Hydraulic Control Valve

The job of directional control valves is to be able to direct the fluid to the desired actuator. Usually, these control valves comprise a spool positioned in a housing made either of steel or cast iron. The spool slides to various places within the housing. Intersecting channels and grooves route the fluid based on the spool's location.

The spool has a neutral or central location which is maintained with springs. In this particular location, the supply fluid is blocked or returned to the tank. If the spool is slid to one direction, the hydraulic fluid is directed to an actuator and provides a return path from the actuator to tank. If the spool is moved to the other side, the supply and return paths are switched. When the spool is enabled to return to the neutral or center position, the actuator fluid paths become blocked, locking it into place.

Usually, directional control valves are built so as to be stackable. They usually have a valve for every hydraulic cylinder and one fluid input that supplies all the valves in the stack.

Tolerances are maintained extremely tightly, in order to tackle the higher pressures and to prevent leaking. The spools will usually have a clearance within the housing no less than 25 µm or a thousandth of an inch. So as to prevent distorting the valve block and jamming the valve's extremely sensitive parts, the valve block will be mounted to the machine' frame with a 3-point pattern.

The location of the spool may be actuated by mechanical levers, hydraulic pilot pressure, or solenoids that push the spool left or right. A seal enables a part of the spool to stick out the housing where it is accessible to the actuator.

The main valve block controls the stack of directional control valves by capacity and flow performance. Several of these valves are designed to be proportional, as a valve position to the proportional flow rate, whereas other valves are designed to be on-off. The control valve is one of the most sensitive and expensive parts of a hydraulic circuit.