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Design and Implement a Semi-Automatic Clutch System for Automobiles Using DCV and the Link Mechanism to Reduce Human Effort While Increasing Process Reliability and Accuracy

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Abstract: ***The pure sense of automation is to reducing the human effort and increasing the reliability and accuracy of the process. The objective of the project is to design and implement a semi-automatic clutch system for automobiles, which provides a simplistic remedy for physically challenged. Applying clutch manually at every instant, while changing gear is comfortless. In synchronizing switch with clutch pedal differently-abled people realize more difficulty in CBA pedal system. During the rush hour of traffic, the driver should be able to shift the legs simultaneously to change the gears, but it is practically a hectic work for the driver to do so. Automation can be achieved through computer, hydraulics, pneumatics, robotics, etc., of these sources' pneumatics form an attractive medium for low-cost automation. Automation plays an important role in automobile. Technical success of this project relies upon the work expected from the different sections of this project. The actuation of the clutch pedal depends upon the signal from the DCV and the link mechanism is used for engaging and disengaging the clutch. Hence this project can be used in either automatic mode or in the manual mode in which the link mechanism can be removed out when not necessary in the hill stations where to remain the vehicles in Half-clutch. The entire process is controlled by using the directional control valve in which the retraction speed of the system is controlled by throttling valve or needle valve.***
Keywords: Automobiles, CBA pedal system, Half –Clutch, Needle valve.

I. INTRODUCTION

An incredible range of manufacturing systems use the force and power of fluids such as water, oil and air. Powered clamps open and close with the force of pressurized air or oil, large presses shape and form metal with hydraulic pressure, and assembly torque tools fasten components with pressurized air. In each example, fluid power provides the energy necessary to exert significant mechanical forces. Systems that use air are called pneumatic systems while systems that use liquids like oil or water are called hydraulic system. The pneumatic systems will be the subject of the first three sessions in the course starting from this session. Pneumatics is all about using compressed air to make a process happens. Compressed air is simply the air we breathe squeezed into a small space under pressure. You might remember that air under pressure possesses potential energy which can be released to do useful work. Their principle of operation is similar to that of the hydraulic power systems. An air compressor converts the mechanical energy of the prime mover into, mainly, pressure energy of the compressed air. This transformation facilitates the transmission, storage, and control of energy. After compression, the compressed air should be prepared for use. A pneumatic system consists of a group of pneumatic components connected together so that a signal (compressed air) is passed through the system to make something happen at the output. These groups of components can be divided into five categories according to their function in the pneumatic circuit as follows:

1) *Supply Elements:* These elements are the sources of power that drives the system which are the compressors.
2) *Input Elements:* These elements are used to send signals to the final control elements and come in two forms; either as components that is actuated by the operator like push buttons or sensors that determine the status of the power elements such as limit switches and proximity sensors.
3) *Processing Elements:* These elements may perform operations on the input signals before sending the signal to the final control elements such as non-return valves, directional control valves and presser control valves.

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4) *Final Control Elements:* To control the motion of actuators such as directional control valves.
5) *Power Elements (Actuators):* these are the outputs of the pneumatic system which use the stored potential energy to perform a certain task such as pneumatic cylinders and motors.

II. MATERIALS AND METHODOLOGY

The components that are used in the project pneumatic auto clutch are as follows,Compressor,,Pressure regulating component, Filter, Pressure regulator, Lubricator, Single acting cylinders ,Double acting cylinders ,Directional control valve, 2/2 Directional control valve and Pneumatic components can be divided into two categories:1.Components that produce and transport compressed air.2.Components that consume compressed air. All main pneumatic components can be represented by simple pneumatic symbols. Each symbol shows only the function of the component it represents, but not its structure. Pneumatic symbols can be combined to form pneumatic diagrams. A pneumatic diagram describes the relations between each pneumatic component, that is, the design of the system.

A. Compressor

A compressor can compress air to the required pressures. It can convert the mechanical energy from motors and engines into the potential energy in compressed air (Fig. 2). A single central compressor can supply various pneumatic components with compressed air, which is transported through pipes from the cylinder to the pneumatic components. Compressors can be divided into two classes: reciprocator and rotary.

Fig: 1 Compressor used inlaboratories

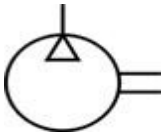

Fig: 2 Pneumatic symbol of compressor

Pressure regulating component Pressure regulating components are formed by various components, each of which has its own pneumatic symbol:

1) *Filter:* Can remove impurities from compressed air before it is fed to the pneumaticcomponents.
2) *Pressure Regulator:* To stabilize the pressure and regulate the operation of pneumaticcomponents.
3) *Lubricator:* To provide lubrication for pneumatic components.

