॥ नमस्ते ॥

HYDRAULIC POWER DISTRIBUTION

POWER DISTRIBUTION

- Power distribution in a **hydraulic system is controlled** through the use of variety of flow control valves.
- These valves **control the speed and/or direction** of fluid flow in the hydraulic system.
- They provide for the operation of various components when **desired and the speed** at which the component operates.
- Examples of flow control valves include:

1. **Selector valves / Direction Control Valve,**
2. **Check valves,**
3. **Sequence valves,**
4. **Priority valves,**
5. **Shuttle valves,**
6. **Quick disconnect valves,**
7. **Hydraulic fuses and**
8. **Shutoff valves.**

1.Shut off Valve

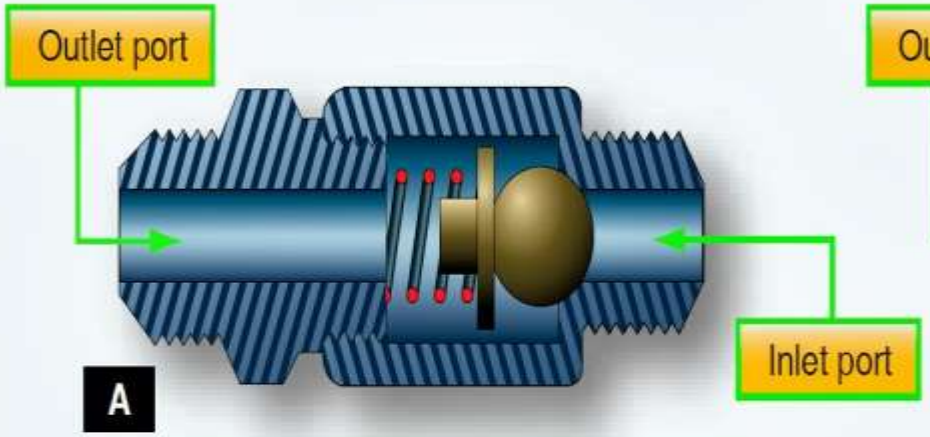
- Shutoff valves are used to shutoff the flow of fluid to a particular system, sub-system or component.
- Valves are electrically powered.
- The switch is adjusted so that if
- pressure drops below the set point, the valve closes.
- All components upstream of the shutoff valve are prioritized in that they receive system fluid pressure even when full pressure is not available.

2. Check Valve(Non Return Valve)

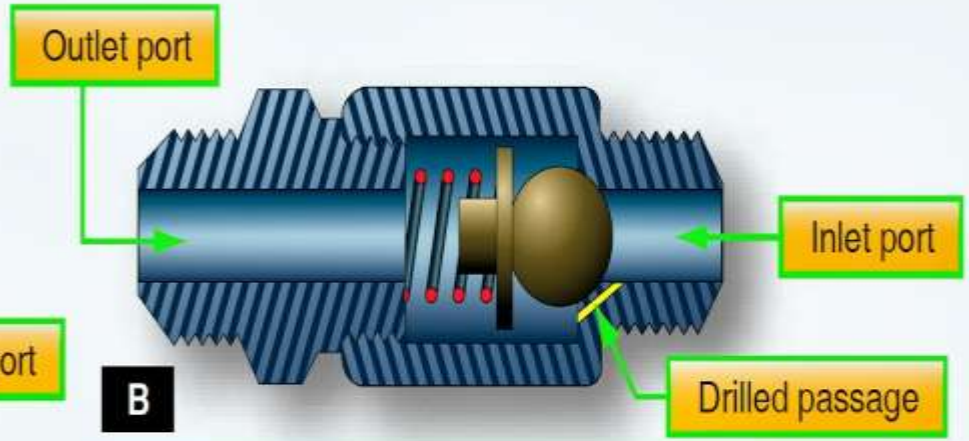
- A check valve allows fluid to flow unimpeded in one direction, but prevents or restricts fluid flow in the opposite direction.

Construction of simple NRV

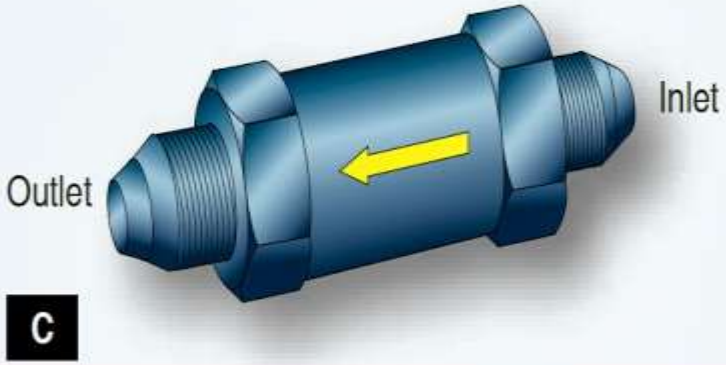
- A typical check valve consists of a spring loaded ball and seat inside a housing.
- The spring compresses to allow fluid flow in the designed direction.
- When flow stops, the spring pushes the ball against the seat which prevents fluid from flowing in the opposite direction through the valve.
- An arrow on the outside of the housing indicated the direction in which fluid flow is permitted.
- A check valve may also be constructed with spring loaded flapper or coned shape piston instead of a ball.



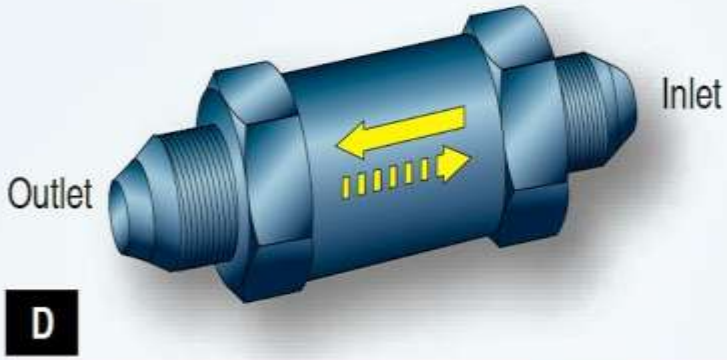
Simple-type in-line check valve (ball-type)



Orifice-type in-line check valve (ball-type)



