

**Abstract**

Motorcycle is widely used around the world and particularly in India. The gear shifting system of motorcycle is conventionally manual. This paper covers development of an indigenous automatic gear shifting system for the standard motorcycle. By this system the manual mechanical gear shifting system will remain unchanged because additional electromechanical system is placed on the vehicle to shift the gear. So the system has both the options manual as well as automatic. This system is of low cost. This system is flexible and can be used with any two wheeler manufactured ranging from 50cc to 200cc. There are disclosed an automatic gear change control apparatus for an automobile and a method of controlling such apparatus. In this system, two electromagnetic coils are coupled to the gear lever of the two ends. The two buttons are used to activate the electro-magnetic coil so that the gear will be shifted.

Key words:- Gear Shift, Two Wheeler, Electromagnetic Coil, Gear lever, Button, etc.

1. INTRODUCTION

The main objective of this paper is to perform an button operated electro-magnetic gear shifting system 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 case two electromagnetic coils are coupled to the gear rod of the two ends.

The two buttons are used to activate the electro-magnetic coil so that the gear will be shifted. An automatic gear change control apparatus for an automobile, comprising an internal combustion engine; 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 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 and load control means for increasing the load of said load device when said gear

change signal-generating means generates the control signal for shifting up the gear in automatic transmission. The control switch is used instead of gear lever in vehicles or automobiles and gear lever is attached with electromagnet solenoid to operate gear lever. Electromagnet solenoid is a switch operated by electric power supply from battery of vehicle. Now mainly concentrates on designing and demonstrating the switch operated gear mechanism unit to operate gear lever for engaging or disengaging the gear. Achieves higher safety, reduces human effort, reduces the work load, reduces the vehicle accident, reduces the fatigue of workers and reduces maintenance cost.

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. The development has concluded also the gearbox, which became much smoother and produces less noise. Gear shifting mechanism must be easy to use and workable, these demands are very important especially for small cars used by special needs people. For some drivers, the gear shifting can cause some confusing at driving specially at critical situations. A crowded road on a hill or a sudden detour makes a lot of tension on the driver. One of the difficulties in this situation is to choose the right reduction ratio and engaging it at the right time.

The automatic gear shifting mechanism takes advantage over manual gear shifting system but in situation where we have to change gears frequently the fully automated system is not much useful. In such condition the electromagnetic gear shifting system is used. This system is much better than button operated hydraulic and pneumatic system. The weight of this system is much lower than hydraulic and pneumatic system because of less equipment. Also here is no need of compressor .hence the weight of setup is decreases. In this system the gears are operated using electronic switch. These switch are connected to battery. The battery is connected to electromagnetic actuator. There are two coils are fitted around the magnetic bar. As push the button the current passes through the coils. Due to supply of current there is generation of magnetic field in the coils. These magnetic field attract the magnetic bar. There is generation of specific torque in the bar. This torque is used to shift the gears.

Electro-magnetic system is better than hydraulic and pneumatic system because of low weight and less space requirement. It also better than fully automated system because it can be used in traffic and urban areas where the gears are needed to change frequently. But the torque generated is very difficult to control. Also the availability of electromagnetic actuator is very low. But these system gives confidence to the driver.

2. CONSTRUCTION

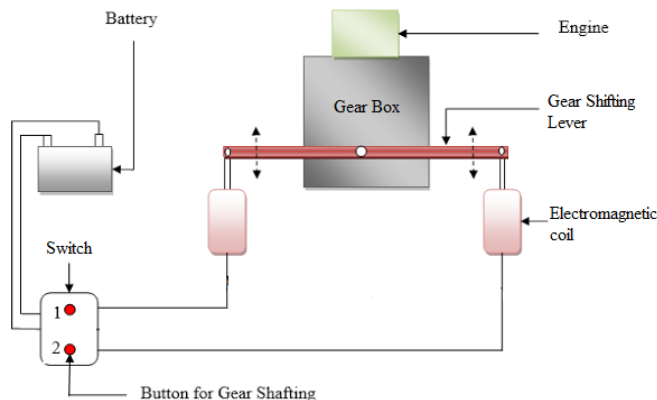


Fig- 2.1 Model of Button operated gear shifting system

The various parts/ components used in the construction of button operated electro-magnetic gear shifting system are:

1. Electromagnetic solenoid.
2. Gear shifting switch.
3. Gear shifting lever.
4. Battery.

1. Electro-magnetic solenoid

It is attached to gear shifting lever.

2. Gear shifting switch

It is attached to electro-magnetic solenoid.

3. Gear shifting lever

It is attached to engine.

4. Battery

It is attached to the gear shifting switch panel.

