

Design and Fabrication of Automatic Gear Changing System

Rohit Kumar¹ Rohit Kumar² Shiva Kumar T S³ Vishal Kumar KV⁴ Dr. Yogesh HC⁵

^{1,2,3,4,5}Nagarjuna College of Engineering and Technology, Bangalore, India

Abstract— A rotational output of an internal combustion engine is connected to drive wheels of the automobile and a load device. when a gear shifting up of an automobile transmission is effected. the load applied by the load device is increased, or the load connected to an output rotation shaft of the engine via selectivity connecting device.

Keywords: Speed Sensor, Microcontroller, Relay Driver, Air Pilot Solenoid Actuator, Energy Dissipation

I. INTRODUCTION

- 1) An automatic gear change control apparatus for an automobile, comprising an internal combustion engine.
- 2) An automatic transmission connected to an output rotation shaft of engine so as to transmit the rotational output of drive wheels through any selected one of gear ratios; apparatus comprising a load device for applying a load.
- 3) Means for connecting load device to output rotation shaft of engine and for generating a gear change control signal for selecting one of gear ratios of automatic transmission in accordance with one of operational conditions of automobile and said engine.
- 4) Increasing demands on performance, quality and cost are the main challenge for today's automotive industry, in an environment where every movement, component and every assembly operation must be immediately and automatically recorded, checked and documented for maximum efficiency.

II. LITERATURE SURVEY

[1]on semi-automatic gear shifting apparatus for use in shifting gears in gearboxes of motorcycles and the like gearboxes wherein gears are shifted by rotating spindles which are connected to the ratchet type gear shifting means. Here the shifting apparatus consists of a lever arm, one end of which is connected to the spindle and the other end is connected to the toe pedal. Also an actuating rod is connected to the toe pedal, the rod is reciprocated to move the lever and in turn the spindle. This spindle is actuated by a pair of push button switches mounted on the handle bar.

[2]as said that a solenoid actuated transmission shifting apparatus is provided for temporary and permanent installation is automobiles with convention motor cycle transmission.

Patent [3]as said that a solenoid actuated transmission shifting apparatus is provided for temporary and permanent installation is automobiles with convention motor cycle transmission. The shifting apparatus allows for up shifting and downshifting through the transmission gears by pressing pushbuttons mounted on the handle bar. It is an object of this invention to provide a pushbutton solenoid shifter that incorporates the use of electronic solenoids to actuate the shifting of gears in manual transmission of motorcycle.

Patent [4]has mentioned that the transmission gears and clutch shifting apparatus for automatic operation of

manual shift mechanism in a automotive vehicle include gear and clutch actuation mechanisms mounted on bar of vehicle and coupled by the cables to the control actuation mechanisms mounted off the vehicle board. The on-board gear shift actuator includes two intersecting movable slots for causing movement of the shift lever. In this invention electrical control and actuation mechanism are mounted outside the vehicle. A relatively small gear and clutches is mounted on the vehicle, cables are used to connect these actuators with each other.

III. OBJECTIVES

To design the gear shifting mechanism and modify the vehicle according to the designed mechanism.
To program the microcontroller according to the needs of the mechanism and build the electronic circuit.
To calibrate the gear shifting mechanism and also to check for the improvements in the efficiency if any.
Fabrication and testing of designed mechanism.

IV. MATERIALS AND METHODOLOGY

A. Methodology:

1) Methodology for objective-1:

The chain drive mechanism between the geared DC motor and gear pedal is designed using Catia V5 software. The geared DC motor is fitted about the pedal with calculated offset. A gear is welded on to the pedal of the vehicle. The timing chain is attached as the driving medium.

2) Methodology for objective-2:

Atmel 89S52 microcontroller is programmed using Keil V5 and burnt using Willar software. Electric circuit is built using some of the components like proximity sensor, microcontroller, LCD display unit, relays and DC geared motor.

3) Methodology for objective-3:

The calibration of automatic gear shifting, with is respect to rear wheel speed, in the C program by trial and error method. The efficiency of the gear vehicle in terms of mileage is tested; it has to be more than the normal CVT vehicles.

B. Equipment (Material)

1) Sealed Lead Acid Battery:

The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage. One cell has a nominal output of 2.1V, but lead -acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

2) Spring:

Spring steel is a name given to a wide range of steels used widely in the manufacture of springs, prominently in Automotive and Industrial suspension applications. These steels are generally low-alloy, medium carbon steel or high-carbon steel with a very high yield strength. This allows objects made of spring steel to return to their original shape despite significant deflection or twisting. A spring is a flexible elastic object used to store mechanical energy.

3) Air Pilot Solenoid Actuator:

This solenoid actuator is used to run bigger compressed air valves.

The direct acting solenoid actuator has a comparatively slow valve mechanism. In this type of solenoid actuator there are two valves, a smaller direct acting valve which opens into a much larger spool valve. The smaller valve is used for de-energizing which results in the rest phase of the big valve, shifting the spool to the right and the extension of spring takes place which is the internal main valve actuator. The air pilot actuator has its own benefits. A little quantity of compressed air from the main line of the bigger power valve can move massive valve with very little amount of electricity.

4) Energy Dissipation

The coils have an electrical resistance, and resistive losses are often very significant indeed. The energy in the magnetic field itself does not simply dissipate; much of it returns to the capacitor when the electric current is decreasing. Unfortunately it does this in the reverse direction (via a 'ringing' mechanism due to inductance of the coils), which can seriously damage polarized capacitors (such as electrolytic). In the circuit the magnetic field keeps the current in the coil flowing after the capacitor has discharged, so that it keeps discharging and builds up a negative voltage (see Lenz's law). This is similar to an LC oscillator. The capacitor charging to a negative voltage can be prevented by placing a diode across the capacitor terminals. Some designs bypass this limitation by using couple of diodes. Then, diodes reverse polarity to charge capacitors instead with proper polarity again, effectively re-using remaining coil energy.

