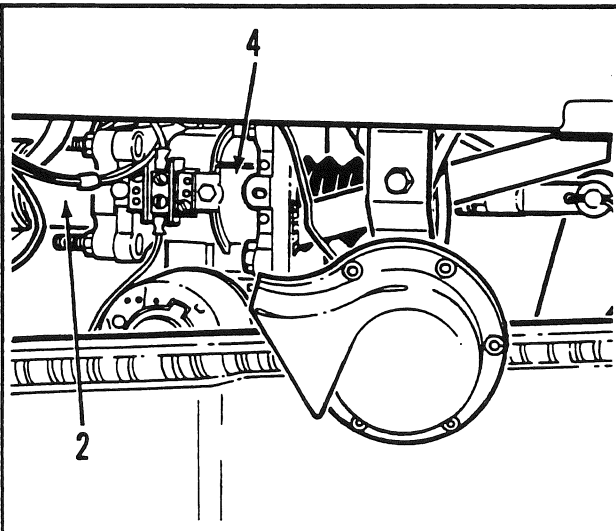


Fig. 11

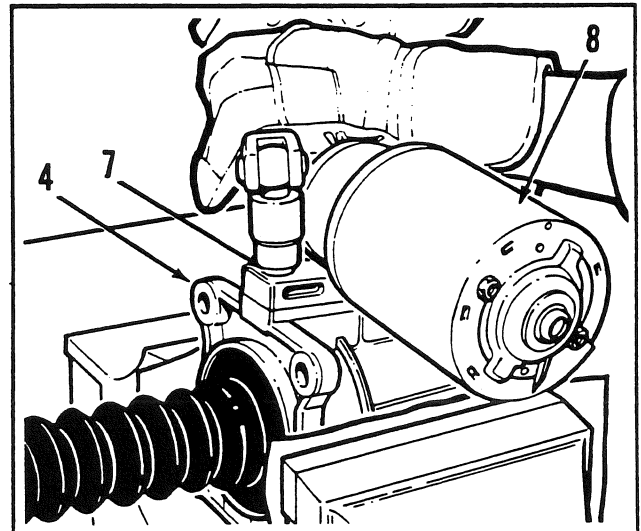


Fig. 14

# 700 SERIES SHOP MANUAL

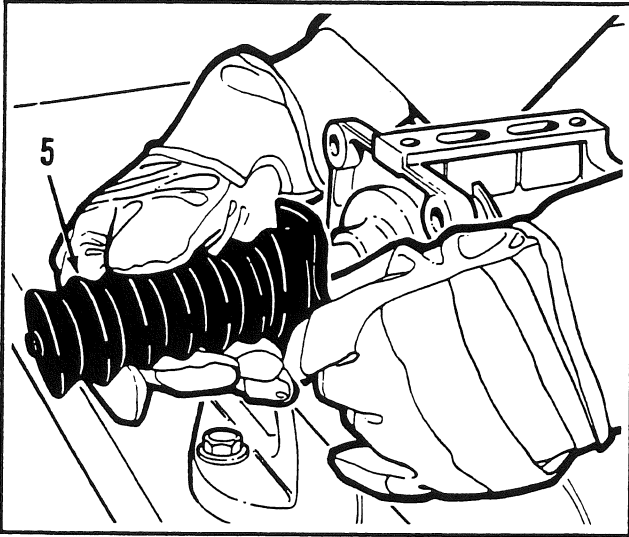


Fig. 15

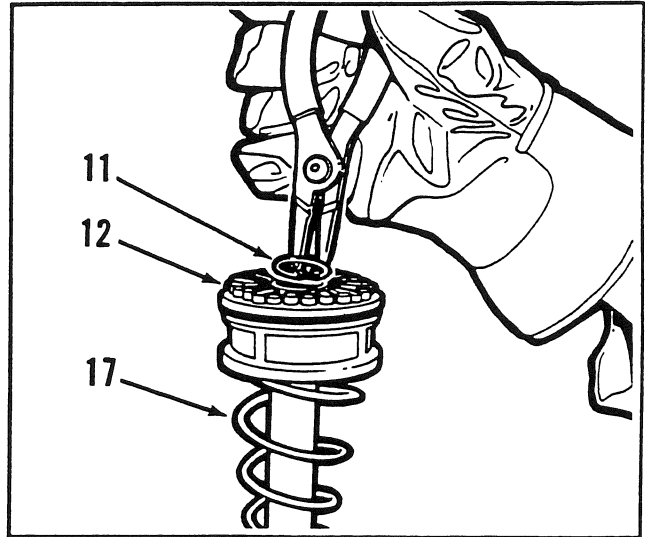


Fig. 18

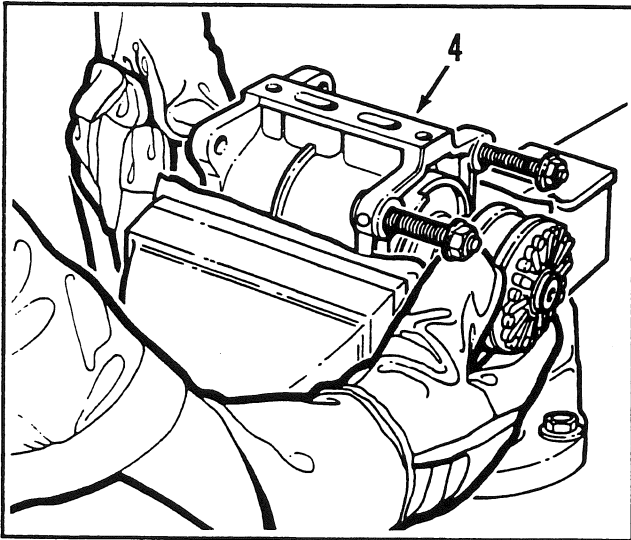


Fig. 16

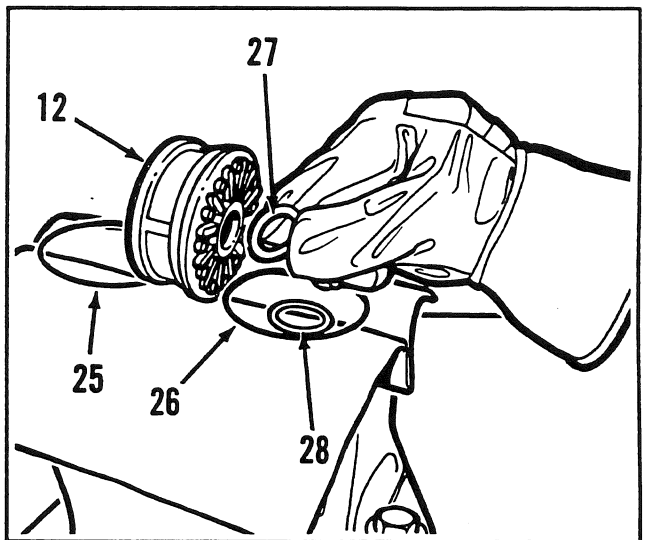


Fig. 19

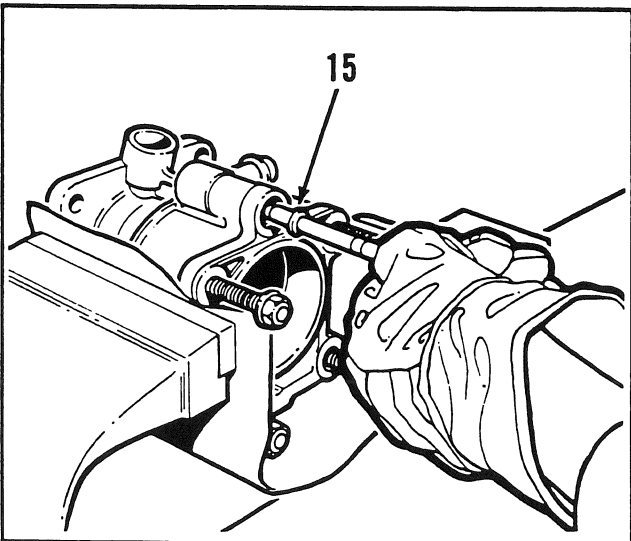


Fig. 17

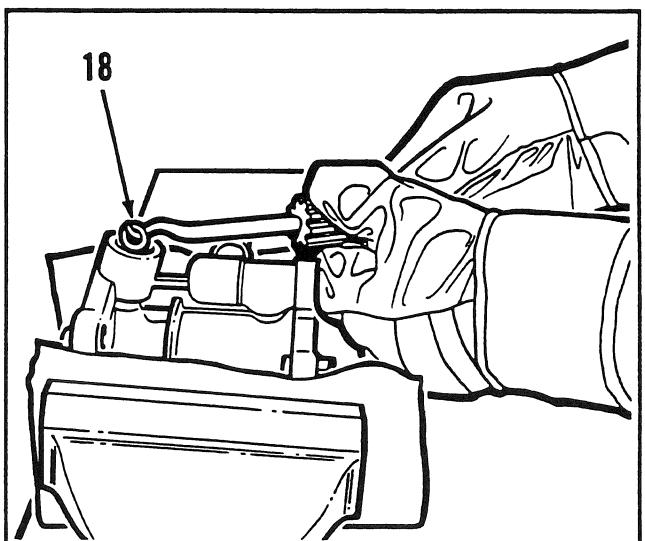


Fig. 20

## 700 SERIES SHOP MANUAL

### Power Booster - Disassembly *continued*

#### Fig. 15

Remove the locknut and adjustable clevis (6) from the push rod. Remove the boot (5).

#### Fig. 16

Push the push rod against spring pressure and carefully remove the power piston assembly from the power booster housing (4).

**NOTE:** *Pull the power piston assembly straight out of the bore to avoid scratching the aluminum surfaces.*

Remove and discard the two oil seals (20) and spacer (23) from the booster housing bore.

#### Fig. 17

Remove the flow switch contact (13). Remove and discard the O-ring (14). Use a small magnet to remove the flow switch piston (15) and spring (16).

#### Fig. 18

With the filter and end cap assembly (12) uppermost, clamp the flats of the input plug (22) in a vise with soft jaws. Do not clamp on the power piston shaft (21). Push against the filter and end cap assembly. Remove and discard the snap ring (11). Remove the filter and end cap assembly. Remove the piston return spring (17).

#### Fig. 19

Remove and discard the O-ring (28) and oil seal (27) from the inside diameter of the filter and end cap assembly (12). Remove and discard the two O-rings (25 and 26) from the outside diameter of the filter and end cap assembly.

#### Fig. 20

Using an appropriate tool, remove the inlet check valve (18). Use a small magnet to remove the inlet check ball (19). Discard these parts. The power booster disassembly is now complete. Place the parts to one side for cleaning and inspection.

