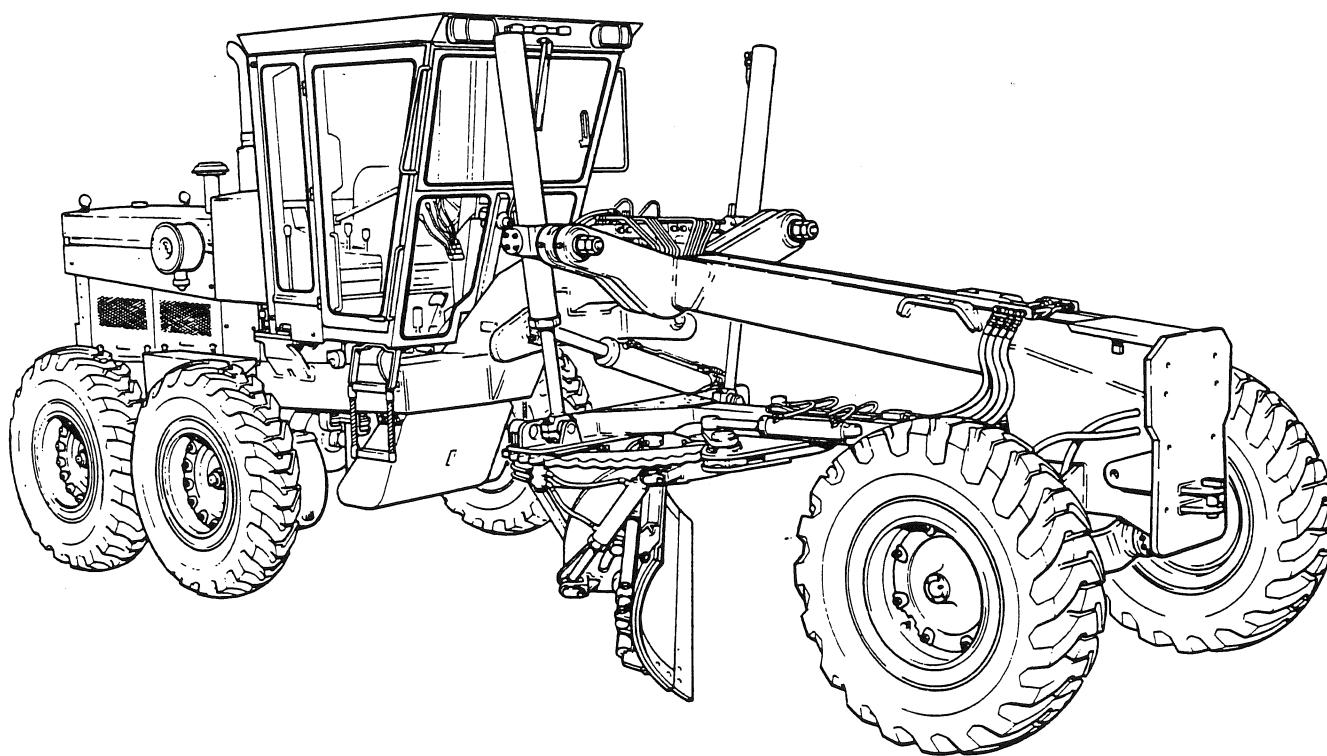


## SECTION 5

# STEERING UNIT AND COLUMN



700 SERIES SHOP MANUAL  
STEERING SYSTEM

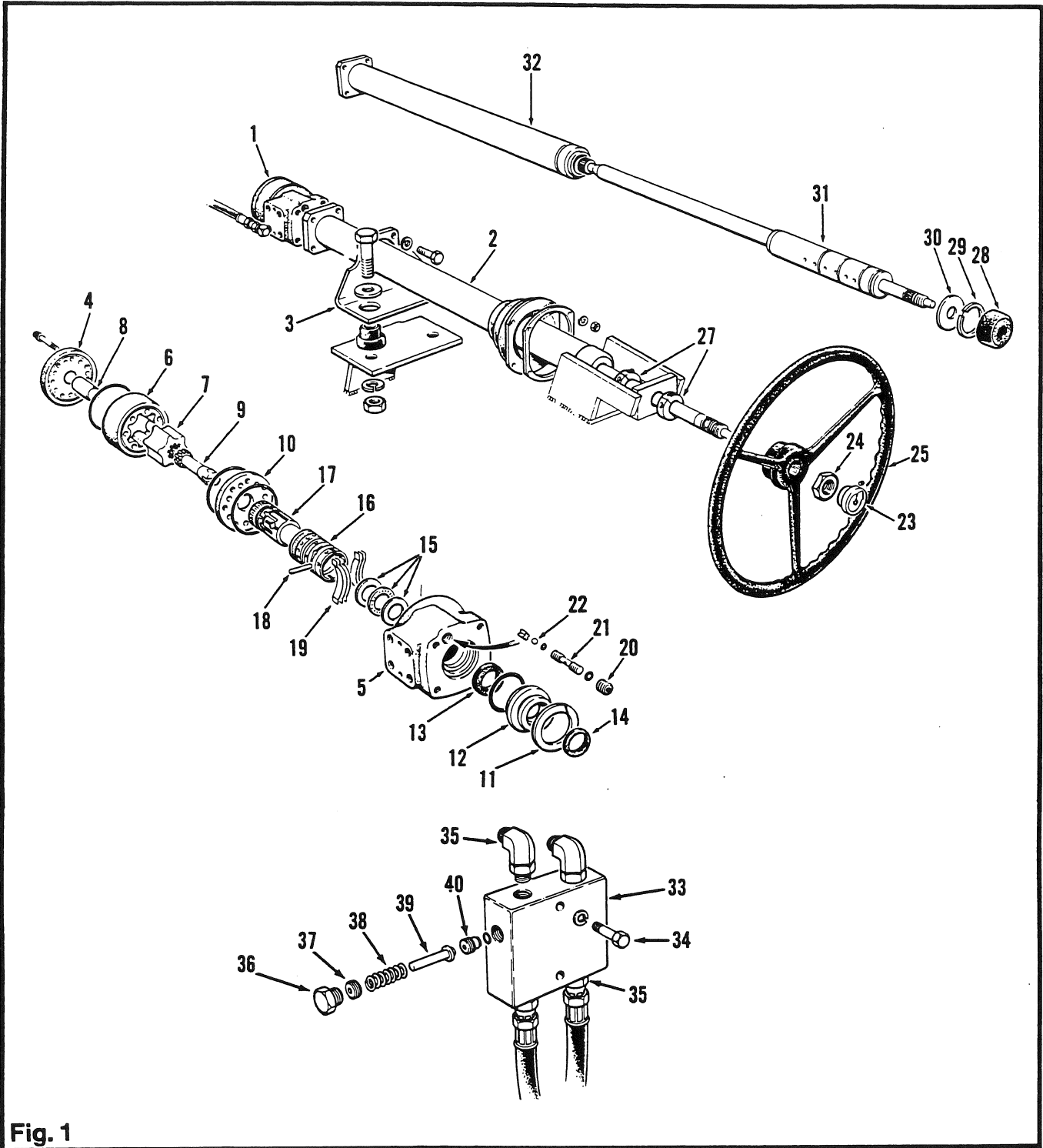


Fig. 1

**700 SERIES SHOP MANUAL**  
**STEERING SYSTEM**

INDEX (Fig. 1)	PAGE
General .....	1
Description and Operation .....	1
Torque Guide .....	1
Troubleshooting .....	2
Steering Unit - Removal and Disassembly .....	3
- Assembly and Installation .....	10
Steering Column - Removal and Disassembly .....	18
- Assembly and Installation .....	19
Cushion Valve - Removal and Disassembly.....	19
- Assembly .....	22
- Adjustment and Installation .....	23

KEY TO FIG. 1					
item	description	item	description	item	description
1	Steering Unit	15	thrust bearing	29	retaining ring
2	Steering Column Assy.	16	control sleeve	30	thrust washer
3	bracket	17	control spool	31	shaft
4	end cap	18	drive pin	32	tube
5	housing	19	centering spring	33	Cushion Valve
6	meter gear housing	20	set screw	34	capscrew
7	meter gear	21	check ball seat	35	O ring fittings
8	spacer	22	check ball	36	O ring plugs
9	drive coupling	23	brass knob	37	adjusting screws
10	spacer disc	24	steering wheel nut	38	springs
11	retaining ring	25	steering wheel	39	poppets
12	seal gland	26	pedestal cover*	40	seat
13	quad ring seal	27	clamping collars		
14	oil seal	28	dust cap		
				*	Not Shown

## 700 SERIES SHOP MANUAL

### STEERING SYSTEM

#### GENERAL

Make sure the work area is clean and safe before starting any service procedure. A clean work area will reduce the chance of foreign matter entering the system.

You must use extreme care and practice maximum cleanliness when overhauling steering system components.

#### DESCRIPTION AND OPERATION

The steering system of your Champion Motor Grader is fully hydraulic. There is no mechanical connection between the steering wheel and the front axle.

When the engine is running, the steering pump, located at the rear of the grader, supplies oil flow to power the circuit.

The steering unit meters and directs the oil to the steering cylinders on the front axle.

The steering cylinders provide the necessary force to move the steering linkage and turn the front wheels.

The steering unit is a precision component and can be easily damaged by very small contaminants or by the effects of thermal expansion.

Make sure proper tools are available and in good working order. You will require a safe lifting device and normal shop tools.

The cushion valve acts as a shock absorber, protecting the system from sudden, high pressure surges by allowing oil to flow from the high pressure side of the circuit to the low pressure side. It is located in the nose of the main frame, above the steering cylinders.

The steering system also provides oil flow to the brake and clutch boosters. (see Section 6)

TORQUE GUIDE			
application		torque	
Steering Wheel Retainer Nut .....	17 N.m	1.7 kg.m	150 lbf-in.
Column to Steering Unit .....	32 N.m	3.2 kg.m	280 lbf-in.
End Cap .....	17 N.m	1.7 kg.m	150 lbf-in.
Set Screw for Check Ball .....	17 N.m	1.7 kg.m	150 lbf-in.



