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作品名稱

Prototype Educational resources for teaching basic pneumatic

得獎獎項

四等獎

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INTRODUCTION

The didactic prototype for the teaching of the pneumatic Basic is designed, so teachers can instruct knowledgement of pneumatics focused to identification, handling and application of its elements based on constructivist theory in which the student learns making, working on projects and in a collaborative way. This implies that his presentation should include the basic elements to be used in this study area, as well as allowing that the student can interact with it, still easy to use, and take them by the teacher into his area of education, which can be a classroom, room, Auditorium, workshop, lab, and even training courses to the industry, the only thing that requires is compressed air (2 to 4 bars). As well as, to create a secure environment for the user when this is manipulating.

Its construction based on a compact, lightweight and ergonomic, structure to ensure that it can be transported without difficulty. Also that must comply with the minimum essential to enable the student to acquire competencies in the curriculum which consider the identification, handling and application of pneumatic elements; IE has the following 2 directional valves 3/2 NC, 1 directional valve 3/2 NC-operated with a knob, 2 valves 3/2 pneumatic drive, a 5/2 valve NC NC of stable pneumatic drive, 1 valve of simultaneity or function, and 1 valve selector or function, or double effect with pressure regulator piston1 piston of double effect, 1 piston for simple effect, 1 valve 3/2 NC with motorized drive and roller.

INDEX

Reminder

What is air?

It is the technology that uses compressed air as a mode of transmission of the energy needed to move and operate mechanisms. Air is an elastic material and therefore, to apply a force, compressed, keep this compression and will return the accumulated energy when allowed to expand, according to the law of ideal gases.

Pneumatic energy: differential air pressure used to cause movement in different systems (to inflate tires and or put systems in motion).

Today there are many technical systems which based its operation in this type of energy. For example, the doors of some buses and trains are operated with compressed air; industry pneumatic systems are very useful because they provide linear motion and develop large forces to be used to push and lift heavy loads on networks of automated Assembly, etc.

In pneumatic systems compressed air is produced in an element named compressor, which is a compressed air pump-usually powered by an electric motor. This air is stored in a tank known receiver, from this, air is led through valves to cylinders, which are the components responsible for the work.

When compressed air flows into the inside of a cylinder, increases the pressure and forced to move to a plunger located inside, and providing a linear motion and doing a job.

Valves mission is flow control for compressed air into and out the cylinders. Valves are elements for controlling the circuit.

Objective:

Facilitate the teaching of basic pneumatics components at not very high cost to the student and which function like the trademark and in the same way components provide teachers the tools needed to teach more didactic and understandable for students.

Principles of Control.

System	Inputs	Processing of	Conversion	Outputs
Pneumatic / Pneumatic	-2/3 Valve manual action, etc.	-"OR" valve -"AND" valve		Linear or rotary actuators

Components of the prototype:

1 compressor.

1 maintenance unit.

2 manually operated button type fungus 3/2 directional valves NC.

1 directional valve manually operated with a knob 3/2 NC.

2 pneumatically operated 3/2 directional valves NC.

1 bi-directional valve for pneumatically operated 5/2 NC.

1 control valve selector or function "O"

1 simultaneity or function control valve "Y".