## 700 SERIES SHOP MANUAL

### Power Booster - Assembly

#### **Fig. 21**

Remove the three largest O-rings from the repair kit. Lubricate and install one thin O-ring (25) and the thickest O-ring (26) in the appropriate external grooves of the filter and end cap assembly (12).

**NOTE:** *Lubricate all O-rings and oil seals with fresh hydraulic fluid. Do not use brake fluid or petroleum base fluid (PBF).*

#### **Fig. 22**

Remove the 1 in. (25 mm) diameter O-ring (28) and the smallest of the three oil seals (27) from the repair kit. Lubricate and install the O-ring and oil seal in the appropriate internal grooves of the filter and end cap assembly (12).

**NOTE:** *Ensure the lip of the oil seal faces the power piston when the filter and end cap assembly is installed on the power piston shaft. Incorrect oil seal installation will allow pressurized oil to leak from the interior of the power booster housing.*

#### **Fig. 23**

Lubricate and carefully install the two identical diameter oil seals (20) and spacer (23) into the bore of the power booster housing (4).

**NOTE:** *Ensure the lips of both oil seals face the interior of the power booster housing.*

#### **Fig. 24**

Remove the inlet check valve (18) and inlet check ball (19) from the repair kit. Lubricate and install the appropriate O-ring from the repair kit on the inlet check valve. Lubricate and install the check ball. Lubricate and fully install the inlet check valve.

#### **Fig. 25**

Install the flow switch spring (16). Lubricate and install the flow switch piston (15). Lubricate the appropriate O-ring (14) from the repair kit and install on the flow switch contact (13). Install the flow switch contact and tighten to the specified torque.

#### **Fig. 26**

Clamp the flats of the input plug (22) in a vise with soft jaws. Do not clamp on the power piston shaft (21). Install the piston return spring (17), small end first.



