

Design and Fabrication of Semi-Automatic Transmission System

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Abstract— Automobile is the most important mode for the transportation, during this current era. Thanks to the technological advancements there have been heap of recent upgrades, new safety options offered that comforts the motive force and additionally the passengers. Manual engagement of clutch whereas shifting between the gears in traffic areas could be a feverish job for drivers. At some purpose, most drivers can be exposed to a trying scenario behind the wheel, be it a traffic congestion, violence incident or inconsiderate behaviour by alternative drivers. Indeed, a survey conducted by Brake and Direct Line disclosed that seventy one of drivers had lost concentration at the wheel thanks to stress or annoyance. Fatalities and injuries ensuing from road traffic accidents square measure a significant and growing public pathological state in Asian nation. Every week nearly 2,650 people get killed and 9,000 get injured due to traffic accidents by stress. This project is proposed to avoid the necessity of pressing the clutch plates while changing gears. The semi-automatic clutch system comprises a sensor in the gear rod knob. With this sensor the motive force controls the clutching operation. The dominant is completed with a Proportional management Valve and therefore the exploit by a double acting cylinder. The positioning of the clutch is completed by the gas by victimization metering out circuit. Hence engaging of the clutch is completed semi-automatically by this mechanism and therefore the retraction of the gas cylinder is achieved smoothly. Rather than pressing the clutch manually, the engagement and disengagement of the clutch is completed semi mechanically. Driver so are experiencing a lot of comfort in 2 pedal systems than in common 3 pedal systems. This project are a lot of snug for amputees who have the spirit of driving serious vehicles.

Keywords: Fabrication, Semi-Automatic Transmission System

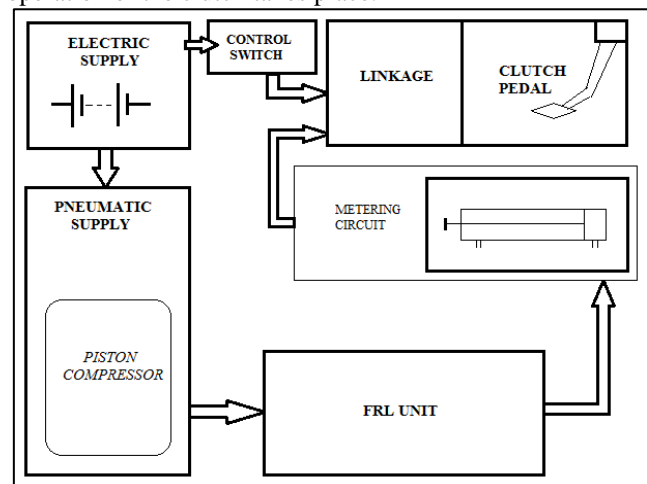
I. INTRODUCTION

In the late 90's, automation was the fashion of the engineering world. The simplest of the minds, rallied day and night to induce enhancements of great magnitude, one thing that may build a sway within the regular life. Today, it's a over plus of fields that have embraced automation, right from producing, to food process, medicine and pharmaceutical industries. In such a situation, domestic applications have additionally been developed with a standard man in mind. Nowadays, use or make the waste in to one thing helpful is appreciated all round the globe. It reduces greenhouse emissions that contribute to world global climate change. This study deals with provision of the automated clutch mechanism in vehicles to facilitate the graceful dynamical of gears. This study projected to use the exhaust gases that square measure ordinarily expelled out as a waste from the turbocharger to actuate the clutch mechanism in vehicles to facilitate the graceful dynamical of gears. At present, clutches are operated mechanically by improvisation associate compressor within the four wheeler.

During this study, a abstract style is projected during which the clutch is operated by the exhaust gas from the turbocharger and this can take away the usage of compressor within the existing system. With this method, usage of compressor is eliminated and therefore the riders needn't to control the clutch manually. This work concerned in development, and validation of the abstract style through simulation computer code. Then the developed abstract style of associate automatic gas clutch system is tested with early sort. Additional the processes that were manual before square measure slowly being reborn to semi - machine-driven and automatic nature. It forever is attended with a number of intricacies on the part of understanding the method parameters, the methodology to bring in an impact part to manage it, with none human intervention, the choice of elements for that individual application etc. Semi machine-driven clutch in significant vehicles, that successively reduces the efforts of the motive force in addition as contused persons UN agency have the aspiration of driving significant cars.

II. MATERIAL & METHODS

Pneumatic source is the crux of this project. A switch is connected to the gear rod which is directly coupled to the solenoid actuated 5/2 spring return Proportional Valve upon the signal from the switch 12 V supply is connected to the directional control valve. A double acting cylinder is actuated by using the directional control valve. The compressor port is available in the heavy vehicles for the usage of air conditioners and also for air brakes. It generates the total pressure of 13 bar; but 5 bar is sufficient for the cylinder to retract and extend. During the forward stroke of cylinder the piston extends with normal speed, this in-turn presses the pedal and disengaging operation takes place. Whereas during the retraction of the cylinder flow control valve or needle valve is introduced in order to reduce the speed of the retraction stroke. Hence the smooth engaging operation of the clutch takes place.