700 SERIES SHOP MANUAL  
STEERING SYSTEM

TROUBLESHOOTING:

PROBLEM	CAUSE	REMEDY
<p>Hard Steering. Slow Steering. No Power Assist.</p>	<p>Worn Pump.  Malfunctioning flow divider valve.  Malfunctioning relief valve.</p>	<p>Replace the pump.  Repair or replace the flow divider valve.  Repair or replace the relief valve.</p>
<p>Wander - Grader will not hold a straight line.</p>	<p>Air in the system.  Severe wear in the steering unit.  Worn or damaged steering linkage.  Worn steering cylinder(s).</p>	<p>Check for leaks, low oil level, cavitating pump.  Repair or replace the steering unit.  Repair the steering linkage.  Repair the steering cylinder(s).</p>
<p>Slip - Slow movement of the steering wheel does not cause the front wheels to move.</p>	<p>Worn steering cylinder(s).  Worn steering unit meter.</p>	<p>Repair the steering cylinders.  Repair or replace the steering unit.</p>
<p>Free Wheeling - Steering wheel turns freely with no feeling of pressure and no movement in the front wheels.</p>	<p>Defective steering column.  Lack of oil in the steering unit after service.  Lack of flow to the steering unit.</p>	<p>Repair the column.  Wait for the steering unit to fill with oil after starting.  Check for low oil level, or leaks.</p>
<p>Binding, Steering Wheel does not centralize.</p>	<p>Steering column damaged or misaligned.  Serious contamination.</p>	<p>Repair the steering column.  Clean the steering unit and purge the system.</p>
<p>Steering Wheel oscillates or turns by itself.</p>	<p>Steering unit improperly assembled, timing wrong.  Lines connected improperly.  Broken centering springs.</p>	<p>Assemble the unit correctly.  Reconnect the lines.  Repair steering unit.</p>
<p>Front Wheels turn opposite to Steering Wheel.</p>	<p>Lines from steering unit to cylinders are connected in reverse.</p>	<p>Reconnect the lines.</p>

700 SERIES SHOP MANUAL  
STEERING SYSTEM

STEERING UNIT

Removal

1. Be sure to clean all dirt and flaking paint from the outside of the steering unit before disconnecting the hoses. (Fig. 2)
2. Disconnect the hoses from the steering unit (1). (Fig. 3) Plug the hose fittings and the ports of the steering unit to prevent contamination of the system.
3. Remove the capscrews that fasten the steering unit (1) to the steering column (2) and bracket (3). (Fig. 4) Remove the steering unit (1) from the grader.

Disassembly

1. Place the control section of the steering unit into a vise with the metering end up. Tighten the vise only enough to hold the unit in place. (Fig. 5)
2. Remove the capscrews retaining the end cap (4) and lift it off the housing (6). (Fig. 6)
3. Carefully lift off the meter housing (6), meter gear (7), spacer (8) drive coupling (9) and spacer disc (10) and set them aside. Discard the three O rings. (Fig. 7)