# 700 SERIES SHOP MANUAL

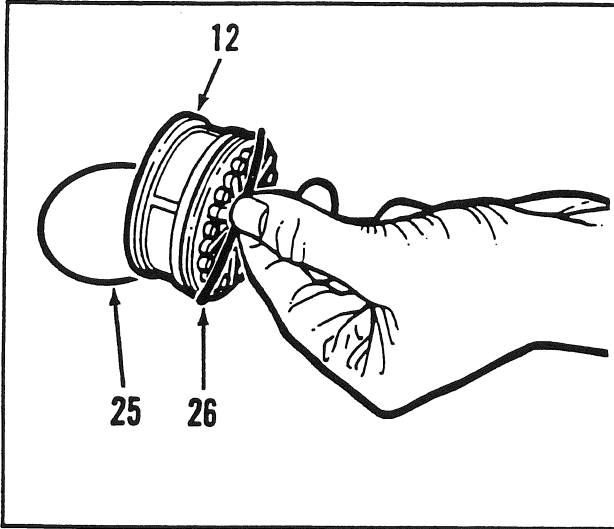


Fig. 21

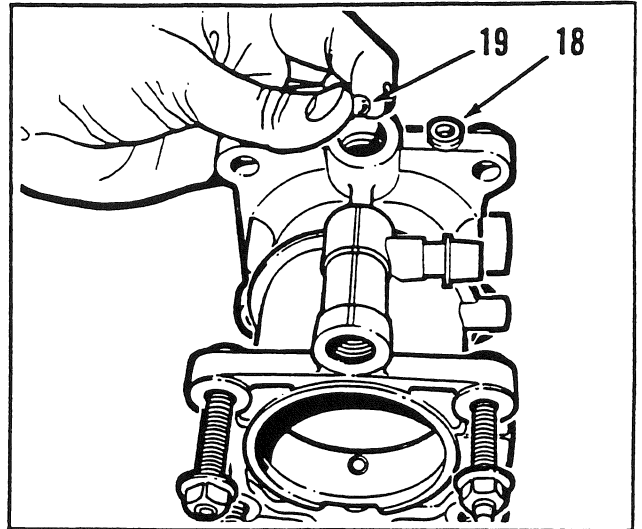


Fig. 24

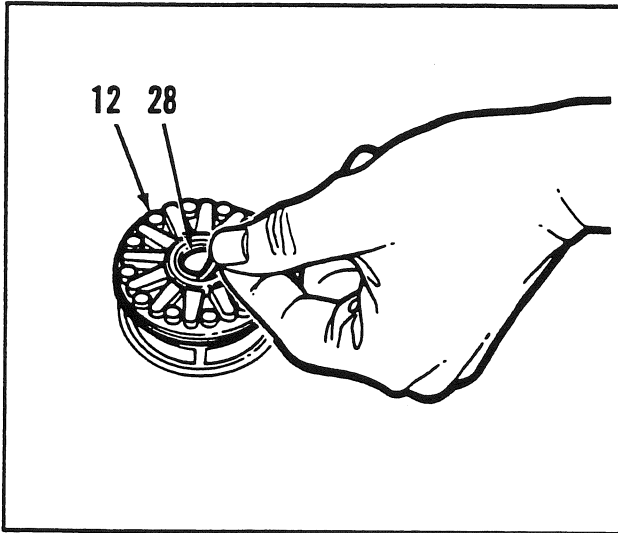


Fig. 22

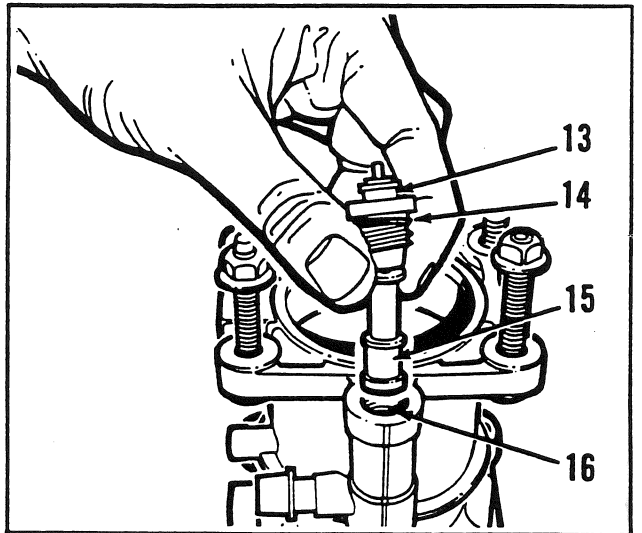


Fig. 25

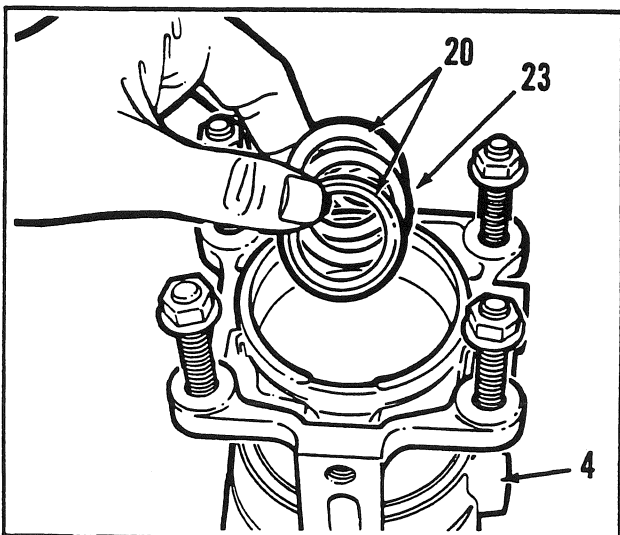


Fig. 23

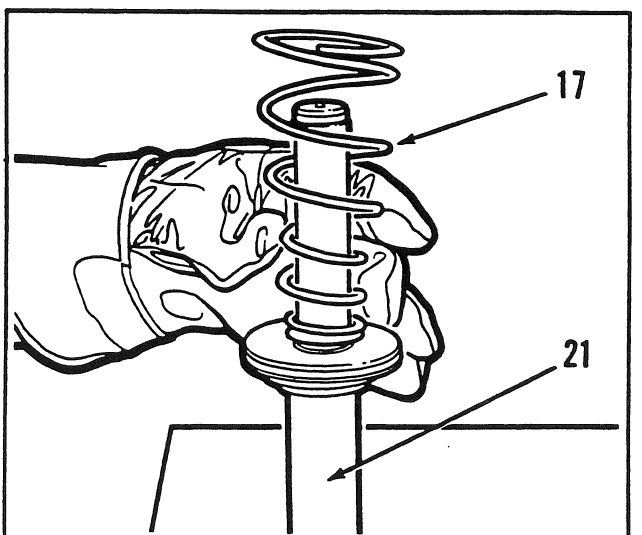


Fig. 26

# 700 SERIES SHOP MANUAL

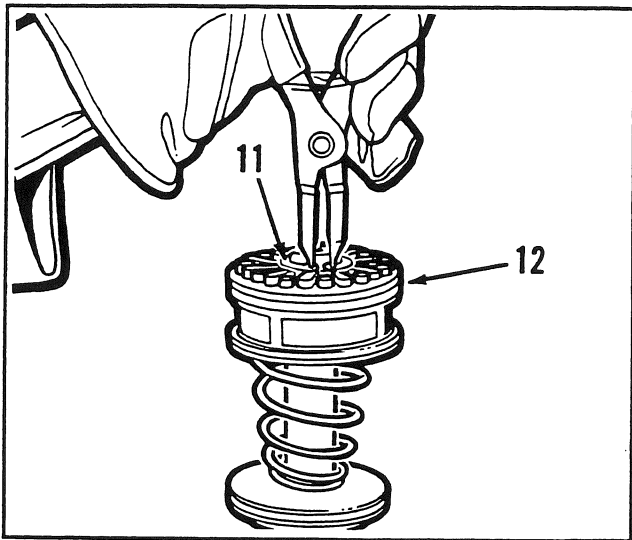


Fig. 27

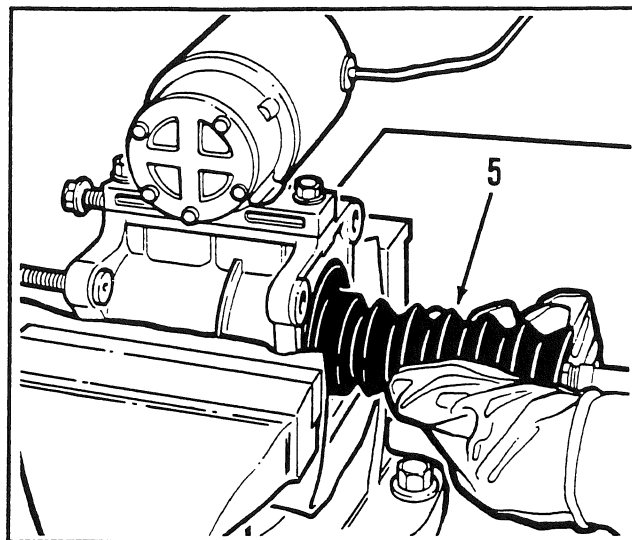


Fig. 30

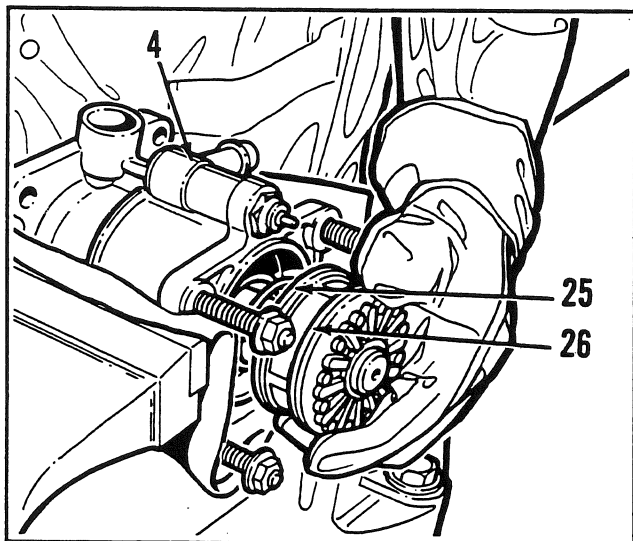


Fig. 28

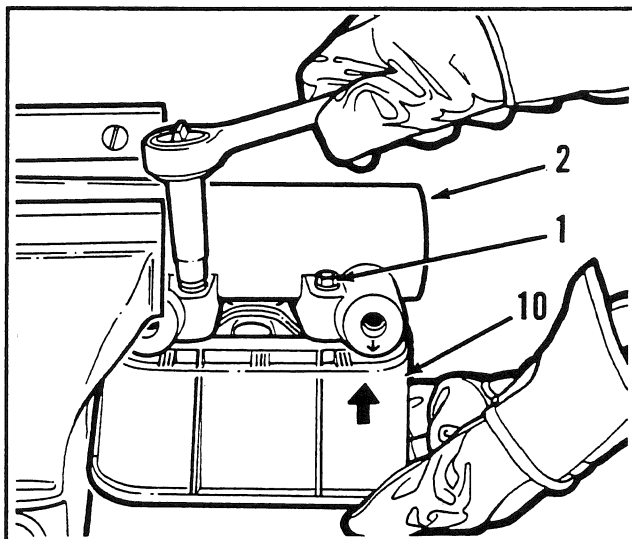


Fig. 31

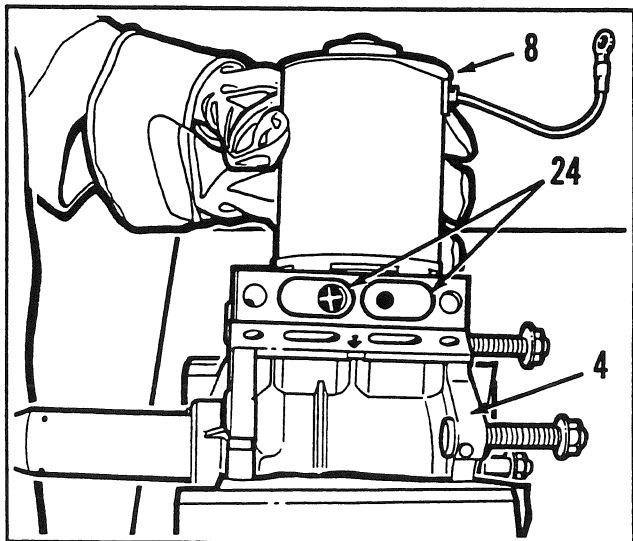


Fig. 29

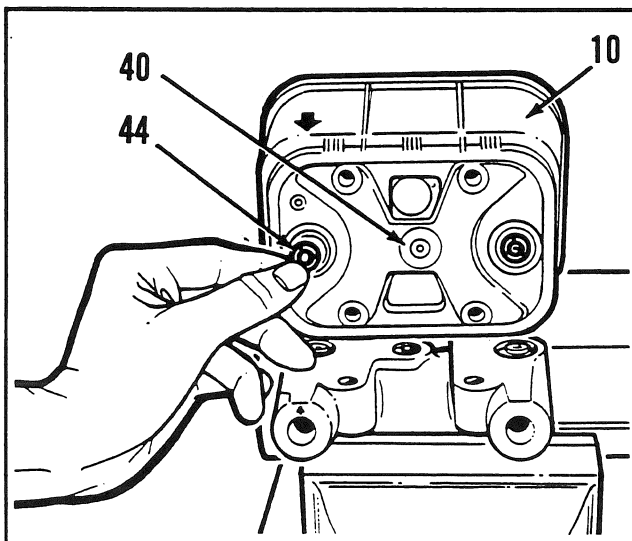


Fig. 32

# 700 SERIES SHOP MANUAL

## Power Booster - Assembly continued

### Fig. 27

You are recommended to install a protective metal sleeve (also known as a seal bullet) over the end of the output push rod. The sleeve prevents damage when you install the filter and end cap assembly internal oil seal (27) over the snap ring groove.

**NOTE:** *You can use plastic electrical tape to cover the snap ring groove. Ensure the surface is smooth for easy installation. Remove all traces of tape and adhesive. Clean the shaft with an alcohol solution and apply fresh hydraulic oil.*

Carefully install the filter and end cap assembly (12). Depress the assembly until the snap ring groove is exposed and install a new snap ring (11).