A. Air Compressor:

An air compressor is a device that converts power (usually from an electric motor, a diesel engine or a gasoline engine) into kinetic energy by compressing and pressurizing air, which on command, can be released in quick bursts. A reciprocating or piston compressor is a positive-displacement compressor that uses pistons driven by a crankshaft to deliver gases at high pressure

B. FRL Unit:

FRL unit stands for filter, regulator and lubricator; generally it is used in various pneumatic systems. Before the compressed gas fed in to pneumatic cylinder it must be passed through an FRL unit, which cleans, lubricates and regulates the air to be supplied to the pneumatic devices. The unit shown in figure ensures freedom from dust particle moisture, abrasive materials to the system and to lubricate the system

C. Double Acting Cylinder:

The double-acting cylinder is a cylinder in which the working fluid acts alternately on both sides of the piston. It has a port at each end, supplied with hydraulic fluid for both the retraction and extension of the piston. A double-acting cylinder is used where an external force is not available to retract the piston or where high force is required in both directions of travel. The double acting cylinder is more commonly used than the single acting cylinder. It works at any angle and in almost any application where hydraulic power is needed. Even with applications where gravity (or weight) can assist retraction, hydraulic pressure is often applied to control acceleration, change the rate of travel and cushion the stoppage. Travel in one direction always differs from travel in the other, all things being equal; the push action requires more force and is slower but more work output is generated. The pulling action is faster, but less work output is created.

D. Direction Control Valve:

Directional control valves are one of the most fundamental parts in hydraulic machinery as well and pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled.

E. ANSI:

The figure shows a 5/2 solenoid operated spring return DCV, Which are used to control the direction of air flow in two directions. The movement of the spool restricts or permits the flow, thus it controls the fluid flow. Generally a normal DCV consist of only the spool setup only other mountings like solenoid coil mounting, push button mounting, joystick mountings, etc., are provided to control the spool movement.

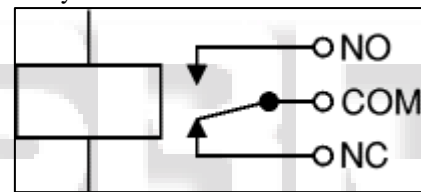
F. PCB:

Printed circuit boards, or PCB, form the core of electronic equipment domestic and industrial. Some of the areas where PCB are intensively used are computers, process control, telecommunications and instrumentation.

G. Relay Circuit SPST:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which

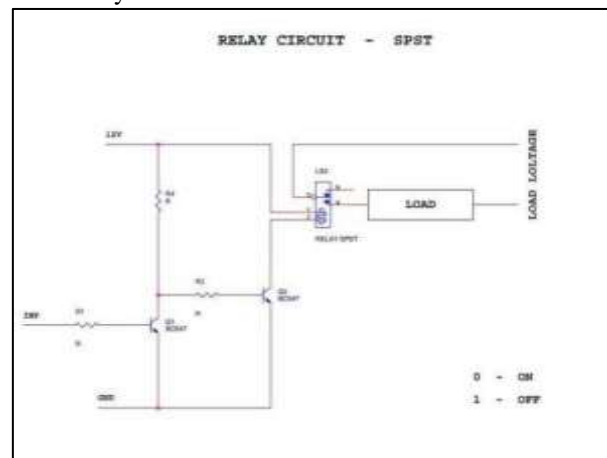
attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

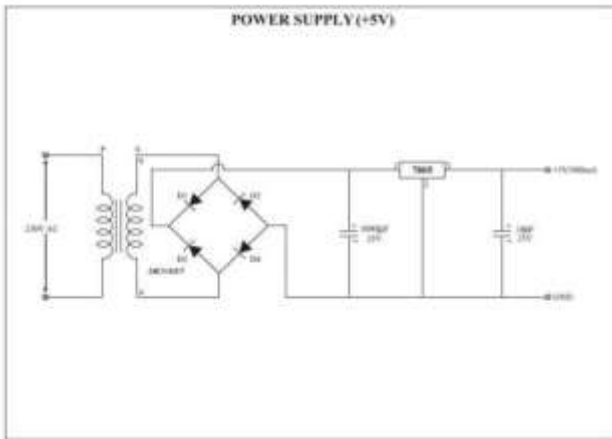


Relay NO,COM and NC

The relay's switch connections are usually labeled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.