Flow direction marking on simple-type in-line check valve



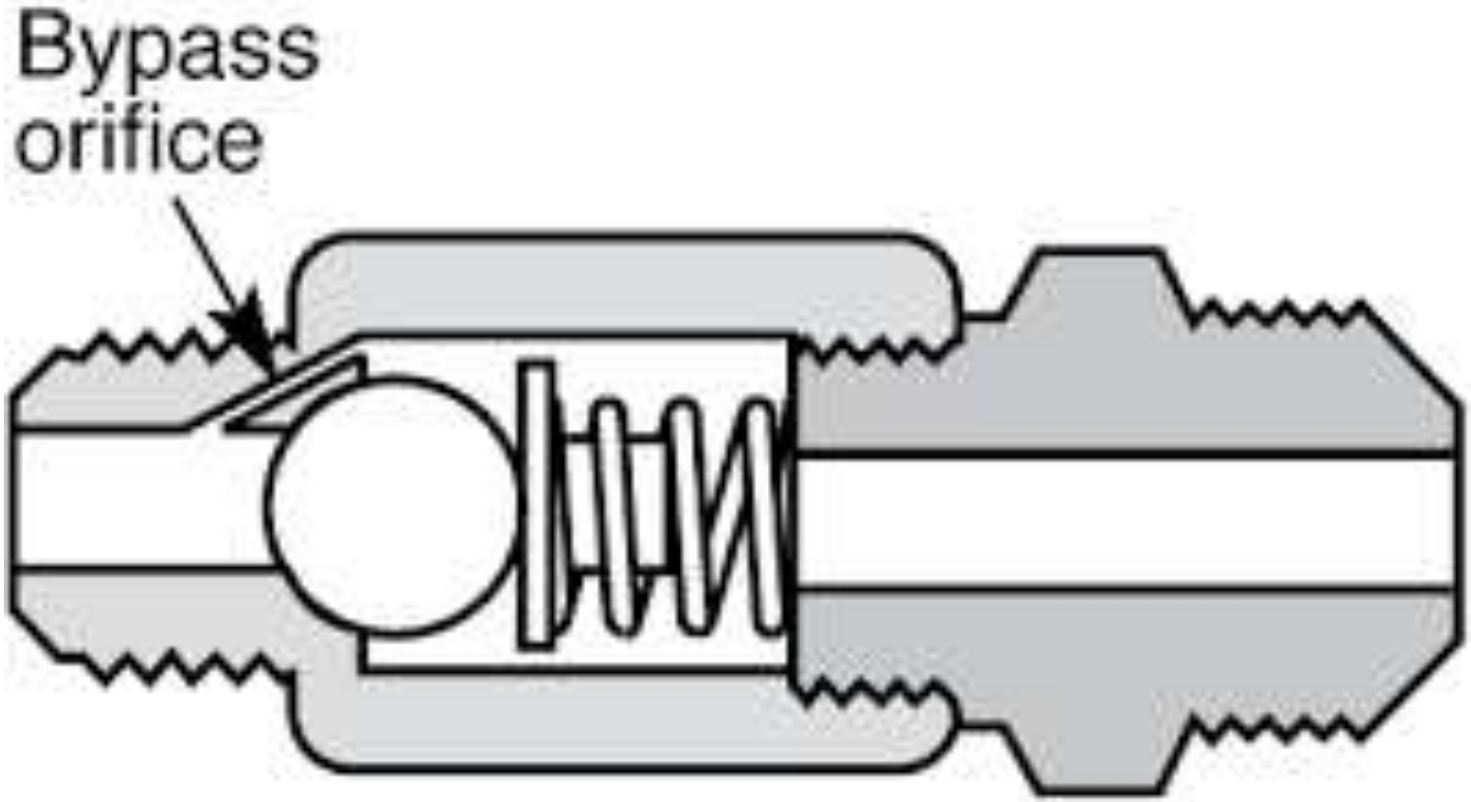
Flow direction marking on orifice-type in-line check valve

1.2 Orifice Type Check Valve

- Some check valves allow full fluid flow in one direction and restricted flow in the opposite direction. These are known as orifice-type check valves, or damping valves.
- The valve contains the same spring, ball, and seat combination as a normal check valve but the seat area has a calibrated orifice machined into it.
- Thus fluid flow is unrestricted in the designed direction while the ball is pushed off of its seat.
- The downstream actuator operates at full speed. When fluid back flows into the valve, the spring forces the ball against the seat which limits fluid flow to the amount that can pass through the orifice
- The reduced flow in this opposite direction slows the motion, or dampens, the actuator associated with the check valve.

An orifice check valve may be included in a hydraulic landing gear actuator system. When the gear is raised, the check valve allows full fluid flow to lift the heavy gear at maximum speed.

- When lowering the gear, the orifice in the check valve prevents the gear from violently dropping by restricting fluid flow out of the actuating cylinder.