700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING UNIT

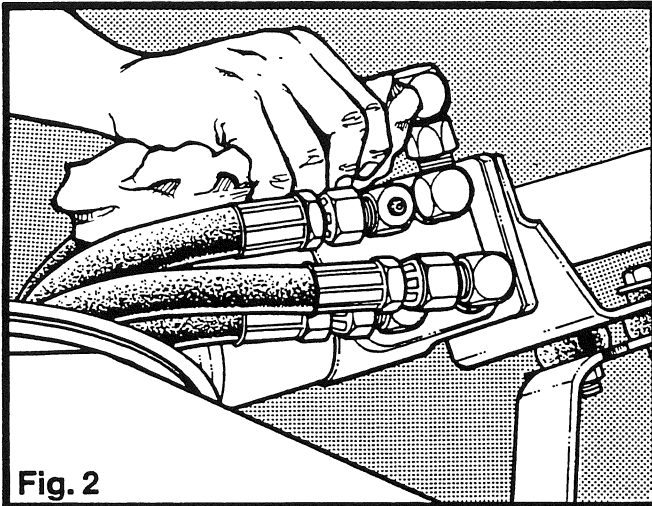


Fig. 2

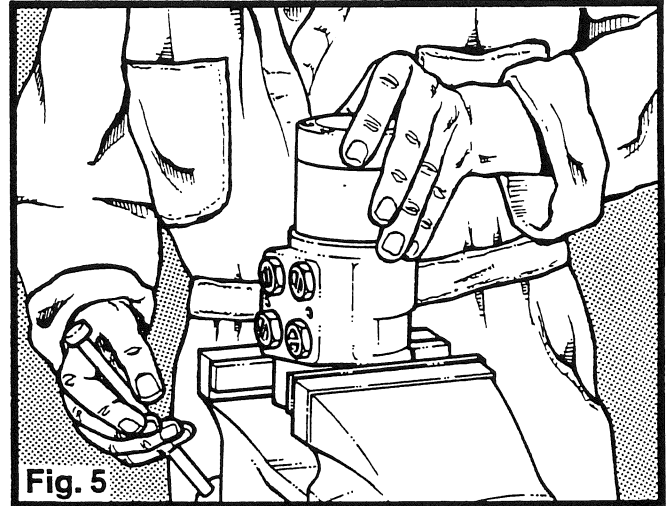


Fig. 5

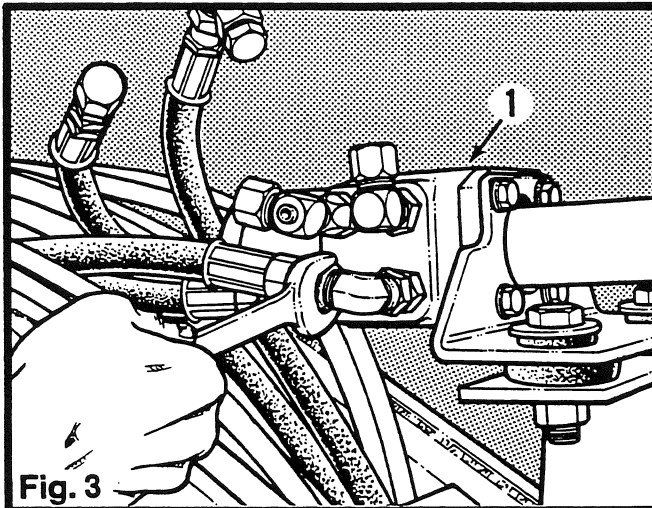


Fig. 3

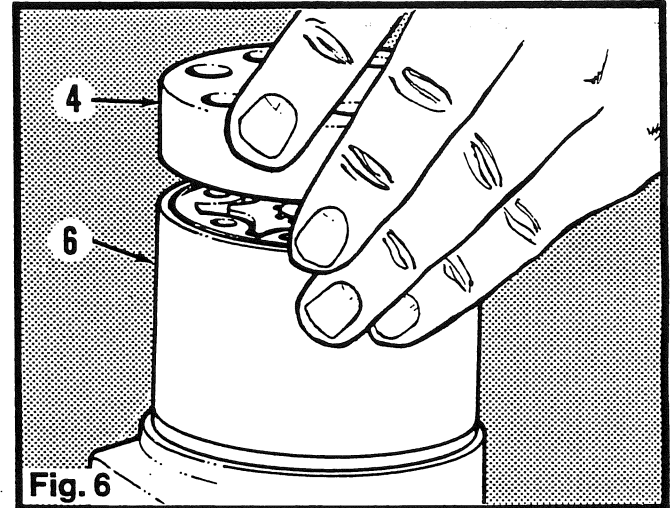


Fig. 6

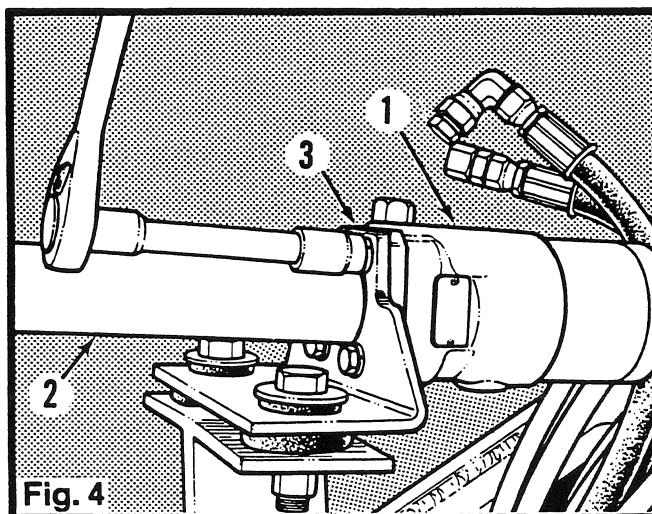


Fig. 4

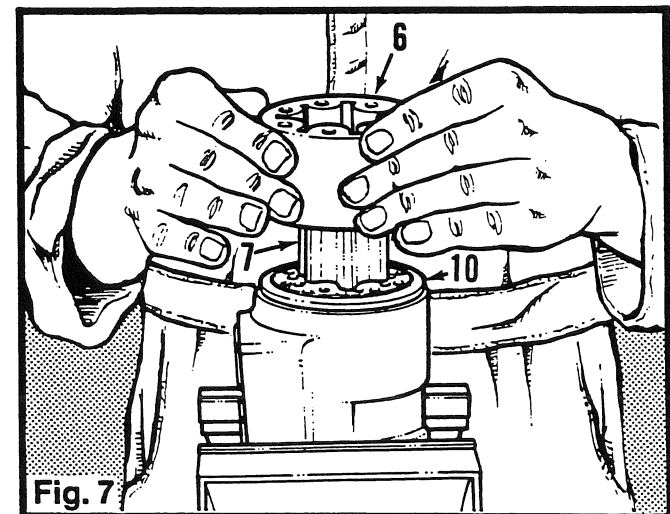
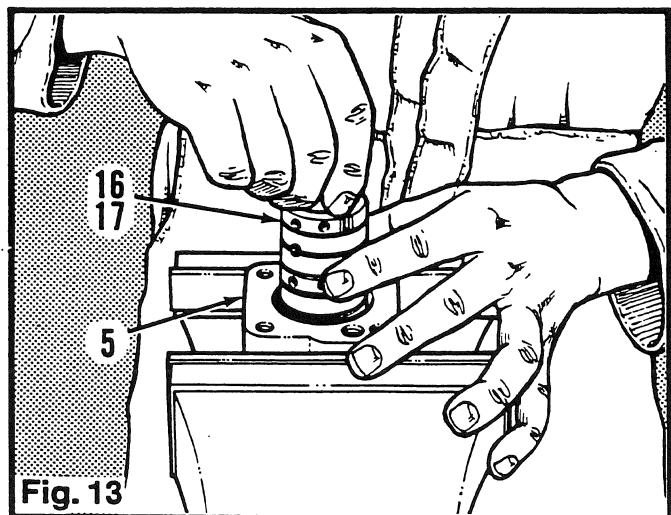
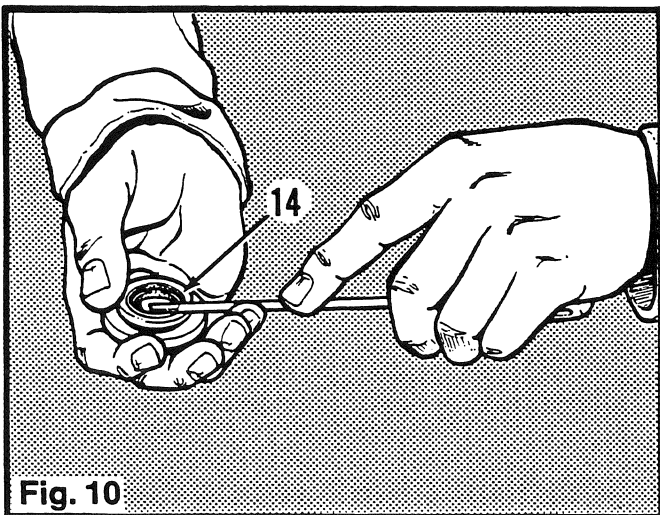
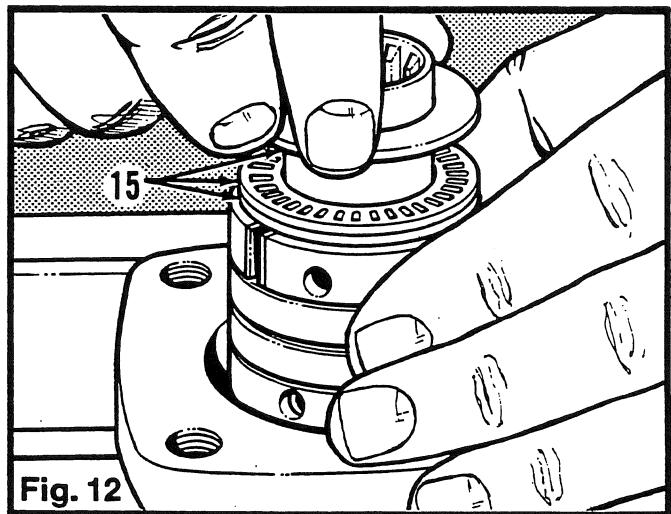
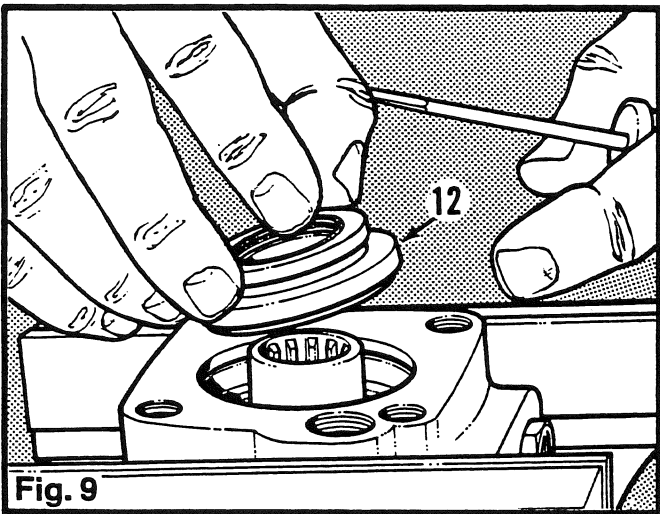
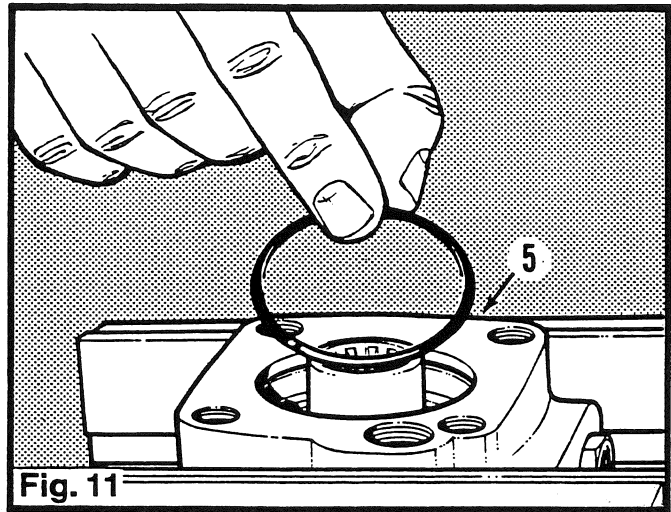
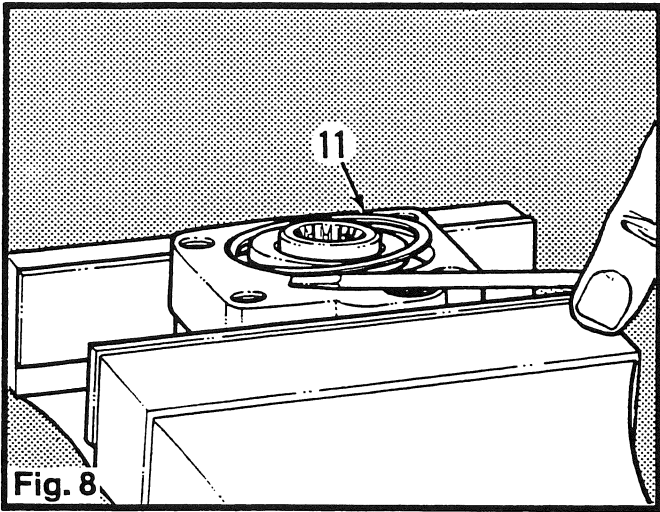


Fig. 7

700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING UNIT



## 700 SERIES SHOP MANUAL

### STEERING SYSTEM

#### STEERING UNIT

##### Disassembly (cont.)

4. Turn the assembly over and remove the retainer ring (11). (Fig. 8)
5. Remove the seal gland (12). (Fig. 9)
6. Remove and discard the quad ring (13) and oil seal (14). (Fig. 10)
7. Remove the O ring from the housing (5) and discard it. (Fig. 11)
8. Remove the thrust bearing (15). (Fig. 12)
9. Loosen the jaws of the vise. Rotate the control assembly (16, 17) while pulling it from the housing (5). (Fig. 13) Take care not to force the components.

##### IMPORTANT

The tolerances of the control assembly and housing are very close and the heat of your hand can cause enough expansion to make these components tight. If the components do get tight, set them on the bench for a couple of minutes to cool off. Apply more lubricant, and try again.

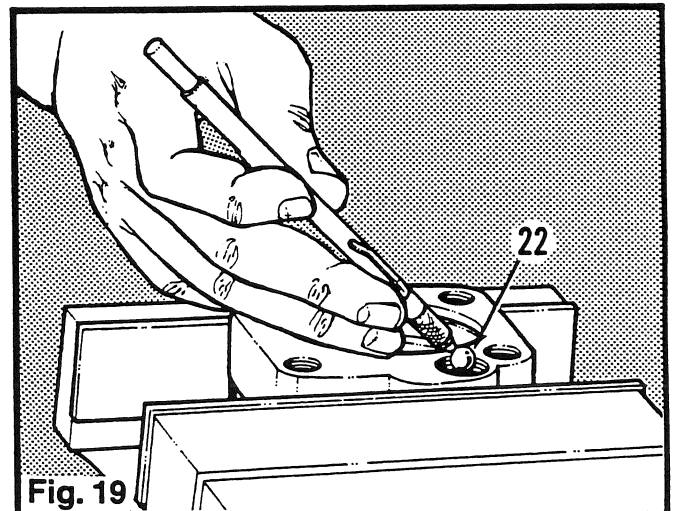
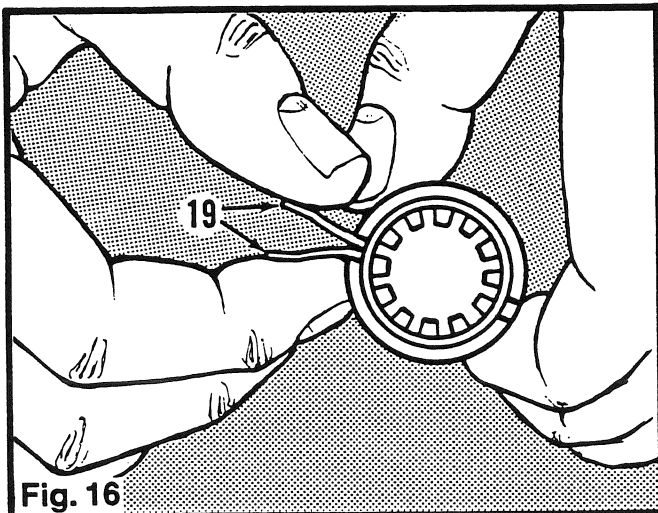
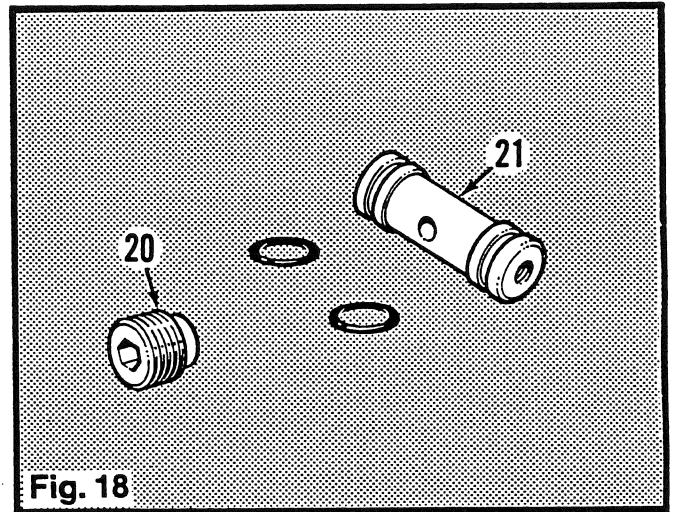
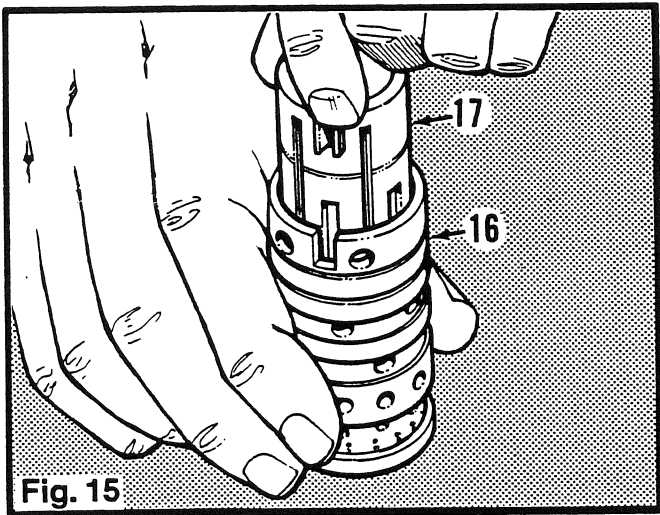
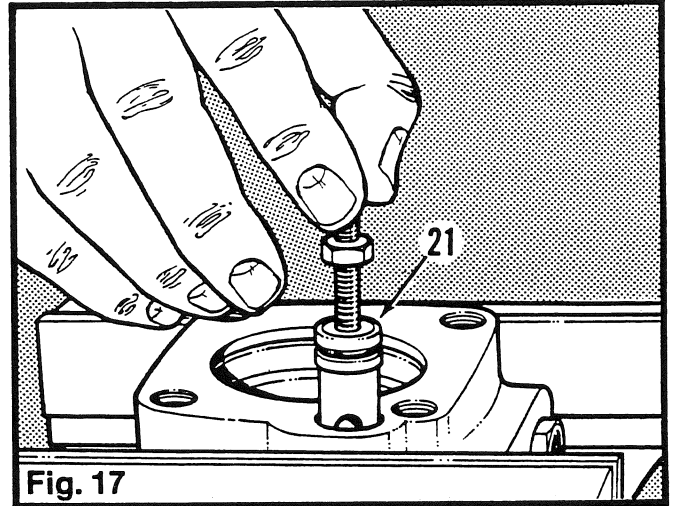
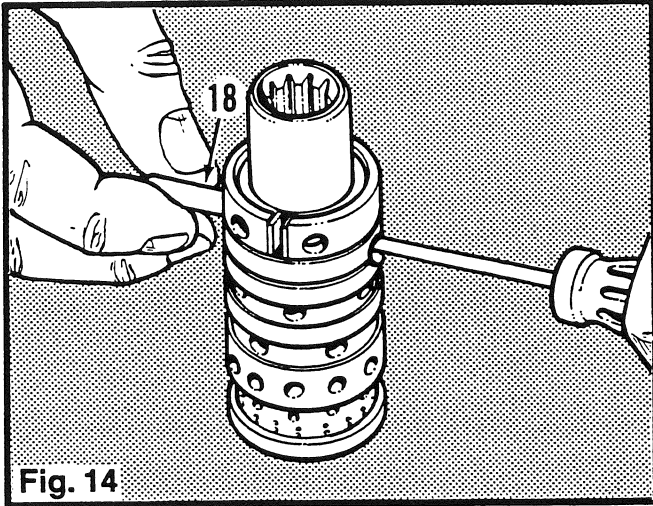
700 SERIES SHOP MANUAL  
STEERING SYSTEM  
STEERING UNIT