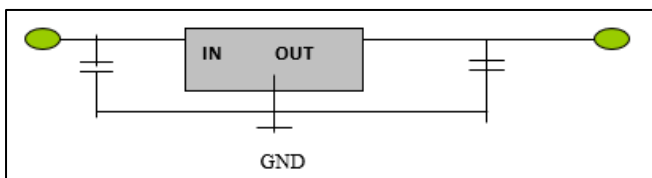




H. Power Supply:

Power supply is an integral parts a vital role in every electronic system and hence their design constitutes a major part in every application. In order to overcome mal-operation which results due to fluctuations in the load and discontinuity in the supply proper choice of power supply is indeed a great need in this hour. The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes. A block diagram containing the parts of a typical power supply and the voltage at various points in the unit is shown in fig 19.1. The ac voltage, typically 120 V rms, is connected to a transformer, which steps that ac voltage down to the level for the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains the same dc value even if the input dc voltage varies somewhat, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of a number of popular voltage regulator IC units.

I. Fixed Positive Voltage Regulators:



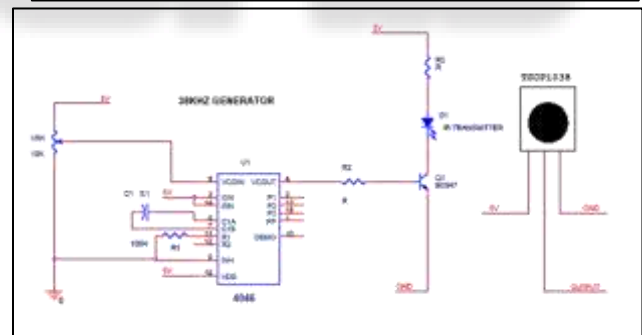
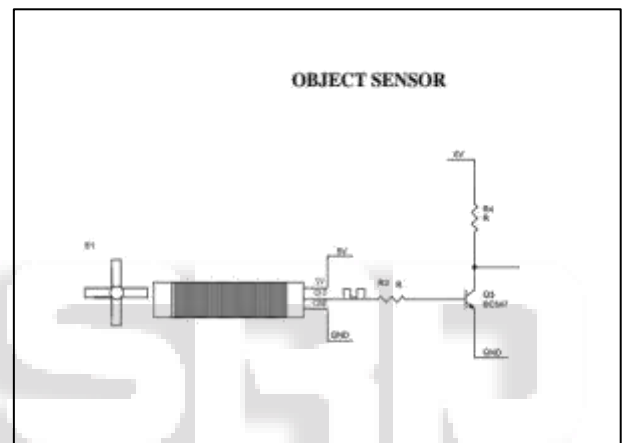
The series 78 regulators provide fixed regulated voltages from 5 to 24 V. Figure shows how one such IC, a 7812, is connected to provide voltage regulation with output from this unit of +12V dc. An unregulated input voltage V_i is filtered by capacitor C1 and connected to the IC's IN terminal. The IC's OUT terminal provides a regulated + 12V which is filtered by capacitor C2 (mostly for any high-frequency

noise). The third IC terminal is connected to ground (GND). While the input voltage may vary over some permissible voltage range, and the output load may vary over some acceptable range, the output voltage remains constant within specified voltage variation limits. These limitations are spelled out in the manufacturer's specification sheets. A table of positive voltage regulated ICs is provided in table.

IC Part	Output Voltage (V)	Minimum V_i (V)
7805	+5	7.3
7806	+6	8.3
7808	+8	10.5
7810	+10	12.5
7812	+12	14.6
7815	+15	17.7
7818	+18	21.0
7824	+24	27.1

Table 1: Positive Voltage Regulators in 7800 series

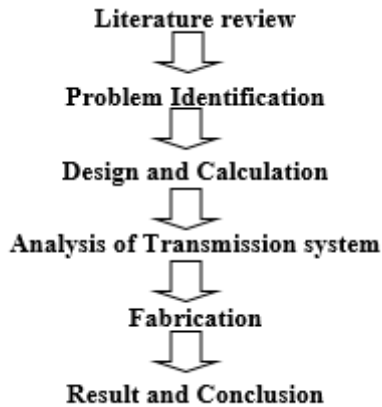
J. Object Sensing Circuit:



This project is used to sense the object for different application. The 4046 clock generator is used to generate 38 KHZ carrier signal which is transmitted through the sensor TSOP1038. The CD4046 micro power phase locked loop consists of a low power, linear, voltage controlled oscillator, a source follower, a zener diode, and two phase comparators. The two phase comparators have a common signal input and a common comparator input. The signal input can be directly coupled for a large voltage signal, or capacitive coupled to the self biasing amplifier at the signal input for a small voltage signal. Phase comparator 1, an exclusive OR gate, provides a digital error signal and maintain 90 phase shifts at the VCO center frequency between signal input and comparator input, it may lock onto the signal input frequencies that are close to harmonics of the VCO center frequency. Phase comparator 2 is an edge controlled digital

memory network. It provides a digital error signal to indicate a locked condition and maintain the a 0 phase shift between signal input and comparator input. The linear voltage controlled oscillator produce an output signal whose frequency is determined by the voltage at the VCO input, and the capacitor and resistors at the VCO input and the capacitor and resistors connected to pin C1a, C1b, R1 and R2.