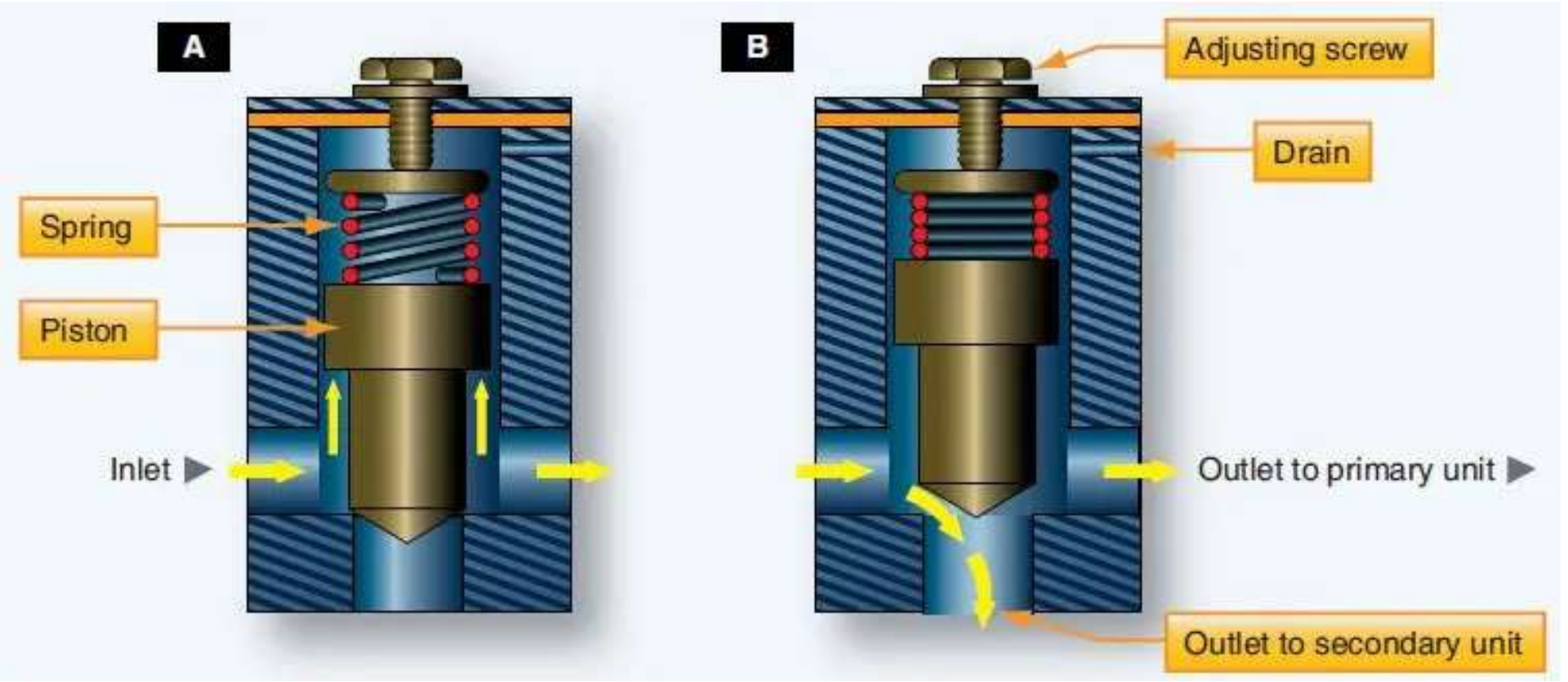


orifice check valve

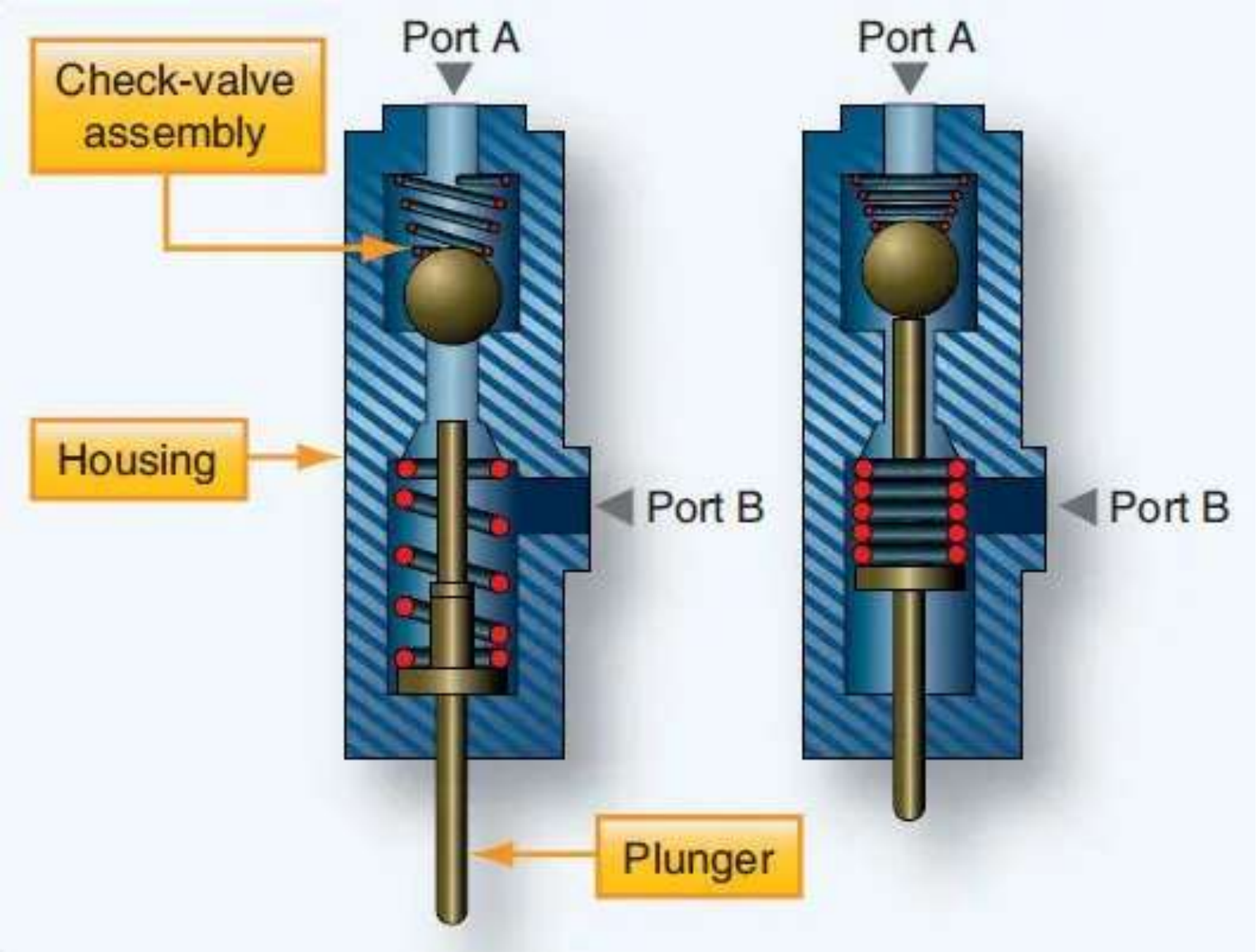
3.SEQUENCE VALVES

- Sequence valves control the sequence of operation between two branches in a circuit; they enable one unit to automatically set another unit into motion.
- An example of the use of a sequence valve is in an aircraft landing gear actuating system.
- In a landing gear actuating system, the landing gear doors must open before the landing gear starts to extend.
- Conversely, the landing gear must be completely retracted before the doors close

- A sequence valve is somewhat similar to a relief valve except that, after the set pressure has been reached, the sequence valve diverts the fluid to a second actuator or motor to do work in another part of the system.
- There are various types of sequence valves. Some are controlled by pressure, some are controlled mechanically, and some are controlled by electric switches



