

# Gear Changing in Two Wheelers by using Electromagnetic Solenoid

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**Abstract**— Solenoid operated gear shifting mechanism is mainly designed for the handicapped persons who unable to shift the gears by their foot. The technique used in this gear shifting mechanism consists of solenoid. Solenoid completes one up and down motion called as one stroke. This stroke time depend on supplied voltage and current. According to stroke length and voltage calculation, solenoids are mounted on both sides of gear shifting pedal at ends. By pressing that switch, person easily shifts the gear with the help of foot which is most efficient to handicapped persons.

**Keywords:** Solenoid, Gear Shifting, Permanent Magnet

## I. LITERATURE REVIEW

For easy gear shifting mechanism many researchers did theory and experiments. Muntaser Momani, Mohammed Abuzalata, Igried Al-Khawaldeh and Hisham Al-Mujafet had designed gear shifting mechanism and applied to makethe shifting process faster and less destructible for the driver. They used many devices like pneumatic double acting cylinder; four pneumatic two positions five ways DCV, Programmable logical controller (PLC) were used [1].

Researcher beitaoguo, hongyiliu, zhonglou used Fuzzy logic and control which was applied in hydraulic pressure control of solenoid valve seal performance test. Hence the problem of supplying constant pressure requested by the test can be resolved [2].

## II. METHODOLOGY

### A. Button Operated Electromagnetic Gear Shifting System

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. The two buttons are used to activate the electro-magnetic coils so that the gear will be shifted.

Automotive technology has been developed in many areas, like ABS system, active steering system and other safety systems, which are implemented to increase the passenger safety and comfort. 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.

## III. SOLENOID SELECTION

Actuators are defined as energy converter which converts one form of energy (electrical) into mechanical energy in a controlled form. Electromagnetic actuator which converts electrical to magnetic field is called “Solenoid” [3]. This system consists of an electromagnetic system which will work on the principle of British scientist William Sturgeon of electromagnet. An electric current flowing in a wire creates a magnetic field around the wire. To concentrate the magnetic field of a wire, in an electromagnet the wire is wound into a coil, with many turns of wire lying side by side. The magnetic field of all the turns of wire passes through the centre of the coil, creating a strong magnetic field. Some simple mechanism is arranged with the electromagnet and will help us to change the gear as per the desired speed.

The proposed solenoid consists of a coil and a movable plunger as shown in fig.1. The electromagnetically inductive coil is wound around the plunger [4]. We used a permanent magnet (PM) as a plunger, rather than generally used metal rods, to generate a higher actuation force. Therefore, two kinds of forces are exerted in the solenoid. One is the electromagnetic force induced by the magnetic field inside the solenoid when a current flows into wound coils. The other is the magnetic force caused by a permanent magnet.

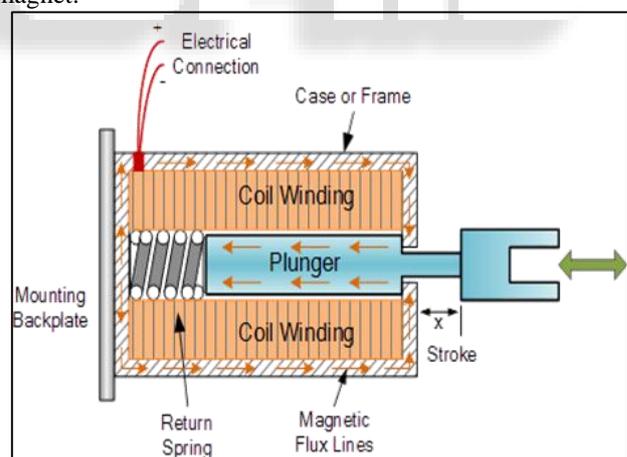


Fig. 1: Working of Solenoid Actuator

This type of solenoid is generally called a Linear Solenoid, due to the linear directional movement and action of the plunger. Linear solenoids are available in two basic configurations called a “Pull-Type” and “Push-type”. Linear solenoids are useful in many applications that require an open or closed (in or out) type motion such as electronically activated door locks, pneumatic or hydraulic control valves, robotics, automotive engine management, irrigation valves to water the garden and even the “Ding-Dong” door bell has one. They are available as open frame, closed frame or sealed tubular types [5].

#### IV. OTHER DIAGRAMS

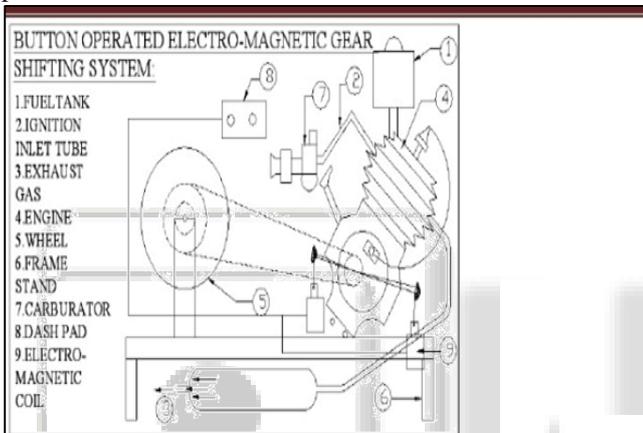
The actual arrangement of solenoid system with button is shown.

##### A. Assembly of Actuators on Bike

Solenoid completed one up and down motion called as one stroke. This stroke time depend on supplied voltage and current. According to stroke length and voltage calculation, mount solenoids on both sides of gear shifting pedal at ends. By providing appropriate voltage it pulls the plunger downward and by cutting off supply it retracts plunger upward.

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#### V. RESULT

##### A. Power required for Solenoid Gear Shifting

Solenoid Operated Gear Shifting Mechanism for Two Wheeler mechanism is 72 watts in Boxer bike which is 48% less, as compared to passion pro and splendor plus and gives more thermal stability due to less current and voltage required for boxer. Solenoid force required in Boxer bike is half of the passion pro and spender plus due to low current and voltage requirement. Also gives smooth Gear shifting motion.

#### VI. CONCLUSION

This project is most useful for handicap persons those who cannot drive the two wheelers because due to gear shifting problem. Hence the gear shifting mechanism is developed and modified according to their requirement. The application of this gear shifting mechanism leads to make the driving process for driver easier, reduces the risk of destabilizing, the chance of miss shifting. Due to this mechanism driver can concentrate on road rather giving concentration of gear shifting and easily drive in traffic areas.

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