

ME 4232: Fluid Power Control Lab
University of Minnesota
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Lab 10: Sequencing Circuits

Objective

In many hydraulic operations, we would like to have one action happens after the completion of another. For example in a clamp-drill operation, the clamp must be activated before the drill is operated. Such "sequencing" can be achieved by the use of a sequence valve in a sequencing circuit. You will study the operation of sequence valves and their effectiveness in achieving proper sequencing in two different applications.

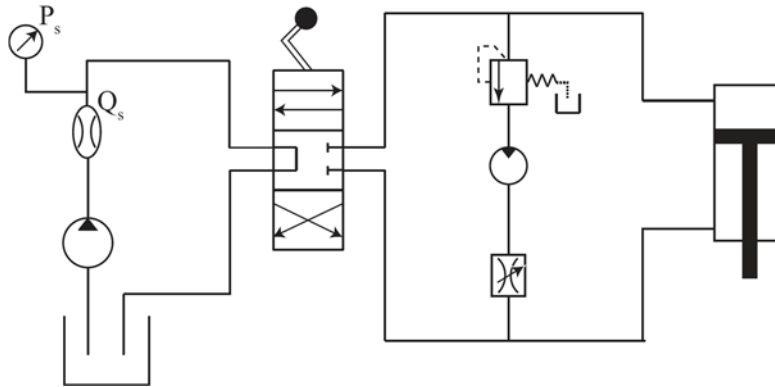


Fig 1: Sequence Valve Circuit

Pre-lab

Read about the construction and working of the sequence valves. Write a one-paragraph summary about how they differ from the relief valves. Also explain the circumstances when it is acceptable to replace a sequence valve with a relief valve.

Procedure

Simple Sequencing circuit

- Study the schematic in Fig. 1 and predict what the circuit will do.
- Construct the sequence valve circuit in Fig. 1 with the needle valve partially open. If we are interested in measuring the speed of the hydraulic motor, where should we place a flow meter?
- Add a flow meter to the circuit and observe the flow rate through the motor (and thus the speed of the motor) and the system pressure in relation to the position of the piston.
- Does the operation conform to the expected operation?
- Develop an experiment (using additional components if necessary, such as a relief valve) to investigate the maximum and minimum cracking pressure limits within which the sequence valve must be set in order for proper sequencing to occur.
- How are these limits affected, if at all, by the friction load on the cylinder, or the needle valve settings?

Bi-directional Sequencing circuit

- Predict the operation of the circuit in Fig. 2.
- Construct the circuit. Does it work the same way as your prediction? How do the sequence/relief valve settings affect its operation?
- Modify the circuit in Fig. 2 such that the cylinders extend and retract in the sequence i.e., design and verify a circuit whose sequencing can be described as “1212”

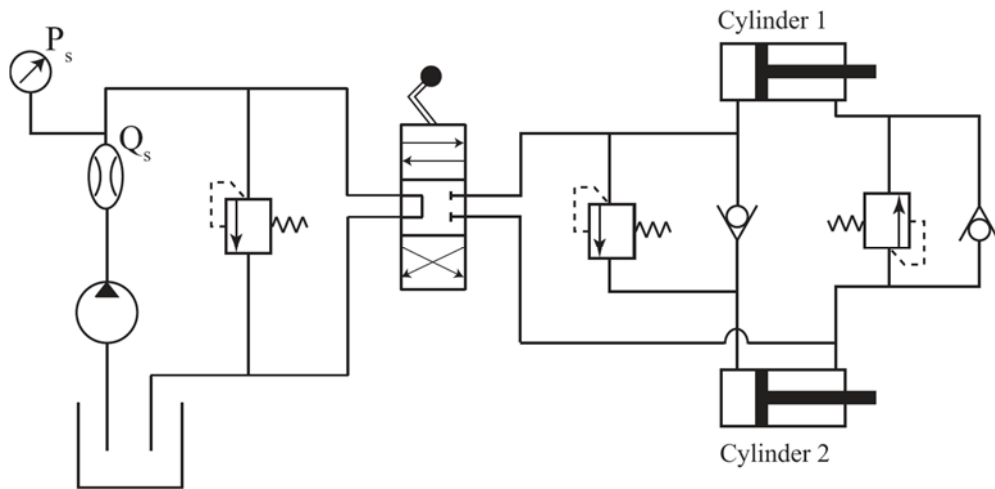


Fig. 2: 1212 - Bidirectional Sequence Circuit

Report

Your report should include the following

- The hypothesized operation of the simple sequencing circuit.
- A discussion on what the sequence valve settings should be in order to ensure proper sequencing
- A detailed explanation of the bi-directional sequence circuit given to you. How should the sequence/relief valves be set in order to ensure proper operation of the circuit?
- Show a sketch of the bidirectional sequence circuit to achieve the 1212 operation.