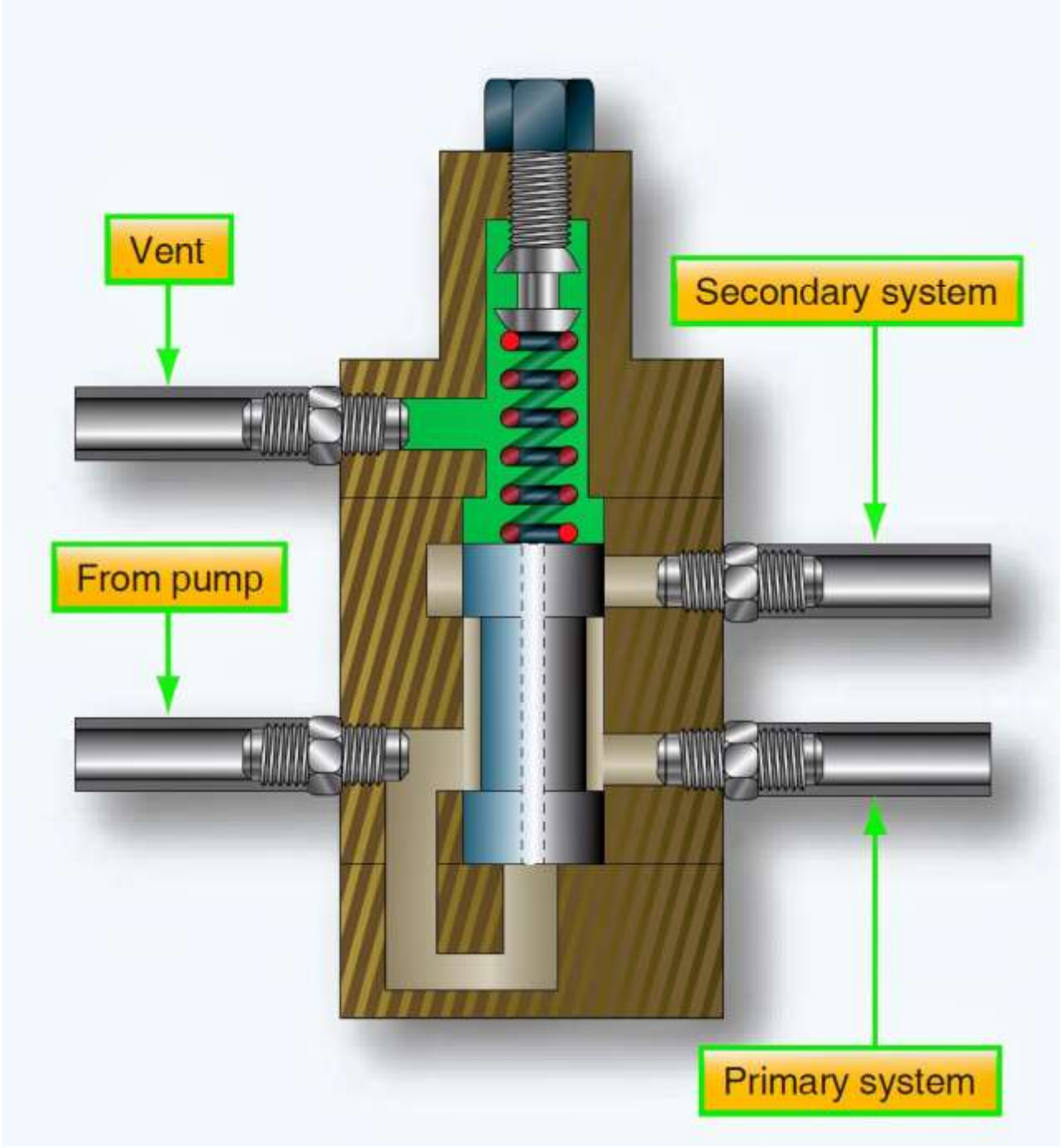
Pressure Operated



Mechanically Operated

4.PRIORITY VALVES

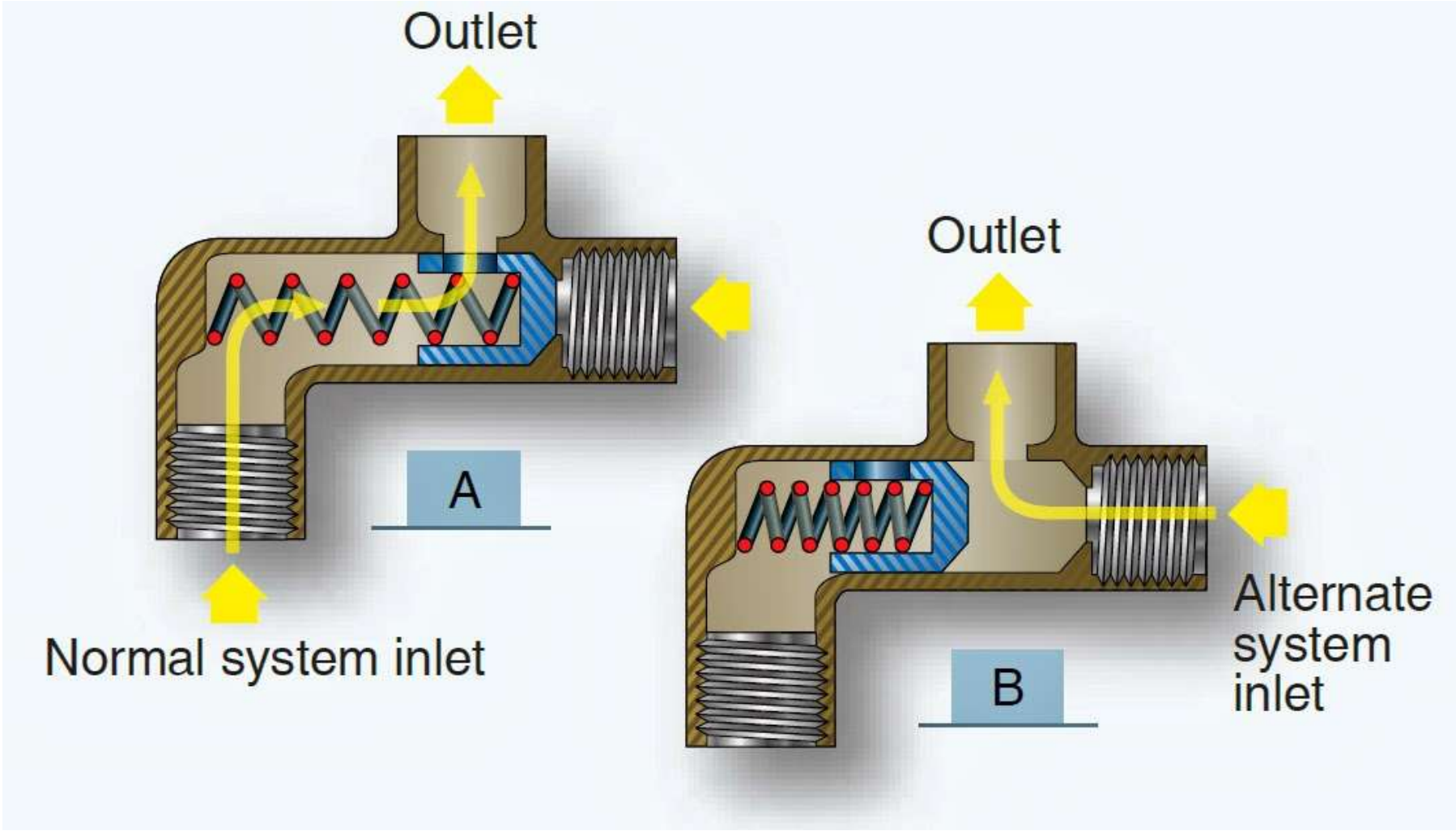
- A priority valve gives priority to the critical hydraulic subsystems over noncritical systems when system pressure is low.
- For instance, if the pressure of the priority valve is set for 2 200 psi, all systems receive pressure when the pressure is above 2 200 psi. If the pressure drops below 2 200 psi, the priority valve closes and no fluid pressure flows to the noncritical systems.


Vent
Secondary system
From pump
Primary system

5.SHUTTLE VALVES

- In certain fluid power systems, the supply of fluid to a subsystem must be from more than one source to meet system requirements.
- In some systems, an emergency system is provided as a source of pressure in the event of normal system failure.
- The emergency system usually actuates only essential components.
- The main purpose of the shuttle valve is to isolate the normal system from an alternate or emergency system.
- It is small and simple; yet, it is a very important component.