### Fig. 28

Lubricate the power piston shaft (21). Generously lubricate the filter and end cap assembly outside diameter. Install the power piston assembly. Use a gentle twisting motion when passing it through the two oil seals (20). Ensure the large O-rings (25 and 26) enter the power booster housing (4) without being pinched.

### Fig. 29

Inspect the electric motor pump (8) to verify that the motor pump check ball and retainer are in place.

**NOTE:** *The electric motor pump can be incorrectly installed. Check the orientation arrow for the proper position of the electric motor.*

Lubricate and install two new oval O-rings (24) into the recesses of the electric motor pump mounting flange. Carefully install the electric motor pump onto the power booster housing (4) and secure with the capscrews (7). Tighten the capscrews to the specified torque.

### Fig. 30

Install the boot (5), adjustable clevis (6) and lock-nut. Connect the electric motor pump wire to the terminal block.

## Master Cylinder - Disassembly

### Fig. 31

Remove the two reservoir caps (9). Drain and discard the system fluid from the reservoir (10). To ensure correct reservoir positioning during assembly, use a felt-tip marker and draw identification marks on the reservoir and the corresponding side of the master cylinder body (2). Remove the capscrews (1) and reservoir.

### Fig. 32

Remove and discard the two compensating valve seals (44) from the bottom of the reservoir (10). Remove and discard the piston stop O-ring (40).

