

Development of Button Operated Gear Shifting Mechanism for Two Wheeler Applications

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Abstract: There are different control systems for a gear change control apparatus for an automobile and there are some controlling methods for that gear shifting mechanisms. The rotational output of the engine is transmitted to the drive wheels via clutch and gear box. When the gear is shifted up, the speed ratio will vary as well as the load capacity. The rotational output will increase as per the gear shifted. The rotational speed will decrease when the gear is shifted down. In this work, we have two electro magnets which are coupled to the ends of the gear rod. Also, this will be actuated by two buttons which will be placed near the left hand. The electric supply is given by the separate battery to the coils to actuate the electro-magnets. When the coils are energized, the magnetic field pulls down the coil to change the gear ratios as per the requirements. This avoids confusion to the rider and also gives comfortable ride while driving through hilly region. This mechanism also helps for the physically challenged persons, who have to shift the gear ratio by hands. These are also meant for the beginners and women who have fear of riding the bikes.

Key words: Bike, Battery, Electro-Magnets, Push Button, Mild Steel rods, Circuit system, Battery Box.

1. Introduction

In an automatic gear shifting mechanism, it comprises of an Internal Combustion engine, an output rotation shaft to transmit the power to the wheels through any one of the gear ratios. The apparatus consists of load device for applying the load, means that connecting a load device to the output rotation of the shaft of the engine and to generate a gear change control for any one of the gear ratios as per the required load conditions of an automobile.

As the years passed, there have been many developments in the Automotive Technology like, ABS system, power steering system, which are implemented for the driver comfort and safety. The gear shifting also became much smoother and less noisy in operation due to change in the gear design. The gear shifting mechanism should be easy to use and handle, these demands is very important in small cars and bikes. Some drivers may have a problem to shift the gears at critical situations like, a crowded road, hilly areas, a sudden speed breaker makes the driver a lot tensed. In these situations,

the right gear ratio must be selected which may otherwise lead to stop the engine or may cause some damage to the transmission systems of the Automobile.

2. Experimental procedure

The mild steel rod is fixed near the gear lever to form a joint to the electro-magnets. The electro-magnets are fixed below the joints so that the gear ratio can be changed. The battery is connected to the electro-magnets to actuate the electro-magnets.

2.1 Materials and Methods

The Mild steel rods are cut into pieces so that we can attach to the gear lever so that we can accommodate the electro-magnets. Battery of 7 amps is used to actuate the magnets.

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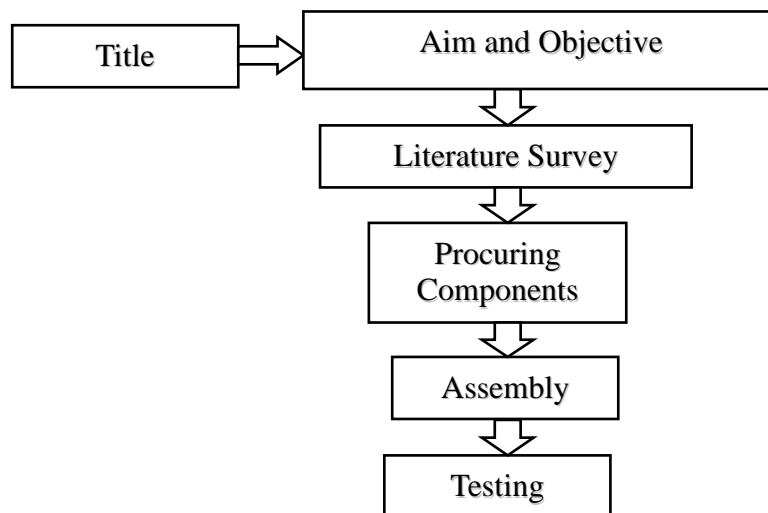


Fig 1: Methodology of the work

Components Used

1. Electromagnets

Electromagnets are used in all kinds of electric devices, including hard disk drives, speakers, motors, and generators, as well as in scrap yards to pick up heavy scrap metal. They're even used in MRI machines, which utilize magnets to take photos of your insides.

Use in this project,

- In this project we use 2 electro-magnets to shift the gear ratio.
- The electro-magnets are placed below the gear lever. This allows to actuate the gears.
- When the power is supplied, the electro-magnets will actuate and pulls the gear lever.
- Thereby shifting the gear.