Disassembly (cont.)

10. Remove the pin (18). (Fig. 14)
11. Carefully separate the control sleeve (16) and control spool (17). (Fig. 15)
12. Compress and remove the centering springs (19). (Fig. 16)
13. Remove the set screw (20) and the check ball seat (21). (Fig. 17)
14. Discard the O rings. (Fig. 18)
15. Remove the check ball (22). (Fig. 19)

700 SERIES SHOP MANUAL  
STEERING SYSTEM

STEERING UNIT









700 SERIES SHOP MANUAL  
STEERING SYSTEM  
STEERING UNIT

**Inspection**

Wash all of the components in solvent, dry them with compressed air and set them in a clean dry place. (Fig. 20)

Inspect each part for scoring, wear or pitting. Remember that the control assembly components are matched and if one is damaged, all must be replaced.

You can dress the mating surfaces of the body components and the meter gear using 600 grit paper laid on a flat surface or an equivalent stone. (Fig. 21) After 6-10 strokes, wash the components thoroughly in solvent and dry them with compressed air. After inspection, dip them in oil and set them aside. Discard all seals and "O" rings.

Use extreme care and practice maximum cleanliness when assembling the steering unit.

**Assembly**

1. Lubricate new O rings and install them on the check ball seat (21). (Fig. 22)

2. Install the check ball (22) and seat (21) in the housing (5). This will be easier if you install a machine screw in the end of the seat. (Fig. 23)

3. Install the set screw (20). (Fig. 24)

4. Install the centering springs (19) into the control spool (17). (Fig. 25)

Remember, the fit of the control components is critical and can be affected just by the heat from your hands.

## 700 SERIES SHOP MANUAL

### STEERING SYSTEM

#### STEERING UNIT

##### Assembly (cont.)

4. Apply lubricant to the spool (17) and rotate it as you install it in the control sleeve (16). (Fig. 26) Remember, the fit of the control components is critical and can be affected just by the heat from your hands.
5. Compress the centering springs (19) into their slot. (Fig. 27)
6. Install the drive pin (18). (Fig. 28)
7. Apply lubricant to the control assembly (16,17). Rotate the control assembly as you install it in the control housing (5). (Fig. 29)
8. Install the thrust bearing (15). (Fig. 30)
9. Lubricate a new O ring and install it. (Fig. 31)

##### IMPORTANT

Do not force the control assembly. If the components jam during installation, you may permanently damage them.