- Enclosed in the housing is a sliding part called the shuttle. Its purpose is to seal off one of the inlet ports.
- There is a shuttle seat at each inlet port. When a shuttle valve is in the normal operation position, fluid has a free flow from the normal system inlet port, through the valve, and out through the outlet port to the actuating unit.
- The shuttle is seated against the alternate system inlet port and held there by normal system pressure and by the shuttle valve spring.
- The shuttle remains in this position until the alternate system is activated. This action directs fluid under pressure from the alternate system to the shuttle valve and forces the shuttle from the alternate system inlet port to the normal system inlet port.
- Fluid from the alternate system then has a free flow to the outlet port, but is prevented from entering the normal system by the shuttle, which seals off the normal system port.


Outlet
Outlet
A
B
Normal system inlet
Alternate system inlet

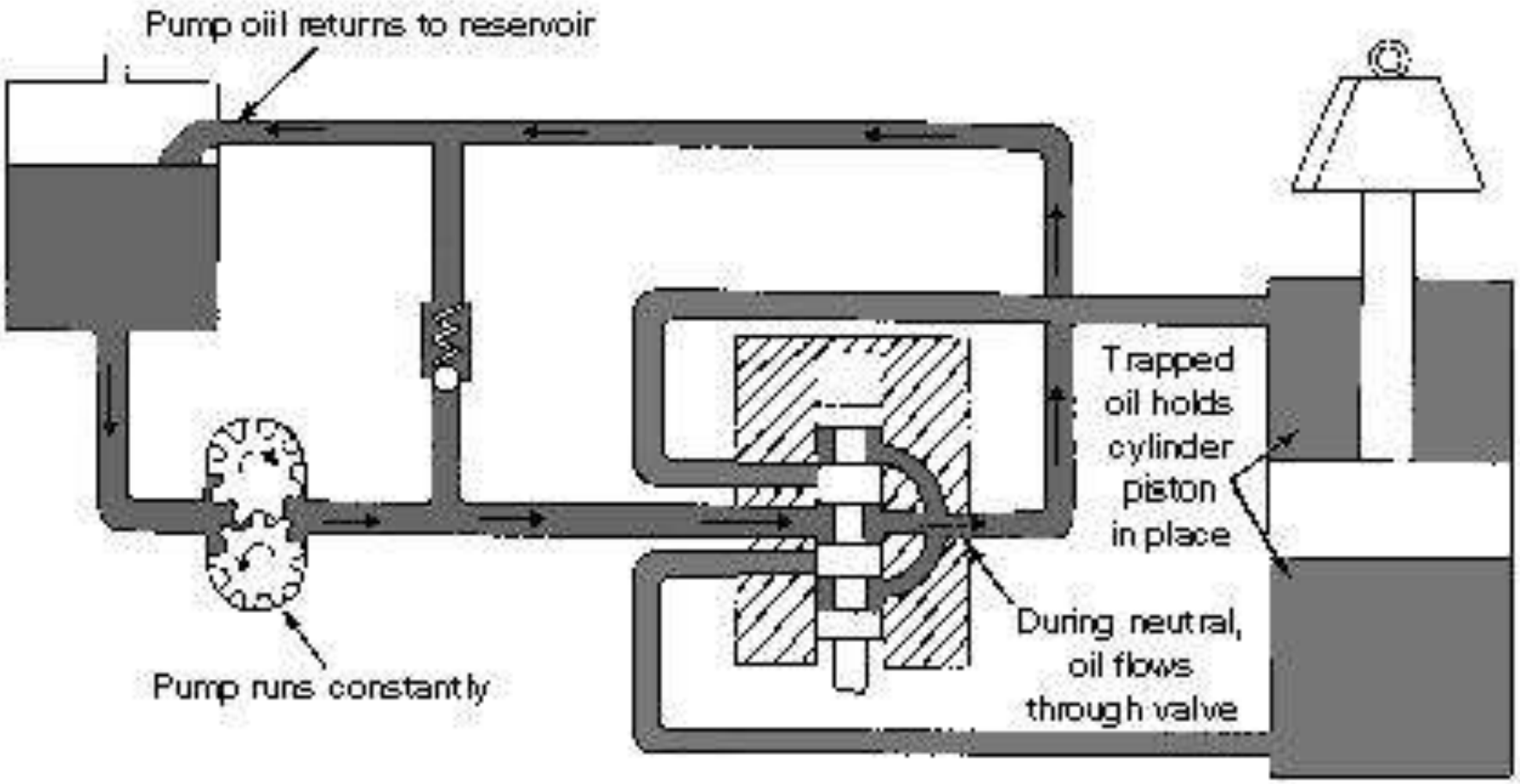
6.Selector Valve / Direction Control Valve

- A selector valve is used to control the direction of movement of a hydraulic actuating cylinder or similar device.
- Hydraulic system pressure can be routed with the selector valve to operate the unit in either direction and a corresponding return path for the fluid to the reservoir is provided.
- There are two main types of selector valves:

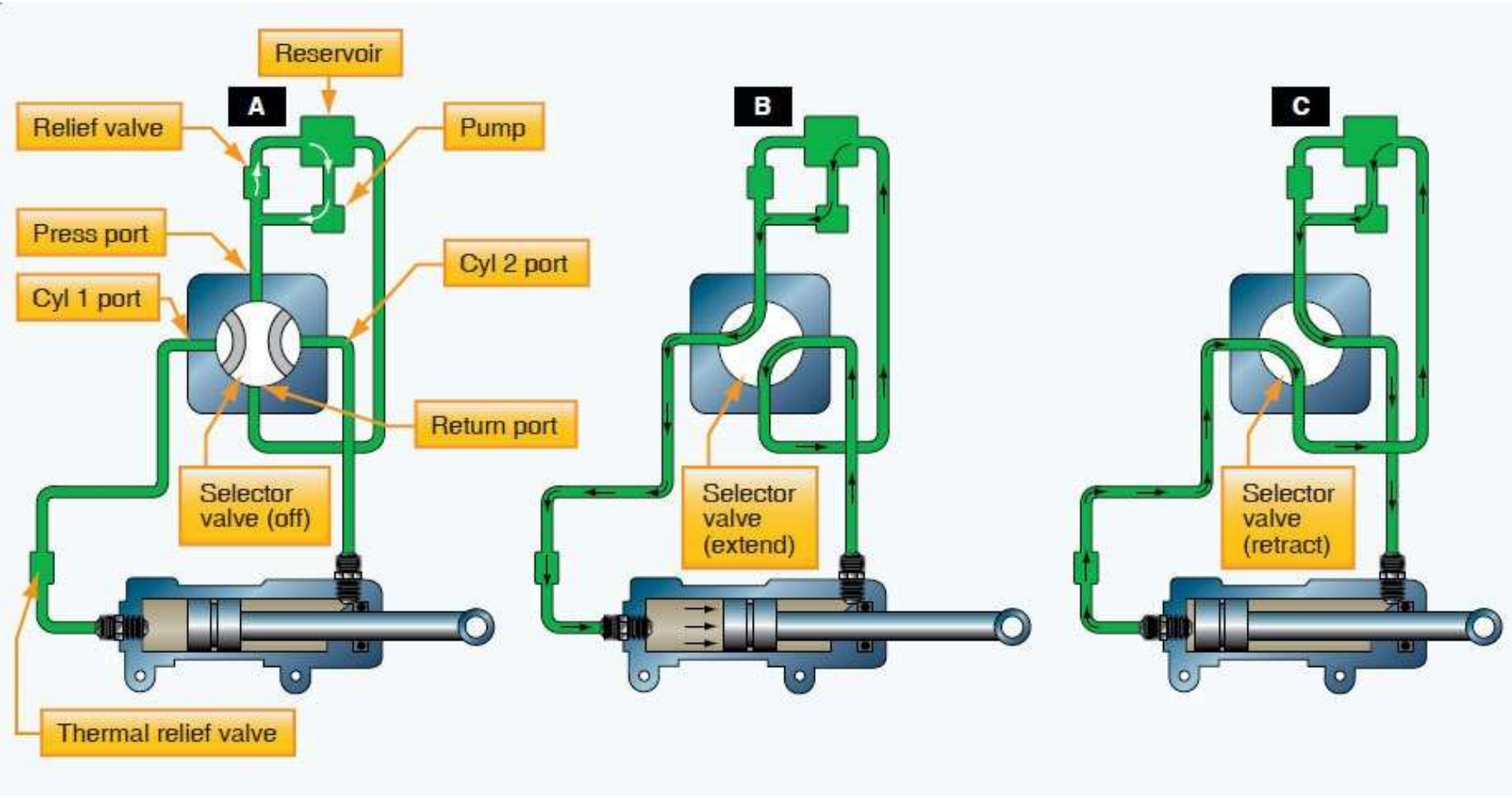
1. Open Center and
2. Closed-center.