5) Proximity Sensor

A proximity sensor is a device which detects the presence of nearby objects without any physical contact. It often emits an electromagnetic field or a beam of electromagnetic radiation

V. WORKING

The two electro-magnetic coils are fixed to the gear shaft of the two ends. One is used to shift the gear in upward direction. Another one is used to shift the gear in downward direction. These two coil is operated depends upon the speed of the vehicle this is automatically button operated electromagnetic gear changer for two wheeler. To perform an automatic gear change control apparatus for an automobile and a method of controlling such apparatus. A rotational output of an internal combustion engine is connected to drive wheels of the automobile and a load device. When a gear shifting-up of an automatic transmission is to be effected, the load applied by the load device is increased, or the load is connected to an output rotation shaft of the engine via a selectively -connecting device, thereby reducing the rotational speed of

the output rotation shaft of the engine to a required level. In this work, two electromagnetic coils are coupled to the gear rod of the two ends.

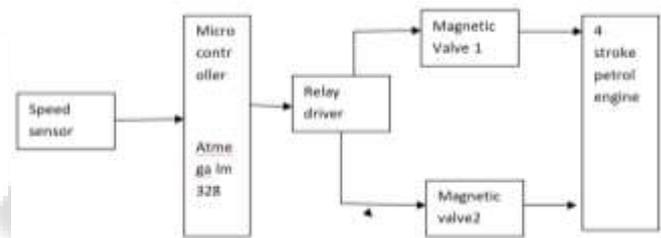
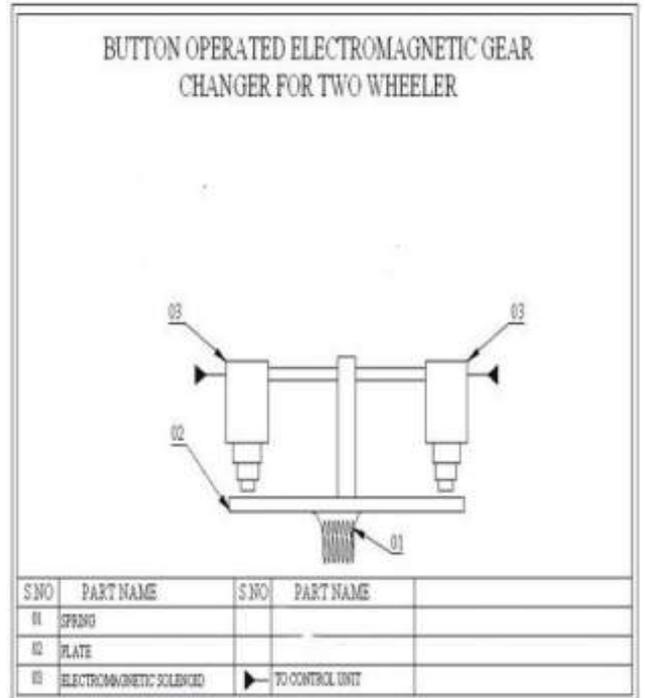


Fig. 1: Flow chart

VI. CONCLUSION

This project is made with pre-planning, that provides a lot of practical knowledge regarding, planning, purchasing, assembling and machining. The application of electromagnetic coil produces smooth operation. Even though the initial cost of button operated electro-magnetic gear shifting system is very high, but it is very much useful for two wheelers, car owners & auto-garages. By using more techniques, this design can be modified and developed according to the applications. This project also helped us to know the periodic steps in completing a project work. And let to know the strength of team work.

REFERENCES

- [1] R. Hembree, "SEMI-AUTOMATIC ELECTRIC GEAR SHIFTING APPARATUS FOR A MOTORCYCLE". United States 15 July 1975.
- [2] U. M. Friedrich Raff, "SHIFTING ARRANGEMENT FOR AN AUTOMATIC TRANSMISSION OF A MOTOR VEHICLE". United States 3 Sep 1991.
- [3] David G. Funk, "PUSHBUTTON SOLENOID SHIFTER". United States of America Patent 6070485, 6 Jun 2000.

- [4] P. Alexander M.E, “AUTOMATIC GEAR TRANSMISSION IN TWO WHEELERS,” vol. 3, no. 2, 2012.
- [5] Oliver J. Tysver, “AUTOMATIC GEAR SHIFTING MECHANISM FOR MULTI- SPEED MANUALLY POWERED VEHICLES”. UNited States 28 Dec 1999.
- [6] Francis G. King, “AUTOMATED MANUAL TRANSMISSION SHIFTER WITH ELECTRONIC CONTROL ACTUATORS EXTERNAL OF THE VEHICLE”. United States of America Patent 4554824, 26 nov 1985.
- [7] Robert E. LaWrie, “AUTOMATED MANUAL TRANSMISSION SHIFT SEQUENCE CONTROLLER”. United States 1 Feb 2000.
- [8] Pierre A. G. Lepelletier, “MULTISPEED AUTOMATIC TRANSMISSION FOR AUTOMOBILE VEHICLES”. United States 21 April 1992.
- [9] Luigi Glielmo, “Gearshift Control for Automated Manual Transmissions,” IEEE /ASME, vol. 1, p. 11, 2006.
- [10] Y. Huang, “Hybrid intelligent gearshift control of technical vehicles based on AGA- NN,” International Journal of Control and Automation, vol. 6, no. 4, p. 14, 2013. [11] C. X. Zhenyu Zhu