700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING UNIT

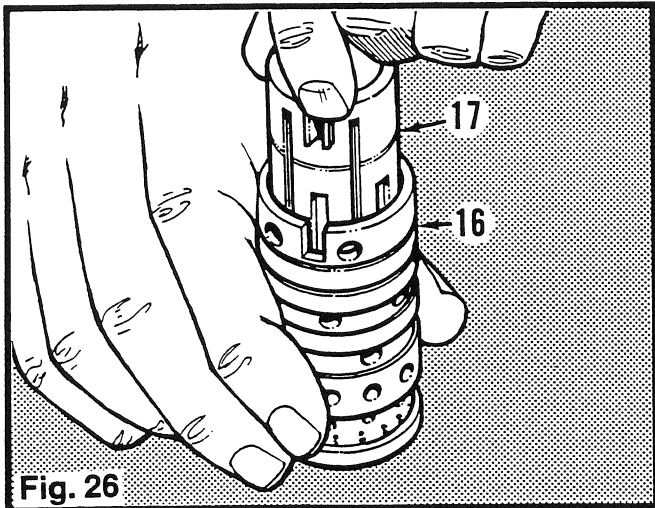


Fig. 26

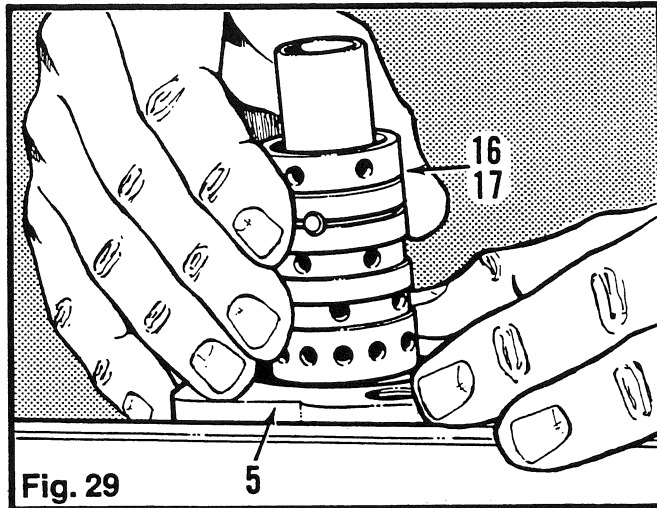


Fig. 29

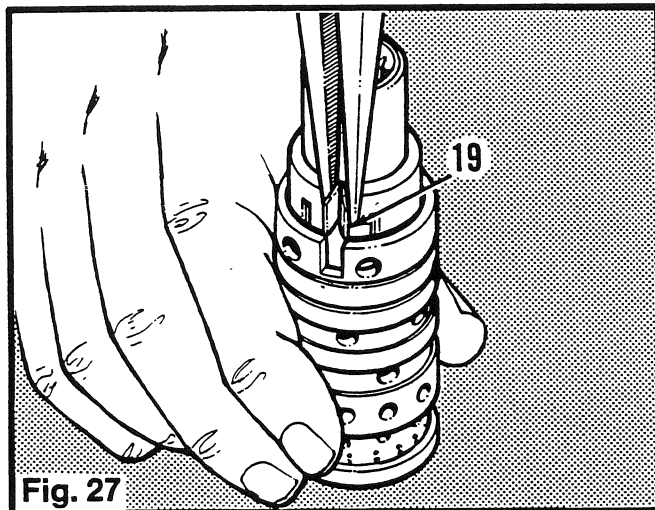


Fig. 27

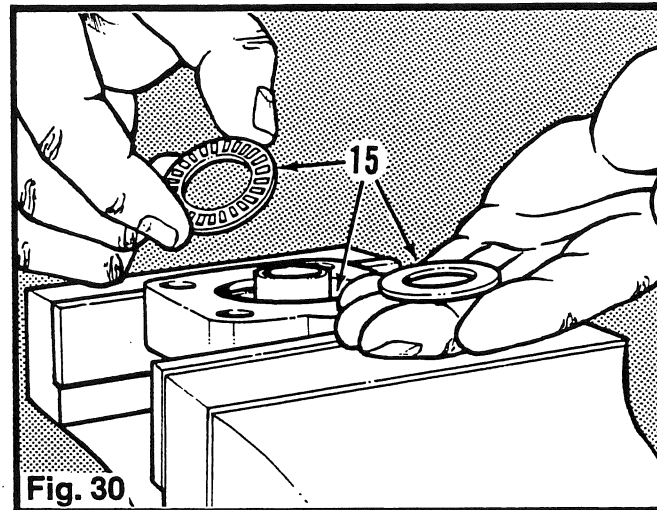


Fig. 30

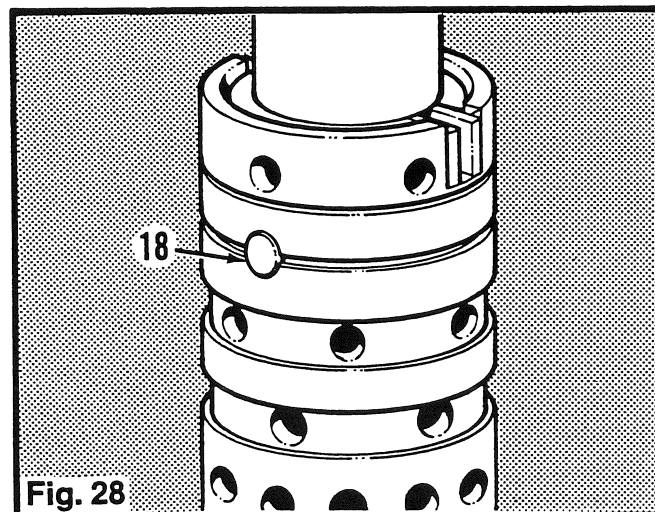


Fig. 28

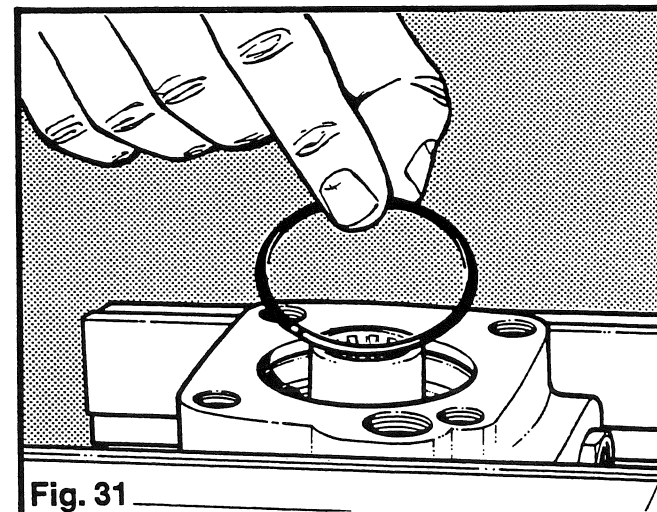
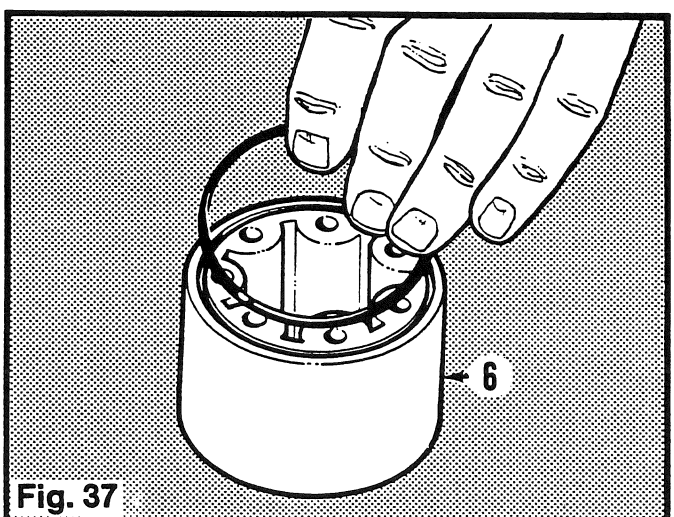
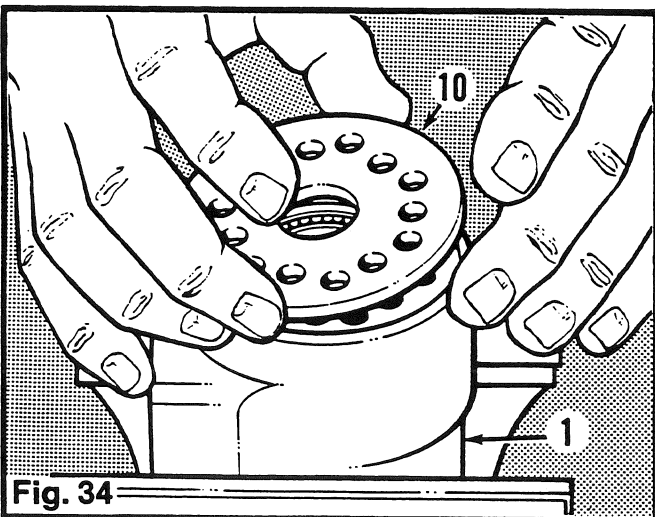
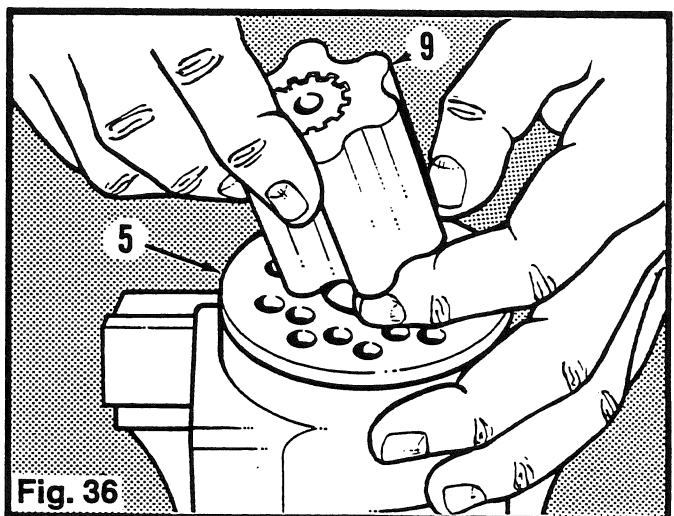
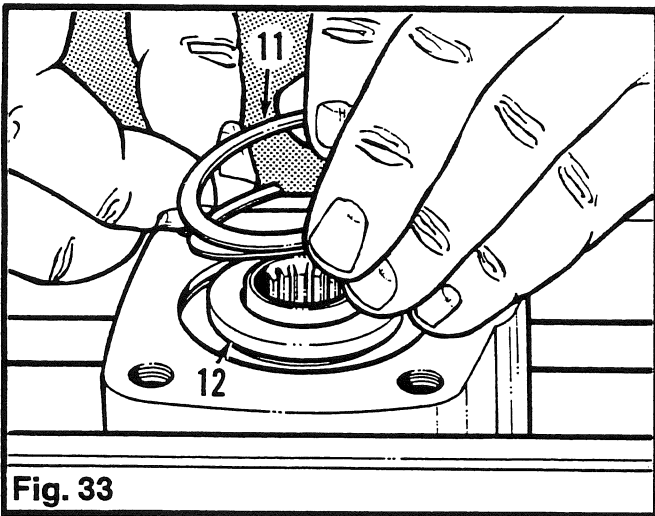
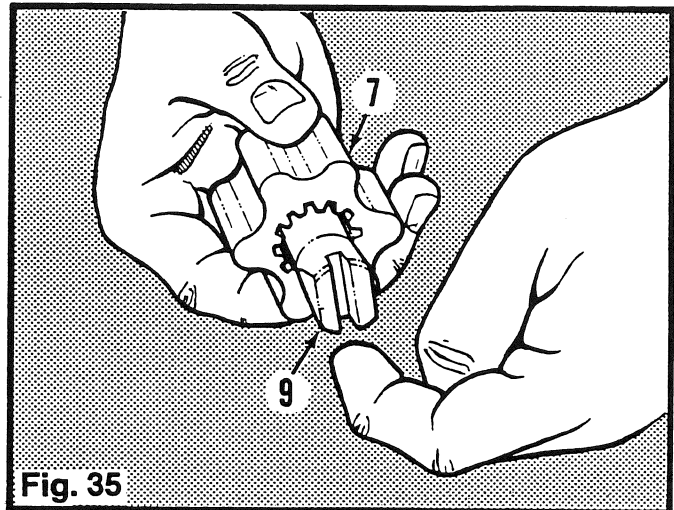
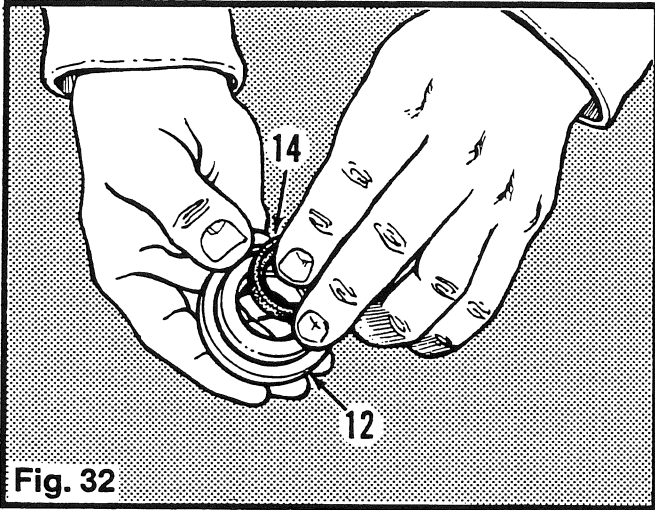


Fig. 31

700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING UNIT



## 700 SERIES SHOP MANUAL

### STEERING SYSTEM

#### STEERING UNIT

##### Assembly (cont.)

10. Lubricate a new oil seal (14) and quad ring seal (13) and install them in the seal gland (12). (Fig. 32)
11. Install the seal gland (12) and retainer ring (11). (Fig. 33)
12. Turn the steering unit (1) over. Lubricate a new spacer O ring and spacer disc (10) and install them. (Fig. 34)
13. Install the drive coupling (9) in the meter gear (7) so that the slot aligns with the valleys in the gear. (Fig. 35)
14. Install the coupling and gear on the housing (5) so that the drive coupling (9) engages the drive pin. (Fig. 36)
15. Lubricate a new O ring and install it on the meter gear housing (6). (Fig. 37)

## 700 SERIES SHOP MANUAL

### STEERING SYSTEM

#### STEERING UNIT

##### Assembly (cont.)

16. Install the meter housing ( **6** ) and align the bolt holes. (Fig. 38)
  
17. Install the spacer ( **8** ). (Fig. 39)
  
18. Lubricate a new O ring and install it on the end cap ( **4** ). Install the end cap ( **4** ) and tighten the capscrews to the correct torque. (Fig. 40)
  
19. Install plugs into the O ring ports to prevent contamination.

##### Installation

1. Install the steering unit ( **1** ) on the end of the steering column. (Fig. 41)
  
2. Install the capscrews that fasten the steering unit ( **1** ) to steering column ( **2** ) and bracket ( **3** ). Tighten the capscrews to the recommended torque. (Fig. 42)
  
