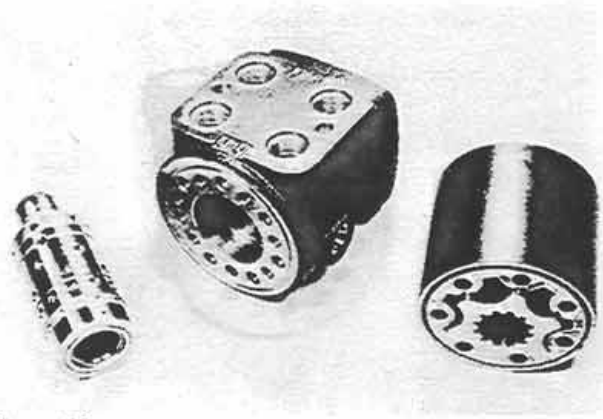

Figure 23:

The steering valve assembly is comprised of three major sections to control oil movement. (See Fig. 23)

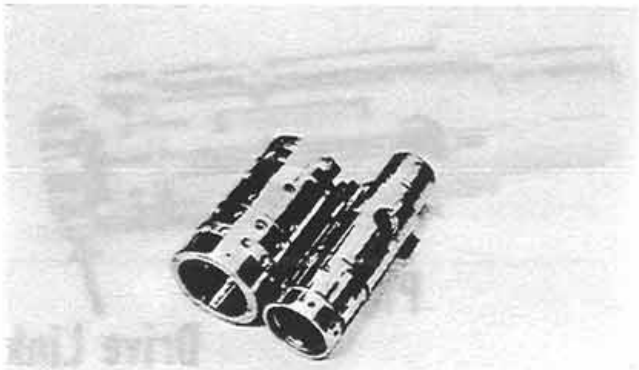

Figure 24:

The rotary type valve section controls the direction of oil flow by means of inner and outer spools which bear relating passages. (See Fig. 24)

Figure 25:

The rotary-type pumping section (gerotor) meters the oil since its physical size determines the amount of oil flow per revolution of the steering wheel. (See Fig. 25)

The valve housing contains the passages to interconnect and also support the valving and pumping sections so they can work as a unit when completely assembled. (See Fig. 26)

Figure 26:

In the valve section, the inner and outer spools are normally held in a neutral position by the leaf-type centering springs. The drive pin which passes through the spools has two functions: it mechanically links the pumping section to the valve and serves as a stop when the inner spool is deflected fully to any position out of neutral. (See Fig. 27)

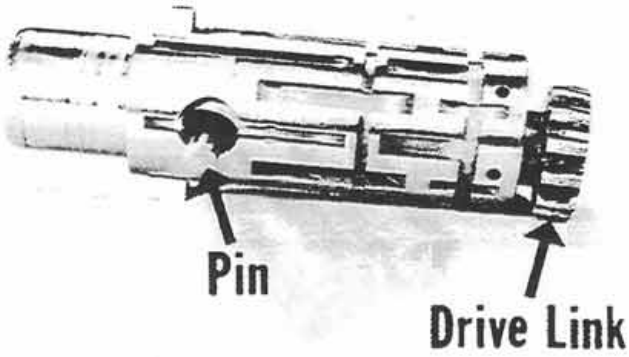

Figure 27:

When steering wheel motion acts upon the inner spool, it deflects (or turns independently) inside the outer spool. The outer spool is mechanically linked to the pumping section and initially sees resistance to rotation. During steering commands the opposite reactions placed on the inner and outer spools cause compression force against the centering springs. (See Fig. 28)

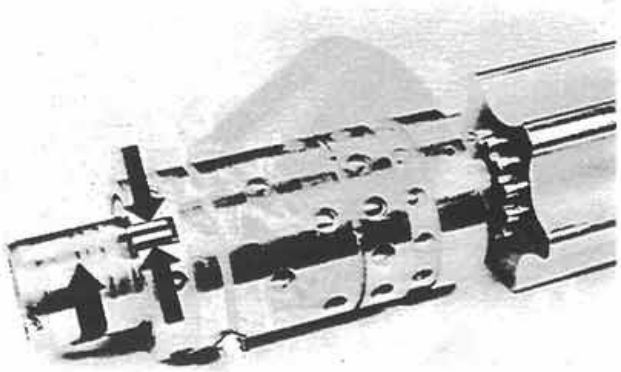

Figure 28:

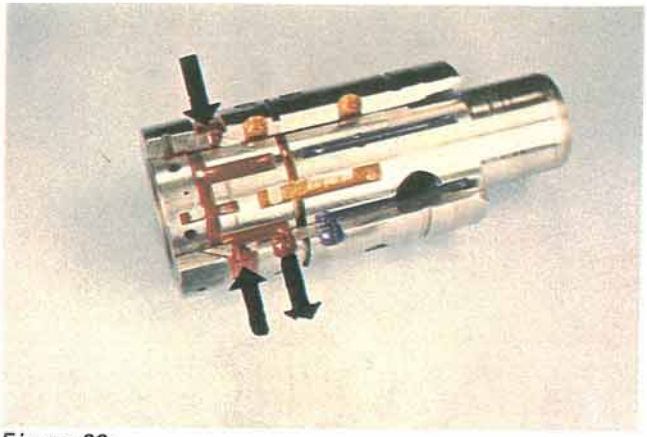

Figure 29:

As the inner spool is deflected, its passages are exposed to the outer spool passages. Oil fow at CONTROL PRESSURE now enters the supply passages shown on the spools. (See Fig. 29)

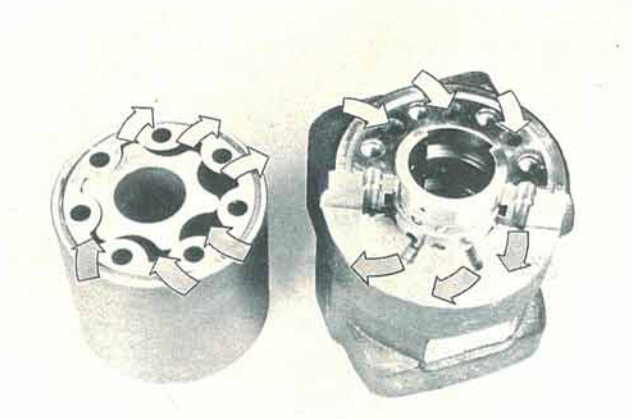

Figure 30:

If a left turn is selected, the flow leaves the outer spool transfer ports and pressurizes the trailing side of the rotor as it gyrates inside its stator. (See Fig. 30)

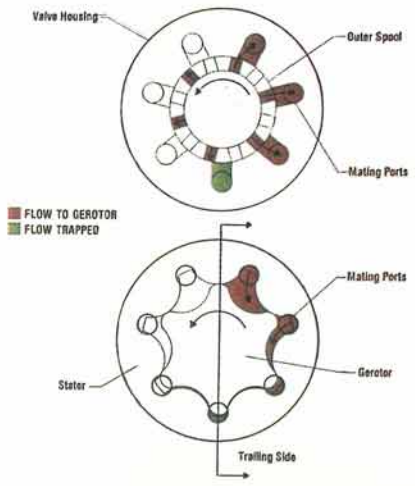

Figure 31:

Oil is fed to the gerotor through the housing ports that are timed to coincide with the outer spool transfer ports as the rotor and spools turn. (See Fig. 31)

As the rotor displaces oil on its leading side, it is forced back into the housing passages which coincide with those transfer ports that can accept oil. (Fig. 32)

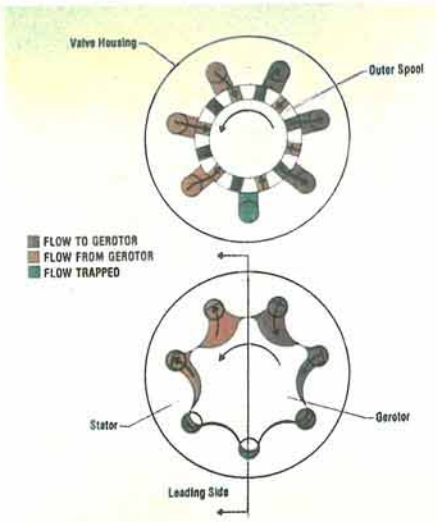

Figure 32:

Since the left turn is being described, the only transfer ports that can accept oil are those which are parallel with the left delivery ports. A series of transfer slots on the inner spool connect the transfer and delivery ports on the outer spool. (See Fig. 33)

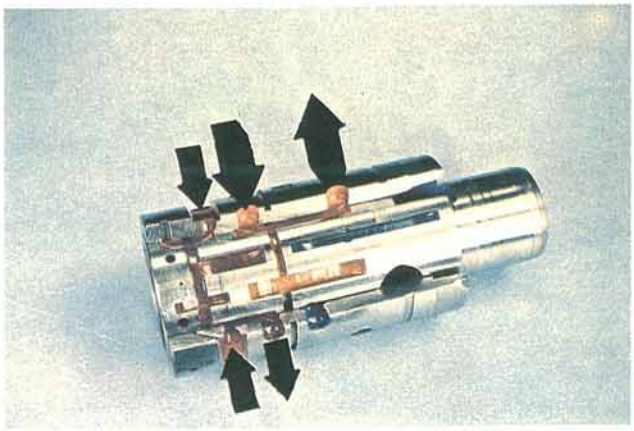

Figure 33:

If a right turn is selected, the same supply passages are used, but as shown, they furnish flow to the opposite transfer ports. This is caused by the inner spool deflection from left to right. (See Fig. 34)

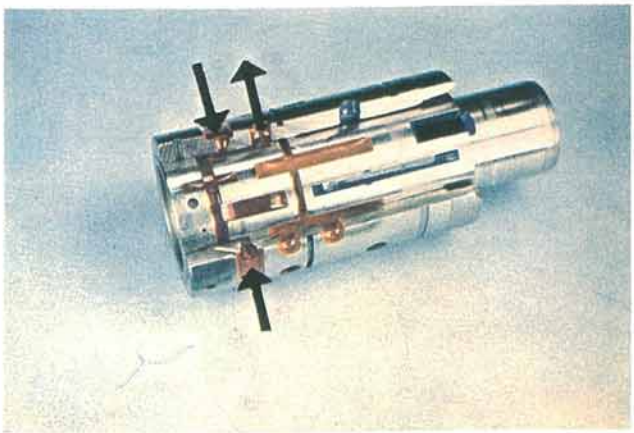

Figure 34:

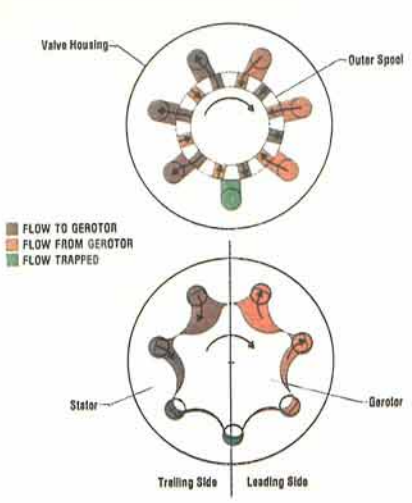

Figure 35:

During the change in steering direction, the trailing and leading sides of the gerotor have changed. The oil displaced now must flow into the transfer ports which are parallel to the right delivery ports. Again, the direction of spool deflection determines the direction of flow. (See Fig. 35)

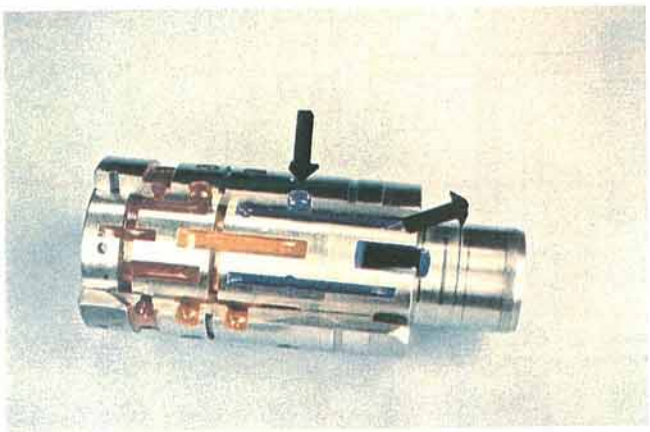

Figure 36:

The inner spool slots will permit exhausting oil from the steering cylinders to enter the interior of the whole assembly and eventually return to the reservoir. When the right delivery port is discharging oil, the left delivery port must accept return oil and vice versa. (See Fig. 36)

As oil flow at CONTROL PRESSURE passes through the entire steering valve to the cylinders, a resistance to flow (or pressure) is created as the cylinders act upon the load. (See Fig. 37)

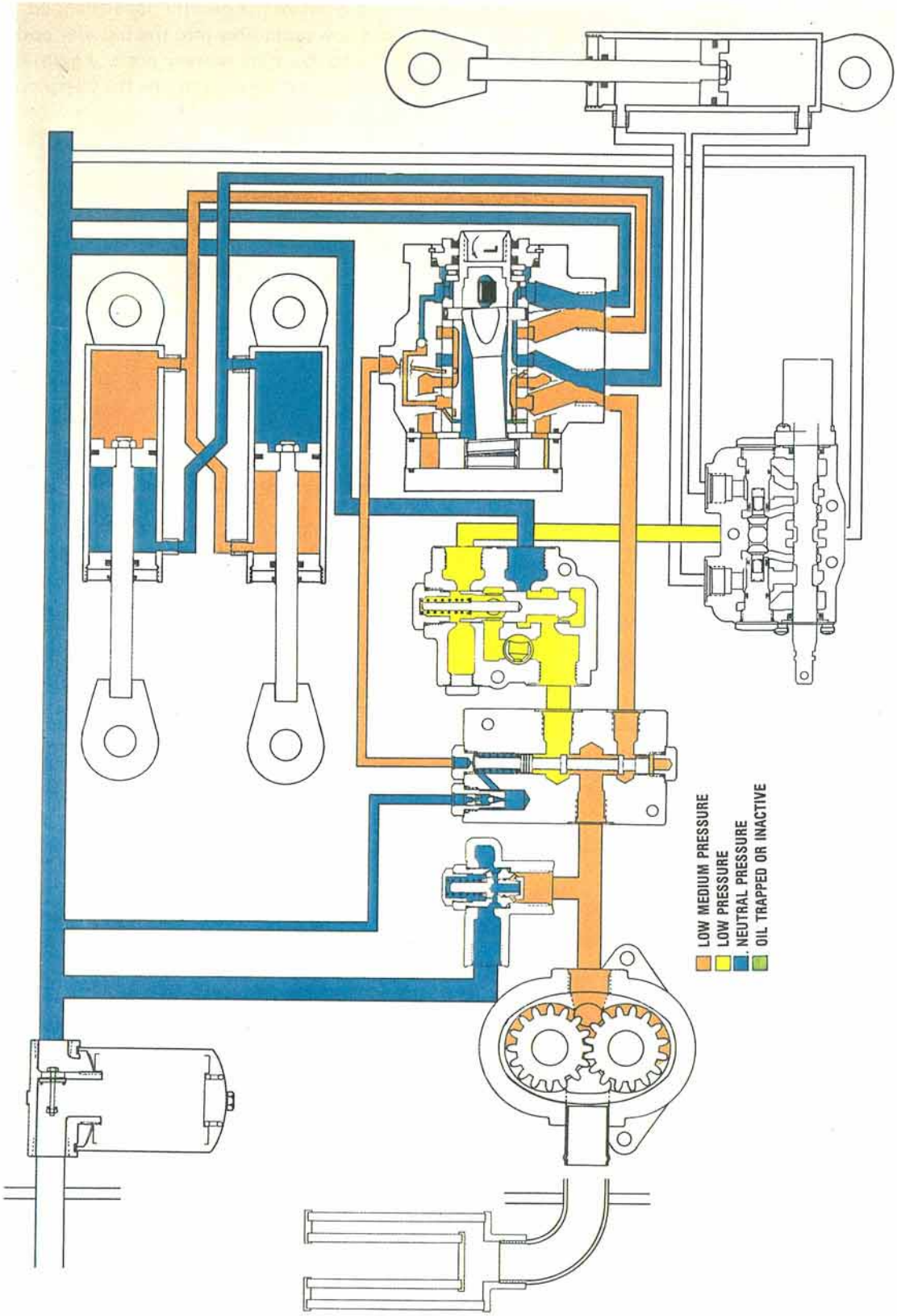
LOW MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 37:

The increase in pressure is seen within the supply passages of the inner spool, only during spool deflection. At this time LOAD SENSING passages in the outer spool transmit pressure to the LOAD SENSE port in the housing. The load sense and supply passages become pressurized from the supply passages only during inner spool deflection. (See Fig. 38)

A flexible line carries the load sense SIGNAL to the spring loaded end of the PRIORITY SPOOL. When the pressure on the unsprung end of the priority spool reaches a pressure equal to CONTROL PRESSURE, the spool will overcome spring pressure. In this case the steering cylinders would see only CONTROL PRESSURE if a steering command were given. (See Fig. 39)

WORKING PRESSURE is required to operate the steering cylinders so, during a FULL steering command, the LOAD SENSE pressure is control pressure for an instant, then becomes equal to WORKING PRESSURE. With equal HYDRAULIC pressure on both ends of the priority spool, spring pressure shifts the spool to allow maximum flow to the steering circuit. (See Fig. 40)

When only a partial steering command is given, the ports in the steering valve will be opened only to the degree required to control the tractor's turning speed. This condition indicates that full steering speed or pressure is not required and the priority spool will be MODULATED to control the rate of flow to the steering circuit. Pump flow not required by the steering circuit goes to the implement circuit. (See Fig. 41)

