

SPEED CONTROL OF CYLINDERS

- It is always necessary to reduce the speed of cylinder from maximum speed based on selected size of final control valve to the nominal speed depending on the application
- Speed control of Pneumatic Cylinders can be conveniently achieved by regulating the flow rate supply or exhaust air.
- The volume flow rate of air can be controlled by using flow control valves which can be either Two way flow control valve or One way flow control valve

Speed Control of cylinder

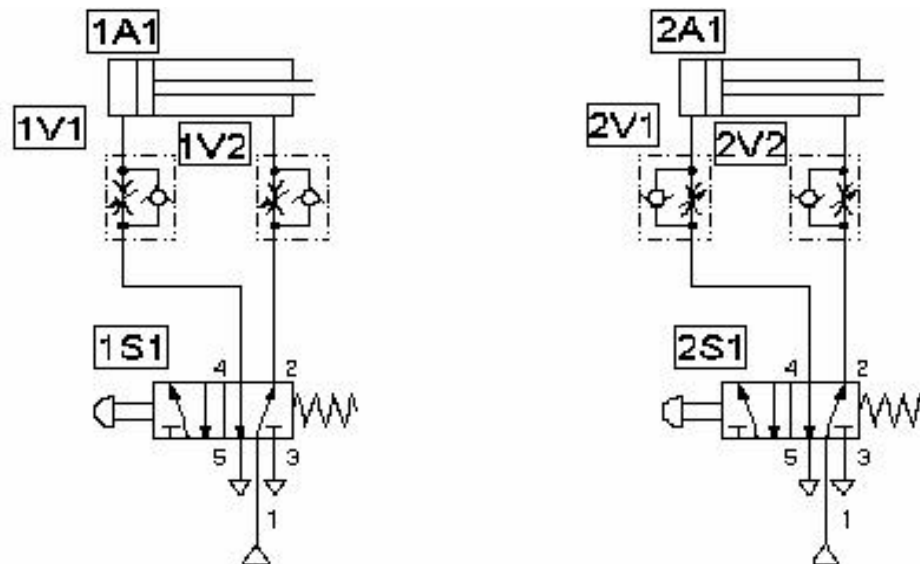


Figure 4A.5 Speed Control Valve

Stick Slip Effect

- There is a limitation in achieving smooth movement of cylinder with low speed setting of flow control valve. This results in jerky motion of piston which is called as the stick slip effect
- When the flow control valve is set for low flow rates, it takes considerable time for the supply air to build up to the required pressure [corresponding to the load]

behind the piston. Every time this pressure is reached, the piston jerks in the direction of motion which results in increase in cylinder volume. This further results in drop in pressure in the cylinder and the piston momentarily halts until the pressure build up takes place. This intermittent motion is called as the Stick Slip Effect

Quick Exhaust Valve

- In many applications especially with single acting cylinders, it is a common practice to increase the piston speed during retraction of the cylinder to save the cycle time
- This is carried out by incorporating a Quick exhaust valve.
- The Quick exhaust valve has essentially three ports
Supply port 1, is connected to the out put of the final control element (Directional control valve). The Output port, 2 of this valve is directly fitted on to the working port of cylinder. The exhaust port, 3 is left open to the atmosphere

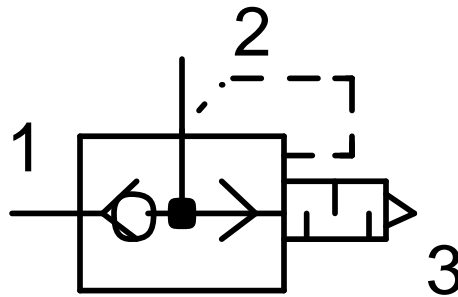


Figure 4A.6 Symbol for Quick Exhaust Valve

Forward Motion

During forward movement of piston, compressed air is directly admitted behind the piston through ports 1 and 2. Port 3 is closed due to the supply pressure acting on the diaphragm. Port 3 is usually provided with a silencer to minimise the noise due to exhaust.

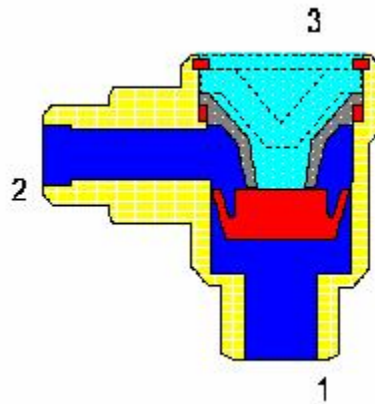


Figure 4A.7 Quick Exhaust Valve during Forward Motion

Return Motion

During return movement of piston, exhaust air from cylinder is directly exhausted to atmosphere through opening 3 (usually larger and fitted with silencer). Port 2 is sealed by the diaphragm. Thus exhaust air is not required to pass through long and narrow passages in the working line and final control valve