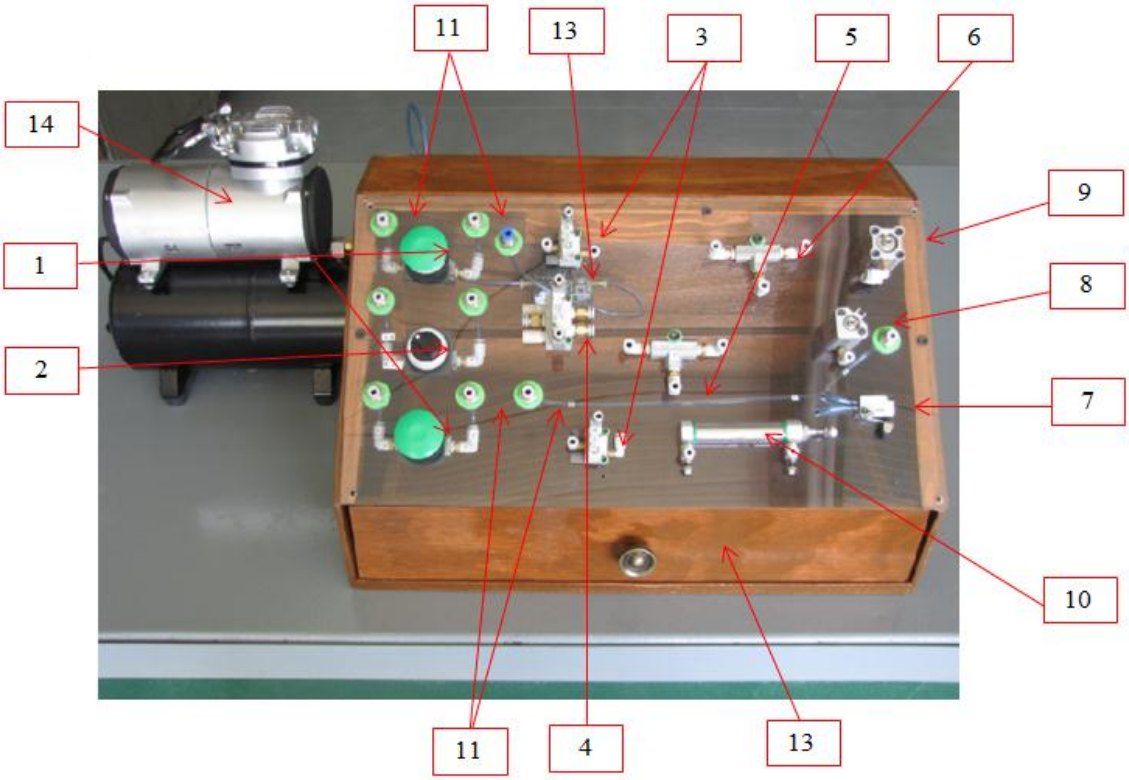
1 single piston

1 double effect piston.

1 piston of double effect with air pressure regulating valve.

1 mechanical drive 3/2 directional valve NC

Prototype :



Item	Description
1	3 port air operated valve N.C., manual operation (push button “Mushroom”).
2	3 port air operated valve N.C., manual operation (Twist selector).
3	3 port air operated valve N.C. (single pilot).
4	5 port air operated valve (double pilot).
5	“OR” Valve (3 ported check valve with one output and 2 pneumatic signal and input ports).
6	“AND” Valve (3 ported relay valve with one output and 2 pneumatic signal and input ports).
7	3 port air operated valve N.C., mechanical operation (Roller lever).
8	Single acting air cylinder.
9	Double acting air cylinder.
10	Double acting air cylinder with flow regulator and check valve.
11	Connectors passing walls (4 mm).
12	Modular Unit (Mist Separator, Filter Regulator and Lubricator).
13	Multipurpose drawer.
14	Compressor.

Compressor:

A compressor is a fluid which is built to increase the pressure and move some kind of compressible fluid, as gases and vapors. This is done through an exchange of energy between the machine and the fluid in which the work exerted by the compressor is transferred to the substance which passes by, becoming in energy flow, increasing its pressure and kinetic energy to drive it to flow.

How does it work?

Making ambient air, entering the piston through the inlet valve, this it compresses, escaping by the exhaust as a compressed air valve. They deal with air as working fluid is more compressible gas there.

Maintenance unit (Modular Unit)

Maintenance:

Preventive or corrective maintenance will help extend the life of the training prototype.

“maintenance unit”

It is used to maintain the pneumatic elements, and regulate the air pressure so that the devices are not damaged and its life term is longer.

How to used it:

To regulate air: the maintenance unit is a pressure regulator.

It is used moving the black handle of the upper part both to the left to decrease air pressure and to the right to increase the air pressure.

Maintenance items:

Extraction of water: usually when extracting the oxygen of the atmosphere, it contains water which at time of going through the elements are rusting in time.

In Maintenance unit there is a filter in its lower part to transfer air, water is trapped in a bottle.

As empty tank:

The deposit contains a knob that can be loosen by hand (do not use pliers or other object but hands), let water goes out from tank.

Lubrication of elements: on the other side the first bottle is another small bottle,

This is deposited oil, which at the time of passing air pressure is part of the oil and goes through hoses lubricating elements and avoid dry and throw to lose.

(a) How to insert the oil:

At the top is a small mechanical element with entry flat or Palau. When it is turned loose can be opened so you can insert the necessary oil in the output.

