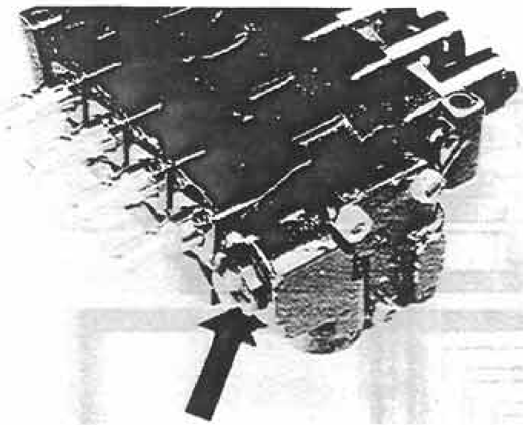

Figure 63:

The inlet cover of the implement control valve incorporates a Secondary Relief Valve which has the same type cartridge and pressure setting as the main system relief. (See Fig. 63)

The purpose of the second relief valve is to protect the system from sudden high pressure surges caused by the speed of the oil flow such as when a cylinder rapidly reaches the end of its stroke. The main relief will open to protect the pump and components near it, but when flow beyond the main relief is moving fast, then suddenly required to stop, extreme shock could be present if no secondary relief was present to provide a cushion effect by opening momentarily. (See Fig. 64)

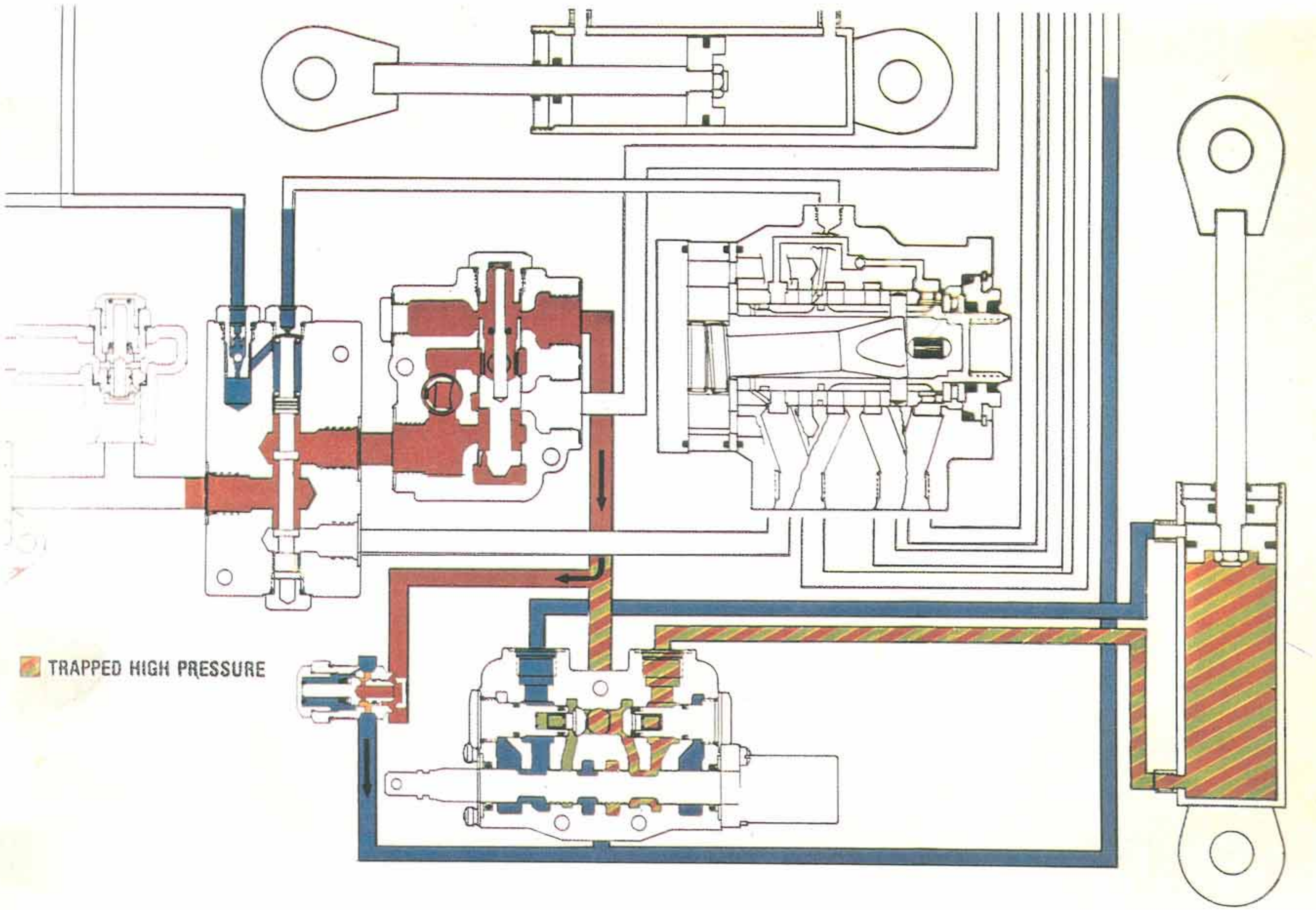

Figure 64:

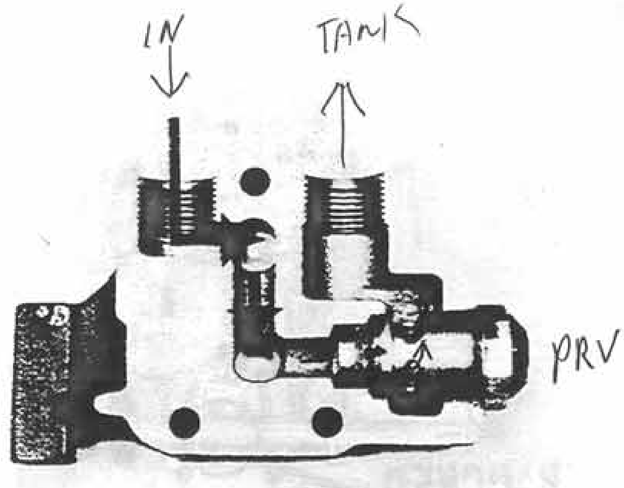

Figure 65:

Flow which is regulated by the flow control valve enters the implement control valve on the inlet cover. Upon entering the inlet cover supply port, the flow is available to the supply and open center passages shown. The flow to either of these passages is determined by the spool position in the valve sections mounted behind the cover, as you will see later. These passages match with similar passages in each valve section. (See Fig. 65)

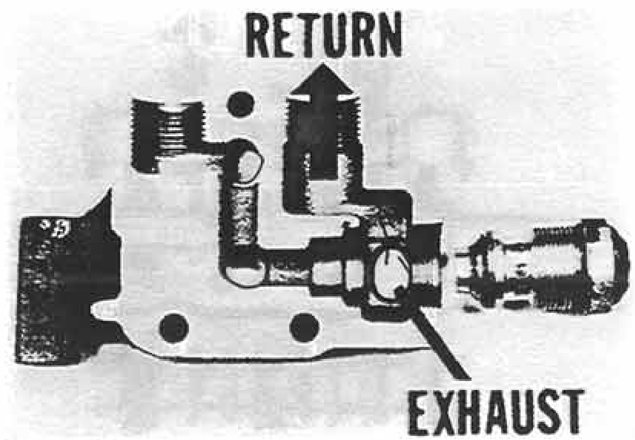

Figure 66:

