

# Button Operated Electro-Magnetic Gear Changing Mechanism For Two Wheelers

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**Abstract**—The project involves gear changing with the help of electromagnetic coils which is operated by push buttons and mounted on the foot pedal. Electromagnetic coils produces an electromotive force which shifts the gear. The two push buttons are used to activate the two electromagnetic coils respectively. The coils are used to up shift and downshift the gear independently. An additional battery is used to supply the current to these coils.

The concept is based on the "ELECTROMAGNETIC INDUCTION". That is we can produce the mechanical force either by electrical field or by magnetic field. The same concept is used to change the gear with the help of pedal. The rectifier of the bike is changed the, new one will be able to charge the two battery at the same time. The coils are mounted on the upper side of the pedal, and the new pedal is attached which is greater in the length. The push buttons are installed on the panel of the handle and their connections is done with battery and coils. Insulations need to be provided, in order to prevent the coils from the water

## I. INTRODUCTION

In today's generation all bikes are equipped with foot lever gear changing mechanism, but this project involves the gear changing with the help of push buttons and electromagnetic coils. As we all know that if there is production of magnetic field there will production of mechanical force and in our project this force will change the gear easily. When the push buttons are pressed which is connected to the coil, the coils gets activated and mechanical force is produced this leads to the motion of the plunger of the coil in forward direction. For the return back action there will be helical spring of required stiffness is attached.

### 1.1 Problem Definition

In the way of designing "button operated gear changing system", the limitation of the primitives gear changing system is, it uses foot lever for changing of gears.

The bike rider who loves to ride the bike but won't be able to ride just because of the following reason

- Ankle pain
- Pain in their calves
- Cramp problem
- And a handicapped person won't be able to change the gear
- The bikes which is available with this mechanism is too costlier.

These are the problems due to which a person would not be able to ride a bike. To tackle this situations this idea is developed.

### 1.2 Previous Work

The previous work in this project idea had stopped due the time required for engaging the gear with this idea. But in this project this thing is eliminated due to introduction of BSIV vehicles and change that had been done in the electromagnetic coil.

### 1.3 Objective

Introducing electronics system along with mechanical system and their whole arrangement will be under the "Mechatronic System". Hence, the efficiency of the new system will be more than primitive system.

Reduces overall cost as compared to the bikes which exists with these systems.

Time for engagement through this system is less.

This project will provide the a combination of mechanical and mechatronics systems.

## II. INDENTATIONS AND EQUATIONS

Force Exerted by Plunger

Relative permeability of air and coil: - 1

Current density in coil: -  $1 \times 10^6$  Amp. / m<sup>2</sup>

(1) Cross-sectional area of coil = Height \* Width =  $0.04 \times 0.011 = 4.4 \times 10^{-4}$  m<sup>2</sup>

Let,

Ampere turn density (ATD) = Current density (I)

Current density =  $1 \times 10^6$  Amp. / m<sup>2</sup>

(2) Ampere turn (AT) = Ampere turn density \* Area of coil =  $1 \times 10^6 \times 4.4 \times 10^{-4} = 440$

Hg = AT/g =  $440 / 0.002 = 2,20,000$  Amp./Meter

Where, g is air gap distance

(3) Bg =  $\mu_0 \times Hg = 4\pi \times 10^{-7} \times 220,000 = 0.276$  Tesla

Force exerted on plunger

(4)  $f_e = 0.5 \times (Bg / \mu_0) \times A$

Where, A is plunger cross sectional area =  $\pi / 4 \times d^2 = \pi / 4 \times (0.025)^2 = 4.9 \times 10^{-4}$  m<sup>2</sup>

$f_e = 0.5 \times (0.276 / 4\pi \times 10^{-7}) \times 4.9 \times 10^{-4}$

$f_e = 54$  N

Torque on gear shaft

(5) From front =  $54 \times 0.09 = 4.86$  Nm

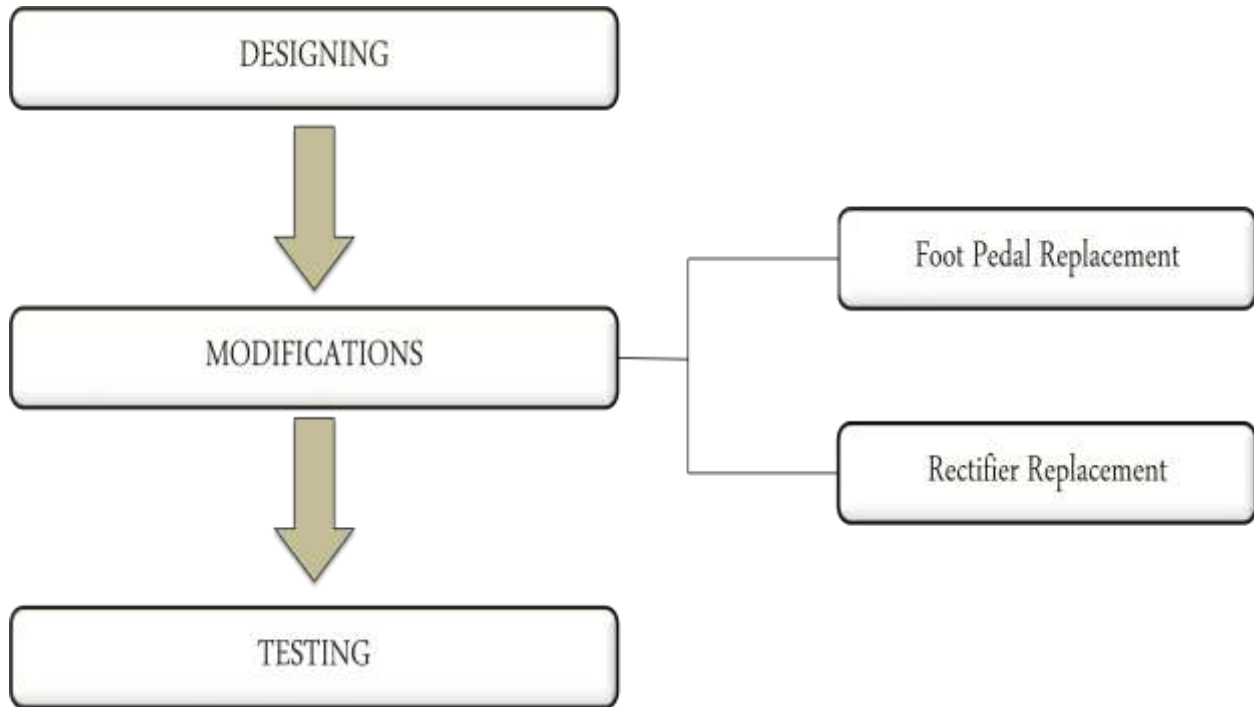
(6) From rear lever =  $54 \times 1.10 = 5.94$  Nm

## III. FIGURES



Fig.3.1: Bike And Electromagnetic-Coil

#### IV. METHODOLOGY



The method adopted in this idea is firstly we design the component like electromagnetic coil, foot lever pedal and specification of the battery.

After these designing some modifications has to be done in the bike before implementing this idea. Foot lever of the bike has to be changed with the new one which is longer in length as compared to original one, this helps to change the gear easily as it will reduce the amount of the force required to change the gear.

To charge an additional battery with original one rectifier has to be change so that it will charge both the batteries simultaneously.

Once these steps has been complete it's time for testing our vehicle for the required output.

#### V. CONCLUSION

##### 5.1 Advantages

- Low cost
- Does not require additional battery in BSIV vehicles for the operation of coil
- A disable person can also ride the bike easily
- Time for engagement is less.

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