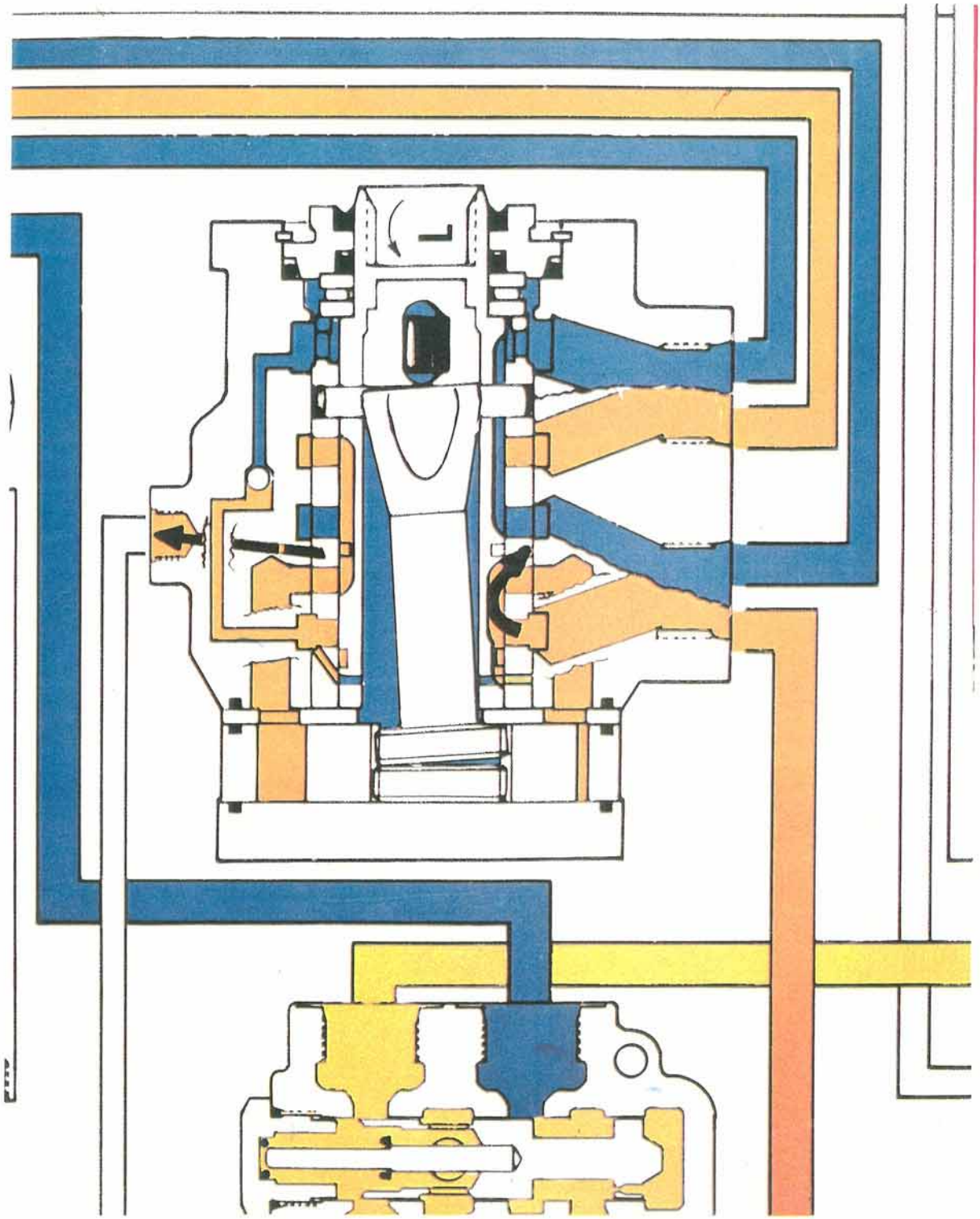

Figure 38:

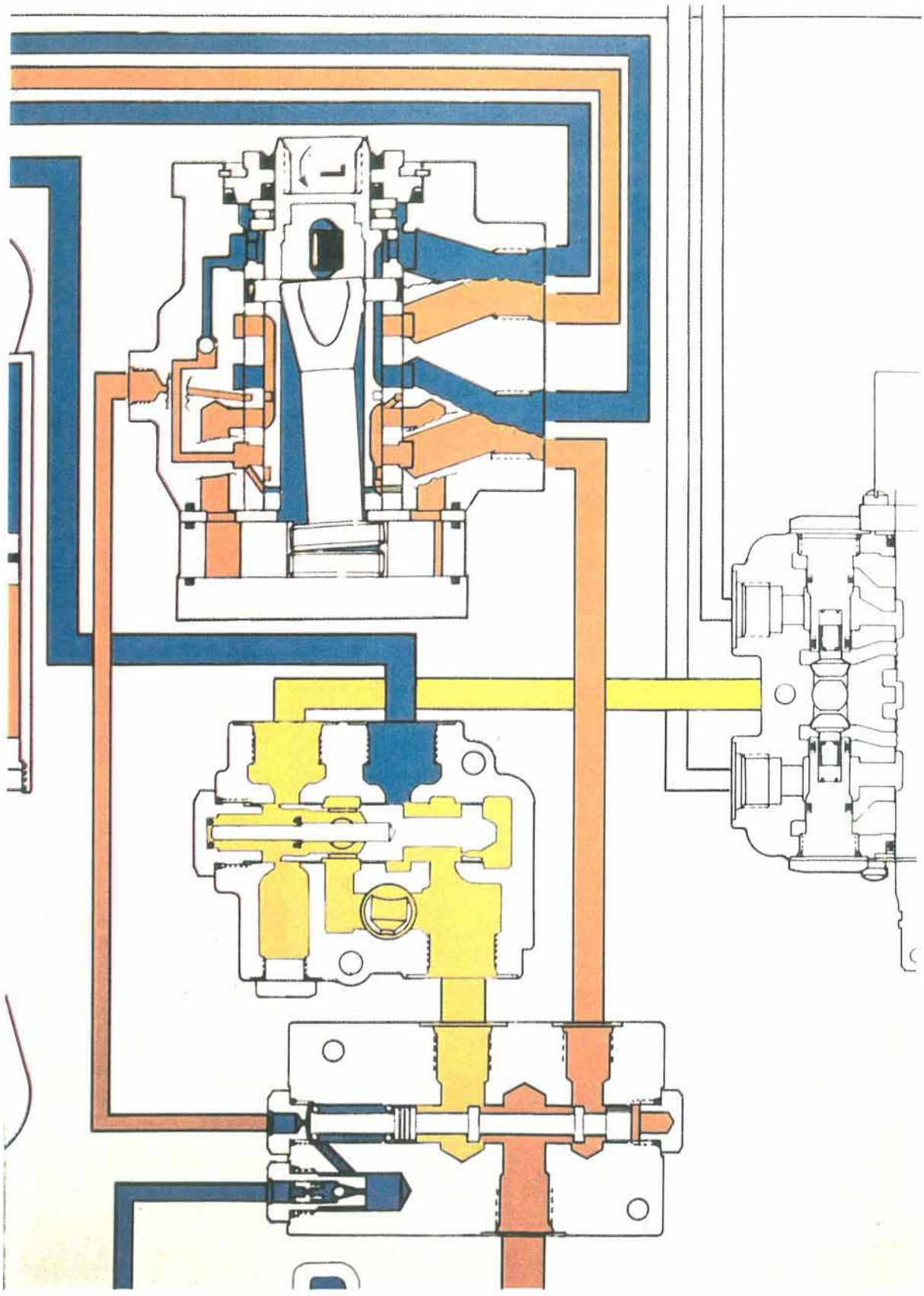

Figure 39:

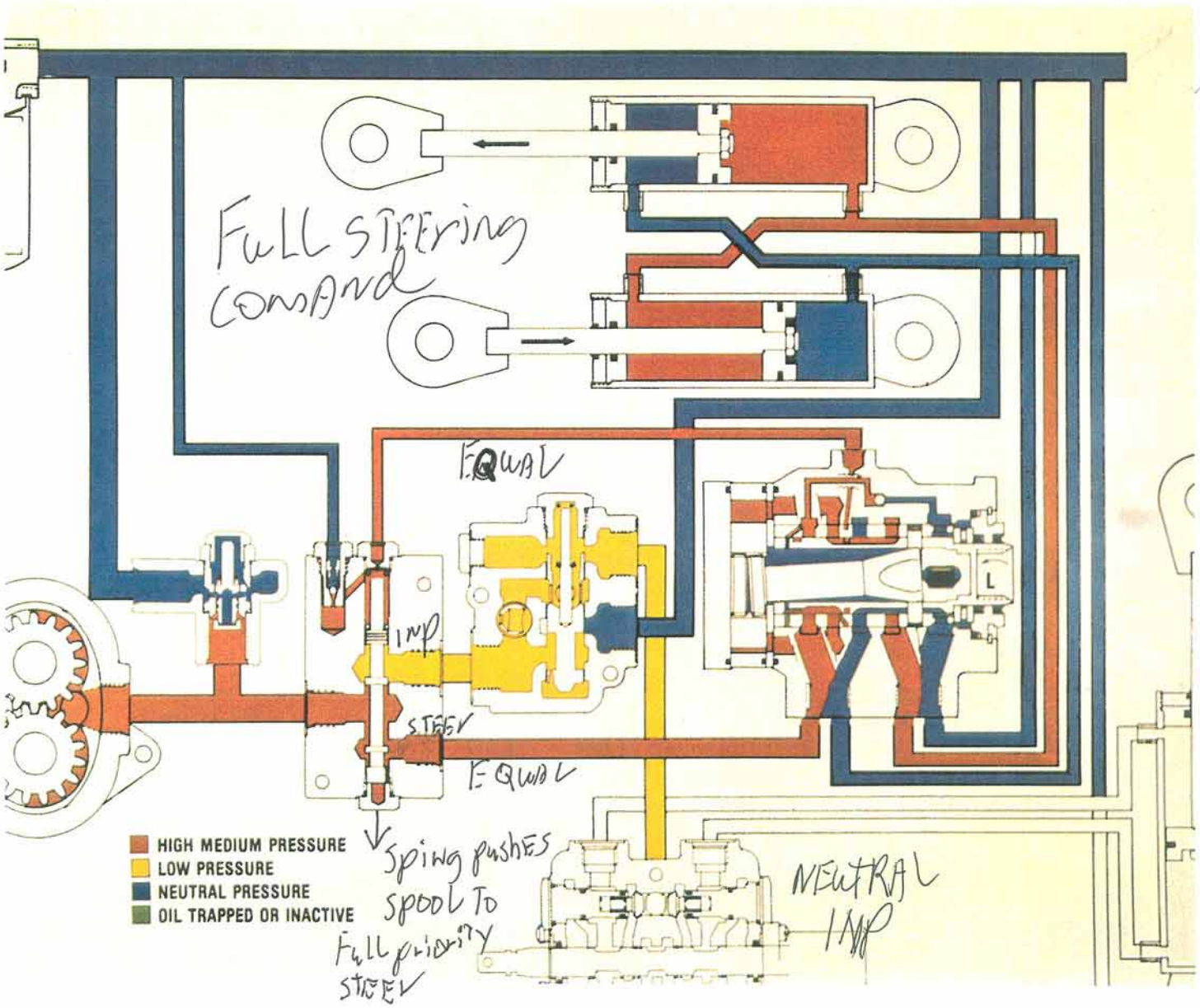
FULL STEER
Full steering
command
EQUAL
INP
STEER
EQUAL
L
HIGH MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE
Spring pushes
spool to
Full priority
STEER
NEUTRAL
INP

Figure 40:

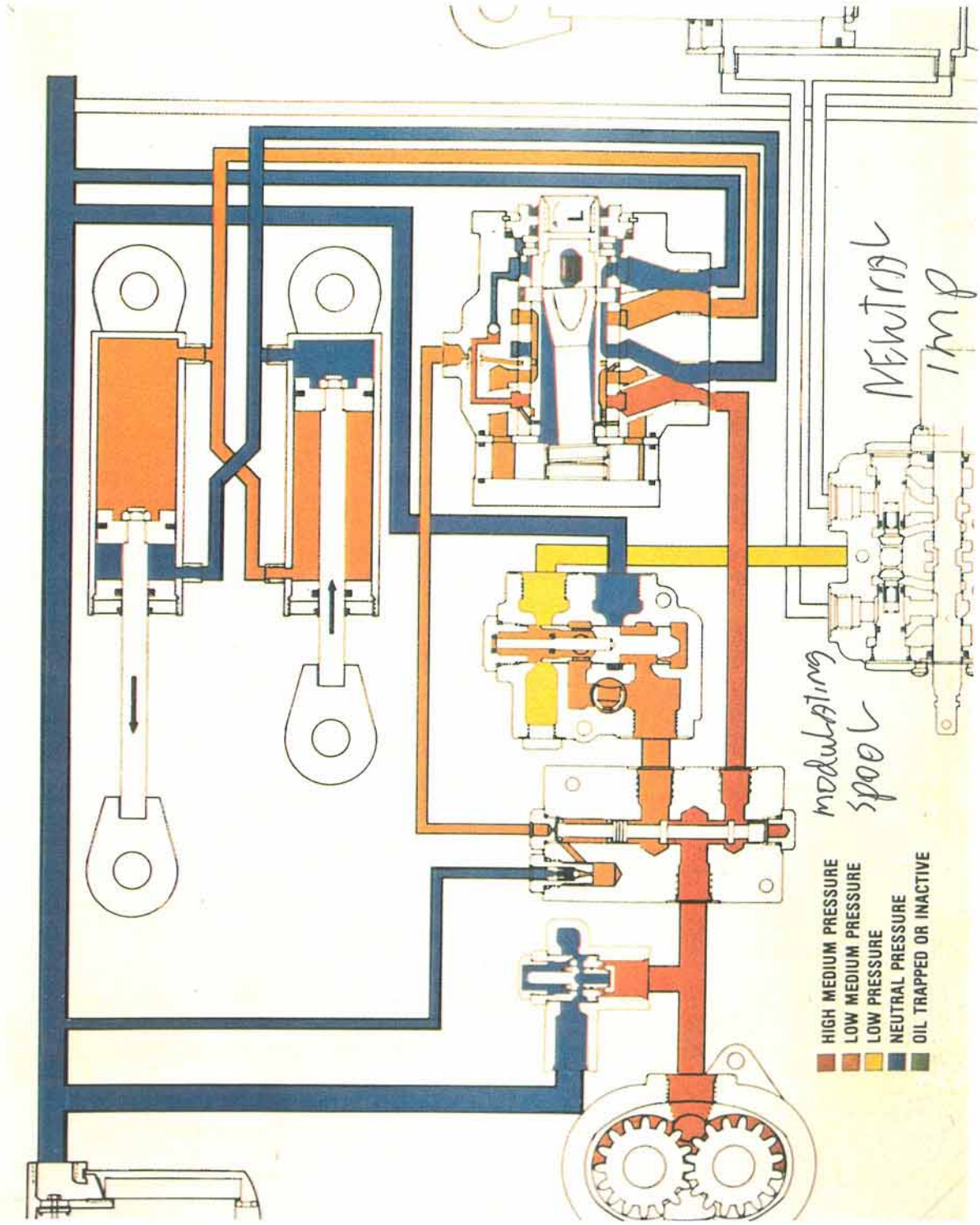
HIGH MEDIUM PRESSURE
LOW MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE
modulating spool
Neutral lmp
Partial STEER

Figure 41:

If the steering circuit pressures exceed 2000 PSI, the LOAD SENSE RELIEF VALVE will open letting the signal flow return to the reservoir. The LOAD SENSE PRESSURE will remain at working pressure but will not act with equal force on the priority spool ends. The signal flow is reduced as it passes the inlet orifice above the priority spool, ensuring that spring end of the spool does not see more than 2000 PSI. The working pressure (just under main relief pressure) will be greater than the load sense relief pressure and will force the spool to modulate against spring pressure. The major oil flow will be toward the implement circuit if steering controls are held in this condition. (Fig. 42)

Implement functions can be used in the normal manner during this period until/or unless the main system relief valve is activated by high pressures within the implement circuit.

When the steering valve is returned to neutral position after any steering command, the leak through passages on the inner and outer spools will again align to allow draining of the load sense signal to the interior of the unit. The supply and cylinder passages are again closed and oil in the cylinders is trapped, so any mechanical force imposed upon the steering cylinders will not be transmitted to the steering wheel. This is called "non-load reaction." (See Fig. 43)

NOTE: *Oil under pressure can pass the upper land of the priority spool and cross the leak through passage of the steering valve spools. The amount of flow lost will be governed by Priority spool and housing fit, control pressure and/or implement circuit working pressure. The flow and pressure in this circuit can have effects upon CONTROL PRESSURE readings. Oil which passes the upper spool land must also pass the inlet orifice, so if leakage past the spool is high, hydraulic pressure force adds to spring pressure to increase CONTROL PRESSURE.* (See Fig. 44)