Fig: 3 Pressure regulating component

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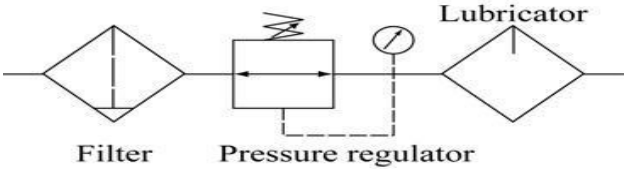

Fig: 4 Pneumatic symbols of the pneumatic components within a pressure regulating component

A pneumatic machine can be thought of as a large flexible mechanical structure that is moved by some sort of control system. The control system takes its input from a human operator and translates this command into the motion of actuators, which move the mechanical structure. The high performance and highly powerful, Pneumatic machine vice together with the capacity for high volumes are suited for Holding Heavy Objects. One form of inefficiency in current systems is due to the link between the flows of the two ports of the cylinder. This is because most valves use a single spool to control the flow in both ports. Because of this link, it is impossible to set the pressure levels in the two sides of the cylinder independently. Therefore, the outlet side will develop a backpressure, which acts in opposition to the direction of travel, which increases the pressure required on the inlet side to maintain motion. Since the force generated by the actuator is proportional to the pressure difference between the two sides, the actual pressures in the cylinder don't affect the action of the cylinder.
Generally, Pneumatic cylinder operations are based on Pneumatic pump operation. Air is pumping to the Pneumatic cylinder by using Pneumatic pump system. It's the manual operation.

III.EXPERIMENTAL DESIGN

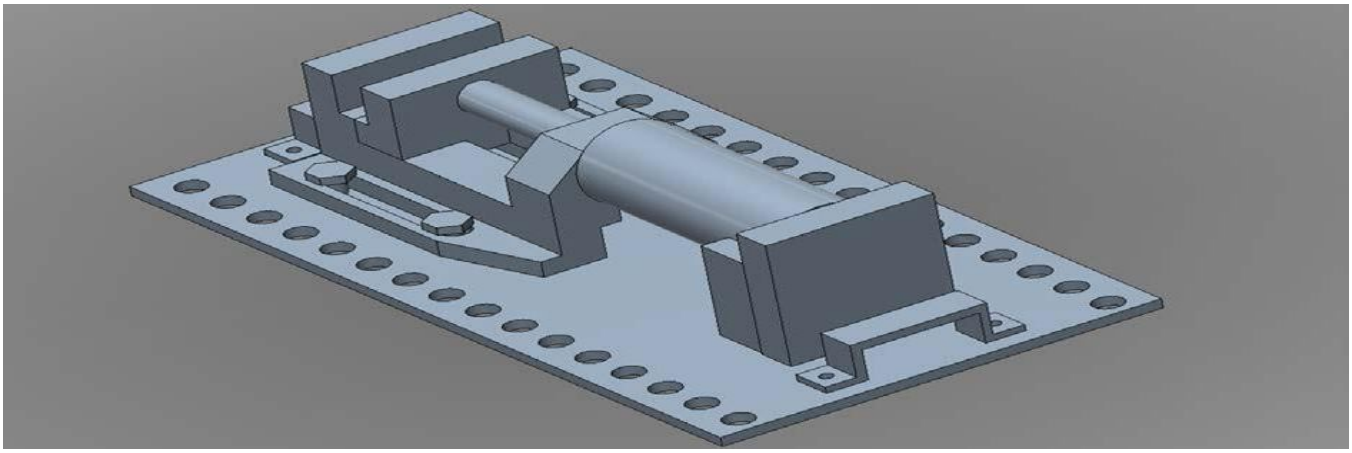
Fig: 5 Experimental design cad model designed by solid works

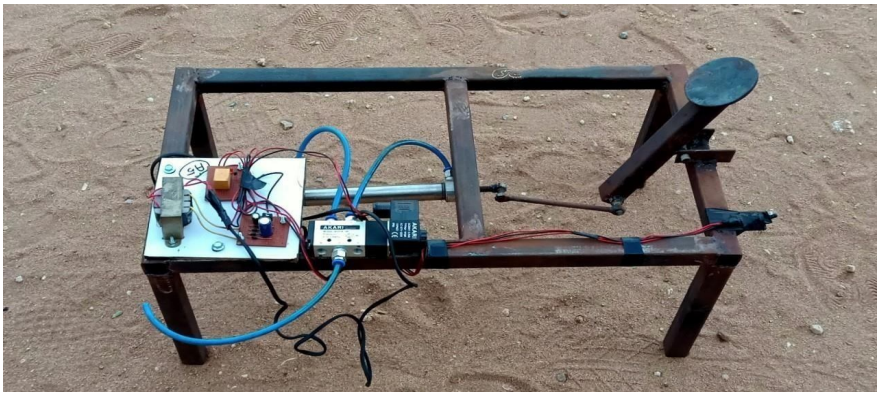
Fig: 6 Full Setup Model

For engaging and disengaging of clutch practically needs some push or pull. A simple theoretical, force calculation was done and the cylinder was selected using working pressure as the major consideration. During trial and error experimentation, the minimum pressure required for the process was found to be 5 bar. To calculate the force required:

The assumed constants;

Working pressure P = 6 bar = 6×105 N/m2
Cylinder diameter d1 = 50 mm= 0.05 m
Piston rod diameter d2 = 20 mm= 0.02 m
Stroke length S = 150mm
Therefore, the force generated by the doubleThus,

$F = P \times A$ (2.1) $= P \times \pi (d1\ 2 - d2\ 2) / 4$

$= 6 \times 105 \times \pi (0.052 - 0.022) / 4$

F = 989.6 N the retraction stroke of a cylinder produces 989.6 N In extension stroke

$F = P \times A = P \times \pi (d1\ 2 - d2\ 2) / 4$

$= 6 \times 105 \times 3.14 \times (0.052 - 0.022) / 4$

= 1178 N

Thus, Extension of the cylinder produces 1178 N Force applied manually by thedriver to the clutch pedal is 150 N (approx.)

IV. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, and assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. The “FABRICATION OF AUTOCLUTCH” is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed a “FABRICATION OF AUTO CLUTCH” which helps to know how to achieve low cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the applications.

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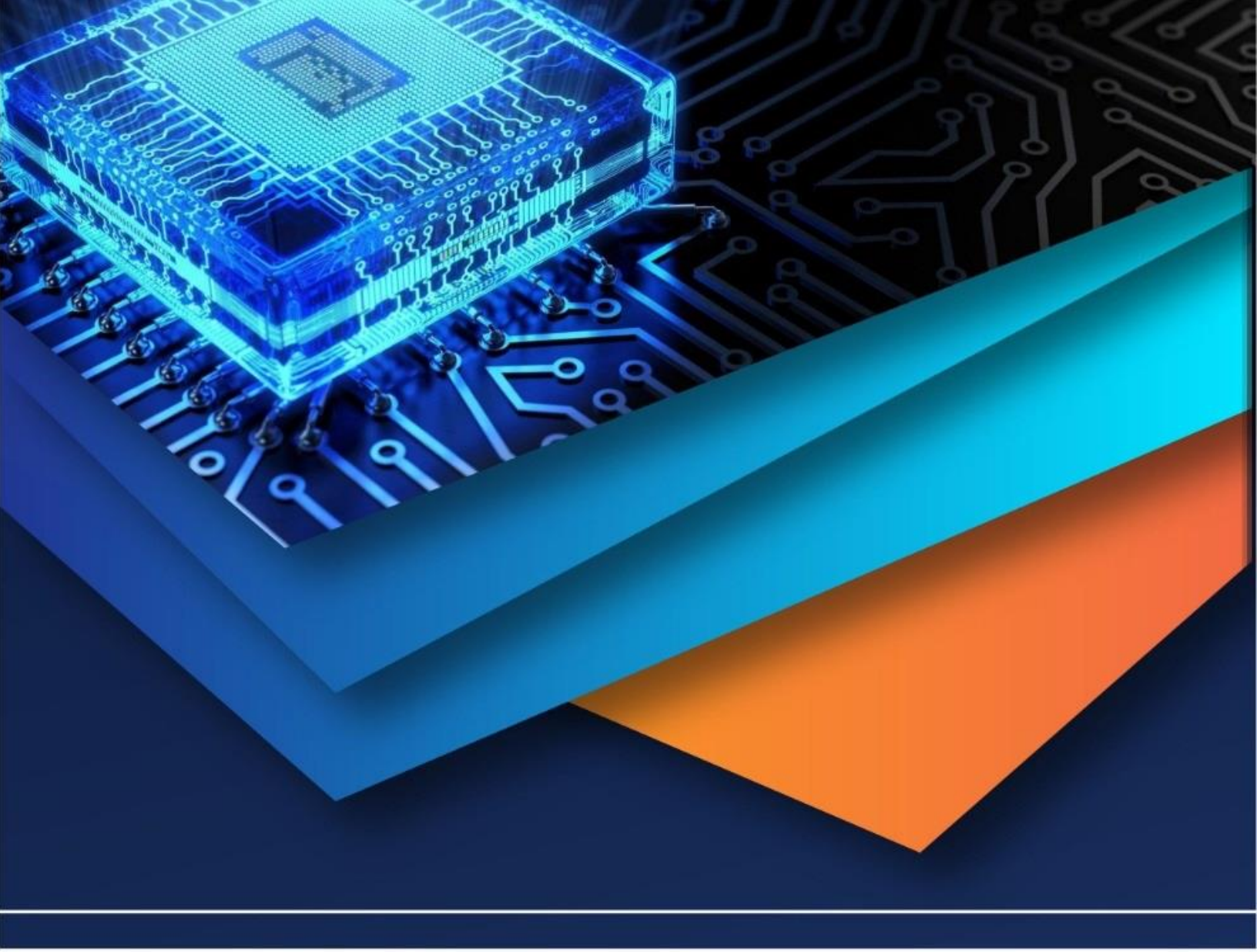

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