The parts/components attached as battery is attached to the gear shifting switch panel and gear shifting switch is attached to the electro-magnetic solenoid and electro-magnetic solenoid is attached to the gear shifting lever and gear shifting lever is attach to the engine. In this system control switch is used instead of the gear lever in vehicle and the electro-magnetic solenoid is attached to the gear lever to operate lever. Electro-magnetic solenoid is switch operated by electric power supply from battery of vehicle and switch that can be engaging or disengaging the gear. There are two buttons for operating the gear shifting lever. First button for neutral the gear or down the gear. Second button for up the gear.

3. 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 electro-magnetic gear changer for two wheeler.

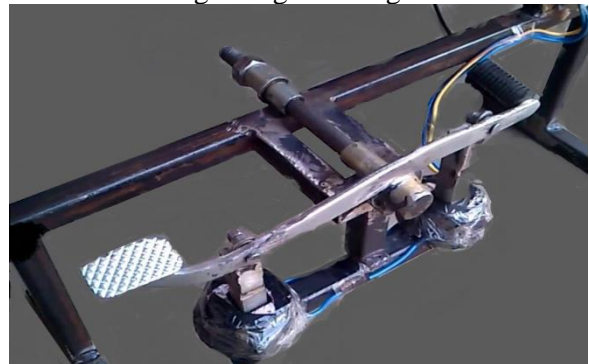


Fig-3.1 Working Model of Button operated gear shifting system

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 electro-magnetic coils are coupled to the gear rod of the two ends.

The fully automatic system is very costly and not afforded by middle class people. Also the semi-automatic gear system has advantage over fully automatic system and its cost is much lower than fully automatic system. In semi-automatic gear shifting the gears are operated with the help of electronic switch

provided on the handle of bike. The two switches are provided to sift the gears.

3.1 Working Principle of Electro-magnetic Solenoid

Linear solenoids are electromechanical devices which convert electrical energy into a linear mechanical motion which is used to control an electrical or pneumatic or hydraulic system. The solenoid consists of an electromagnetically inductive coil wound around a movable armature, or plunger. The coil is shaped such that the armature can be moved in and out of its centre altering the coil’s inductance. The plunger provides mechanical force to activate the control mechanism.

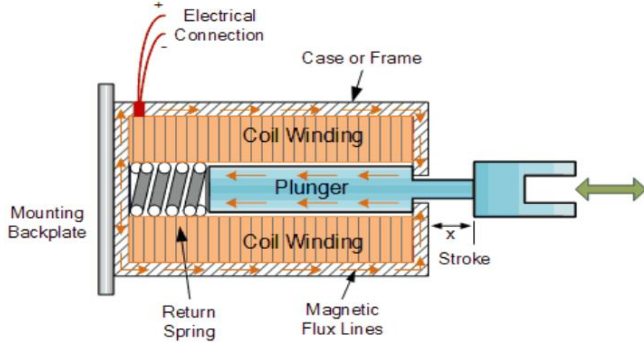


Fig-3.2 Cross sectional view of an electro-magnetic solenoid

The solenoid is operated by applying an excitation voltage to the electrical terminals of the solenoid. This voltage builds up current in the solenoid winding. This current produces a magnetic flux that closes through the solenoid’s housing, plunger and air gaps which form a magnetic circuit. The magnetic field, through the main air gap, exerts an attractive force on the plunger intent to pull it inside the housing. In general a typical solenoid consists of an electro-magnetic system and a mechanical system. The electro-magnetic system converts applied voltage to magnetizing current which in turn produces an electro-magnetic force. The mechanical system consists of the plunger and return spring producing the linear movement due to the electro-magnetic force.

4.COST ESTIMATION FOR BUTTON OPERATED GEAR SHIFTING SYSTEM MODEL

Sr. No.	Parts	Qty.	Material	Amount (Rs.)
1.	Frame Stand	1	Mild Steel	1200
2.	Battery	1	Lead Acid	2000
3.	Electro-magnetic coil	2	Coil	500
4.	Bearing with Bearing Cap	1	M. S.	300
5.	Engine	1	100 cc	8000
6.	Chain with Sprocket	1	M. S.	1200

7.	Bolt and Nut	-	M. S.	300
8.	Wheel Arrangement	1	-	500
Total Cost				14,000.00
Labour Cost(lathe, drilling, welding, grinding, gas cutting)				1,000.00
Manufacturing Cost (Total cost Labour cost)				15,000.00

5. ADVANTAGE

- Easy to control the gear shifting.
- Cheaper compared to the other alternatives.
- Maintenance is easy.
- Occupy lesser space compared to the other alternatives.
- Low weight.
- Reduces human effort.

6. DISADVANTAGE

- The driver should be well trained in system to avoid malfunction.
- When battery is completely charged then it can operate continuously.

7. CONCLUSION

This system is flexible and can be implemented on a motorcycle available in the Indian market without any modification. The motorcycle manufacturing can also use the system in their vehicles because it can be easily fitted to the motorcycle and there is no need of internal modification of the gear system. By installing this low cost system in their motorcycle Companies may also be able to increase their sale due to availability of these new features. This will also help in improving fuel economy in addition to improving the parts life.

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