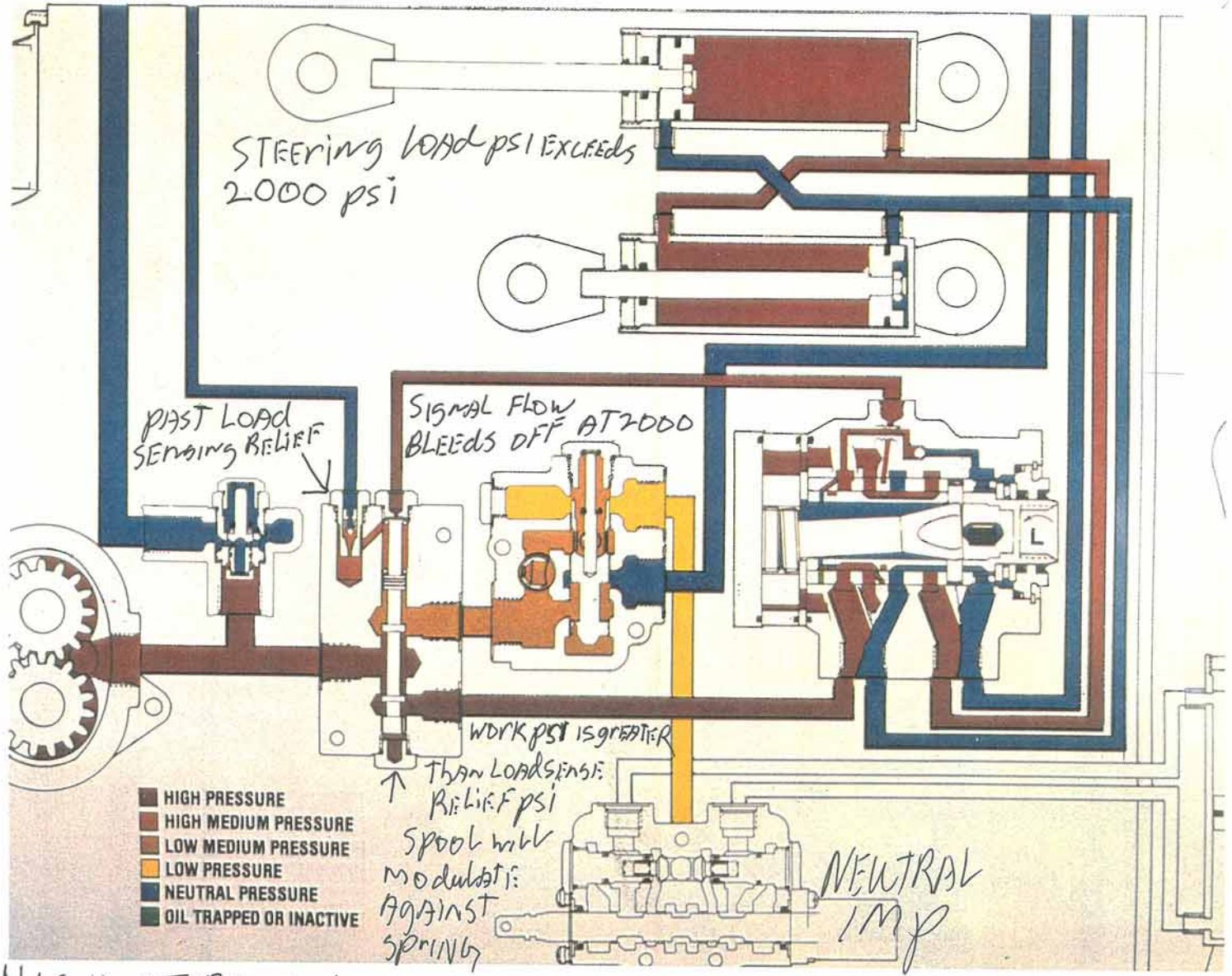

Figure 42: HIGH STEERING LOAD

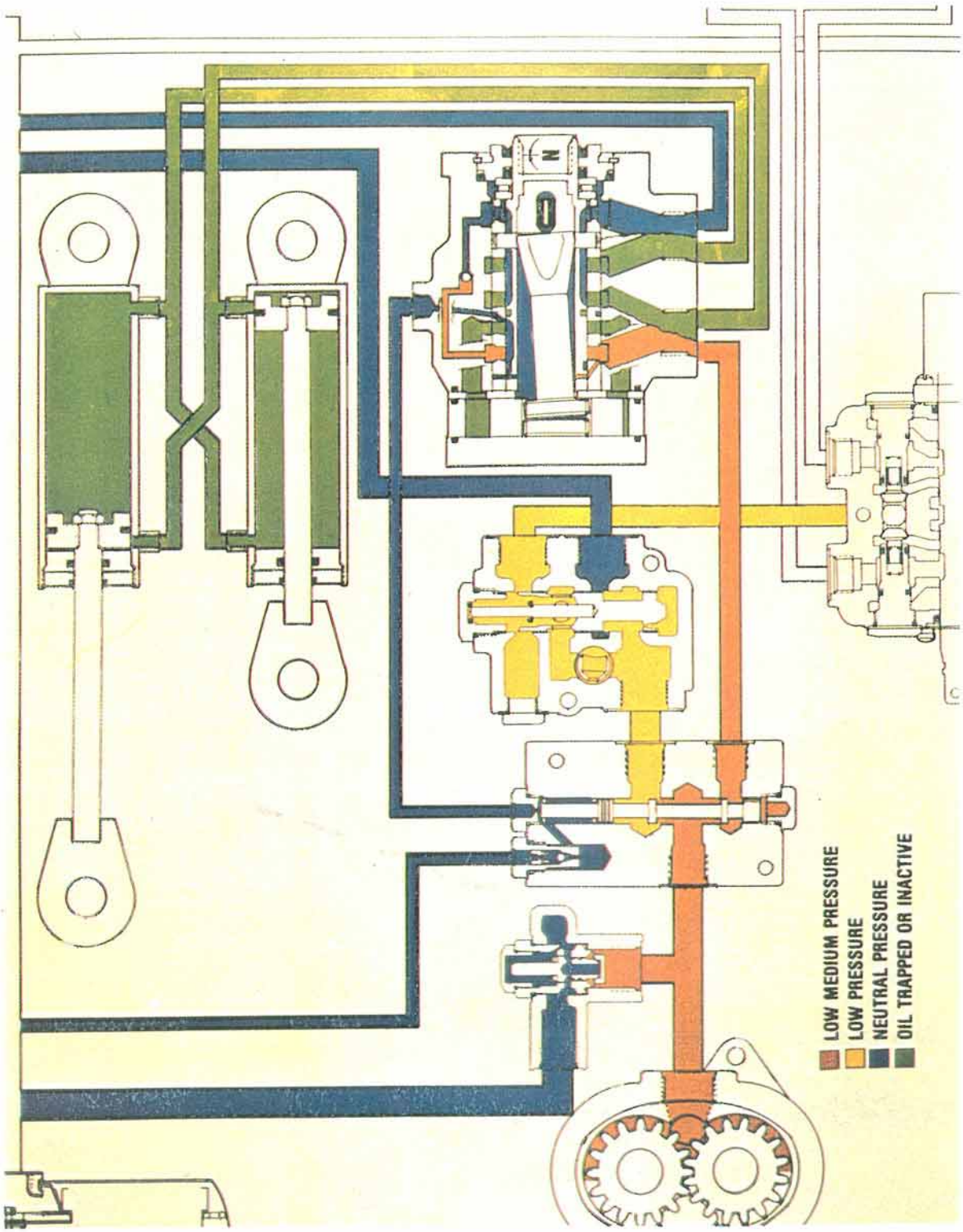
N
LOW MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 43:

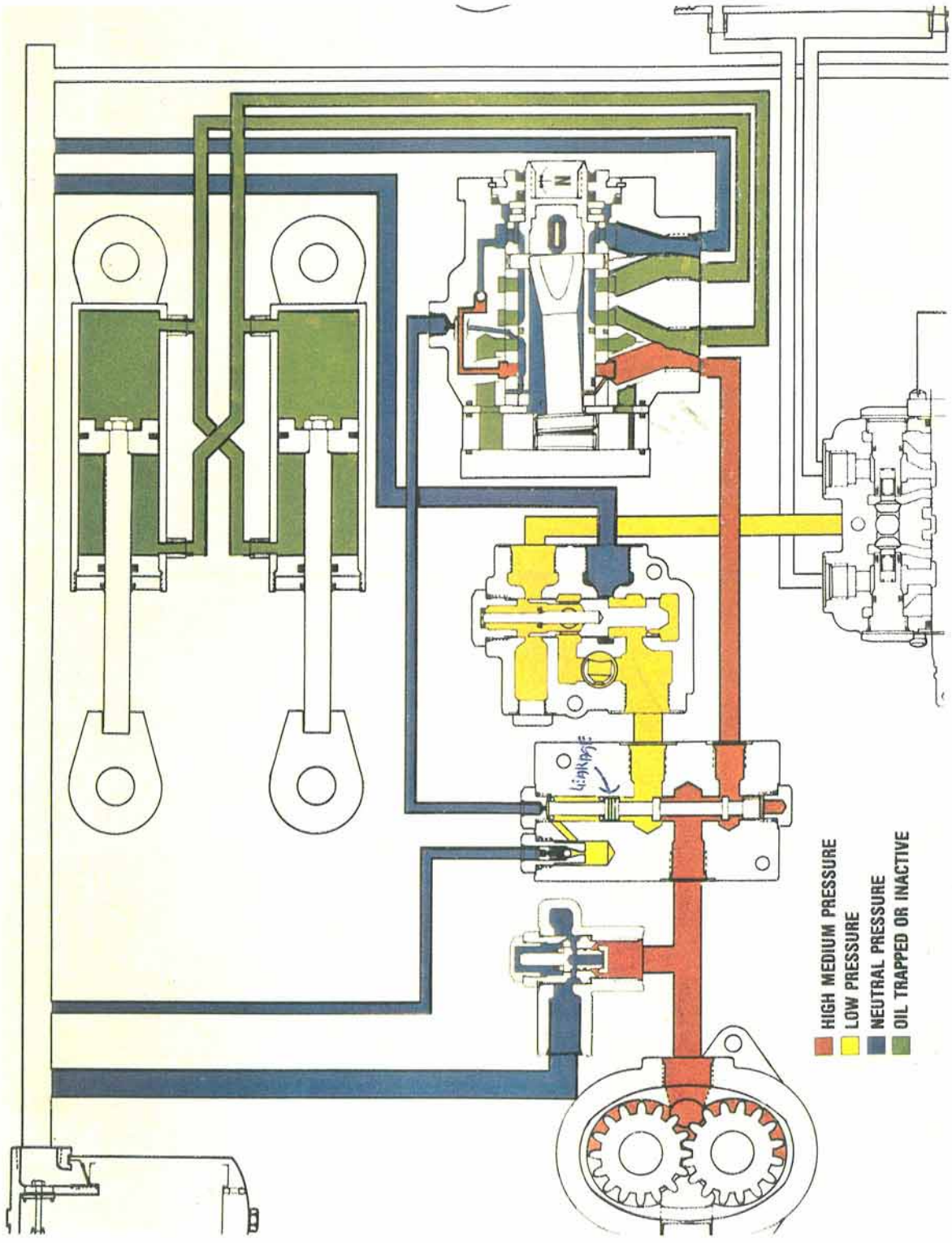
HIGH MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 44:

When the engine is running and the pump is producing flow, the check valve in the steering valve housing will be seated to prevent any supply flow from entering the exhaust passages of the housing. (See Fig. 45)

If the engine is stopped and oil flow ceases, the check ball becomes unseated. The original purpose for this feature is to enable manual steering when there is no hydraulic flow. Human effort applied to the steering wheel causes the gerotor to act as a pump to overcome loads on the steering cylinders. During this action, the inner spool is fully deflected and exhaust oil passing the check valve is used to act as supply oil. The remaining internal passages (except the LOAD SENSE) will operate as previously described (see Fig. 46).

As explained earlier, any pump flow that is not used by the closed center steering system must enter the open center implement circuit. Once in this circuit, the oil flow may be used to control implement demands or return to the reservoir. The route taken by the oil is determined by the spool positions of the FLOW REGULATOR and IMPLEMENT CONTROL valves. (Fig. 47)