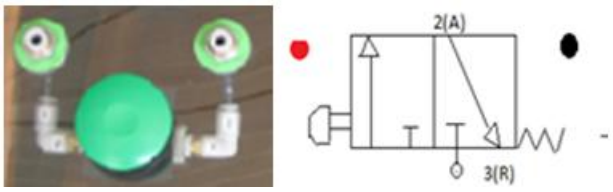
Port Air Valves 2/3 NC:

3 port air operated valve N.C., manual operation (push button "Mushroom") :

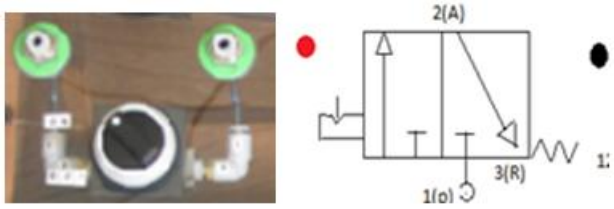
Known as manually operated because we have to apply force to make it work, these valves are 2/3 because it has two positions and three ports or accesses, that it is normally closed, this means that in its current state it does move air.

The ports can be listed with the 1, 2 and 3 or the letters P, A. and r. The via 1 or "P" is the pressure of air, the path entry 2 or that it can be represented with the letter A is the flow of air to our components of control and/or work and the way 3 or the way r is air exhaust.

There are two types of manually operated valves, one is the button type Mushroom, called thus by the circular shape that has the button.



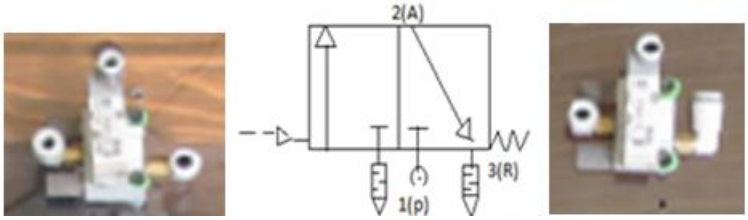
3 port air operated valve N.C., manual operation (Twist selector):



3 port air operated valve N.C. (single pilot):

They are called directional because route flowing air, these valves are pneumatic, this means that we have to give air pressure to work. They are 2/3 because it has 2 two positions and 3 ports or access.

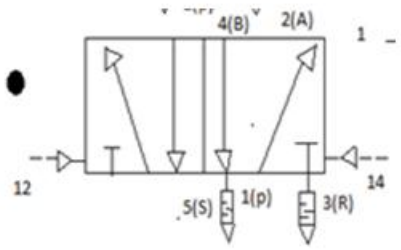
The valves manually operated access are represented with number 1, 2, 3 or with the letters P, A, r as had mentioned it, the port 1 (P) is the entry of air, the way pressure 2(A) is the flow of air to work element and the path components 3(r) is the escape of air.



5 port air operated valve (double pilot):

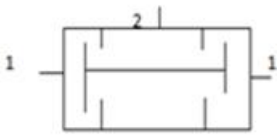
These valves are called bidirectional because gives 2 ways for air flow direction, they are valves for pneumatically operated (that works when we apply air pressure), 2/5 because it has two positions and 5 ports.

5 access of this valve, it can be represented with number them 1, 2, 3, 4, and 5 or with the letters P, A, B, r and t, the port 1 (P) is the entry of air pressure, ports 2 and 4 which are even numbers (A and B) are the flow of air to our working components and ports 3 and 5 which are odd numbers (r and t) is the escape of air.



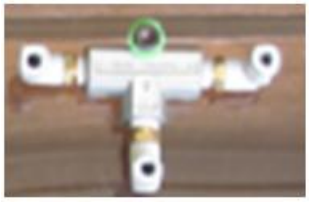
Control valves “AND” Valve (3 ported relay valves with one output and 2 pneumatic signal and input ports):

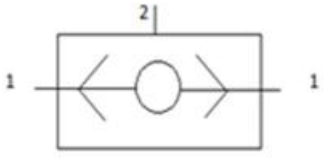
The operation of these valves is not difficult to understand, they function as an "AND” gate, this means that we must apply pressure on both tracks of the valve and so go the flow of air through the valve.