3. Connect the hoses to the steering unit ( **1** ). (Fig. 43)

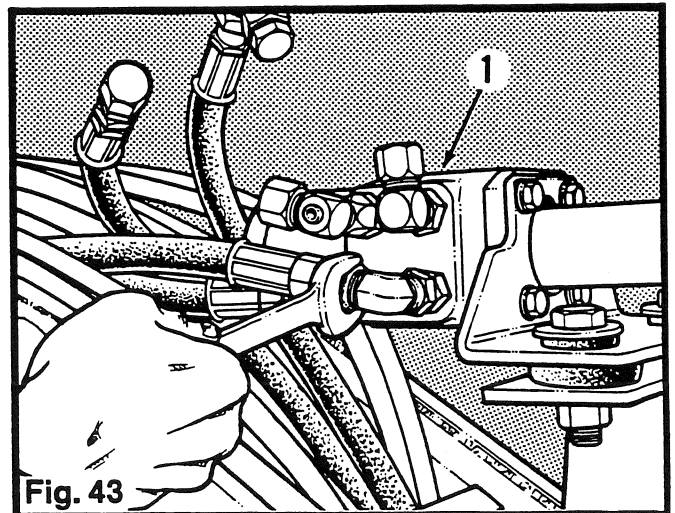
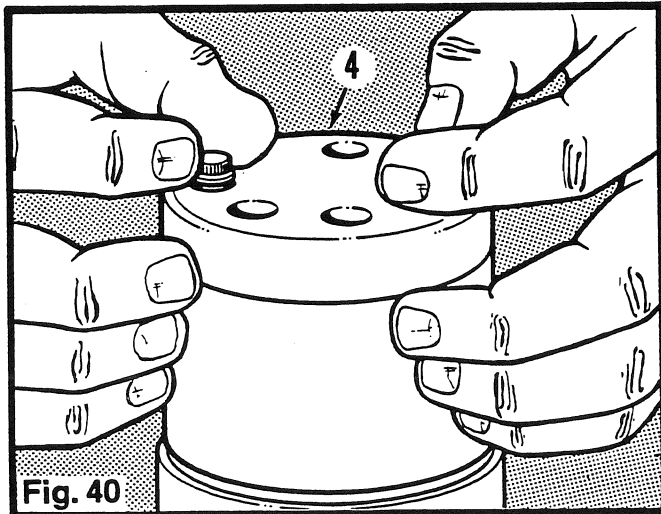
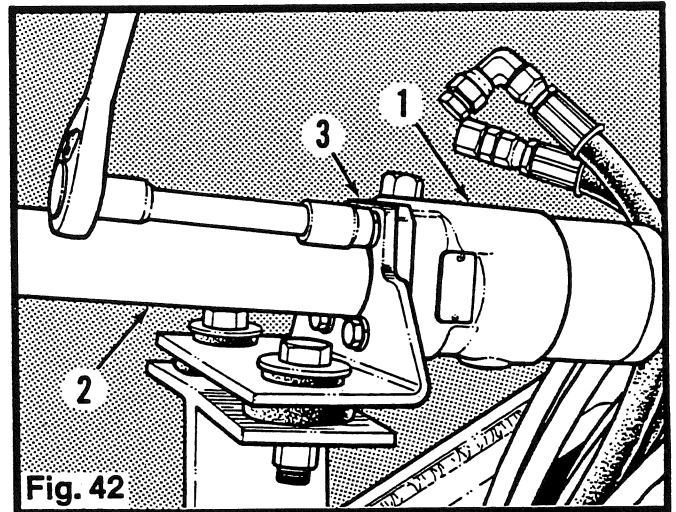
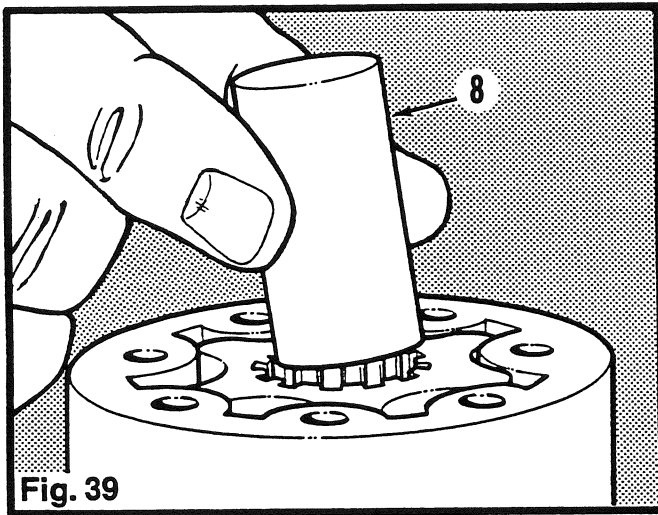
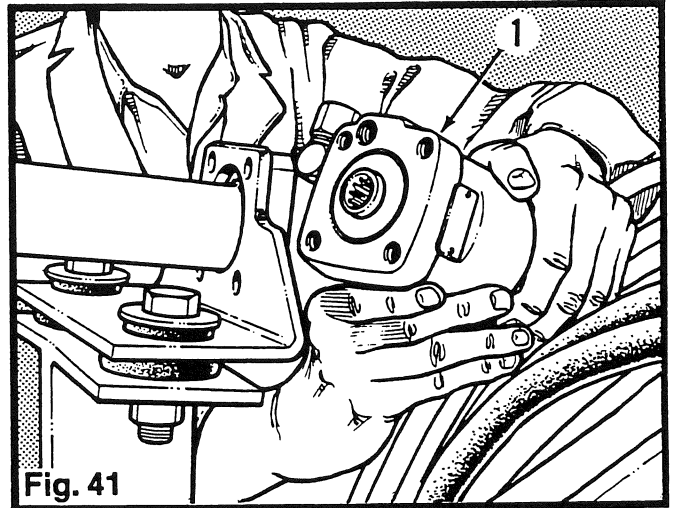
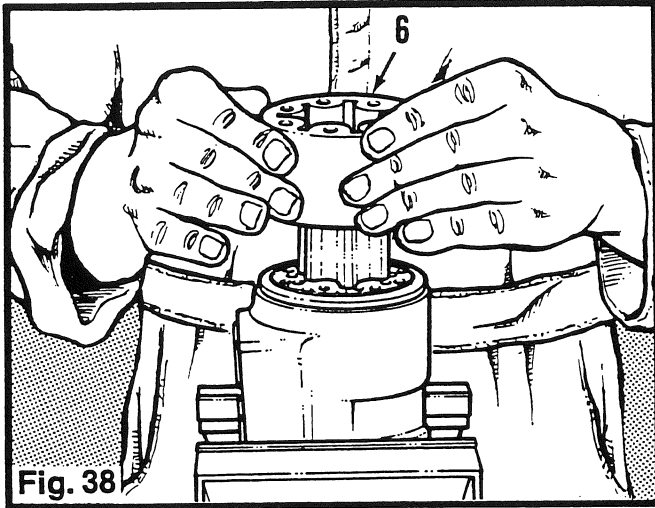
##### IMPORTANT

Always road test the grader before re-turning it to service. Check the hydraulic oil level and add oil as required. Carefully inspect the system for leaks and repair where necessary.

