

UNIT - V

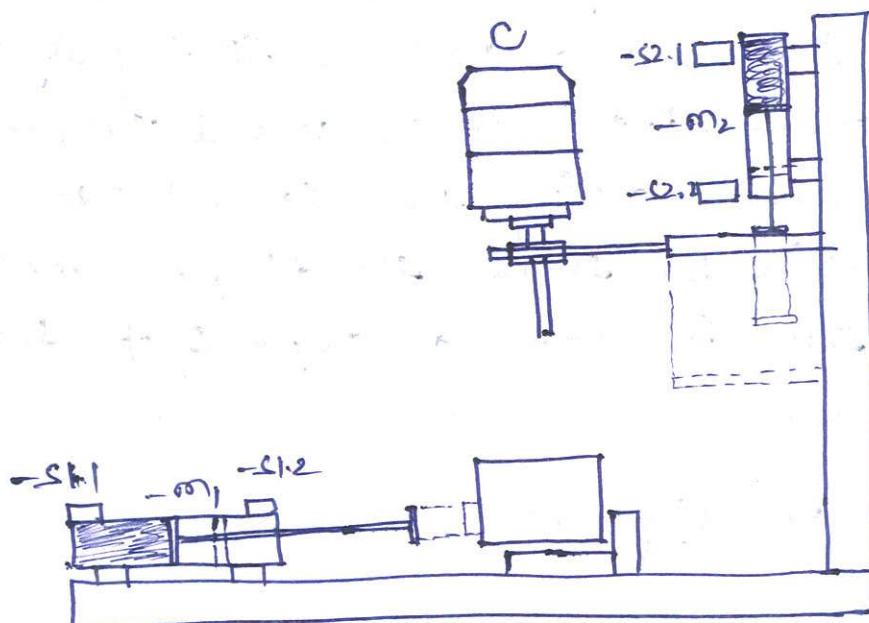
Example of typical procedure using displacement

i) principle of a displacement diagram

A displacement diagram (a) displacement step diagram illustrates how the sequence of movements of an electro-pneumatic control system function in a clear and easily understood fashion. The individual movements of all the working components are plotted along an axis that shows the individual steps. Although such functional diagrams are no longer included in the standards, they are still used frequently in practice. They are particularly useful for simple circuits without too many control sequences.

Example :-

The following animation shows the example of a drilling machine with pneumatic cylinders (m_1 and m_2), each equipped with two limit switches ($s_{1.1}/s_{1.2}$ and $s_{2.1}/s_{2.2}$)



To start with, both cylinders are in their retracted position, i.e. retracted. The drilling machine receives four steps.

(1) Extend cylinder m_1 (clamp the workpiece)

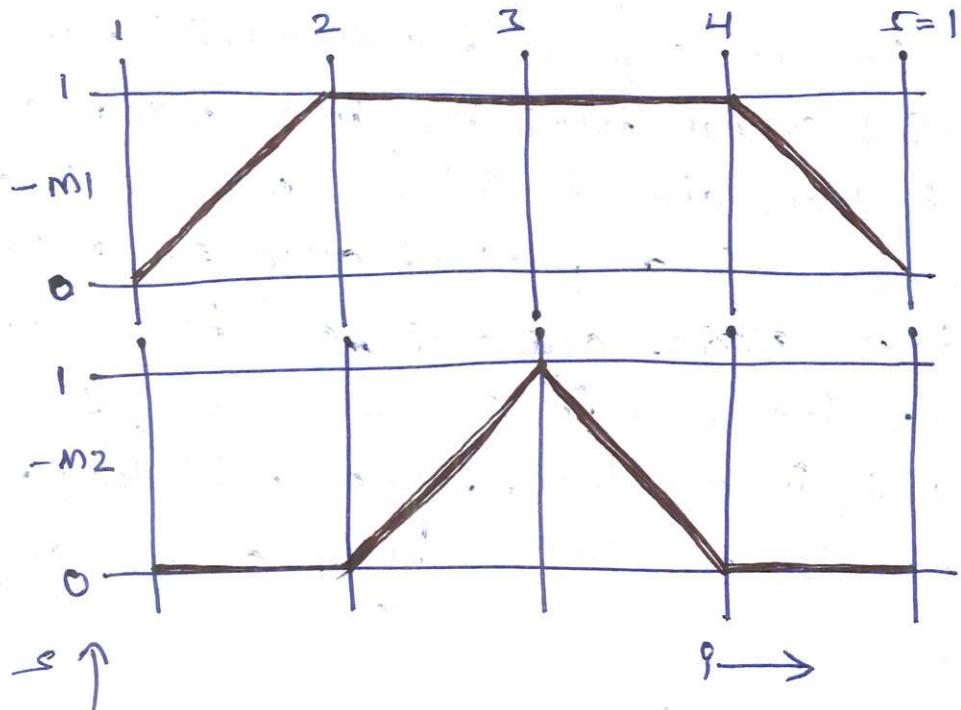
(2) Extend cylinder m_2 (drill the workpiece)