Control valve “OR” Valve (3 ported check valve with one output and 2 pneumatic signal and input ports) :

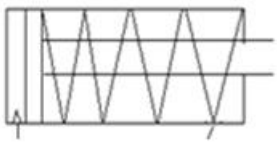
The valve “OR” works as a gate. “OR” means just give it air pressure in one of its two ports going out the airflow of the valve.





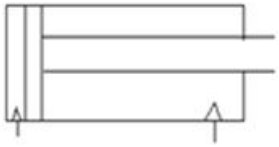
Single acting air cylinder:

The single acting air cylinder works when gets air pressure on its ports and so that the air returns to its home, the piston has an inner spring and when we stop giving air pressure, the spring makes air back to its current state.



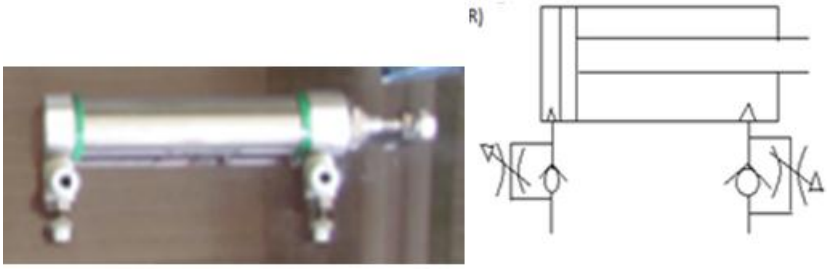
Double acting air cylinder:

Unlike the single piston this piston does not have a spring in its interior and air back to its current state we have to give air pressure on the opposite side of its primer port (where you find the single piston spring), in a nutshell this piston has two access a get out the air of the cylinder and the other so that air of the piston returns to its current state.



Double acting air cylinder with flow regulator and check valve:

This cylinder works in the same way that the previous piston, the only difference is that this piston has two valves to air flow regulation and check valve that is so that the air of the cylinder goes faster or lower.



3 port air operated valve N.C., mechanical operation (Roller lever):

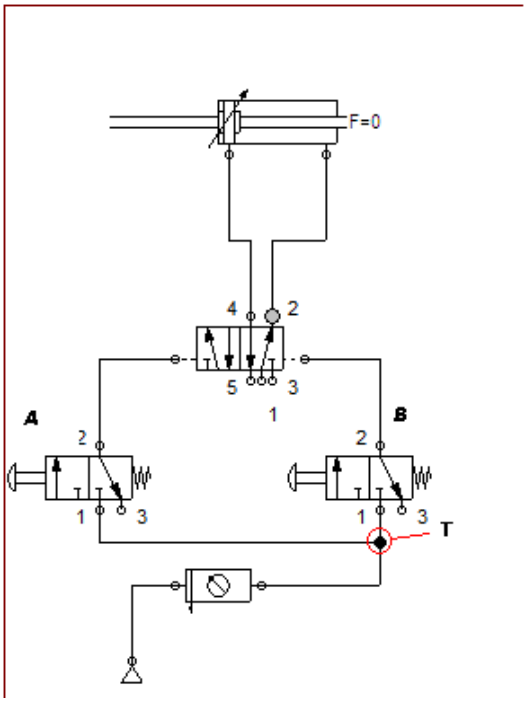
It is called mechanical drive because it works with a roller lever. It has three ports and two positions. The port one (P) is way or the path to entrance of air pressure, the port 2 or via A which is the output of air flow and via 3 or P which is where it leaves the air pressure. It is normally closed by that in its current state will not let out the air flow.

