Hydraulic Control Valve

The function of directional control valves is to be able to direct the fluid to the desired actuator. Normally, these control valves comprise a spool positioned inside of a housing created either of steel or cast iron. The spool slides to various locations in the housing. Intersecting grooves and channels direct the fluid based on the spool's location.

The spool is centrally located, help in place with springs. In this particular location, the supply fluid can be blocked and returned to the tank. If the spool is slid to one direction, the hydraulic fluid is routed to an actuator and provides a return path from the actuator to tank. If the spool is transferred to the opposite direction, the return and supply paths are switched. Once the spool is allowed to return to the center or neutral place, the actuator fluid paths become blocked, locking it into place.

Typically, directional control valves are made so as to be stackable. They usually have a valve per hydraulic cylinder and one fluid input which supplies all the valves inside the stack.

To be able to avoid leaking and deal with the high pressure, tolerances are maintained really tight. Typically, the spools have a clearance with the housing of less than a thousandth of an inch or 25 μm. In order to avoid distorting the valve block and jamming the valve's extremely sensitive parts, the valve block would be mounted to the machine' frame with a 3-point pattern.

Mechanical levers, solenoids or a hydraulic pilot pressure might actuate or push the spool right or left. A seal allows a part of the spool to protrude outside the housing where it is easy to get to to the actuator.

The main valve block is generally a stack of off the shelf directional control valves chosen by capacity and flow performance. Several valves are designed to be on-off, while some are designed to be proportional, as in valve position to flow rate proportional. The control valve is amongst the most sensitive and pricey components of a hydraulic circuit.