700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING UNIT



700 SERIES SHOP MANUAL

STEERING SYSTEM

STEERING COLUMN

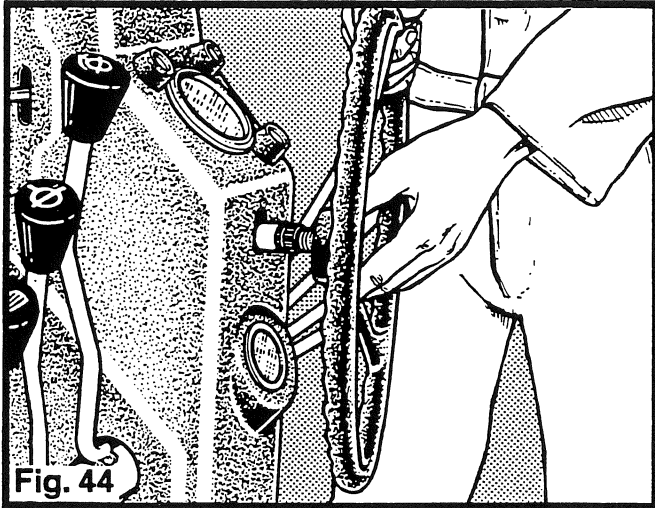


Fig. 44

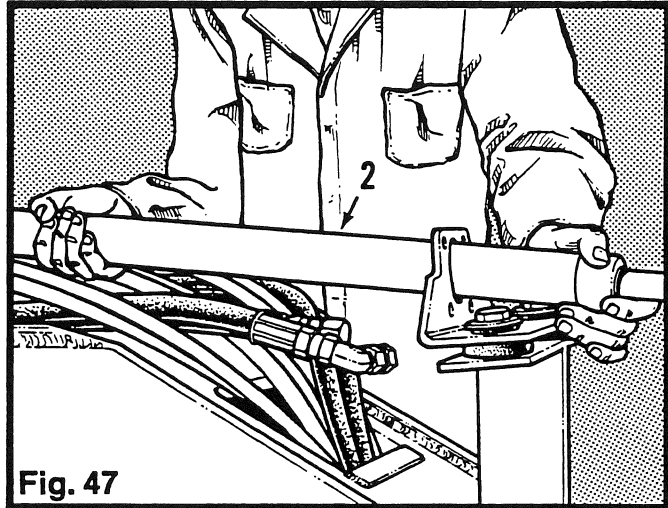


Fig. 47

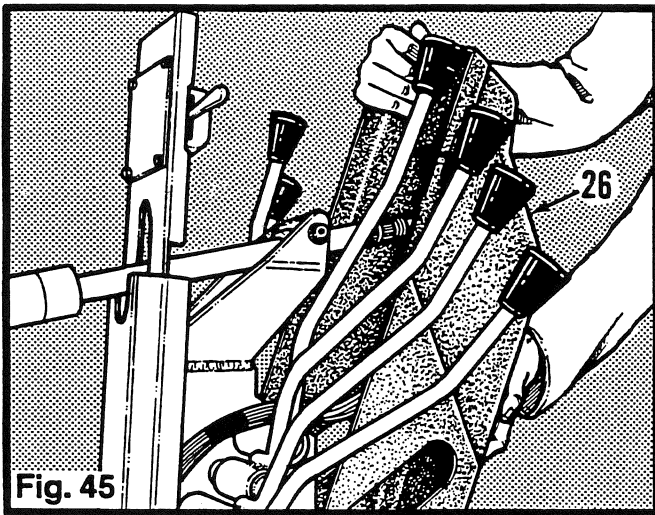


Fig. 45

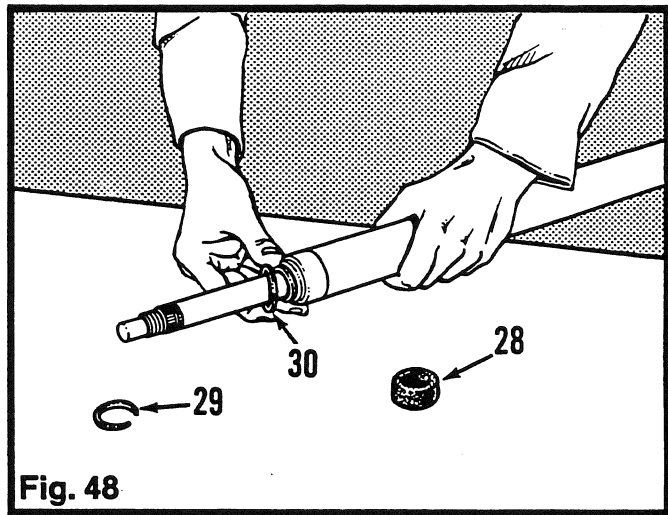


Fig. 48

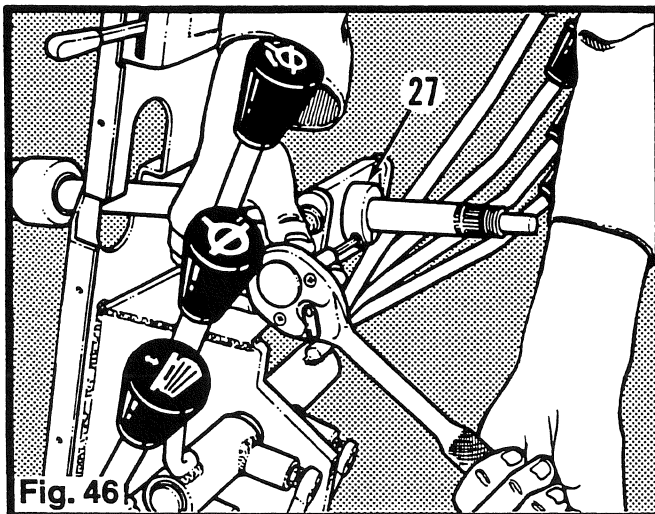


Fig. 46

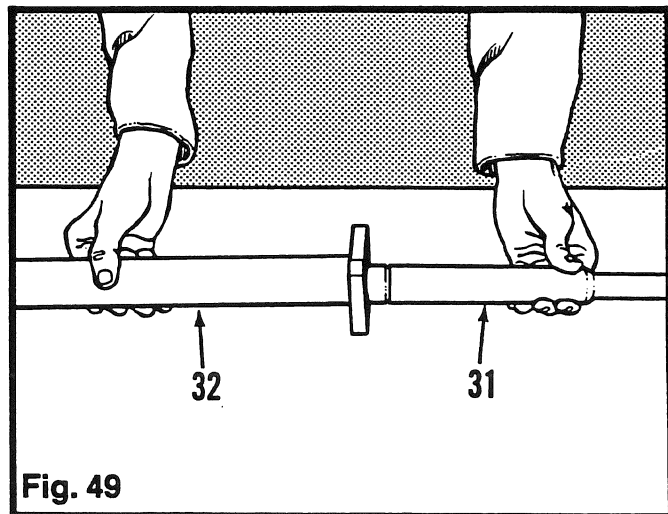


Fig. 49



**700 SERIES SHOP MANUAL**  
**STEERING SYSTEM**  
**STEERING COLUMN**

**Removal**

1. Remove the steering unit (1).  
(see page 3)
  
2. Remove the brass knob (23) and steering wheel nut. (Fig. 44)  
Remove the steering wheel.
  
4. Remove the pedestal cover (26).  
(Fig. 45)
  
5. Remove the clamping collars (27).  
(Fig. 46)
  
6. Remove the steering column (2) from the grader. (Fig. 47)

**Disassembly**

1. Remove the dust cap (28). Release the retaining ring (29) and remove the thrust washer (30). (Fig. 48)
  
2. Remove the shaft assembly (31) from the tube (32) by pushing it in the direction of the flange. (Fig. 49)

**Assembly and Installation**

To assemble and install the steering column, reverse the above procedures. See page 15 to install the steering unit.

700 SERIES SHOP MANUAL  
STEERING SYSTEM  
CUSHION VALVE

Removal

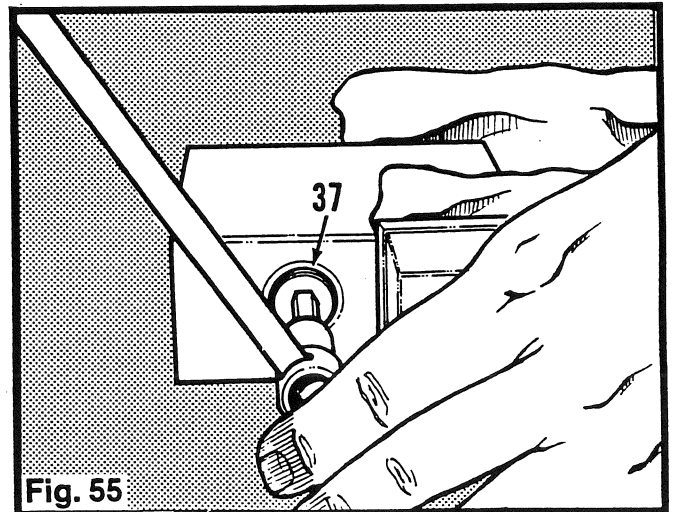
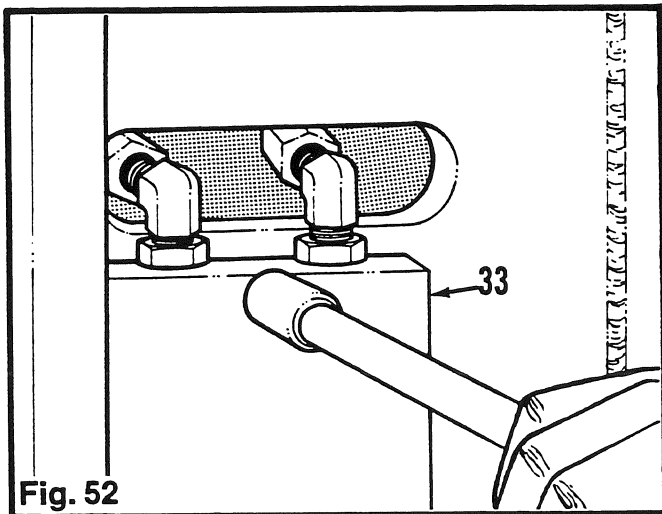
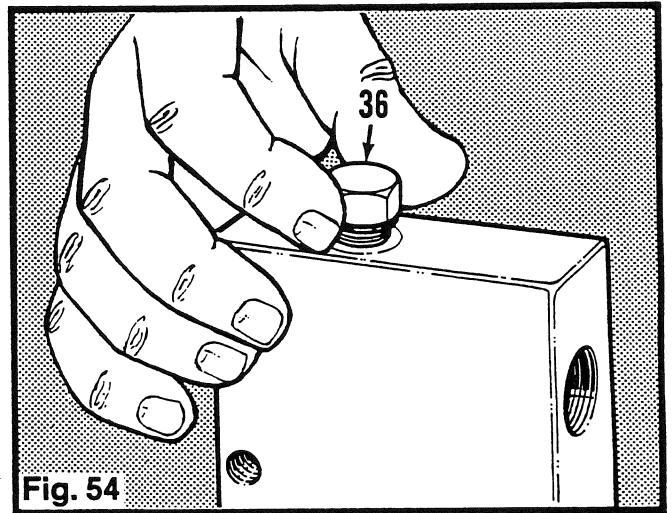
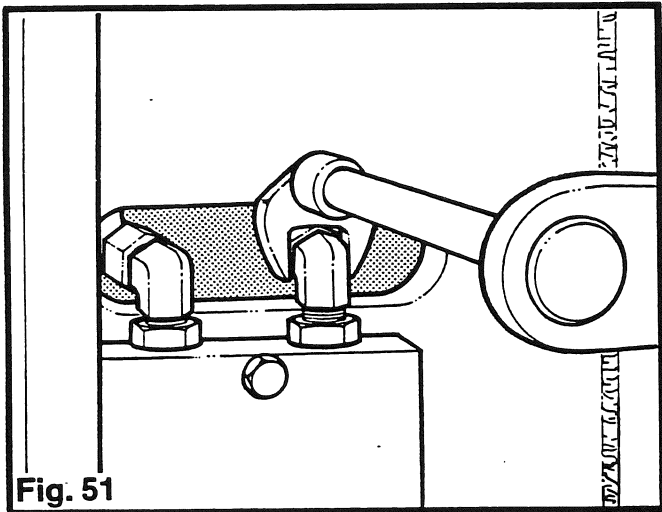
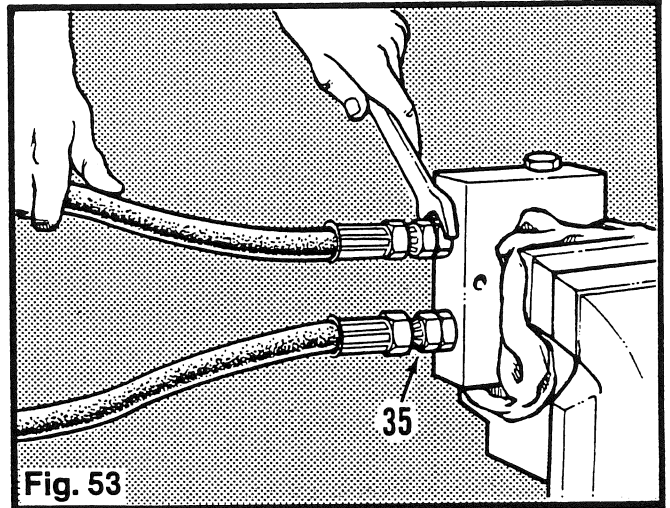
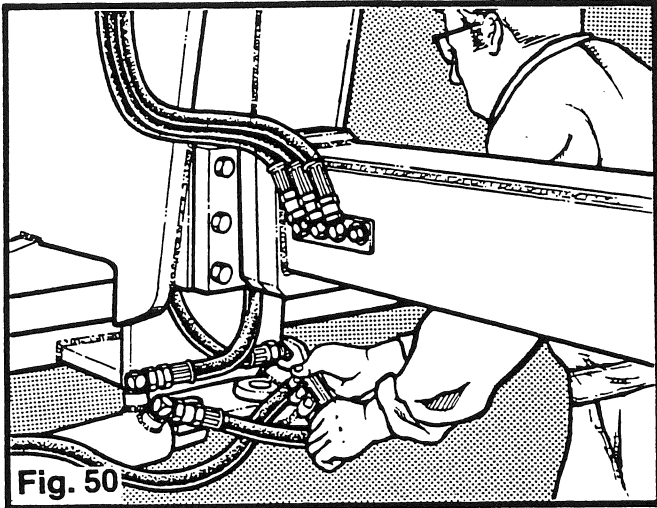
1. Disconnect the two hydraulic hoses from the steering cylinders. (Fig. 50) Plug the fittings and cylinder ports to prevent contamination. Identify the hoses to prevent confusion during reassembly.
2. Disconnect the top hydraulic tubes. (Fig. 51) Plug the fittings and ports to prevent contamination.
3. Remove the two capscrews that fasten the cushion valve (33) to the frame. Remove the cushion valve (33). (Fig. 52)