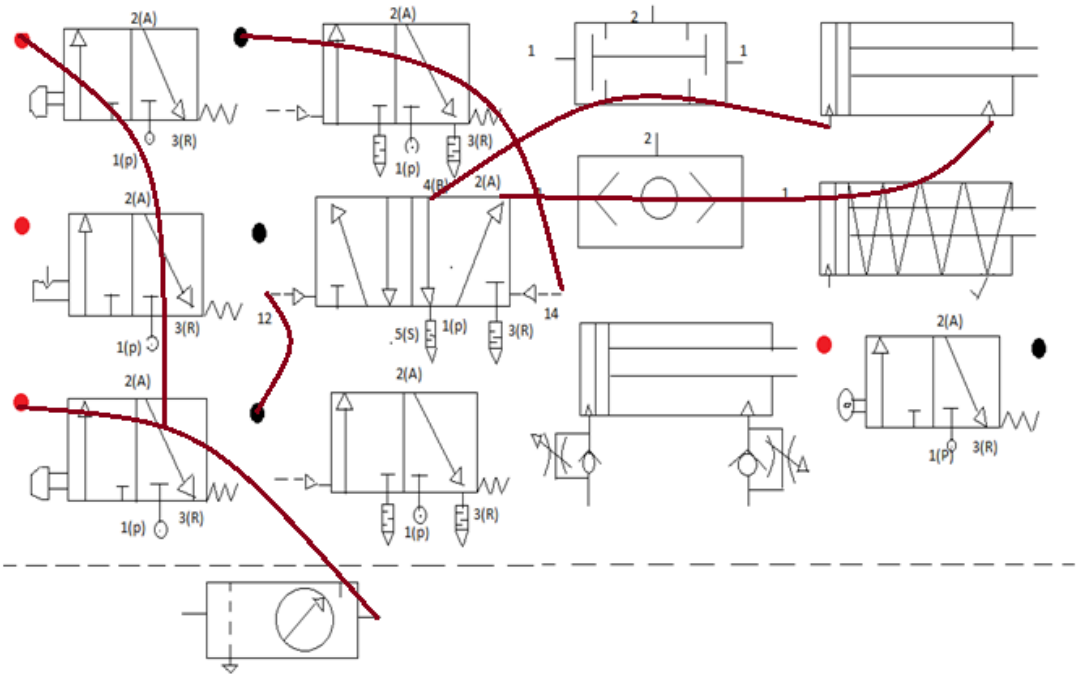
Practices

Exercise 1.- In this practice, we will use a double effect piston, a two-way valve for pneumatically operated 2/5, 2 valve manually operated button type mushroom 2/3 NC a compressor, a maintenance unit, a “Tee” and hoses.

First thing that would do is identify the components in our prototype, then is analyzing the diagram you can see down and says that the compressor is dispatched with a hose to the maintenance and the maintenance unit is blanket to our two manually operated 2/3 valves NC and as a unit of keeping has only a way to connect a hose and need another to send to each valve hose We will use a “Tee” that will send wing via the valves manually operated and port 12 (pilot) will send them to 2/5 pneumatic, and finally access 2 and 4 send with a hose to our labor component which is our double effect piston.

How is it work? When we press the valve A the piston must come out and so he returns to his current state we have to press the valve B.





Exercise 2.- The material used will be: a maintenance unit, a compressor 2 valves manually operated button type fungus 2/3 NC, a selecting valve or valve "OR", a single acting air cylinder, hoses and a T.

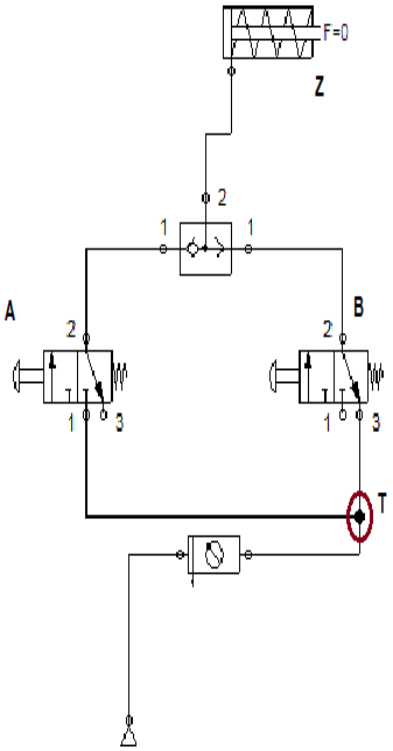
First connect the compressor with the entrance of maintenance unit (modular unit) with a hose and the output of the modular unit the send another hose to routes 1 manually operated valves and so you have two exits maintenance unit will use a T and port 2 of these same valves send them to valve or and output is the valve we send to our component of work that is the single acting air cylinder.