Oil flow which either passes through the secondary relief valve or exhausting from the valve sections will exit through the return port and back to the reservoir. (See Fig. 66)

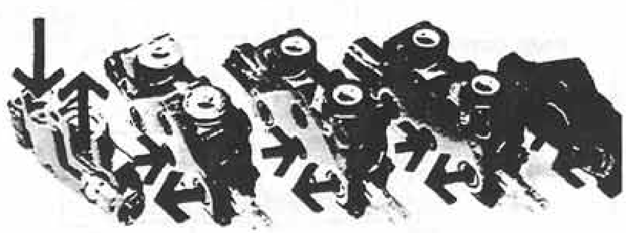

Figure 67:

When all of the valve spools are in the neutral position, flow will be present through the open center passages of the inlet cover and all valve sections and into the manifold cover. Upon entering the manifold cover, the flow will turn around while passing through the cover, then discharge into the valve section exhaust ports which mate with the return port of the inlet cover, then return to the reservoir. (See Fig. 67)

When a valve spool is moved from neutral to a delivery position, the open center becomes blocked by a spool land and flow must enter the supply passage of the inlet cover and valve sections. Since the manifold cover has no supply passage, oil flow will rise in pressure until it raises the proper load check poppet off its seat and permit flow to the undercut of the spool which joins the load check passage to its neighboring cylinder port. (See Fig. 68)

(OUT)
Spool shiFFED Forward charges REAR port Returns Thru Front port

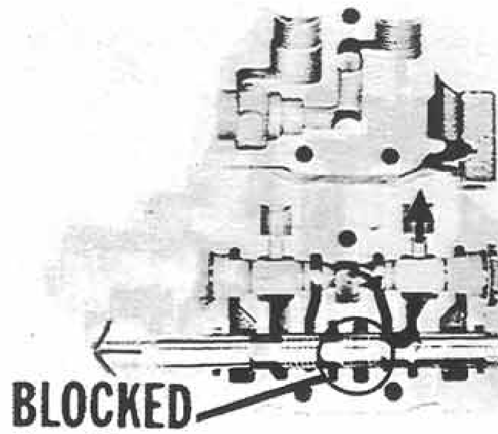

Figure 68:

As flow overcomes the load on the actuator (or cylinder), exhaust flow is created by actuator movement and is routed to the opposite port of the same valve section. This return or exhaust flow passes around the load check body and continues toward the undercut in the spool which allows oil flow to the exhaust passages of the valve section and inlet cover. (See Fig. 69)

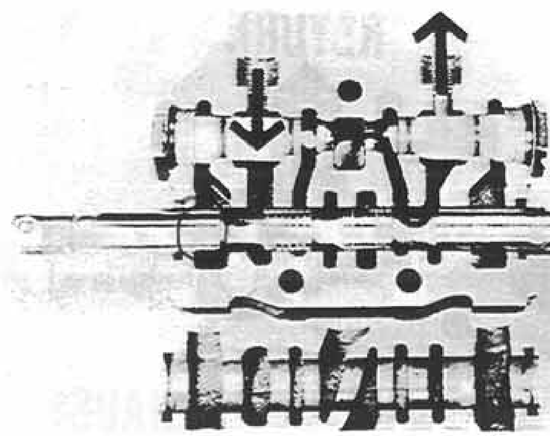
Figure 69:

If the control spool is shifted to a position which causes return or exhaust flow through the valve section end that is not in direct alignment with the return port of the inlet cover, the flow will seek its way to the manifold cover and cross to the exhaust passage that does furnish flow to the return port. (See Fig. 70)

A float valve section is mounted nearest to the inlet cover and operates on the same flow patterns as the previous valve sections shown until the float position is chosen by the operator. In the float position the spool is shifted farther and both cylinder ports are joined by spool undercuts to their respective exhaust passages. This enables the cylinder to stroke freely since the pressures and flows on both its ends are vented to exhaust flow. (See Fig. 71)

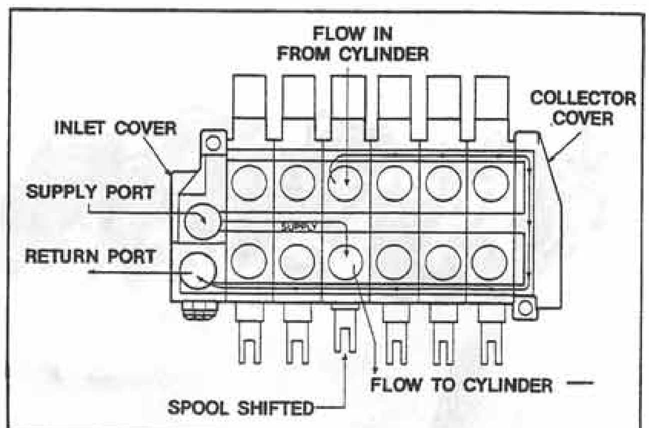

Figure 70:

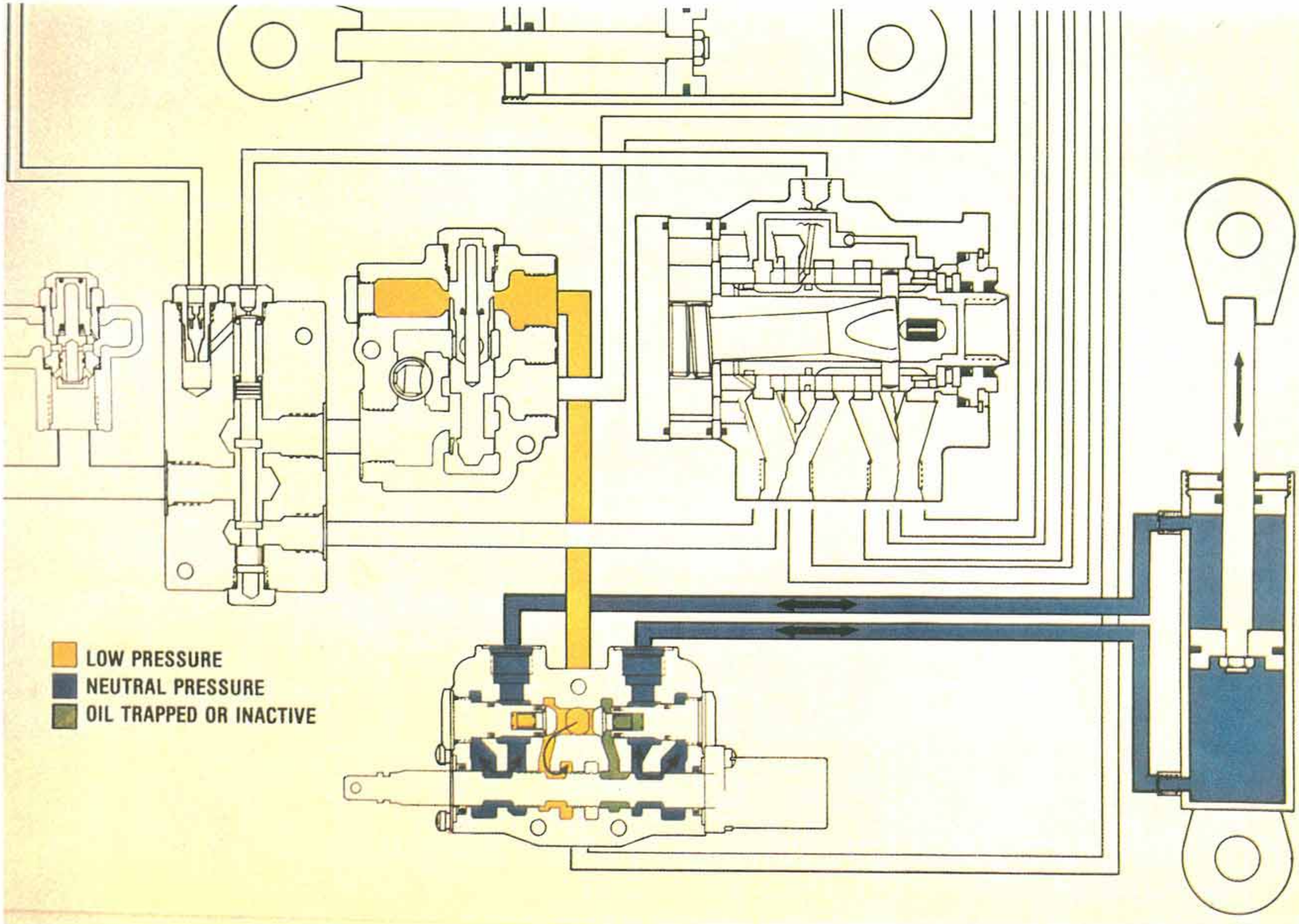

Figure 71:

During this time the spool is blocking the open center inlet, but flow reaches the open center of the remaining valves by opening the load check valve to allow flow to the spool undercut which reveals a passage to the open center outlet of the float valve. If any valves downstream are shifted from neutral they will operate as before, and if they remain in neutral the flow will pass through the open center to the manifold cover and become exhaust flow as before. (See Fig. 72)

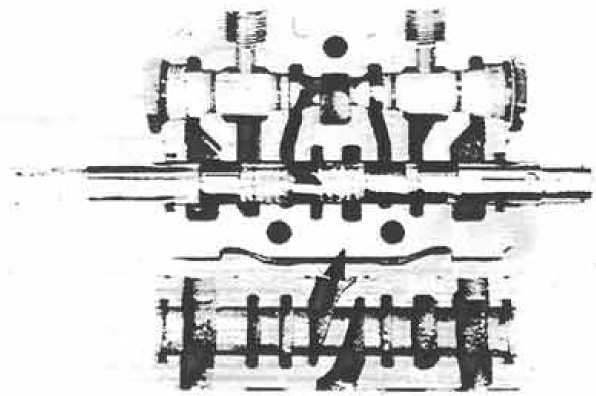

Figure 72:

The purpose of the load check valve is to prevent shock in the system. For example, if the cylinder is already supporting a load and the operator shifted the spool to raise the load farther, it would drop and cause flow under pressure toward the pump because the pump flow has not had enough reaction time to match existing pressure created by the load. If the two flows were allowed to meet head-on, the system may become damaged from sudden pressure surges. (See Fig. 73)

The load check poppet then remains closed until pump supply pressure can overcome the load; at which time it will open. When the incoming flow ceases, it will close immediately. (See Fig. 74)

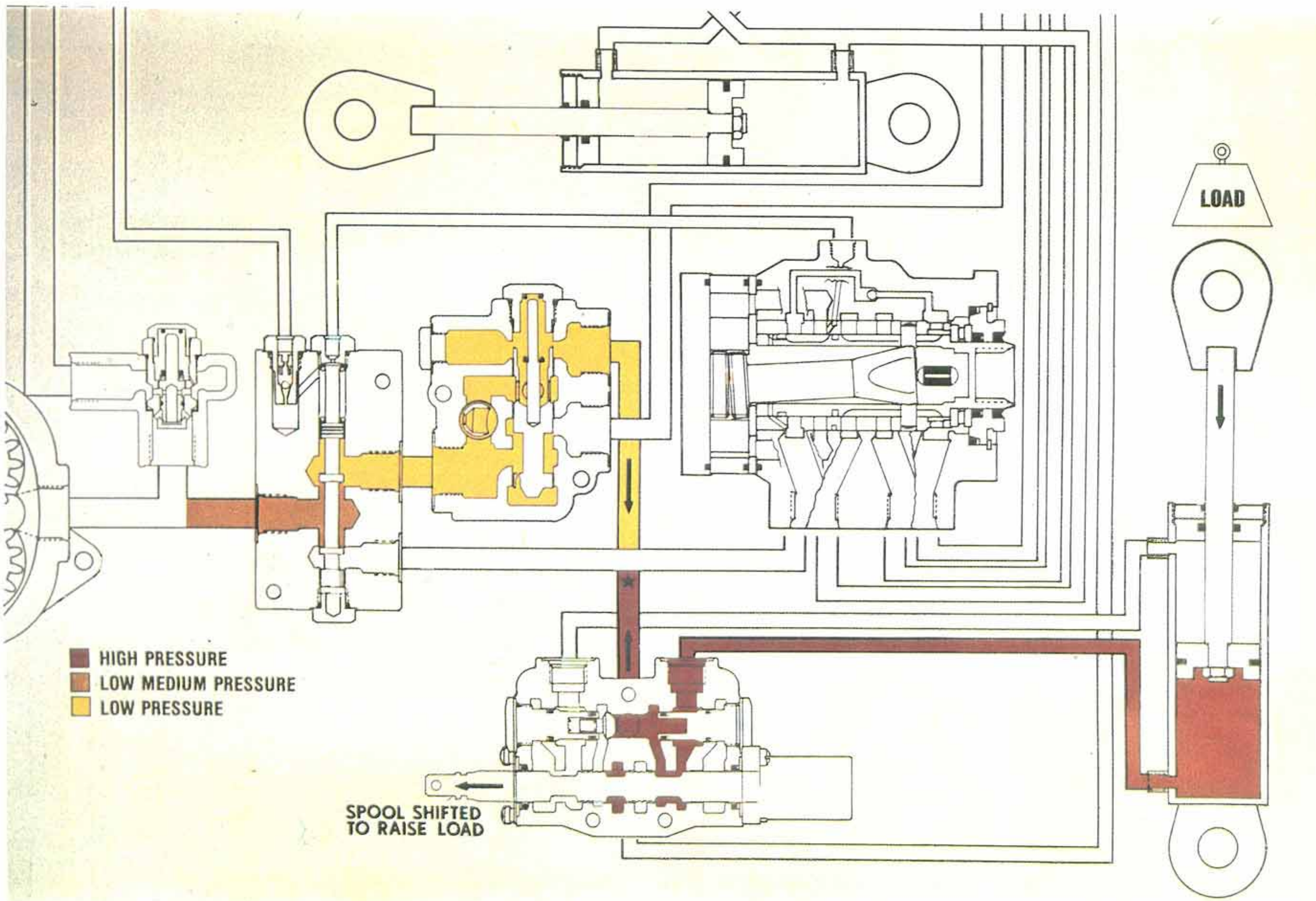
LOAD
HIGH PRESSURE
LOW MEDIUM PRESSURE
LOW PRESSURE
SPOOL SHIFTED
TO RAISE LOAD

Figure 73:

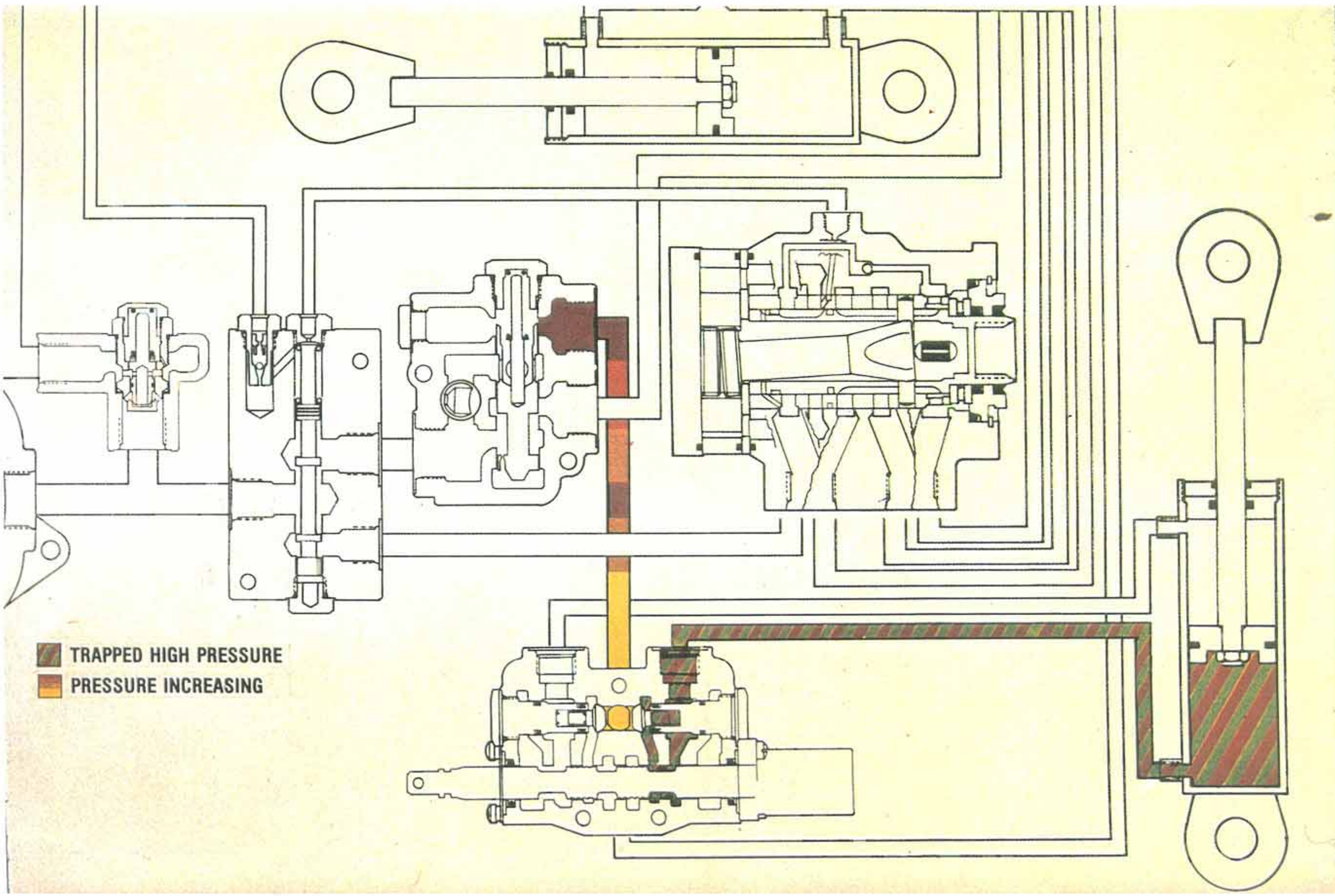

Figure 74:

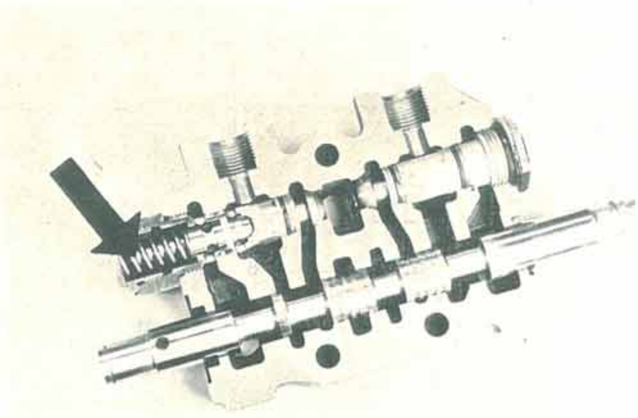

Figure 75:

A combination load check/relief valve assembly is used to limit pressure of a single circuit, such as the down-pressure side of the three-point hitch. The load check here operates the same as previously described and the relief valve operates essentially like the relief valves already described. The mounting and related passages are the major considerations. As shown, if the pressure in the circuit becomes equal to the relief valve setting, the valve will open to allow flow from the pressurized cylinder port to the exhaust passage regardless of spool position. (See Fig. 75)

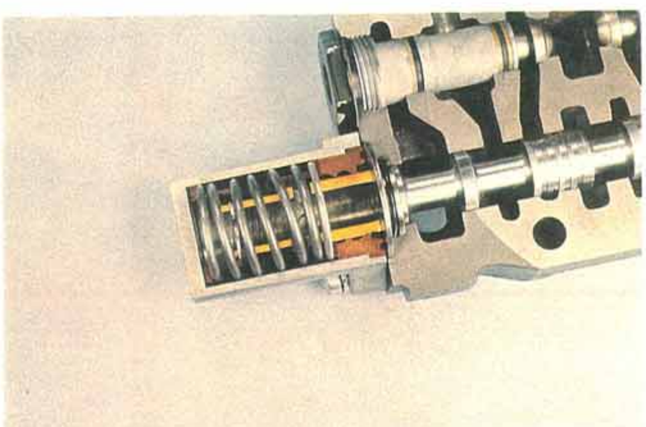

Figure 76:

On the float valve section, the spool is held in the center position by a centering spring between two stop collars near the rear of the spool inside a cylinder shaped cover. While in neutral, the centering springs are causing the stop collars to contact the detent sleeve and inner end of the cover. At the same time, the inside diameters of the stop collars are against both the shoulder and a retaining ring on the spool end. (See Fig. 76)

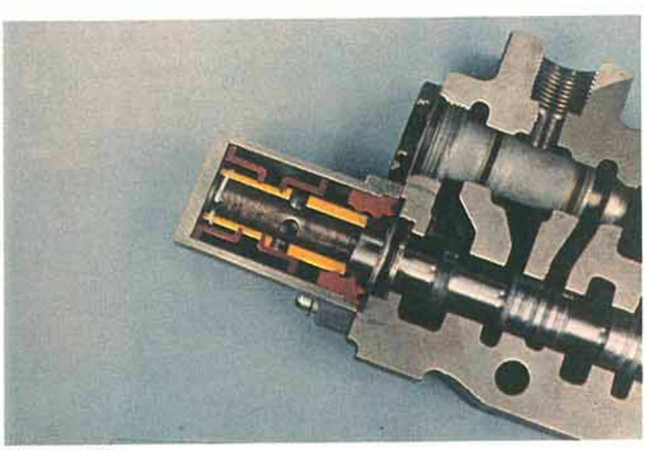

Figure 77:

If a raised position is selected, the front stop collar is moved rearward by the spool thus compressing the spring toward the cover. When the control lever is released, the spool will return to neutral by spring pressure. The cover serves as a spool stop when a full raise position is commanded. (See Fig. 77)

When a lowering position is chosen, the rear stop collar moves forward with the spool and compresses the spring toward the detent sleeve. A physical stop must be felt by the operator, therefore the spool end bore incorporates a spring loaded conical plunger to act upon four detent balls in the spool side bores. Constant pressure is upon the detent balls so when the spool is shifted to its maximum lowering position, the detent balls rest against the first groove of the detent sleeve and this action can be felt on the control lever. Again, if the lever is released, it will return to neutral because of spring pressure. (See Fig. 78)

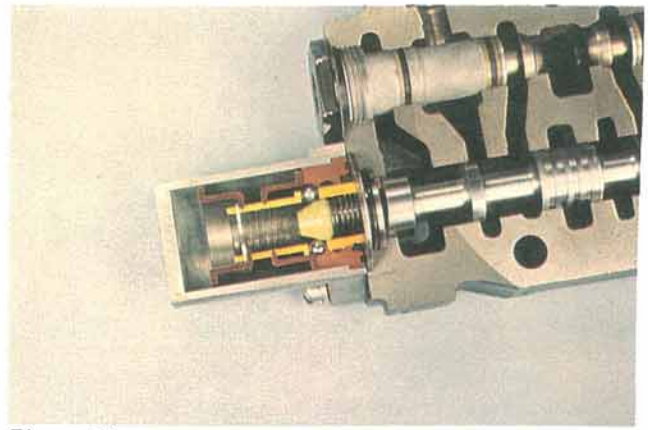

Figure 78:

In the event that a float position is selected, the spool, spring and ball action remain the same through the full lowering spool position. From here on extra force must be exerted upon the control lever to collapse the detent balls against the spring pressure of the conical plunger. As the detent balls align with the second groove of the detent sleeve, spring pressure keeps them latched into the float position. To move the spool from this detent position, the control lever must be manually moved toward neutral. (See Fig. 79)

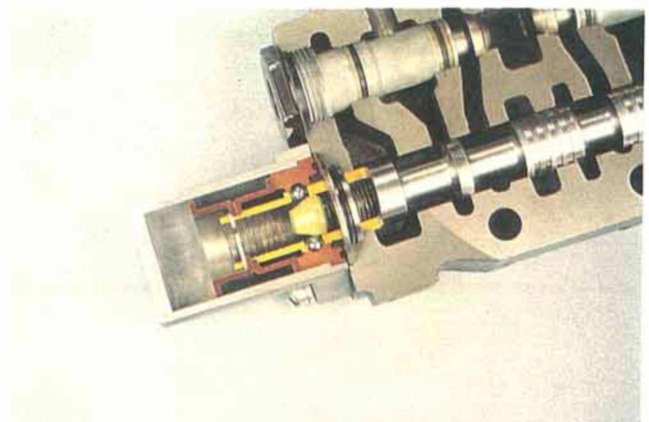

Figure 79:

The remaining valve sections downstream of the float section are called "KNOCK-OUT" sections because they feature automatic detent release from both the full raise and full lowering positions. They can be identified by the cover which has a rubber plug on the end to close the adjustment access hole (the cap of the float valve has only a small vent hole). The knock-out spools can also be manually released from the detent position. (See Fig. 80)

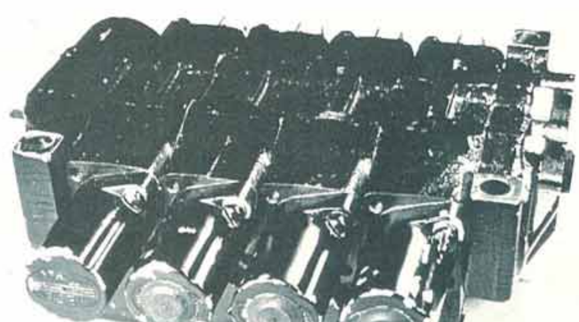

Figure 80:

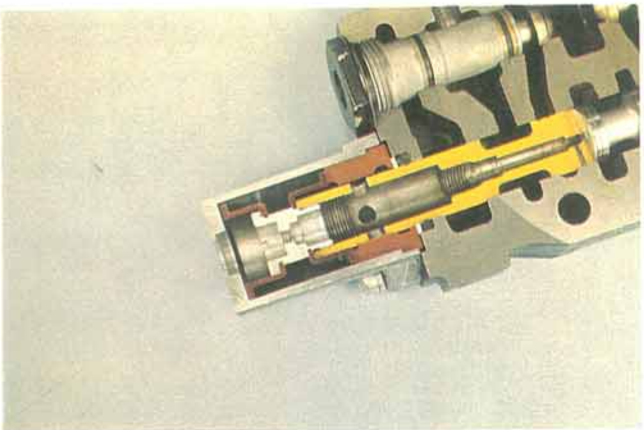

Figure 81:

On the knock-out spools, centering to the neutral position is done in the same manner as the float section spool, except the stop collars ride fore and aft on the spool adapter. (See Fig. 81)

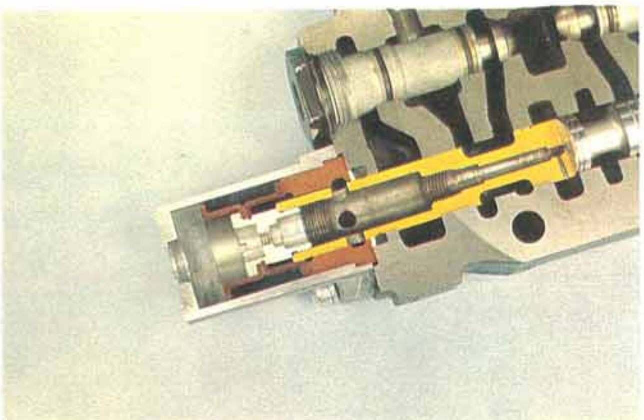

Figure 82:

When the space between the two stop collars is diminished, the spool is in a full delivery position, regardless of the direction of spool travel. (See Fig. 82)

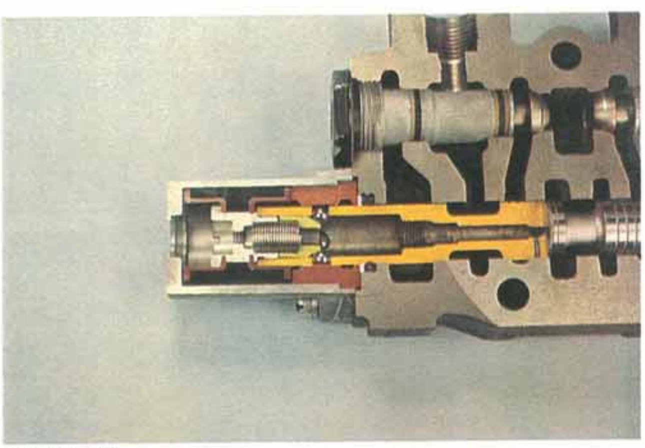

Figure 83:

While the spool adapter is threaded into the rear of the spool, it also holds a spring under compression against a conical plunger BEHIND the detent balls. (See Fig. 83)

The detent balls see constant pressure of the plunger and spring, so when the spool is shifted to either full position they will engage into the appropriate groove of the detent sleeve. (See Fig. 84)