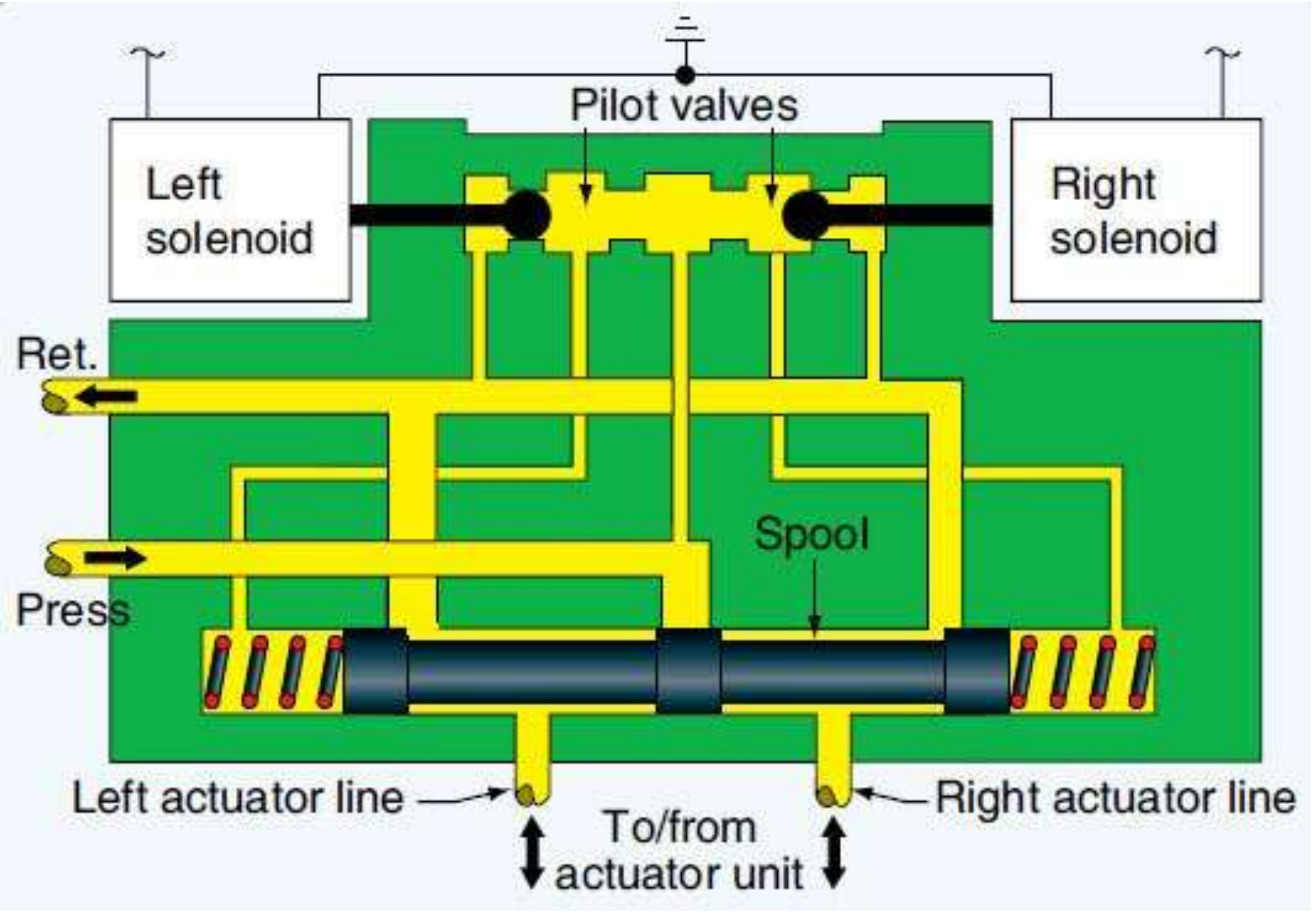
- **Open center -An open center valve allows a continuous flow of system hydraulic fluid through the valve even when the selector is not in a position to actuate a unit.**
- **A closed-center A -closed-center selector valve blocks the flow of fluid through the valve when it is in the NEUTRAL or OFF position.**