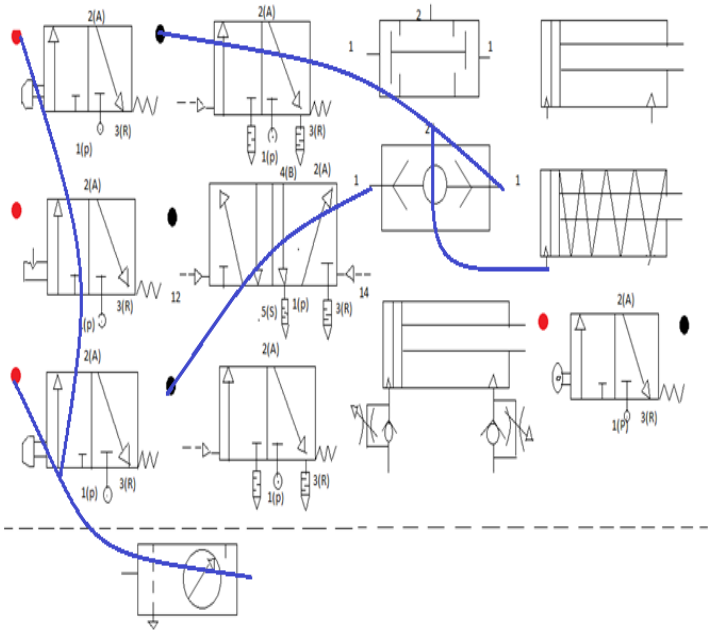
The operation of this practice is as follows:

The valve or works as a gate "OR" this means that I press any of the two manually operated valves the piston rod is going to go out and so he returns to his current state we have to let him give air pressure the single piston has a spring.

"OR"