## 700 SERIES SHOP MANUAL

### Master Cylinder - Disassembly *continued*

Fig. 33



Use an appropriate tool and depress the primary piston assembly (32) approximately one inch (25 mm). Spring compression load is between 90 and 130 pounds (41 and 59 kg). Take care not to scratch the bore surface. Remove and discard the two compensating valves (43) and springs (42). Remove and discard the piston stop pin (39) from the master cylinder body (2).

Fig. 34

Remove and discard the snap ring (29) from the master cylinder body bore (2).

Fig. 35

Slowly relieve the compression on the primary piston (32). Remove the primary and secondary piston assemblies from the master cylinder body bore (2).

Fig. 36



You may have to use low pressure compressed air (25 psi; 1,7 bar) to remove the secondary piston assembly (36). Plug the outlet ports, rear compensating valve port and piston stop pin bore. Place the open end of the master cylinder body (2) approximately one inch (25 mm) from a padded surface to stop the piston. Do not place your hands between the master cylinder body and padded surface. Apply compressed air to the front compensating valve port.

Fig. 37

Remove and discard the O-ring (31) on the primary piston assembly (32). Remove and discard the two O-rings (34 and 38) on the secondary piston assembly (36).

**NOTE:** Do not remove the back-up rings (30, 35 and 37) on the primary and secondary piston assemblies. Do not disassemble the primary and secondary piston assemblies.

Remove the secondary piston return spring (41). Remove the primary piston return spring (33). Place the parts to one side for cleaning and inspection.

### Master Cylinder - Assembly

Fig. 38

Lubricate the master cylinder bore, primary and secondary piston assemblies and all parts in the repair kit.

**NOTE:** For graders equipped with oil disc brakes, use only petroleum base fluid (PBF). For graders equipped with drum service brakes use only SAE J1703, DOT 3 or ISO 4925 specification brake fluid. Do not use hydraulic fluid.