(3) retract cylinder m_2 (raise the drill)

(4) retract cylinder m_1 (release the workpiece)

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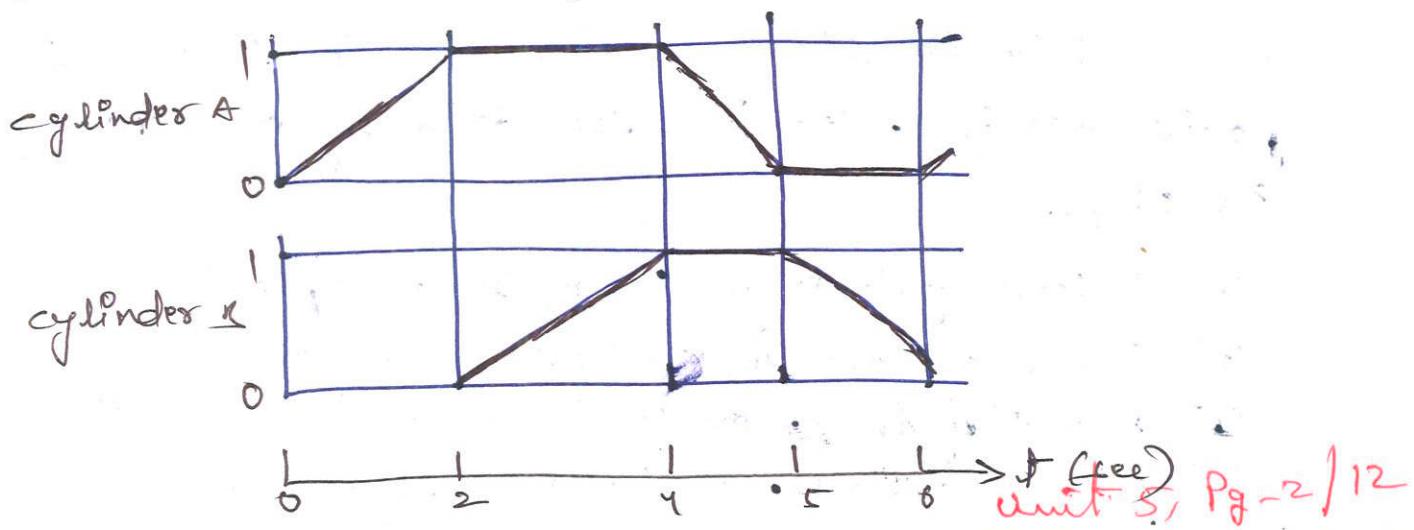
The displacement step diagram shows the movement of the cylinders or the piston plotted along the step axis. The example above produces the following diagram



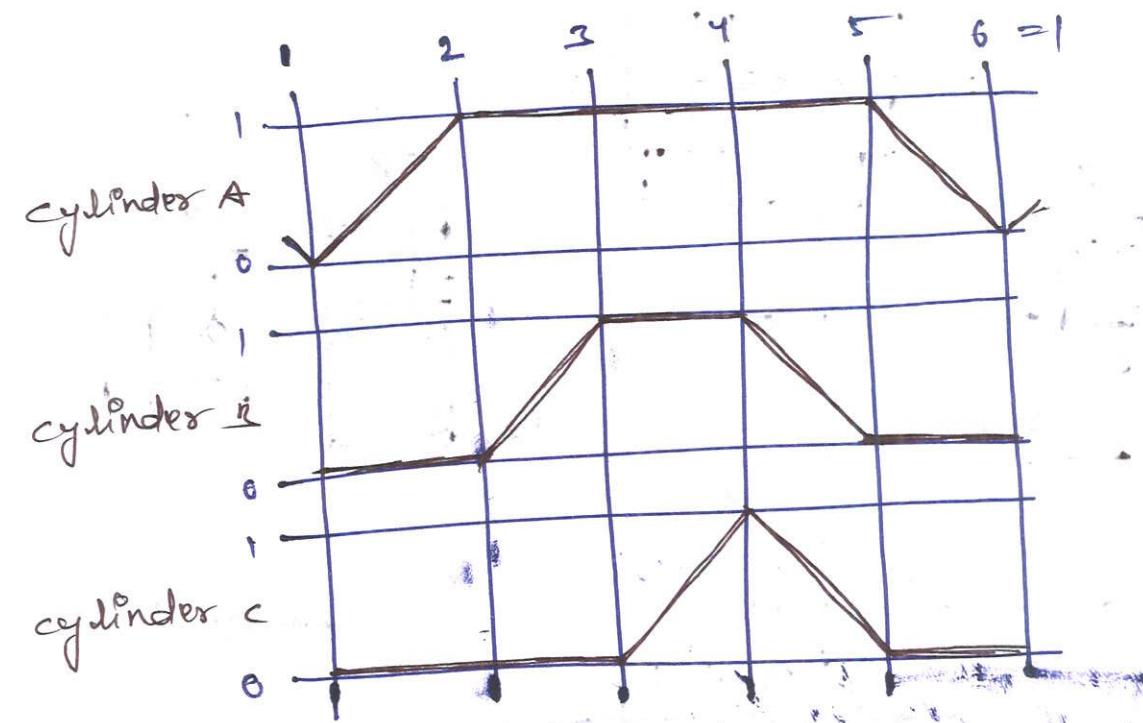
The x-axis has the number of each step (labelled on the instance) while the y-axis has the position of each cylinder entered, m_1 (top, red curve) and m_2 (bottom green curve). A value of 0 implies that the cylinder is fully retracted and a value of 1 means it is fully extended at constant speed, i.e. remaining until step 4. cylinder m_2 extends during the second step and retracts again during the third. the displacement step diagram thus includes all aspects of the sequence of movements