A	B	Z
0	0	0
0	1	1
1	0	1
1	1	1



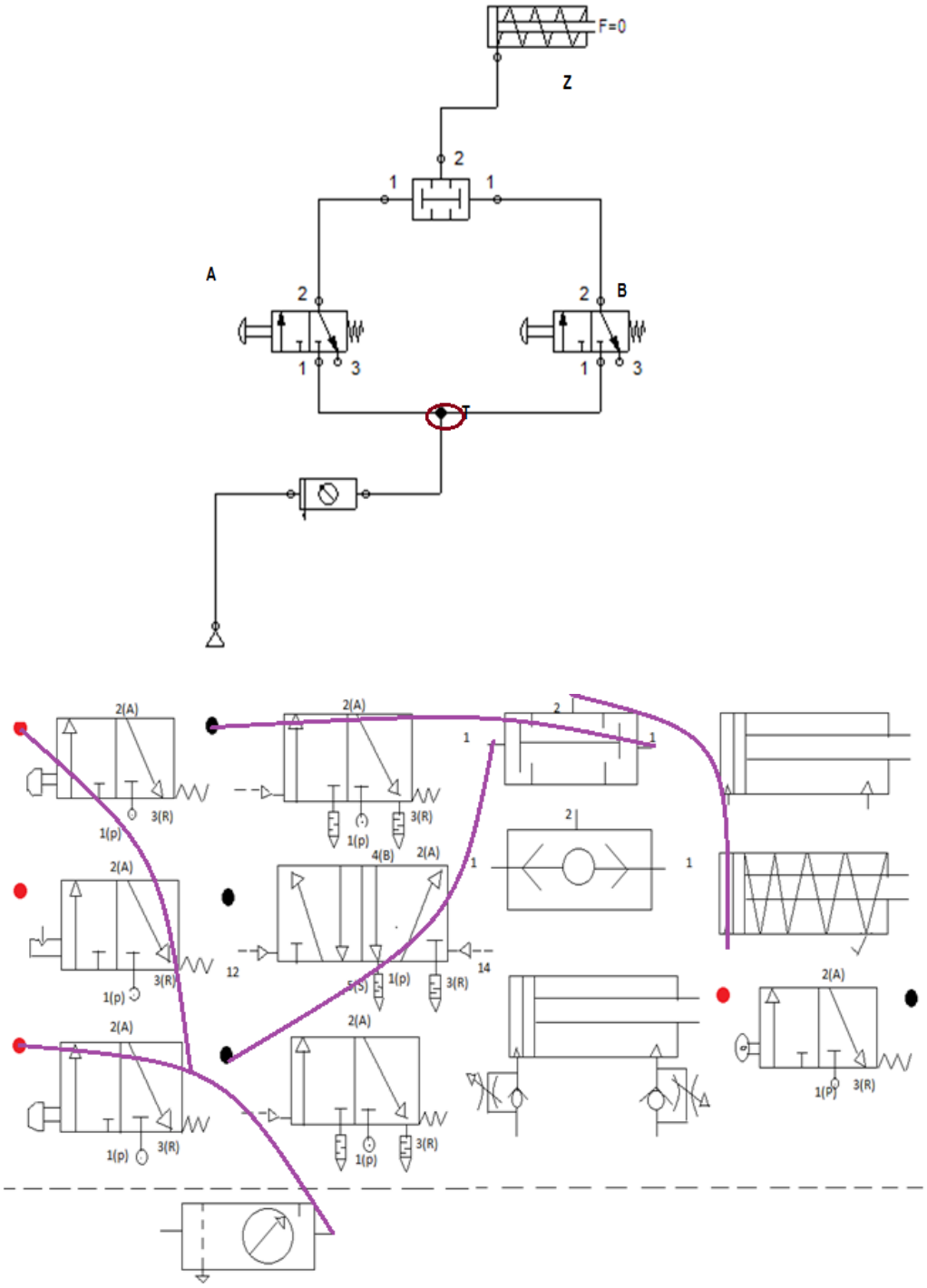


Exercise 3.- In this practice used the same material as earlier practice with meaning valve or to change a valve and or valve of coupled.

To verify that this practice it's armed correctly says that the valve and works as a gate "AND" this means that cylinder air works and we have to press two manually operated valves and the air cylinder return needs to stop applying pressure of air.

"AND"

A	B	Z
0	0	0
0	1	0
1	0	0
1	1	1



Exercise 4.-

Material:

Maintenance Unit

Compressor

Hoses

3 port air operated valve N.C. (single pilot)

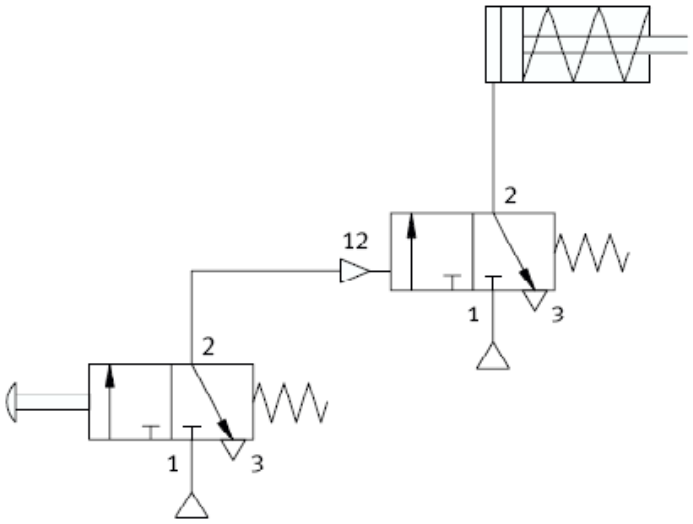
3 port air operated valve N.C., manual operation (push button “Mushroom”)

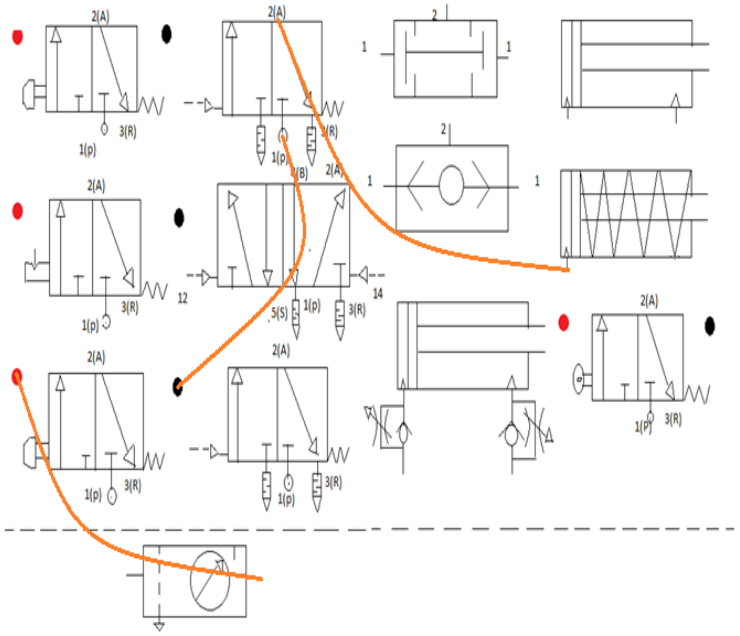
Single acting air cylinder

First connect with a hose to maintenance unit to compressor, after the departure of the modular unit with a hose valve manually operated button type mushroom, the port 1 is sent to the way and port 2 sent to the route 1 valve pneumatically operated and that same valve, route 2 is going to our labor component which is the single acting piston air.