2. Battery

A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars. Common examples are the alkaline battery used for flashlights and a multitude of portable electronic devices.

Use in this project,

- The battery is used to actuate the electro-magnets.
- The battery used is 7 amps output which is sufficient to actuate the electro-magnets.
- The battery is placed at the left side of the driver which will not make the driver feel discomfort.

3. Push Button

A push-button or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed.

Uses in this project,

- The push button switch is used to change the gear ratios.
- The red one indicates switching to lower gear ratio whereas green one indicates switching to higher gear ratios.
- This helps in actuating the coils by breaking and closing the circuit whenever required.

4. Mild Steel Rods

Mild-steel contains approximately 0.05–0.25% carbon making it malleable and ductile. Mild steel has a relatively low tensile strength.

Uses in this project,

- The mild steel rods are used to create an extra projection so that the gear lever is connected to it.
- These rods will transmit the power from the electro-magnets to the gear lever which is then actuated.
- These are also used to make the lower housing of the extra battery.

5. Bike

- A bicycle, also called a cycle or bike, is a human powered or motor powered pedal-driven, single-track vehicle, having two wheels attached to a frame, one behind the other. A bicycle rider is called a cyclist, or bicyclist.
- Bicycles were introduced in the late 19th century in Europe, and by the early 21st century,

more than 1 billion were in existence at a given time.

Uses in this project

- The bike is the main component in this project as it incorporates all the mechanisms and gear box to perform the task.



Fig 2: Construction of the mechanism

The force which is applied to the normal gear lever is dynamic. The shifting of the gear by the electro-magnets mainly depends on the magnetic flux density. The force generated is the square of the magnetic flux density. The force is required equally

on both the ends hence, two electro-magnets are used to exert force bi-directionally which has same pole face area and number of coils. The electro-magnets only pull the shaft. It cannot push the shaft.



Fig 3: Working model of the mechanism without a fully built circuit

Here we can see that the battery will give the electricity for the electro-magnets. Two electro-magnets are fixed to the either ends of the rods. One electro-magnet will shift the gear in increasing order and other one will shift the gear in decreasing order. These two activation of the electro-magnets depends upon the push buttons which is activated.

4. Results and discussion

The application of the electro-magnets provides smooth operation. The cost for the electro-magnets

is affordable so, it can be used in any two wheelers; it is very useful especially for women and physically challenged persons. By using more techniques, this design can be modified and developed according to the applications. In the present study, the effect of the mechanism on the performance of the engine was investigated and also by using more techniques this mechanism can be modified according to our requirements and applications.

5. Conclusions

Working in this area has provides a lot of practical knowledge regarding, planning, purchasing, assembling and machining. The application of electro-magnetic 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.

References

- [1] P. Alexander M.E, T. Sudha M.E, M. Omamageswari M.E, “Automatic Gear Transmission in Two Wheelers using Embedded System”, J of IJARET, Volume 3, Issue 2, July-December (2012), pp. 164-175.
- [2] Chunsheng Ni, Tongli Lu, Jianwu Zhang, School of Mechanical Engineering, State Key Laboratory for Mechanical System and Vibration Shanghai Jiao Tong University, 800 Dong Chuan Road, Shanghai, 200240 China, “Gearshift control for dry dual-clutch transmissions”.
- [3] J-O Hahn1, J-W Hur, G-W Choi, Y M Cho and K I Lee. Department of Mechanical Engineering, Korea Airforce Academy, South Korea, “Self-learning approach to automatic transmission shift control in a commercial construction vehicle during the inertia phase”.
- [4] Pettersson, M.; Nielsen, L. Gear shifting by engine control. IEEE Trans. Control Syst. Technol. 2000, 8, 495–507.
- [5] Inalpolat. M. and A. Kahraman, 2008. “Dynamic modelling of planetary gears of automatic transmissions. Proc. I Mech E Part D”, J. Automobile,Eng., 222: 229-242.
- [6] Glielmo, L., L. Lannelli and V. Vacca, 2006. “Gearshift control for automated manual transmissions”, IEEE/ASME Tran. Mech., 11(1): 17-25.