Time and travel-step diagrams

Displacement time diagram

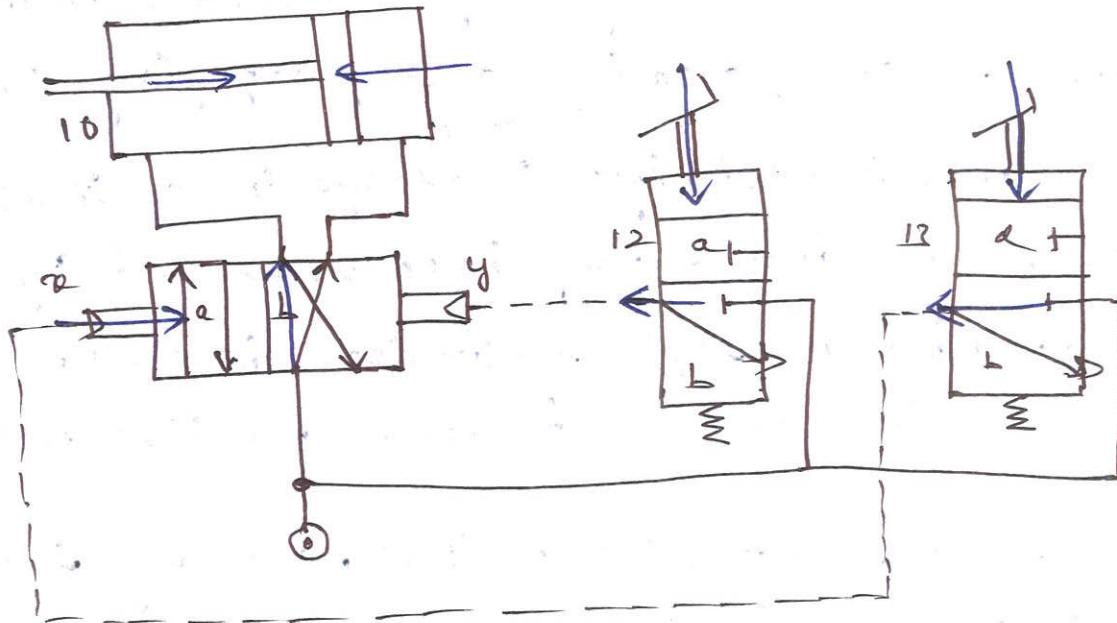


displacement - step diagram



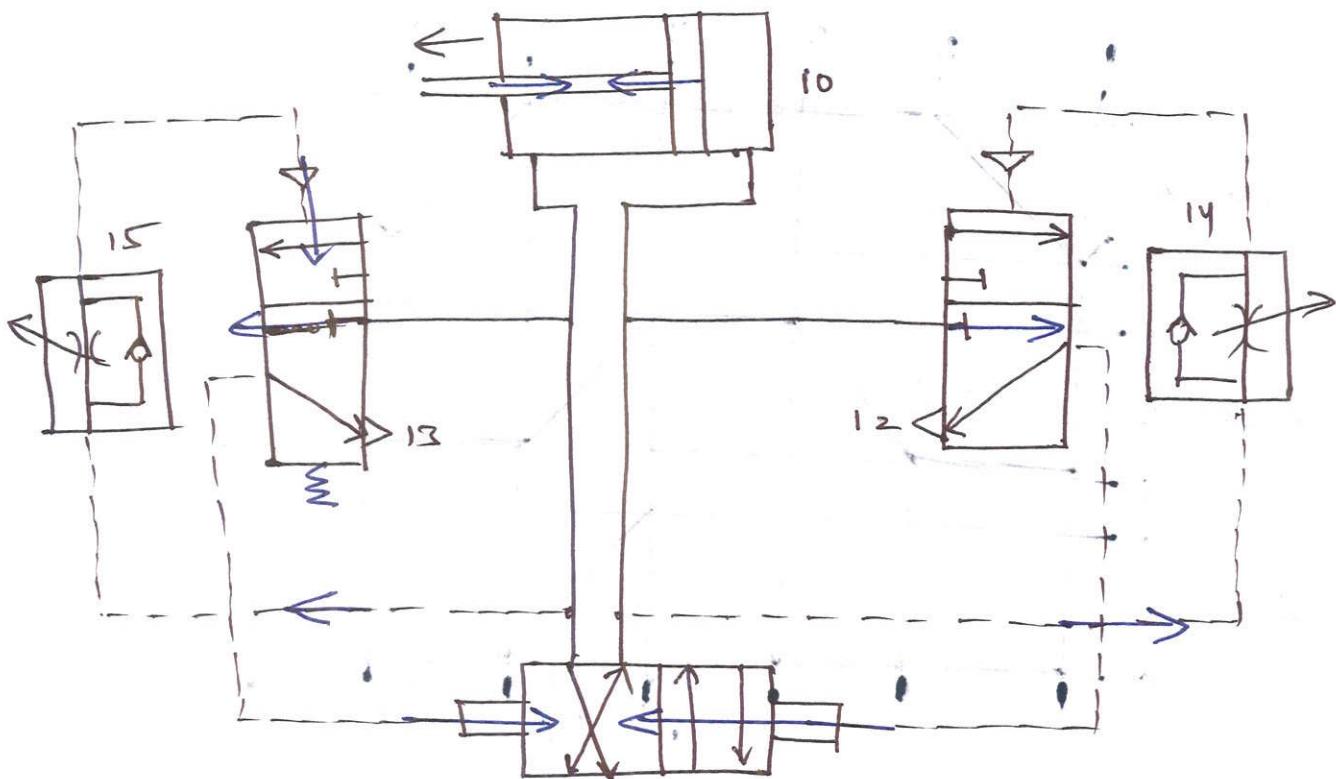
Will-dependent control

The impulses for reversing the main control valve is generated through the manually or pedal-operated pre-control valves.



Time dependent control

This addition two throttle check valves, with which a sequence delay can be set up



Electro-pneumatic control valve

Electro-pneumatic is now commonly used in many areas of industrial low cost automation. They are also used extensively in production, assembly, pharmaceutical, chemical and packaging systems.

There is a significant change in control system. Relays have increasingly been replaced by the programmable logic controllers. In order to meet the growing demand for more flexible automation in electro-pneumatic controls, mainly three important steps are involved:

* Signal input devices

Signal generation such as switches and contactors, various types of contact and proximity sensors.

* Signal processing -

use of combination of contactors or relay

more applications of fluid power

- * agriculture
- * automobile
- * aviation
- * construction industry/equipment
- * defense
- * fabrication industry
- * food and beverage
- * foundry
- * glass industry
- * hazardous waste areas
- * instrumentation
- * jigs and fixtures
- * machine tools
- * materials handling
- * medical
- * movies
- * mining
- * open trade
- * printing industry
- * robots
- * ships
- * telephones
- * under sea
- * wood working

Applications of fluid power systems

Applications in assembly

solenoids, after coolers, air compressors, air dryers,
air line lubricators, condensate, software, eg. binders
holders, valves / regulators / filters, fittings, gauges,
grips, hose, manifolds, molers, moffles, regulators
rotary solenoids, scale, shock absorbers, slides
suspension tubing, vacuum pressure tanks

The applications of stationary hydraulics are as follows

- * production and assembly of vehicles of all types
- * machine tools and transfer lines
- * lifting and conveying devices
- * metal forming presses
- * plastic machinery such as injection-molding machines
- * rolling machines
- * lifts
- * food processing machinery
- * automatic handling equipment and mobile