# 700 SERIES SHOP MANUAL

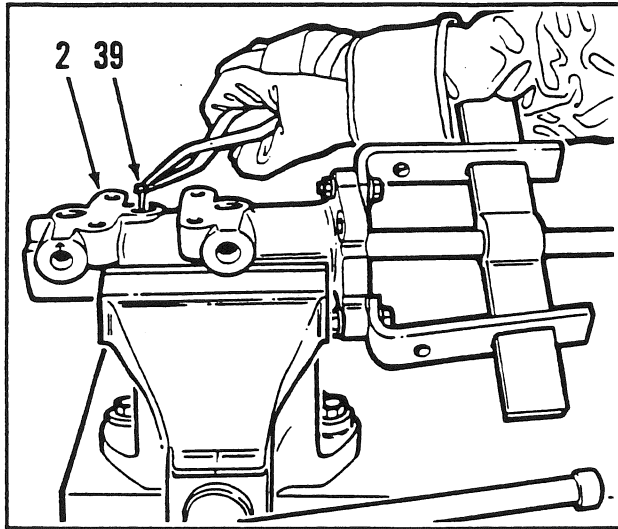


Fig. 33

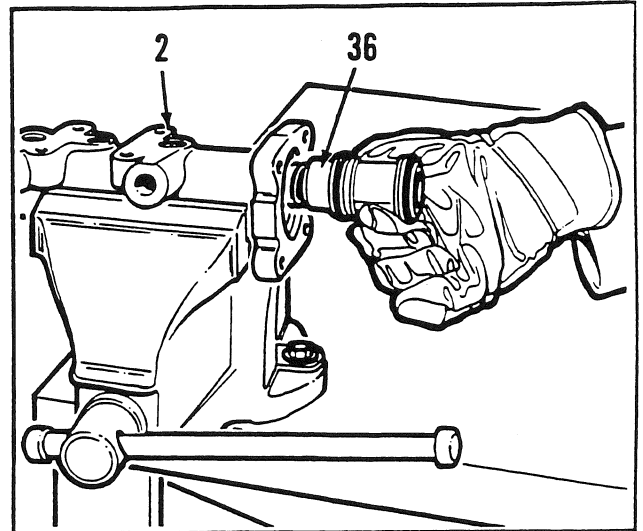


Fig. 36

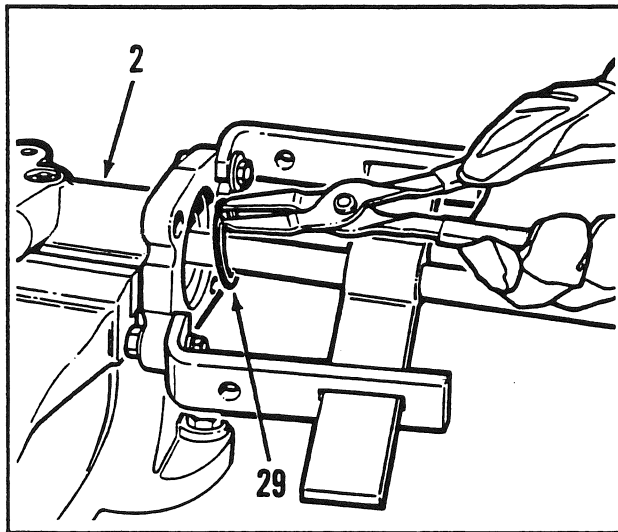


Fig. 34

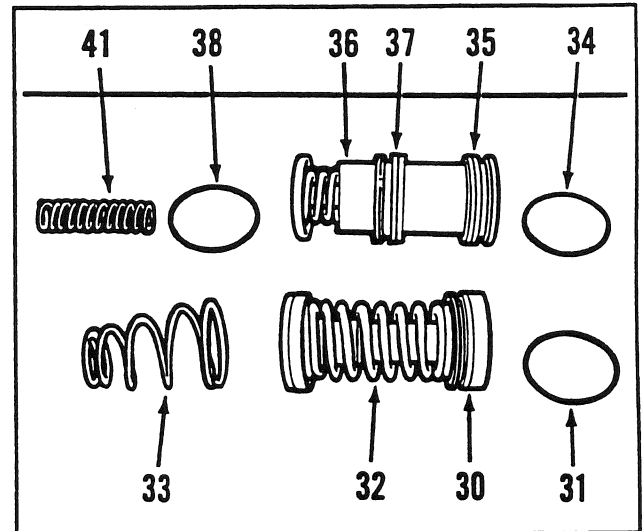


Fig. 37

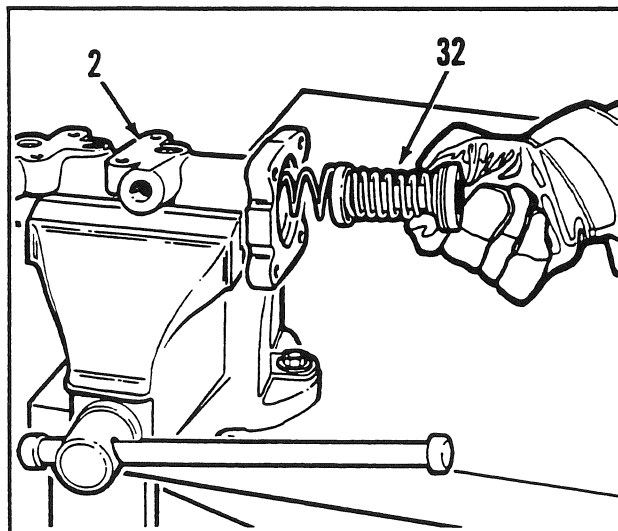


Fig. 35

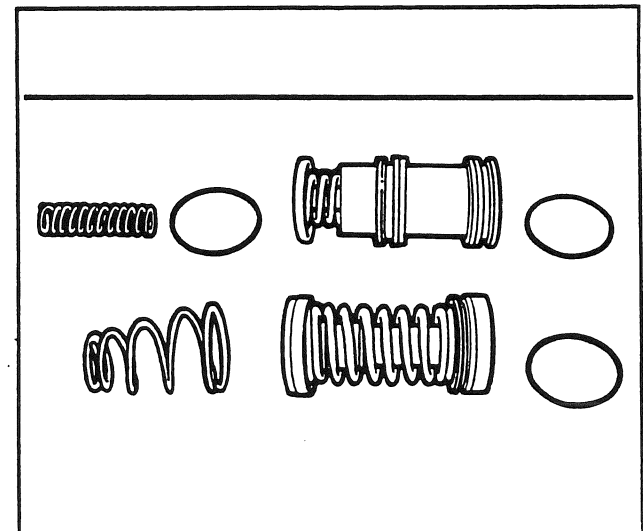


Fig. 38

# 700 SERIES SHOP MANUAL

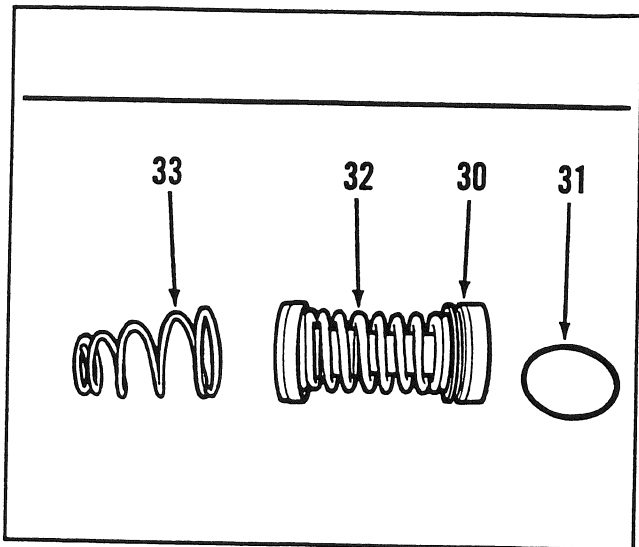


Fig. 39

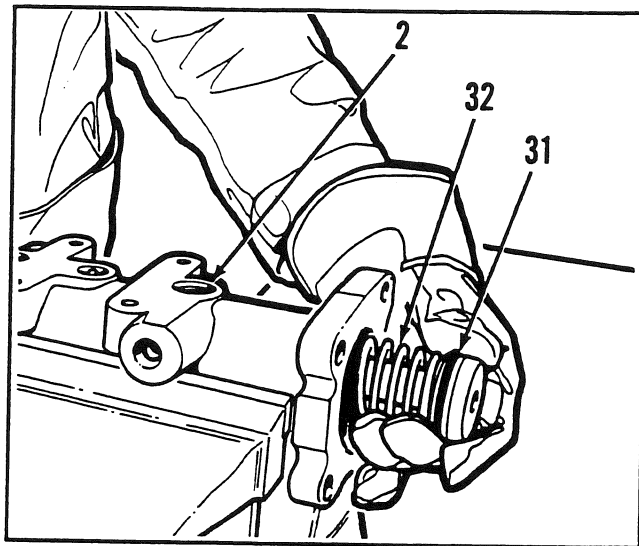


Fig. 42

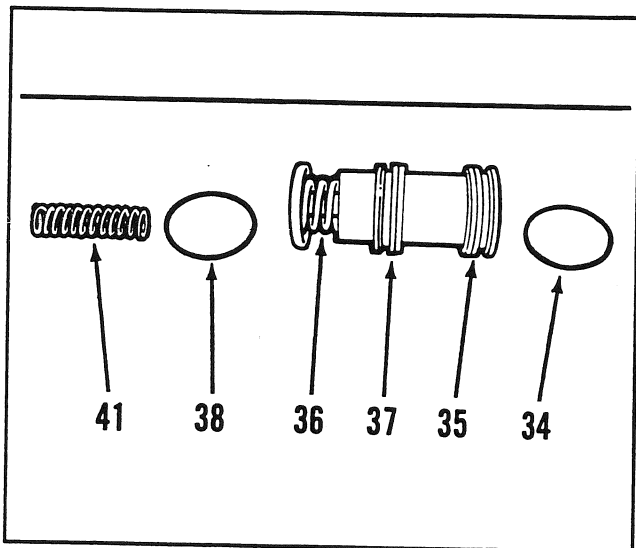


Fig. 40

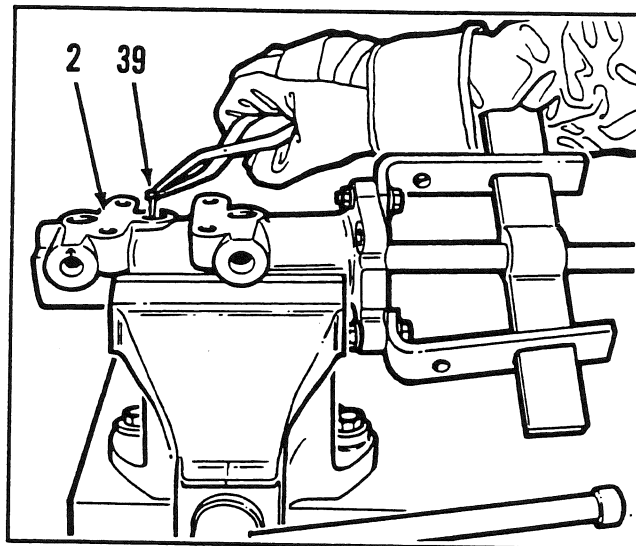


Fig. 43

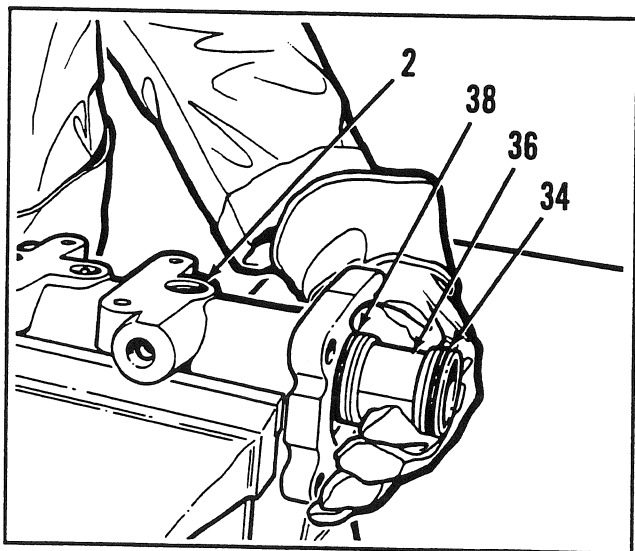


Fig. 41

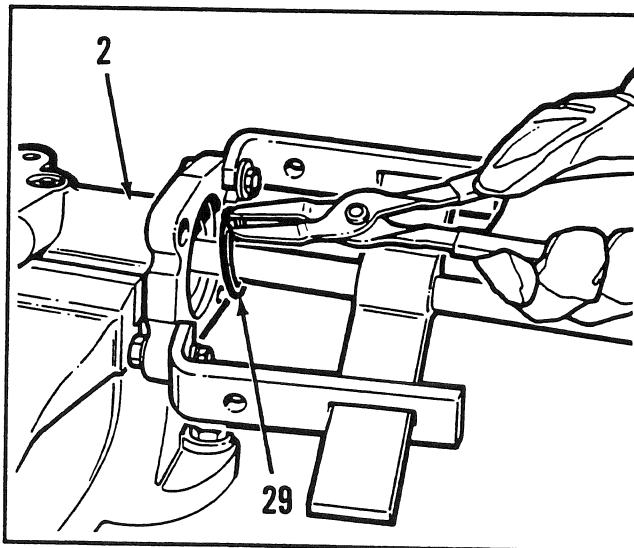


Fig. 44

# 700 SERIES SHOP MANUAL

## Master Cylinder - Assembly *continued*

**Fig. 39**

Install the large diameter of the primary piston return spring (33) into the primary piston actuator. Install the O-ring (31) on the primary piston assembly (32).

**NOTE:** *Ensure that you install the O-ring and the back-up ring (30) in the correct position. Refer to Figs. 1 and 39 for positioning.*

**Fig. 40**

Install the secondary piston return spring (41) into the secondary piston actuator. Install the O-rings (34 and 38) on the secondary piston assembly (36).

**NOTE:** *Ensure that you install the O-rings and the back-up rings (35 and 37) in the correct position. Refer to Figs. 1 and 40 for positioning.*

**Fig. 41**

Carefully install the secondary piston assembly (36), spring end first, into the master cylinder body bore (2). Ensure you do not damage the O-rings (34 and 38) during assembly.

**Fig. 42**

Carefully install the primary piston assembly (32), spring end first, into the master cylinder body bore (2). Ensure you do not damage the O-ring (31) during assembly.