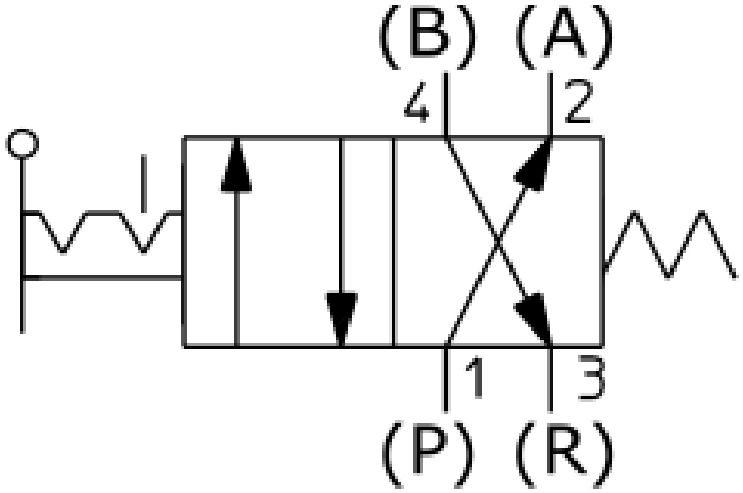
Open center type Selector Valve



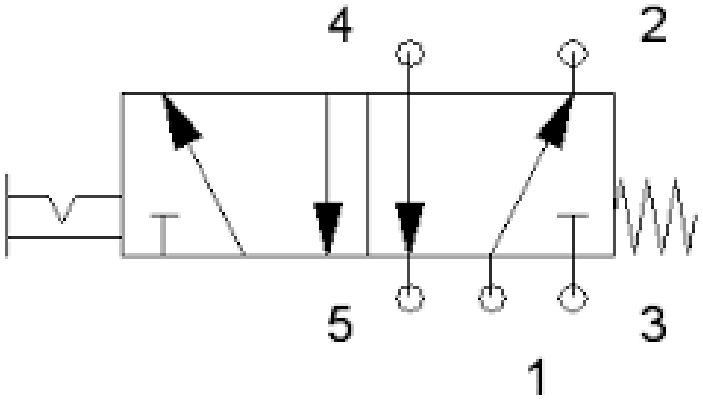
Closed centre Type Selector Valve




Pilot valves
Left solenoid
Right solenoid
Ret.
Press
Spool
Left actuator line
Right actuator line
To/from actuator unit