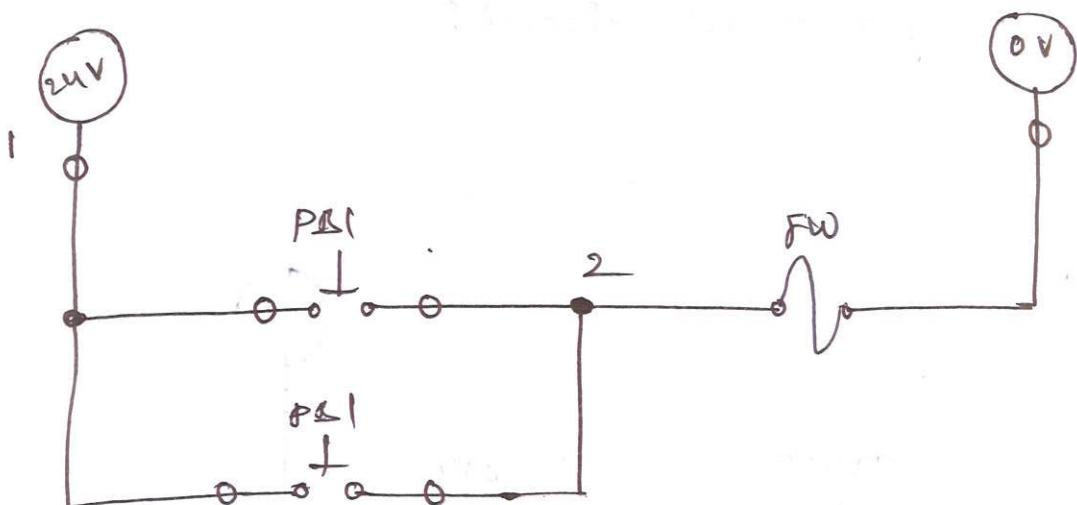
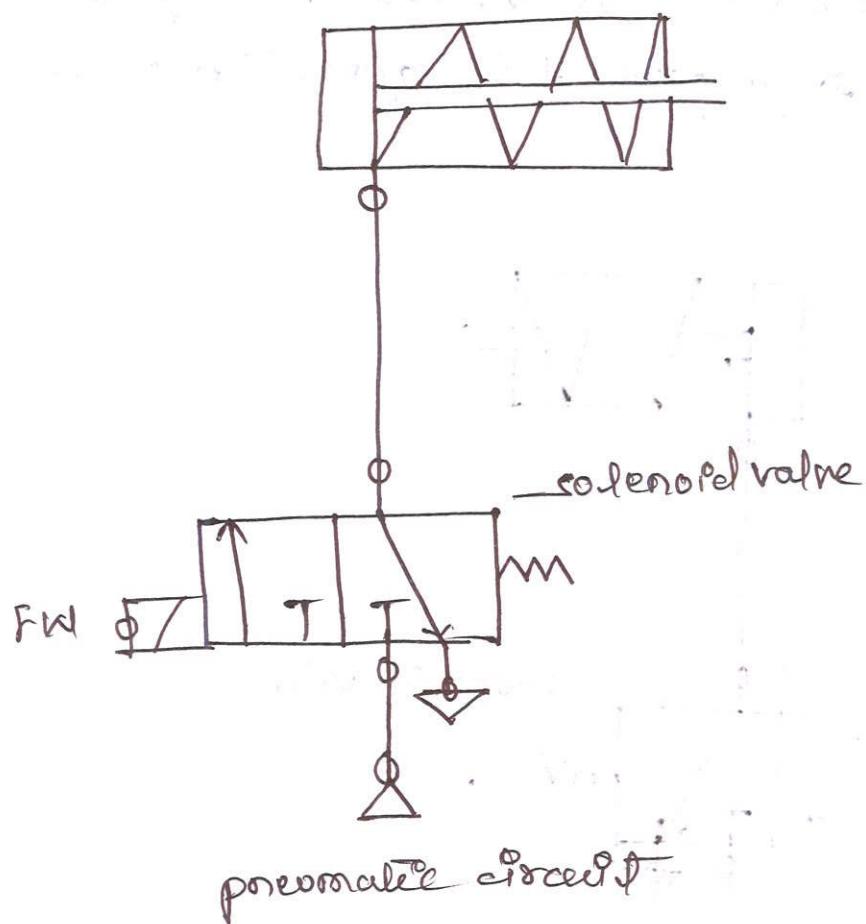
mobile hydraulics

- * automobiles, tractors, aeroplanes, marine, boats etc.
- * construction machinery
- * grippers, excavators and elevating platforms
- * lifting and conveying devices
- * agricultural machinery

Example (2)

(2) Design an electro-pneumatic circuit such that a single acting cylinder will advance upon pressing on electrical push buttons 'PB1' or 'PB2' and will retract upon releasing both of them.

(use 3/2 solenoid activated - spring retained control)