**Fig. 43**



Adapt a bearing puller to depress the primary piston assembly (32) approximately one inch (25 mm). Spring compression load is between 90 and 130 pounds (41 and 59 kg). Take care not to scratch the bore surface. Lubricate and install a new piston stop pin (39) into the master cylinder body (2).

**Fig. 44**

Install a new snap ring (29) into the master cylinder body bore (2). Remove the spring compression tool.

## 700 SERIES SHOP MANUAL

### Master Cylinder - Assembly continued

#### Fig. 45

Install two new compensating valves (43) and springs (42) into their recesses in the master cylinder body (2). Install two new compensating valve seals (44) into their recesses in the reservoir (10). Install a new piston stop O-ring (40).

#### Fig. 46

Place the reservoir (10) into position on the master cylinder (2) as marked during disassembly. Ensure that the compensating valves (43) are free to move. Insert an appropriate clean, metal probe through the reservoir ports and check that the valves can move up and down by 1/16 inch (1,5 mm).

#### Fig. 47

Install the capscrews (1) and tighten to the specified torque. Install short, flexible tubes from the outlet ports at the branch tee fittings into the reservoir sections. Secure the master cylinder with the front end tilted slightly down. Fill the reservoir sections with petroleum base fluid (PBF)(oil disc brakes) or brake fluid (drum service brakes). Depress and release the primary piston several times using any tool with a smooth, rounded end. Secure the master cylinder with the front end tilted slightly up. Again, depress and release the primary piston several times. Remove the tubes and install the reservoir caps.

**NOTE:** Once all air is expelled from the master cylinder, you should not be able to depress the primary piston.

#### Fig. 48

To complete the assembly, carefully install the power booster (4) onto the master cylinder (2) and retain with the nuts (3). Tighten the nuts to the specified torque.