Disassembly

1. Place the valve into a vise with soft jaws. Remove the O ring fittings (35) and hoses. (Fig. 53)
2. Remove the O ring plugs (36). (Fig. 54)
3. Use an Allen wrench to remove the adjusting screws (37). (Fig. 55)

700 SERIES SHOP MANUAL  
STEERING SYSTEM

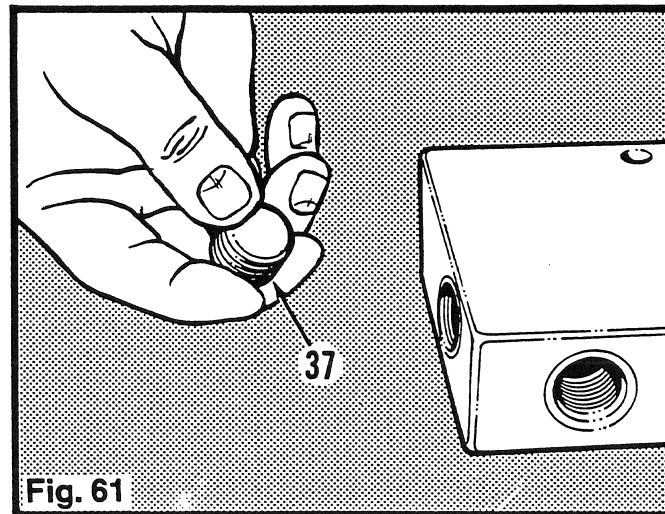
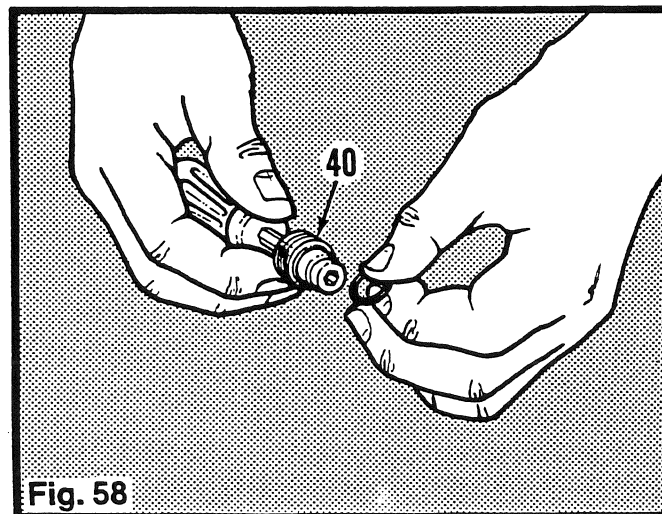
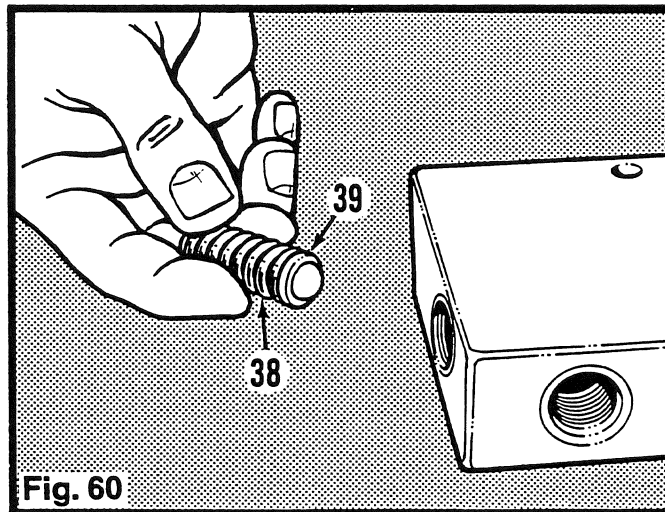
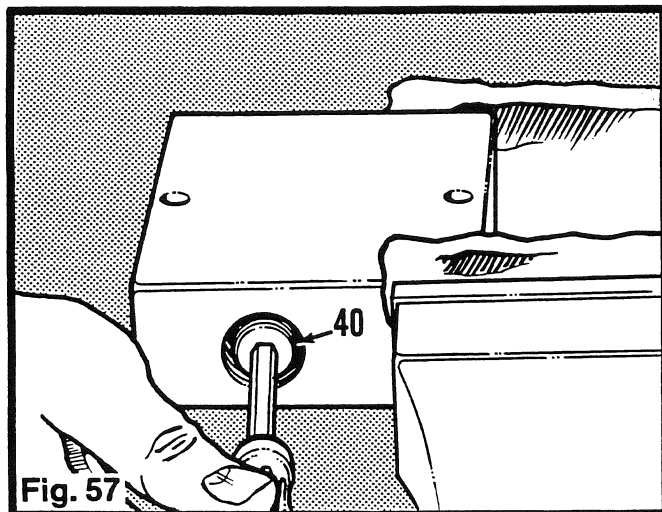
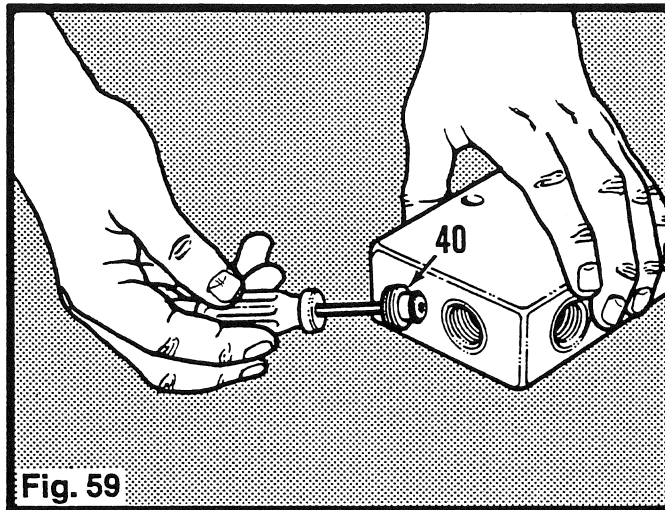
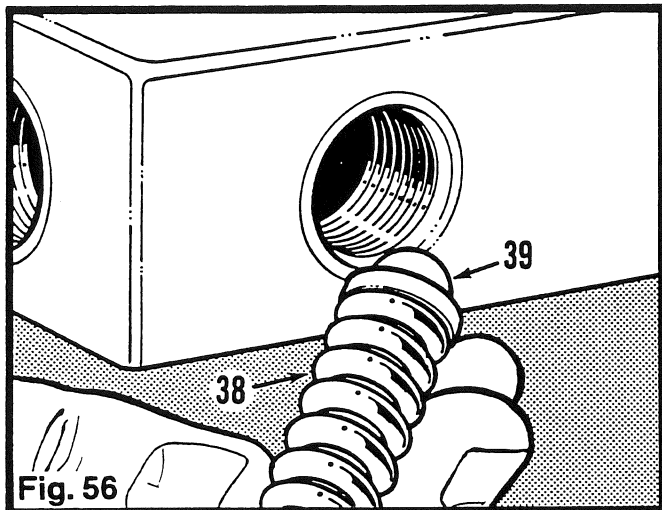
CUSHION VALVE



700 SERIES SHOP MANUAL

STEERING SYSTEM

CUSHION VALVE



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STEERING SYSTEM  
CUSHION VALVE

**Disassembly (cont.)**

4. Remove the springs (38) and poppets (39). (Fig. 56)

5. Remove the seat (40). (Fig. 57)

6. Discard all O rings. Inspect all components for damage or wear. Wash them with solvent and dry them with compressed air.

**Assembly**

7. Install a new O ring on the seat (40). (Fig. 58)

8. Install the seat (40) in the housing and tighten it to the specification in the torque table. (Fig. 59)

9. Install the poppet (39) and spring (38). (Fig. 60)

10. Install the adjusting screw (37). (Fig. 61) Repeat this assembly procedure for the opposite side of the valve.

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### STEERING SYSTEM

#### CUSHION VALVE

##### Adjustment

1. Install a plug in the port on one side of the valve (33) and attach a hydraulic power supply, such as a portable press to the other port. (Fig. 62)
2. Build pressure with the press until the valve begins to relieve oil to the opposite port. (Fig. 63)
3. Turn the adjusting screw until the valve relieves oil at 5515 kPa (800 psi). Repeat this operation for the opposite side. (Fig. 64)

##### Installation

1. Install new O rings on the fittings (35) and install the fittings to finger tightness. Install the two hoses. (Fig. 65)
2. Remove the plugs from the hydraulic tubes and connect them to the valve (33).
3. Fasten the valve (33) to the frame with the two capscrews (34). Tighten the capscrews to the specified torque. (Fig. 66)
4. Connect the hoses to the steering cylinders. Fully tighten the O ring fittings (35) at the valve. (Fig. 67)

##### IMPORTANT

Always road test the grader before returning it to service. Check the hydraulic oil level and add oil as required. Carefully inspect the system for leaks and repair where necessary.

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