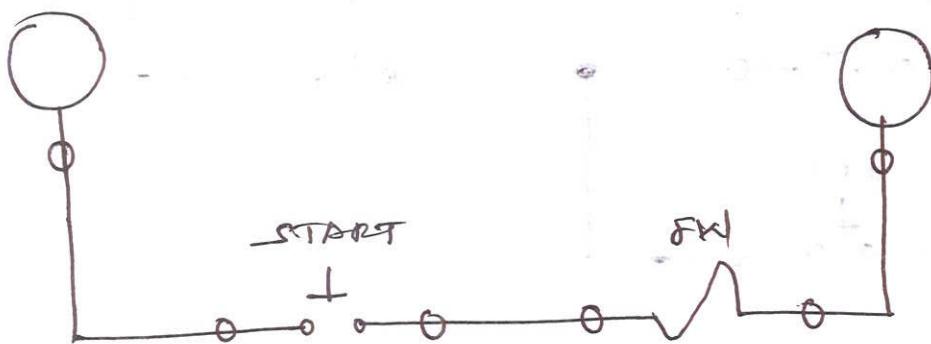
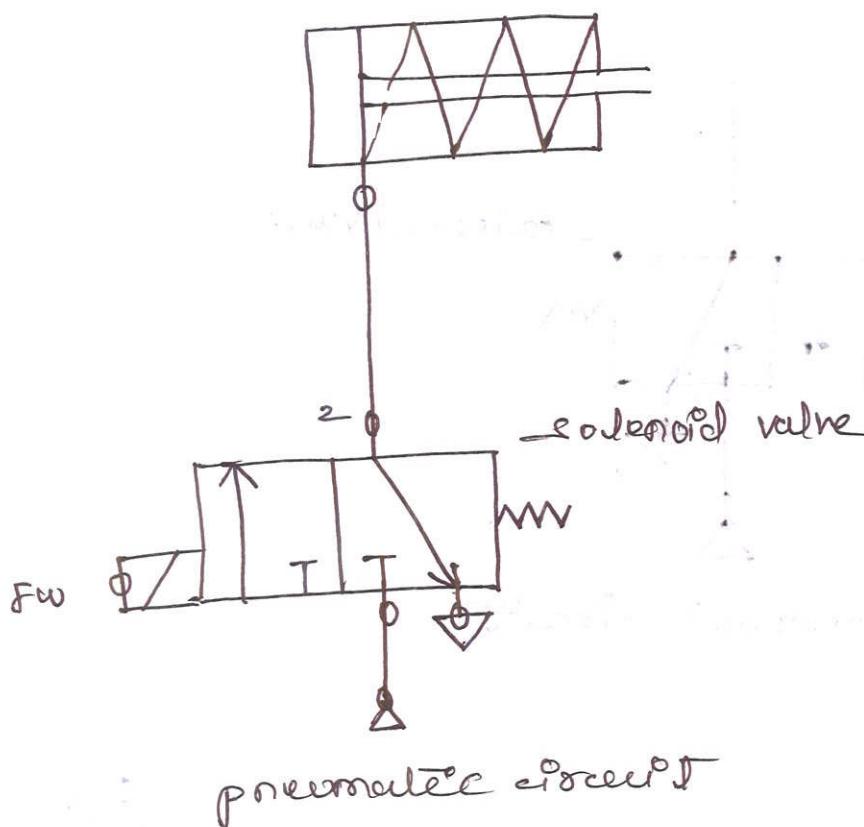


Ladder diagram

examples of ladder diagrams

- 1) Design an electro-pneumatic circuit such that a single acting cylinder will advance upon pressing an electrical push button "START" and will retract upon releasing it (use a $\frac{3}{2}$ - solenoid actuated spring returned control valve)

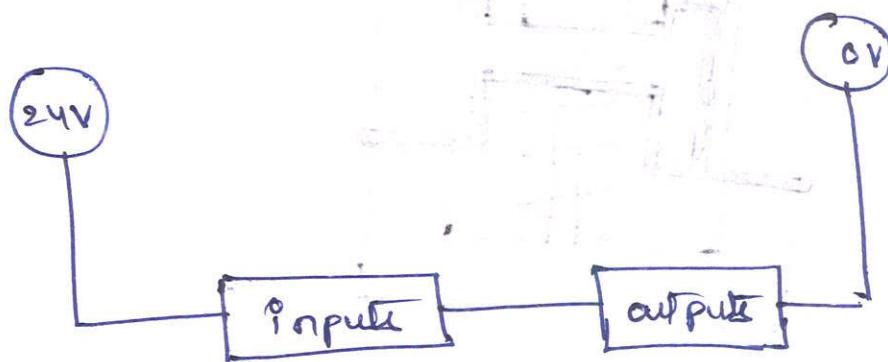
The pneumatic circuit, ladder diagram and parts list needed to perform these operations are shown below.



Ladder diagram

Ladder diagram

Ladder diagram is an important concept not at electro-pneumatic systems, but also at PLC. Each ladder diagram is constructed from input switches and output relays that lie between the positive and negative power lines. The order of elements in a ladder diagram is shown in below.