III. METHODOLOGY:



A. Problem Identification:

Applying clutch manually at every instant, while changing gear is comfortless. In order to reduce this issue, we synchronizing the switch with clutch pedal. Physically challenges, people realize more difficulty in Chase Bliss Audio pedal system. During the rush hour of traffic; the driver should be able to shift the legs simultaneously to change the gears, but its practically a hectic work for the driver to do so. Thus the amputees might also feel very discomfort when applying the clutch with their legs.

B. Force Calculation:

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 $P = 6 \text{ bar} = 6 \times 10^5 \text{ N/m}^2$

Cylinder diameter $d_1 = 50 \text{ mm} = 0.05 \text{ m}$

Piston rod diameter $d_2 = 20 \text{ mm} = 0.02 \text{ m}$

Stroke length $S = 150 \text{ mm}$

Therefore, the force generated by the double acting cylinder,

In retraction stroke,

$$F = P \times A \quad (2.1)$$

$$= P \times \pi (d_1^2 - d_2^2) / 4$$

$$= 6 \times 10^5 \times \pi (0.05^2 - 0.02^2) / 4$$

$$F = 989.6 \text{ N}$$

Thus, the retraction stroke of a cylinder produces 989.6 N

In extension stroke,

$$F = P \times A$$

$$= P \times \pi (d_1^2 - d_2^2) / 4$$

$$= 6 \times 10^5 \times 3.14 \times (0.05^2 - 0.02^2) / 4$$

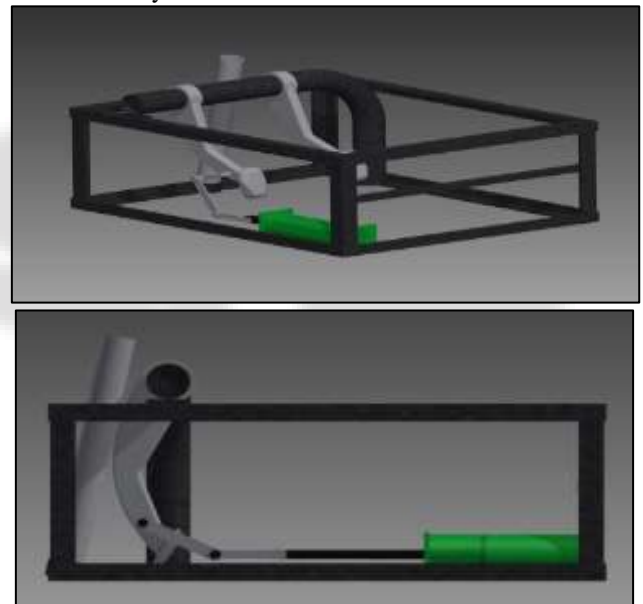
$$= 1178 \text{ N}$$

Thus, Extension of the cylinder produces 1178 N

Force applied manually by the driver to the clutch pedal is 150 N (approx)

C. Working:

Semi automatic clutch system consists of two parts integrated to gather and to provide smooth functioning of the system. Mechanical integrated with electronic system to form a mechatronics system which results in low cost automation. A switch is connected to the gear rod in which one end of the switch is connected to the common terminal of the relay; the NO contact of the relay is connected to the solenoid coil which is integrated with the Proportional valve. A 12 V power supply is given to the relay coil by which the coil gets energized and output of the coil is connected to the solenoid valve which in turn actuates the spool in the directional control valve. Pneumatic source is used here for the actuation of the cylinder. A 5 bar pressure is applied to the DCV. The output of the DCV is connected to the double acting cylinder. The links are connected from x the rod end of the cylinder to the clutch pedal. When the cylinder actuates the engaging of the pedal is done smoothly, for slow retraction of the system the throttle valve is used hence the retraction of the cylinder is done smoothly and slowly as compared to the extension stroke of the cylinder.



IV. CONCLUSION

Thus, this project provides an alternative to the existing clutch applying system in heavy vehicles through semi automation with low cost system. Though the project provides the desired output, the centre positioning of the cylinder is not achieved to bring the system in half clutch while starting and to synchronize with the gear rod. By this project more than 5% of accident has been controlled and the stress level while driving the vehicle in cities will be reduce dramatically. This modification is done in the future scope of this project.

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