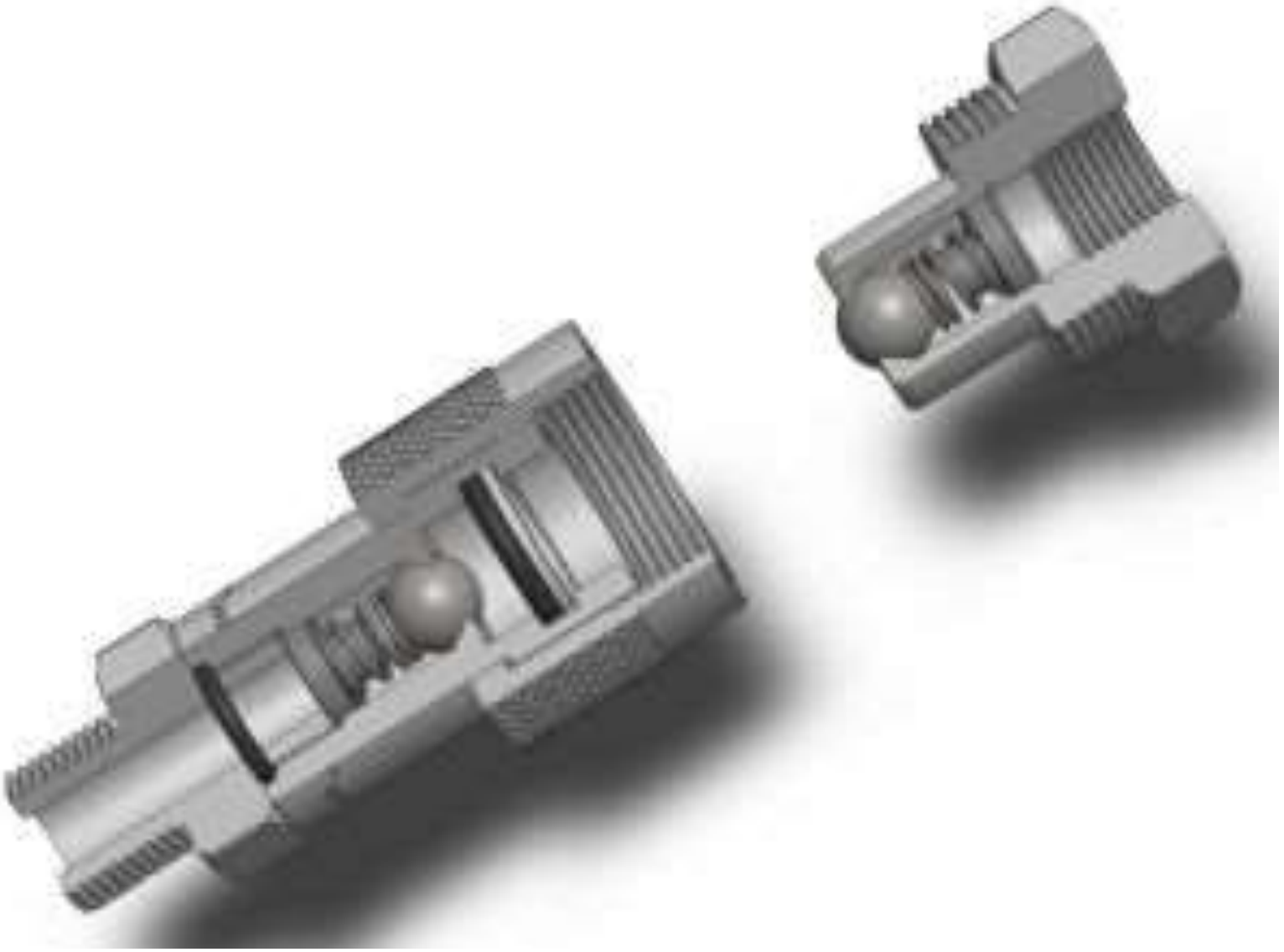
4/2 Way Selector Valve

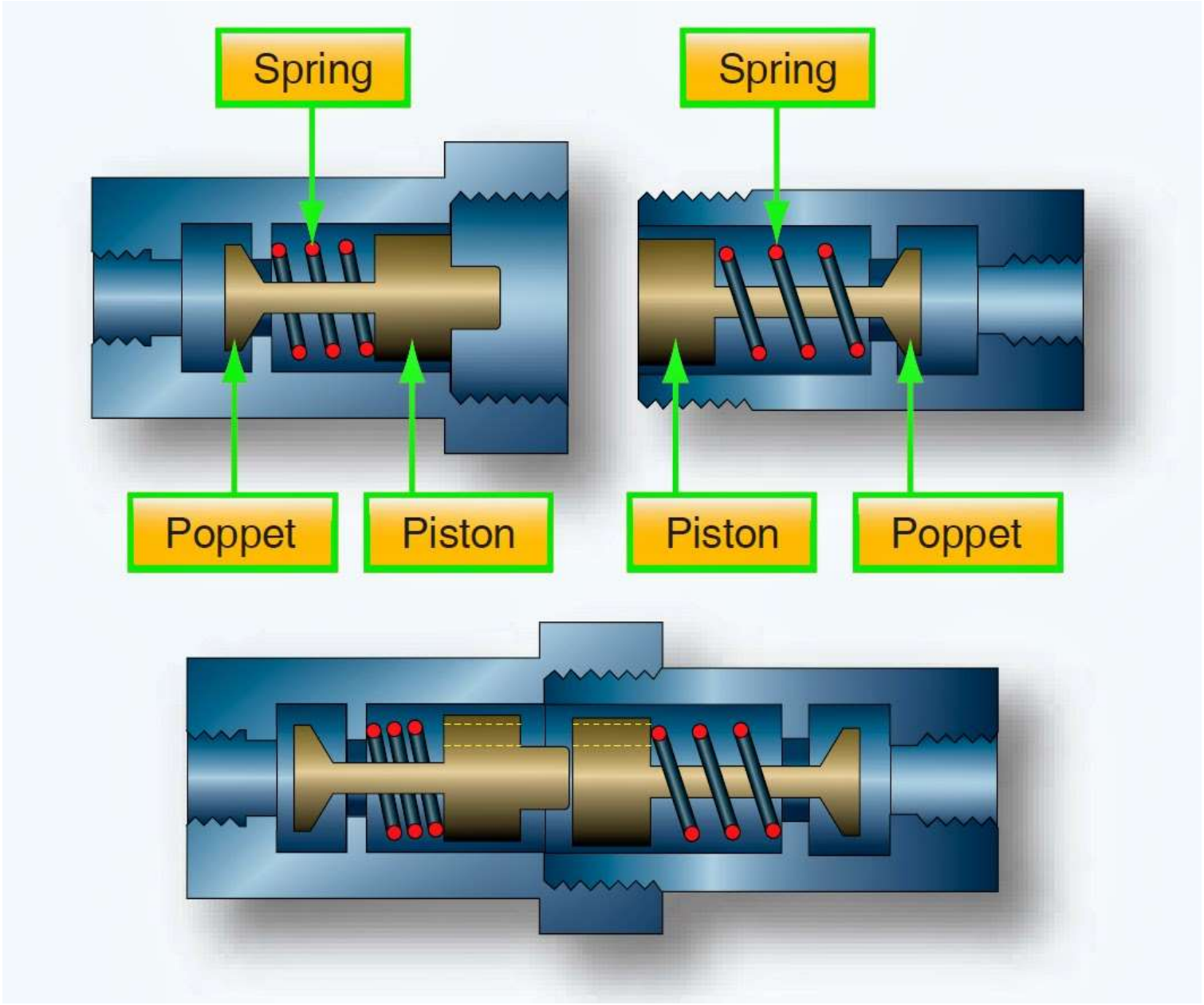


5/2 Way Selector Valve

7.QUICK DISCONNECT VALVES

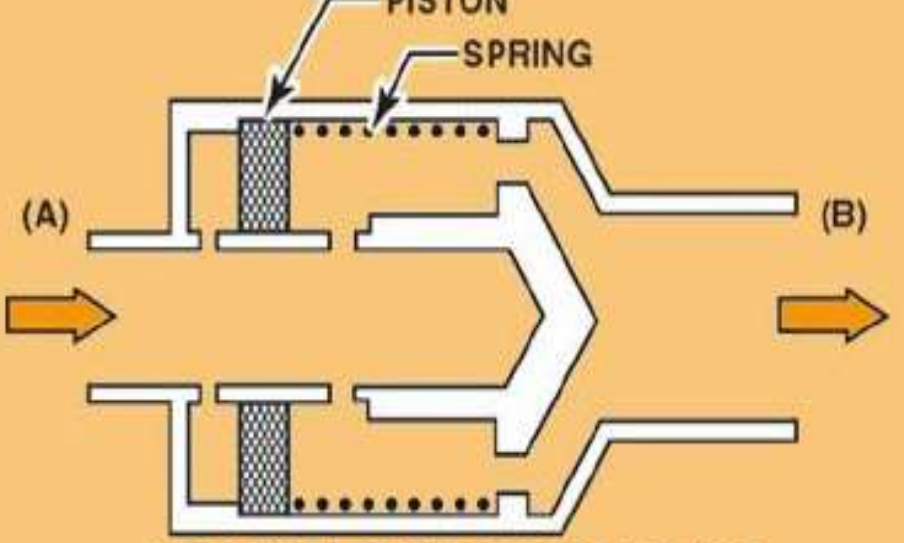
- Quick disconnect valves are installed in hydraulic lines to prevent loss of fluid when units are removed.
- Such valves are installed in the pressure and suction lines of the system immediately upstream and downstream of the power pump.
- These valve units consist of two interconnecting sections coupled together by a nut when installed in the system.
- Each valve section has a piston and poppet assembly. These are spring loaded to the closed position when the unit is disconnected.



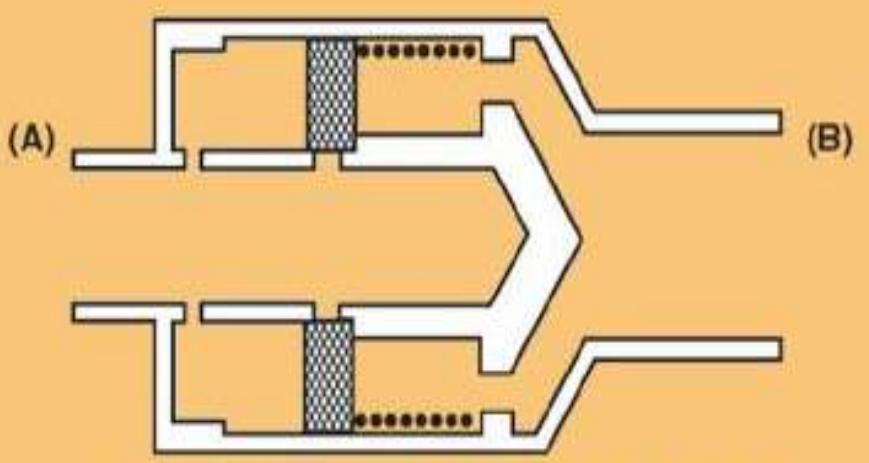

Spring
Spring
Poppet
Piston
Piston
Poppet

8.HYDRAULIC FUSES

- A hydraulic fuse is a safety device.
- They detect a sudden increase in flow, such as a burst downstream, and shut off the fluid flow.
- By closing, a fuse preserves hydraulic fluid for the rest of the system.
- Hydraulic fuses are fitted to the brake system, leading edge flap and slat extend and retract lines, nose landing gear up and down lines, and the thrust reverser pressure and return lines.
- One type of fuse, referred to as the automatic resetting type, is designed to allow a certain volume of fluid per minute to pass through it.
- If the volume passing through the fuse becomes excessive, the fuse closes and shuts off the flow.
- When the pressure is removed from the pressure supply side of the fuse, it automatically resets itself to the open position.
- Fuses are usually cylindrical in shape, with an inlet and outlet port at opposite ends.



NORMAL FLOW THROUGH THE FUSE



FLOW IS STOPPED. THE PRESSURE DROP ACROSS THE FUSE HAS MOVED THE PISTON OVER SO THAT IT COVERS THE HOLES THROUGH WHICH THE FLUID MUST FLOW.

Today's Amazing Fact???????

There's a super massive black hole at the heart of the Milky Way it's four million times more massive than the sun


ANY
QUESTIONS?

धन्यवाद

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