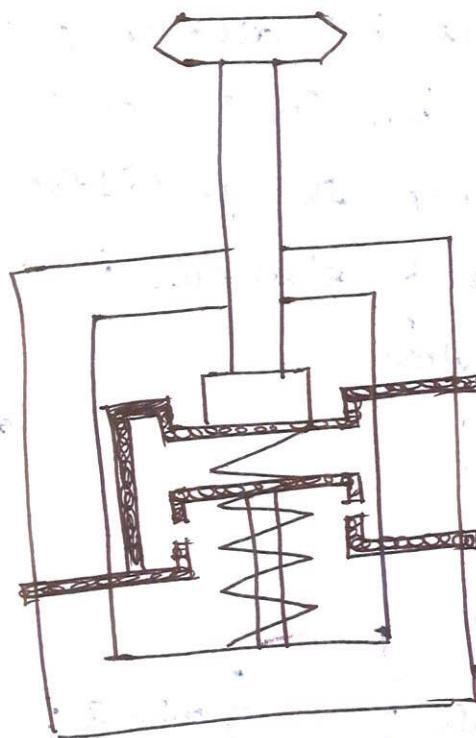


Ladder diagram main components

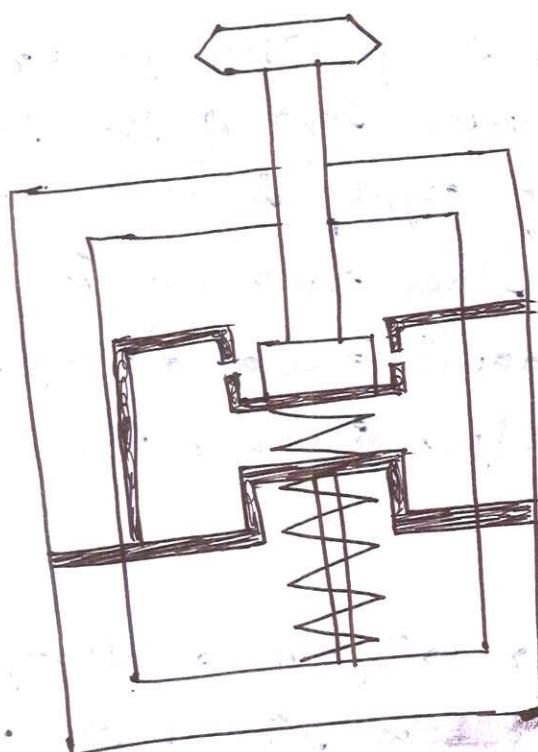
In the above, the positive power line of the supply is on the extreme left of the ladder, while the negative line of supply is on the extreme right. Between the power lines come the inputs and outputs. Each line the ladder is called a "rung". Each rung may contain only one output. In order the outputs are parallel.

Outputs in a ladder diagram are always at the right just before the negative line of the power supply. mainly we want the current to flow from the negative positive line to the negative line through the output in order for it to be activated. Outputs in ladder diagrams are mainly relays in operation. so let's discuss the principle of operation.

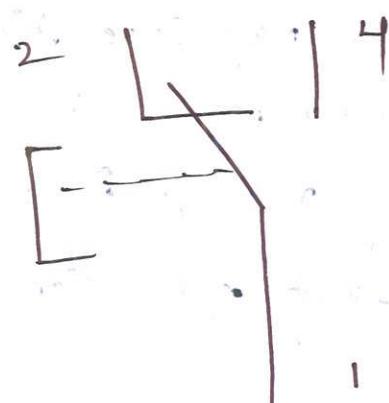
change over (co)