### Master Cylinder and Power Booster Assembly - Installation to Grader

#### Fig. 49

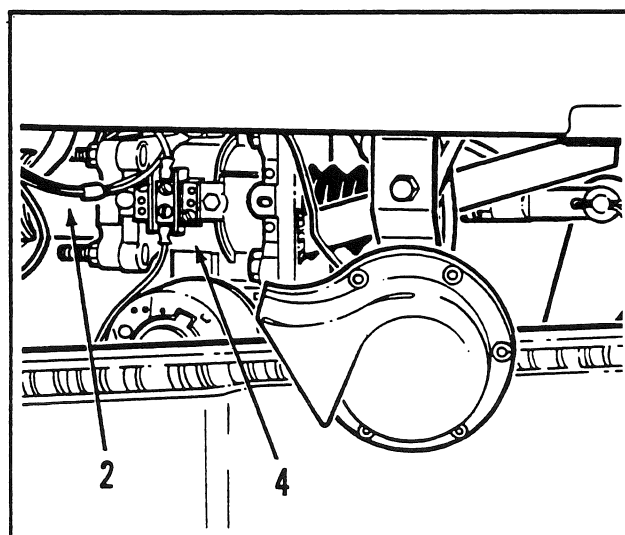
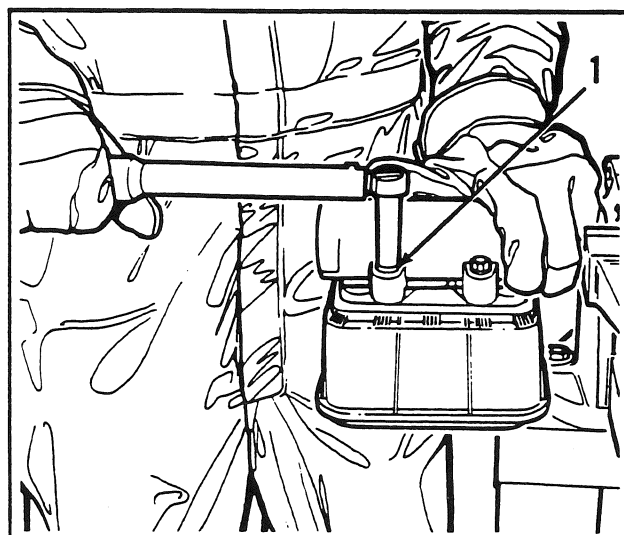
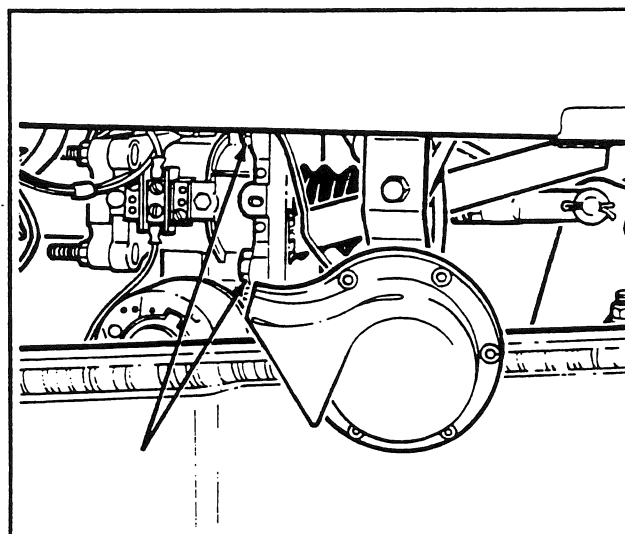
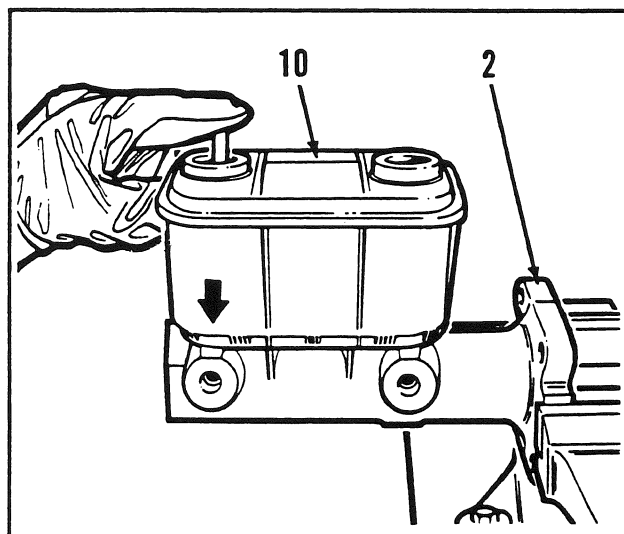
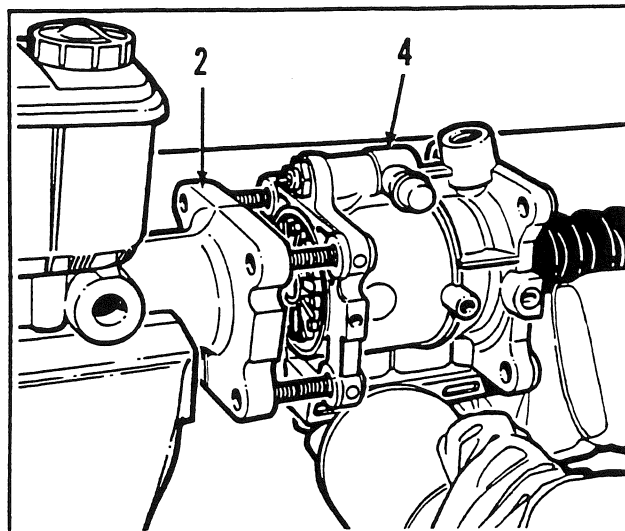
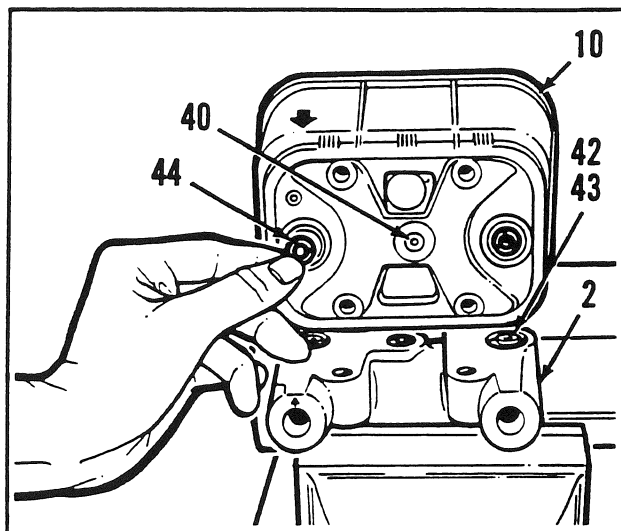
Support the master cylinder and power booster assembly. Apply threadlocking compound onto clean threads and install the capscrews retaining the assembly to the mounting bracket. Tighten the capscrews to the specified torque.

#### Fig. 50

Connect the two brake hoses to the master cylinder (2). Connect the inlet and return hoses to the power booster housing (4).



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### Master Cylinder and Power Booster Assembly - Installation to Grader *continued* Fig. 51

Install the clevis pin retaining the push rod adjustable clevis (6) to the pivot plate. Install and secure a new cotter pin. Tighten the nut to the specified torque. Connect the wire from the harness to the terminal block. Do not connect the wire to the flow switch contact until you have completed the bleeding procedure. Connect the wires from the harness to the terminals of both brake switches and the pressure differential switch.

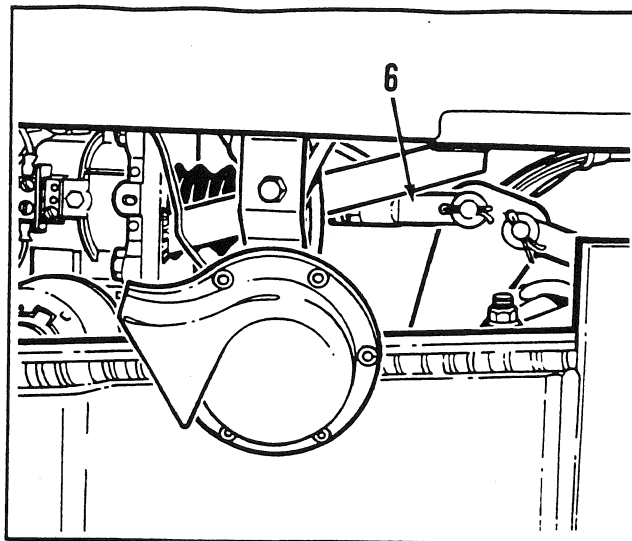


Fig. 51

### Master Cylinder and Power Booster Assembly - Bleeding Procedure

The grader should remain in the SERVICE POSITION. Always wear face protection when working over the bleed fittings. Do not use the electric motor pump for the bleeding procedure.

Connect a flexible tube from the bleed fitting on the front left tandem wheel cylinder into a transparent container half full of fresh petroleum base fluid (PBF)(oil disc brakes) or SAE J1703, DOT 3 or ISO 4925 specification brake fluid (drum service brakes). Immerse the tube.

Release the bleed fitting. Slowly depress the brake pedal and wait for five seconds. Slowly release the brake pedal and wait for five seconds. Ensure the tube remains immersed in the fluid.

Repeat this procedure until the air bubbles stop flowing into the container. Tighten the bleed fitting. Check the level in the reservoir sections and replenish with fresh system fluid if required.

Repeat the bleeding procedure at the rear right, front right and rear left tandem wheel cylinders in that sequence. After each bleeding procedure step, check the level in the reservoir sections and replenish with fresh system fluid if required. Install the reservoir caps.

Connect the wire from the harness to the flow switch contact. Ensure a good connection.

**NOTE:** Secure the wire to the flow switch contact using a twisting motion until the terminal snaps into place. If disconnected, the system operates in a **no flow** condition.

Do not exceed 35 psi (2,4 bar) if you are using pressure bleeding equipment. Follow the pressure bleeding equipment manufacturer's instructions.

Refer to pages 16-3 and 16-5 and perform a brake function test. Road test the service brakes with the grader travelling slowly in low gear.