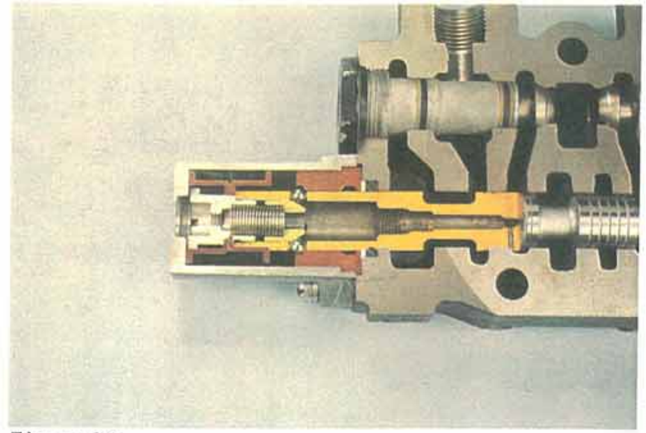

Figure 84:

To provide automatic detent release, a passage is provided through the spool in such a manner that it can always see the pressure generated in the energized circuit. When the spool is shifted forward, this passage sees pressure because of the blocked open center. (See Fig. 85)

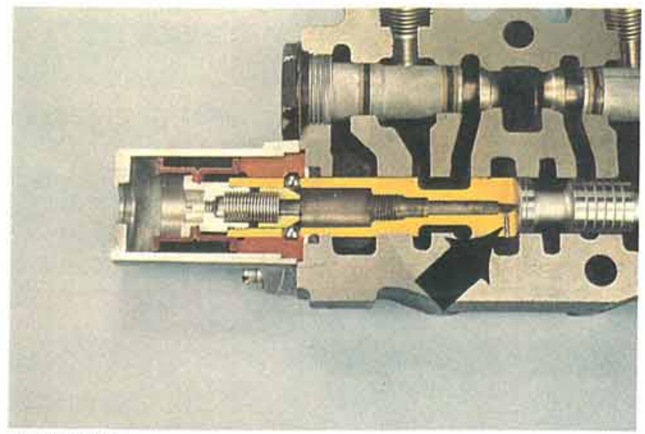

Figure 85:

And when shifted rearward, the passage aligns with the flow under pressure in the load check passage. Therefore, you can see that pressure may act through a single passage from either direction. (See Fig. 86)

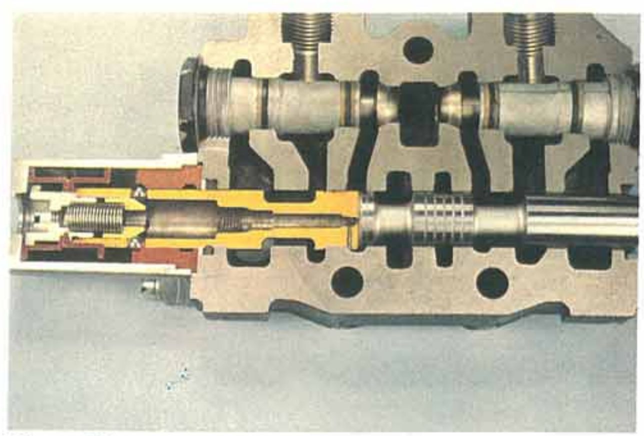

Figure 86:

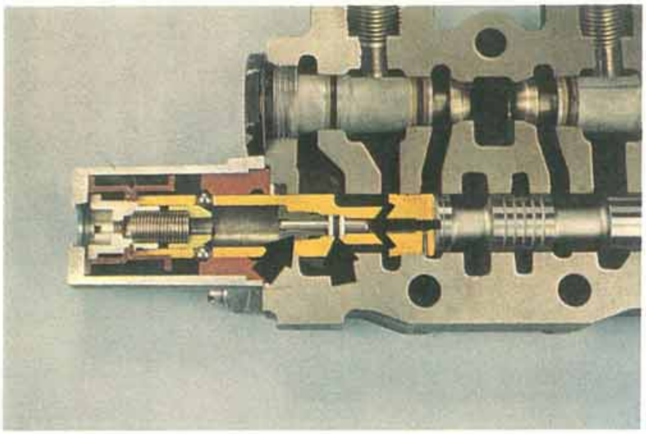

Figure 87:

The pressure produced in the circuit is now acting upon the piston pin which is mounted in seals and a guide inside the spool bore. (See Fig. 87)

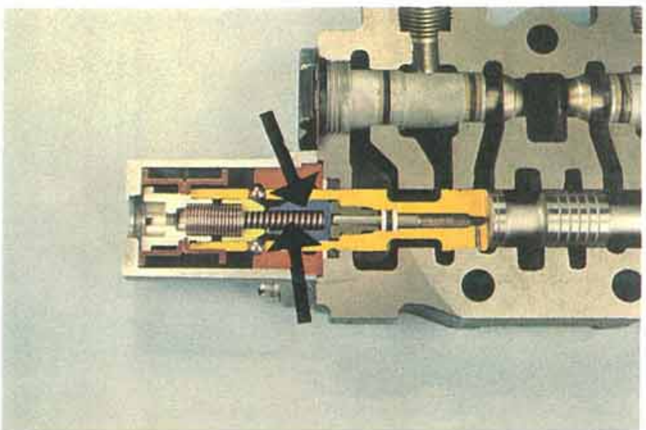

Figure 88:

A release piston follows the piston pin as shown and is held against the guide by spring pressure. (See Fig. 88)

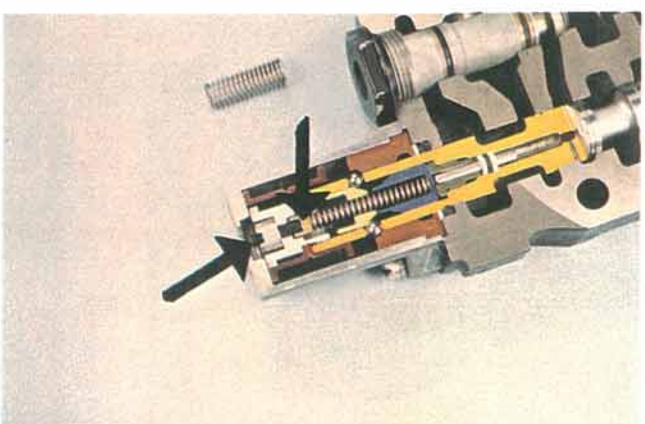

Figure 89:

The detent pressure adjusting screw, located in the center of the spool adapter, acts upon the spring guide. Turning the screw either in or out will vary spring pressure on the release piston, therefore controlling the pressure point at which the detent will release. (See Fig. 89)

When hydraulic force upon the piston pin is great enough to overcome spring pressure on the release piston, the release piston will contact the conical plunger, pushing it against spring pressure, allowing the detent balls to collapse. The spool will now return to the neutral position by the force of the centering spring. (See Fig. 90)

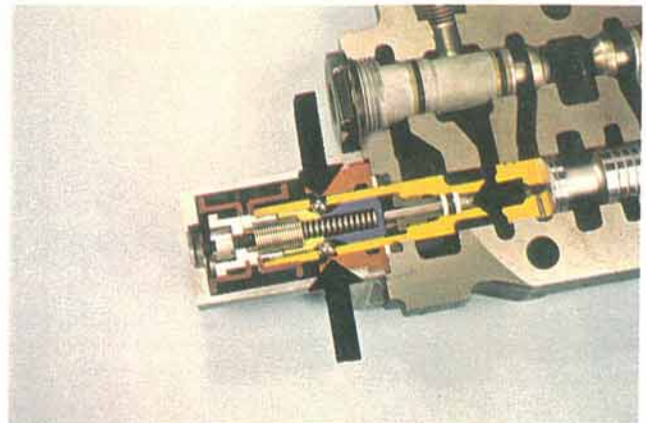

Figure 90:

Oil flow from the implement control valve, flow regulating valve, steering valve, priority relief and main system relief valves will all accumulate in the return manifold to the reservoir. Before entering the reservoir, return oil is filtered. The filter is located here to remove any contamination which could enter the system when the implement is coupled to the tractor's hydraulic system. (See Fig. 91)

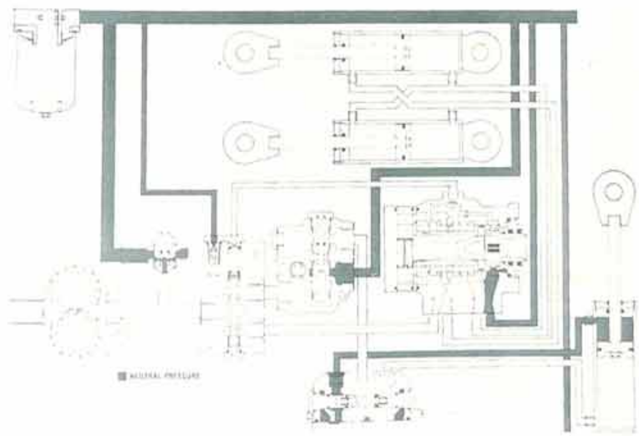

Figure 91:

The cross section view illustrates the filter elements mounted to a filter head which has a bypass valve. Normally, the oil flow to tank takes the path shown. (See Fig. 92)

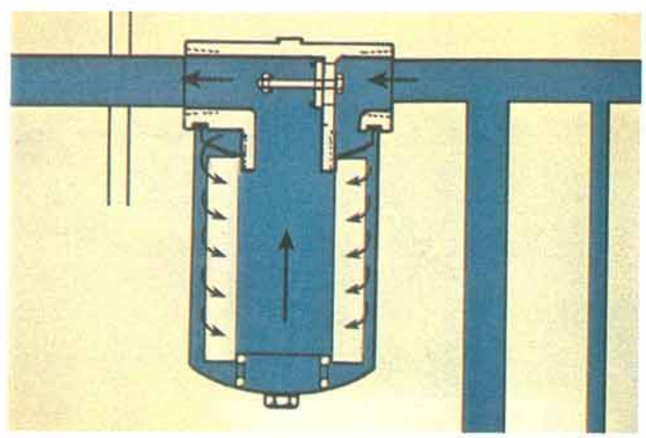

Figure 92:

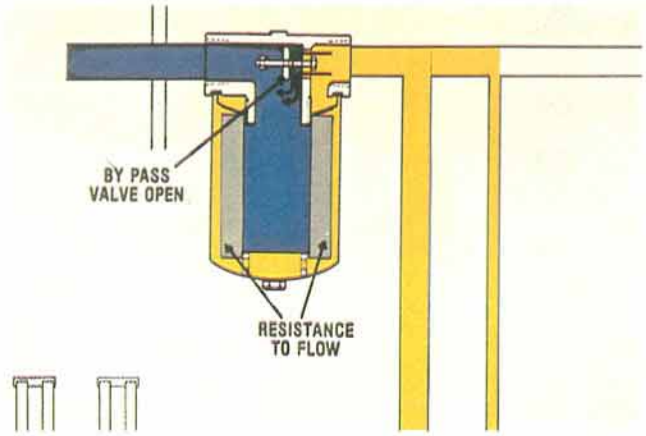

Figure 93:

If the filter becomes clogged or oil flows are high when oil is cold, the bypass valve will be lifted off its seat against spring pressure to allow unfiltered oil flow to tank. (See Fig. 93)

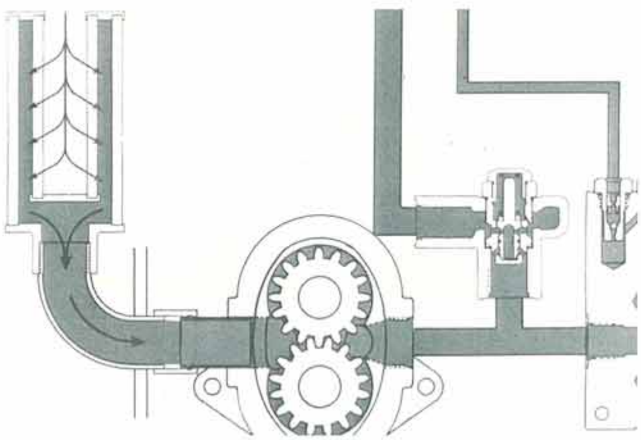
Figure 94:

Inside the reservoir a suction screen is fitted to the supply tube going to the pump. By using such a design, pump inlet restriction is kept to a minimum while maintaining the ability to filter off larger particles. Remember, the oil in the reservoir will already be filtered by the return filter, but the suction screen offers pump protection should foreign material be introduced into the tank filler tube. (See Fig. 94)

A study of the various Steiger Hydraulic Systems reveals that some reservoirs are vented directly to the atmosphere without being pressurized. This is found when the reservoir is located near the pump. If the reservoir is a fair distance from the pump (such as the PT Series of tractors), the reservoir is pressurized to help push oil to the inlet of the pump. Longer oil lines, whether under positive or negative pressure, will have more resistance to flow in comparison to shorter lines of the same diameter. (See Fig. 95)