This practice works this way:

So that the air in the piston goes we have to pressure or to give air to the manually operated valve pressure and return the air to its previous shape have to let him give air pressure which means that we must push the button type mushroom in the valve 2/3.





Exercise 5.-

Material:

Compressor .

Maintenance Unit.

2 “Tees”.

Two 2/3 NC air valves manually operated.

5 port air operated valve (double pilot).

Double acting air cylinder with flow regulator and check valve.

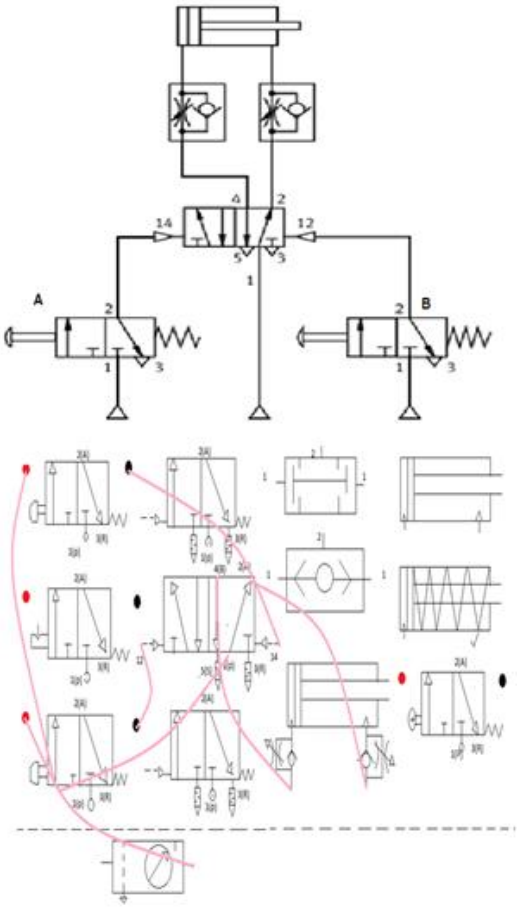
Pressure regulator and hoses.

As in all the practices we will join the maintenance unit with the compressor with a hose and the output of the maintenance unit will another hose but as already knows the only maintenance unit has a way out of and we have to send it to 2/3 valves so we will

use 2 “Tees” and each hose to stay loose the send port 1 of manually operated and pneumatic valves.

The 3 port valves manually operated send them entries of 5/2 valve pneumatic drive air pressure, the ports 2 and 4 are the outputs of air pressure to our work device, which it is our double acting air cylinder with two pressure regulating valve and check valves, that allows come out faster or slower the piston.

This practice works this way: when we press A valve will be joining air pressure on the left side of the 5/2 valve thereby changing position which means that the air flow going out via 4 leaving out the piston rod and return the piston to its current state we have to press the valve B so that he changes position valve 5/2 and the air flow out via 2 between through the right side of the piston and air is compressed in that side of the piston and return the air.



Regular maintenance:

Job name:	frequency
•Detection and check for air leakage •complete inspection of the entire system. •joints, curved lines, teas, elbows, couplings, etc. •determination of accuracy and strategic points. •Traps for condenser. •Automatic drainage of the condenser. •Line air, shock, cuts in lines and holes.	•Each week •monthly •every 3 weeks •once every 3 weeks •daily •once every 3 weeks •weekly
•Determination of the accuracy of the pressure regulator. •Cleaning the filter and the oil Bowl. •Retrieve the oil level. •Clean up the passage of the Jet of oil •Adjust oil Jet. •Change oil after for a thorough cleaning of the Bowl •Leakage of air valve and accessory hose. •Performance for handle of the valve. •Restoration if necessary and if it is possible. •Mechanical damage to the piston rod. •Replace the Cup seal	•Daily •mid-year •every 15 days •every 6 months •as needed •every 3 or 6 months depending on the need for. •Weekly •every activity. •monthly daily •Each when you need to

評語

1. 本計畫旨在建構一套氣動閥流道之教具，以幫助學員對於氣動控制系統之瞭解。

2. 本計畫若能讓此教具系統更完備，並在書面與口頭報告上多加著墨，則此計畫將為更加可讀之價值。