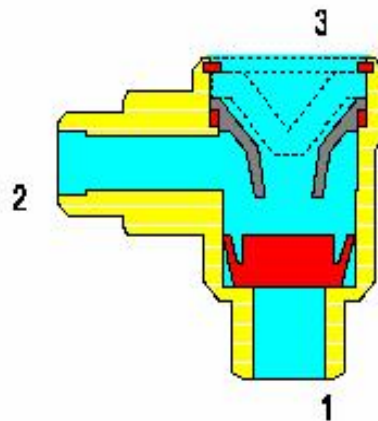


Figure 4A.8 Quick Exhaust Valve during Return Motion

Use of Quick Exhaust Valve

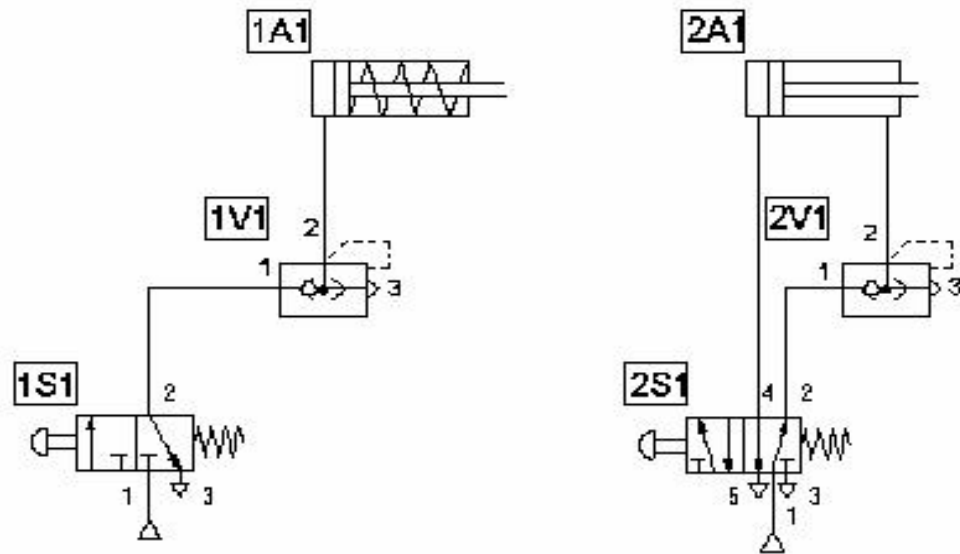


Figure 4A.9 Use of Quick Exhaust Valve

Example 4. 1

Liquid metal is drawn from a smelting crucible by a casting ladle and cast in moulds. The raising and lowering of the ladle is controlled by separate manual push buttons. The raising and lowering speed is separately adjustable. Design a Pneumatic control circuit for this application

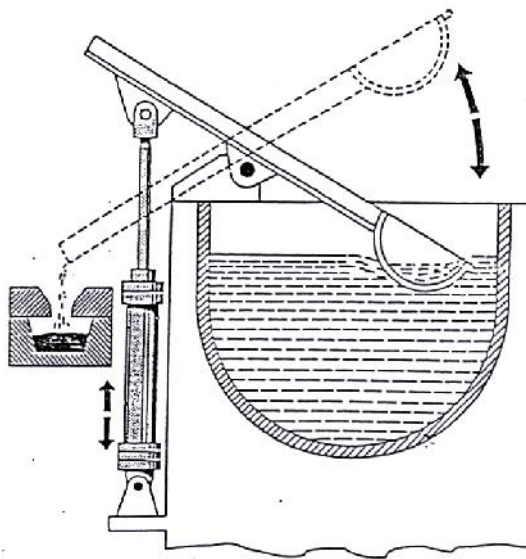


Figure 4A. 10 Casting Ladle Controlled by Cylinder

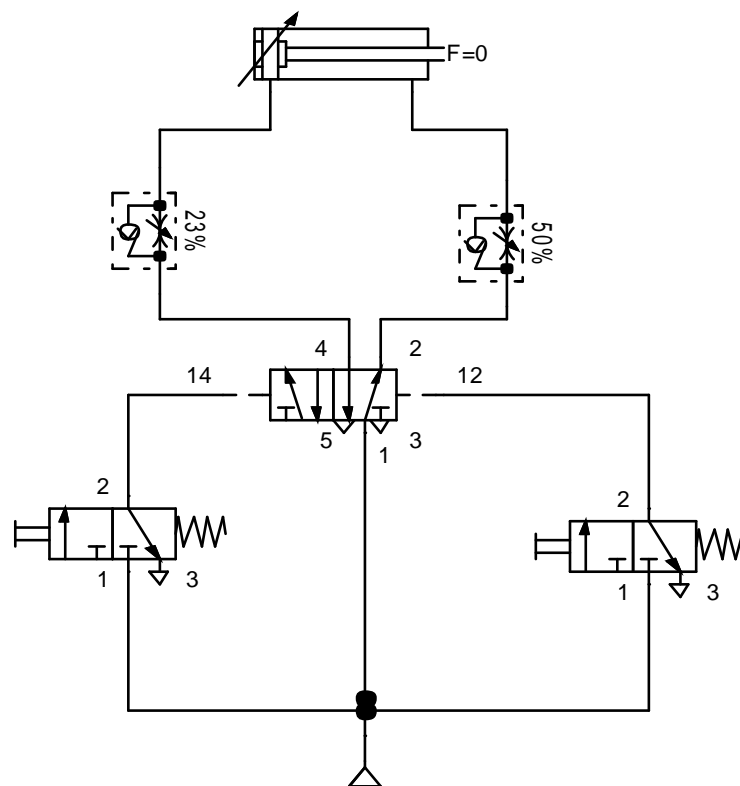


Figure 4A.11 Pneumatic Control for Casting Ladle