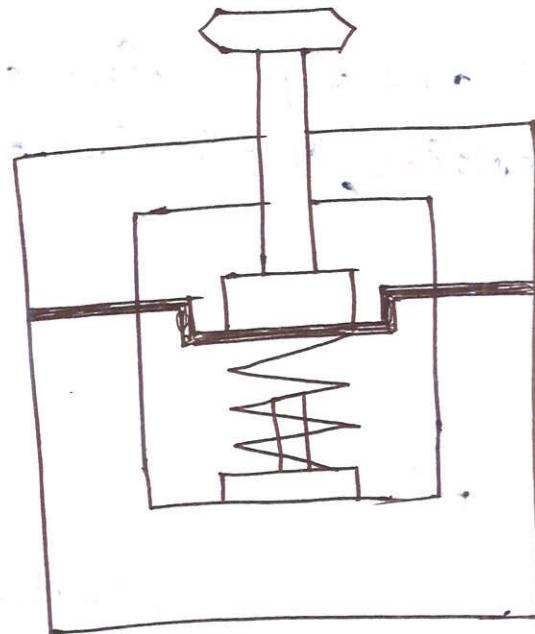
Normal position



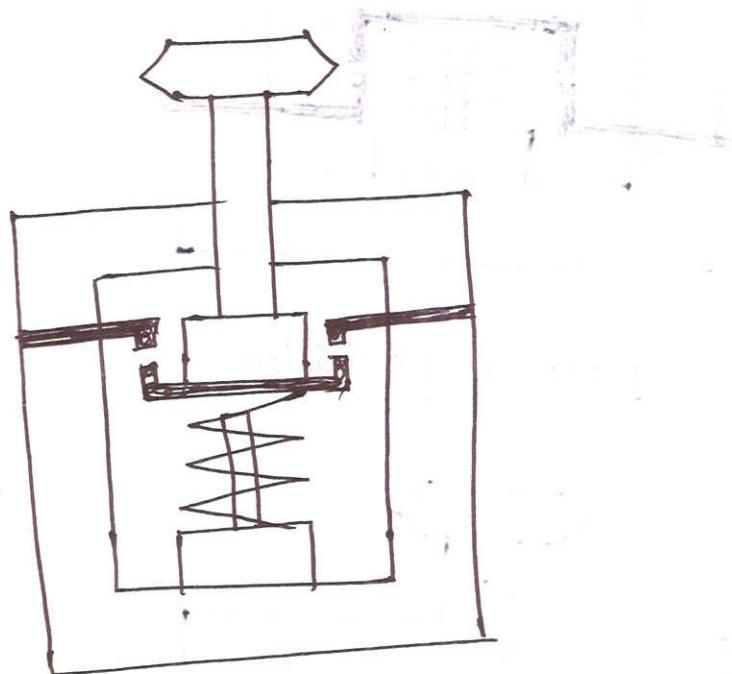
Activated position



Normally closed (Nc)



Normal position



Activated position



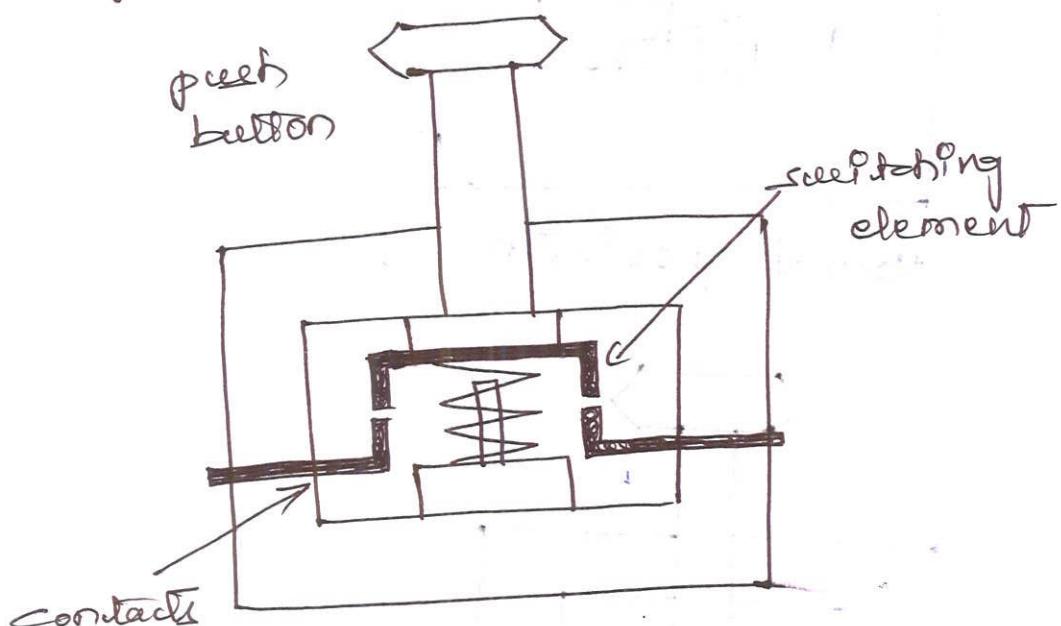
→ symbol

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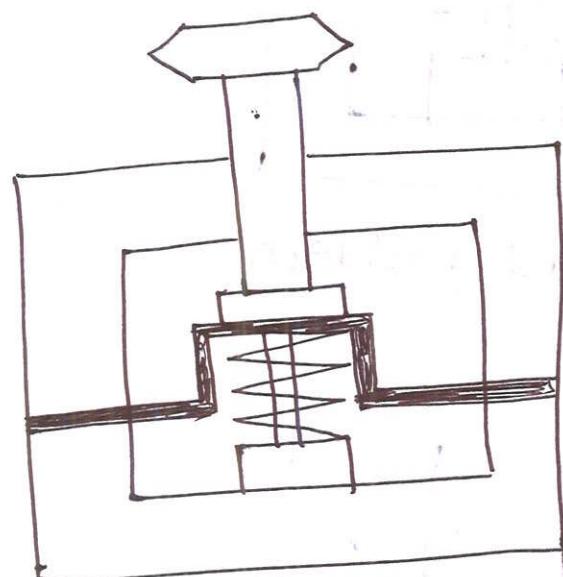
using programmable logic controllers
signal output.

output obtained after processing desired for
activation of solenoids, indicators or audible
alarms.

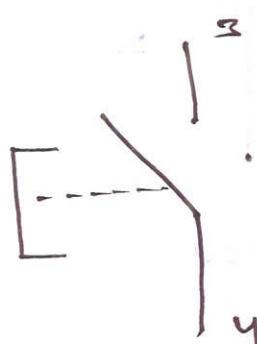
Normally open (ON)



Normal position



Deactivated position



symbol

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