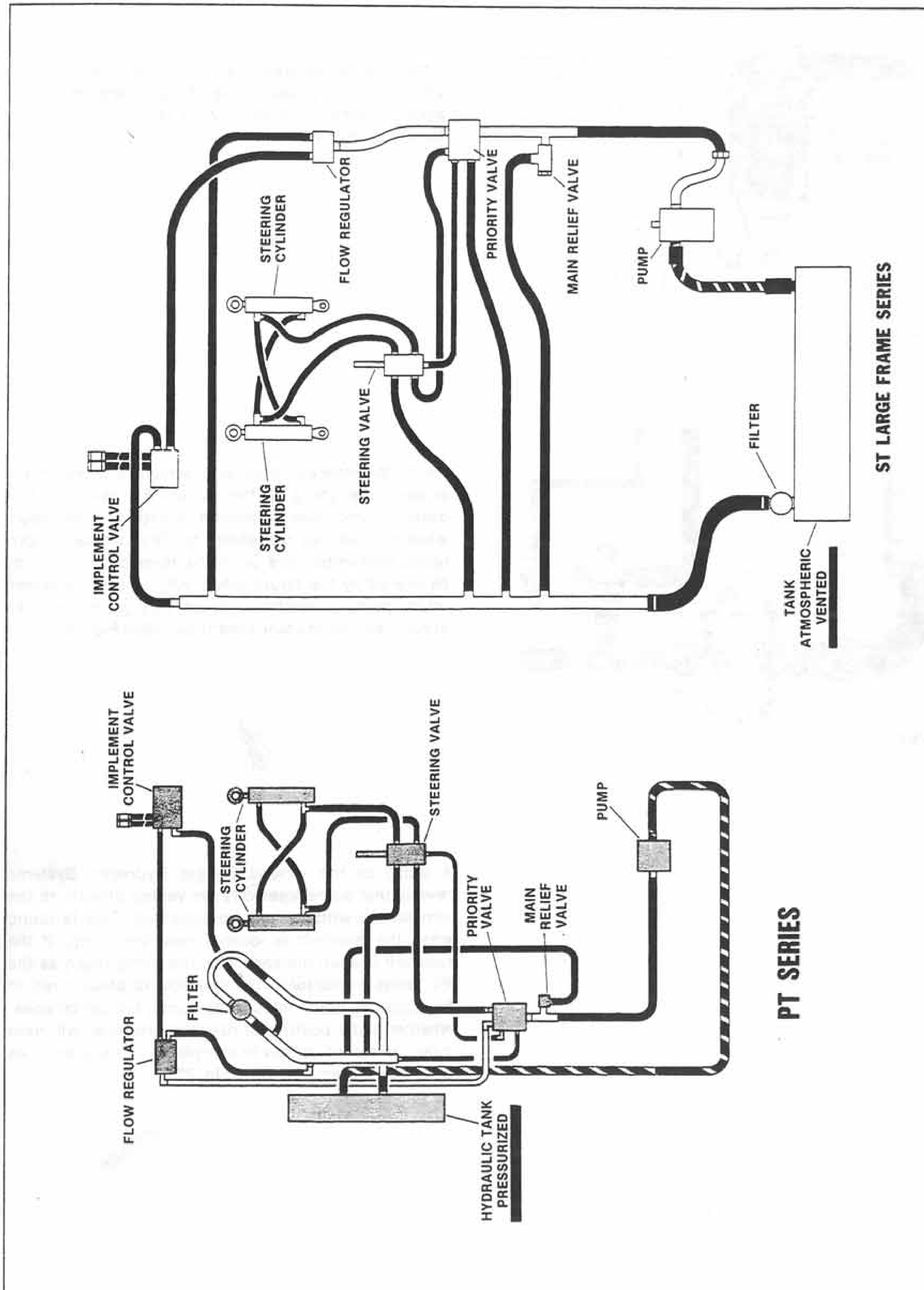
ST LARGE FRAME SERIES
IMPLEMENTAL CONTROL VALVE
STEERING CYLINDER
FLOW REGULATOR
STEERING CYLINDER
STEERING VALVE
PRIORITY VALVE
MAIN RELIEF VALVE
PUMP
FILTER
TANK ATMOSPHERIC VENTED
PT SERIES
IMPLEMENT CONTROL VALVE
STEERING CYLINDER
STEERING VALVE
PRIORITY VALVE
MAIN RELIEF VALVE
PUMP
FILTER
FLOW REGULATOR
HYDRAULIC TANK PRESSURIZED

Figure 95:

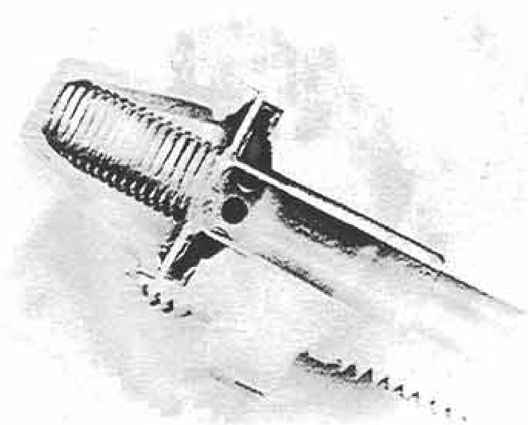

Figure 96:

When the reservoir is pressurized, a special valve is used and is fitted with a filter cartridge. The valve has a pressure relief to limit the pressure when the oil expands or if the level of the oil increases when cylinders are being retracted. An atmospheric valve allows air to enter the tank when the oil cools or the level decreases. (See Fig. 96)

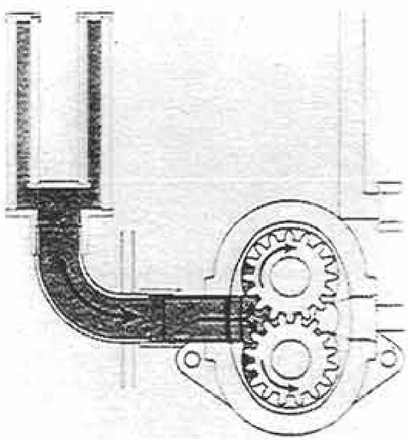

Figure 97:

Pumps, in general, do not draw oil from the reservoir. Instead, atmospheric pressure in the reservoir PUSHES oil toward the pump inlet or the side of the pump where gear teeth form an ever increasing space when the gears turn. When the increasing space is forming, a negative pressure (or pressure below atmospheric pressure) allows oil under atmospheric pressure to fill the space. (See Fig. 97)

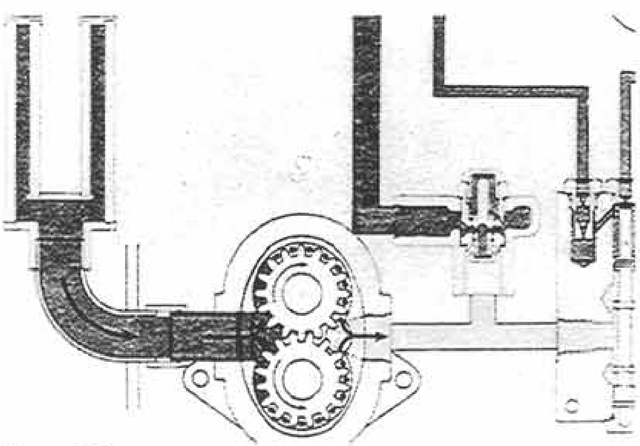

Figure 98:

Oil is trapped between the gear teeth and gear housing and carried to the discharge side of the pump. As the oil approaches the discharge chamber, the gear teeth form a continuous seal so oil cannot flow back through them. (See Fig. 98)

System Principles & Diagnosis

Although pumps vary in design, the units used by Steiger have pressure plates on both sides of the gears. When pump discharge pressures are low, the plates assume a relaxed position—meaning they have very little pressure (due to resistance to flow or load). The plates squeeze against the gears to increase pump efficiency during working pressure conditions by minimizing internal leakage at the gear sides. The amount of pressure of the discharge flow will govern the pressure upon the plates since a passage connects the discharge and plate seal chambers. (See Fig. 99)

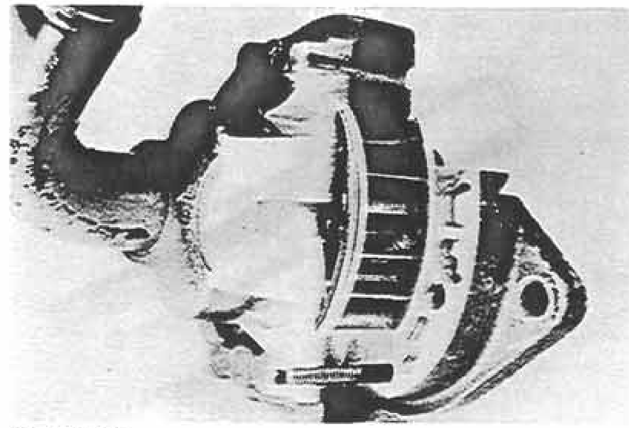

Figure 99: