

# CIRCUIT OPERATED HAND BRAKE

<sup>1</sup> Anup Sonawane , <sup>2</sup> Dinesh Panchal , <sup>3</sup> Karan Tekwani , <sup>4</sup> Omkar Garud , <sup>5</sup> Ashutosh Joglekar

<sup>1,2,3,4</sup>Students ,Suman Ramesh Tulsiani Technical Campus,Kamshet,Pune.

<sup>5</sup>Professor, Suman Ramesh Tulsiani Technical Campus,Kamshet,Pune.

Department Of Mechanical Engineering,

Suman Ramesh Tulsiani Technical Campus,Kamshet,Pune.

**Abstract:** *In circuit operated hand brake the brake will be engaged and disengaged with the help of electric motor and micro controller .the electric motor will be operated by the command given by the microcontroller. Microcontroller is programmed such that as ignition switch is turned Off then the microcontroller will rotate in anti clockwise direction causing the hand brake to engage and vice versa.*

**Keywords:** *Sensors, motor, microcontroller, IR sensors, relays, hand brake*

## I. INTRODUCTION:

“CIRCUIT OPERATED HAND BRAKE”, which is fully equipped by automatic system. It is a genuine project which is fully equipped and designed for Automobile vehicles. This forms an integral part of best quality. This product underwent strenuous test in our Automobile vehicles and it is good. In cars, the parking brake, also called hand brake, emergency brake, or e-brake, is a latching brake usually used to keep the vehicle stationary. It is sometimes also used to prevent a vehicle from rolling when the operator needs both feet to operate the clutch and throttle pedals. Automobile hand brakes usually consist of a cable directly connected to the brake mechanism on one end and to a lever or foot pedal at the driver's position. The mechanism is often a hand-operated lever (hence the hand brake name), on the floor on either side of the driver, or a pull handle located below and near the steering wheel column, or a (foot-operated) pedal located far apart from the other pedals. Hence, there is great demand for an electronic applied mechanism, with automation for actuation of the parking brake. It should also save space, reduce overall weight, complication in linkages, less mechanical parts prone to wear and tear, good responsive technique, high durability, very less or no involvement of human, easy to repair and economic.

## II. LITERATURE REVIEW:

1. International Journal of Innovative Research in Science, Engineering and Technology, Design & Analysis of Parking Brake System of Car, Amit B. Maske, S.B Tuljapure, P.K Satav , Vol. 5.

Brakes are one of the most important safety systems in a motor vehicle. The main functions of brakes system are to decelerate the vehicle, to maintain the vehicle's speed during downhill operation and finally to park the vehicle stationary either on a flat or slope road condition. The first two functions are related to the service brakes, while the last function is referred to the secondary or parking brakes. Conventional parking brake actuation involves the human interference. Without pulling or pushing the lever, the parking brake will not work. Also, sometimes due to negligence or in emergency conditions, we humans often forget to apply parking brakes.

2. The International Federation of Automatic Control Seoul, Korea, July 6-11, 2008 Stability Analysis of an Electric Parking Brake (EPB) System with a Nonlinear Proportional Controller, Young O. Lee , Choong W. Lee , Chung C. Chung , Youngsup Son , Paljoo Yoon and Inyong Hwang

An Electric Parking Brake (EPB) system is a kind of X-bywire system. The system replaces the manual force of the conventional lever parking system with motor torque. One performance requirement is that the EPB system maintains brake force without a power supply. To satisfy this condition, the system needs to use the friction of the screw, which changes according to the operation region. The controller of the EPB system should be designed to be robust and to provide uniform performance

3. Hindawi Publishing Corporation, Slide Mode Control for Integrated Electric Parking Brake System, BinWang, uexun Guo, Chengcai Zhang, Zhe Xiong, Huan Xia, and Jie Zhang.

Electronic parking brake (EPB) system is one kind of brake-by-wire systems, which generates The parking force by motor torque instead of the manual force. Hence, the EPB system can increase the vehicle cabin space, facilitate the parking process, and have potential function . There are mainly two kinds of EPB: the first one generates the force by pulling down traditional parking cable The second one is called integrated EPB (IEPB), which has the similar structure with the electro mechanical brake and hence it can offer numerous possibilities

4. International Conference on Technologies and Materials for Renewable Energy, Environment and Sustainability, Investigation Of DC Motors Mechanical Characteristics With Powered By Comparable Capacity PV Array, Olga V. Shepvalova , Alexander T. Belenov.

Results of research have been analyzed dedicated to the investigation of dependence of mechanic characteristic  $n = f(T)$  of commentator-type DC motors with three types of excitation (independent, parallel and series) on PV array characteristics and parameters in natural conditions of solar radiation for comparable capacity of PV array and DC electric motor in autonomous photoelectric systems

## III. SYSTEM ARCHITECTURE:

The parking brakes or the hand brakes must be locked every time when the vehicle is parked. While travelling in hilly areas, these brakes are highly useful. Hence our project incorporates the feature of the circuit operated hand brake system. That is every time, the key is inserted in its slot for ignition, the control unit senses and sends signals to activate the motor, the motor releases the hand brake through a cable. On the other hand, when the key is released after parking, the motor is controlled by the control unit and is rotated in the reverse direction such that the hand brakes are locked automatically.

### Circuit design

As shown is below figure, microcontroller is always supplied with 5V DC and sends the actuating signal of range 0V to 5V to relay based on the ignition condition of engine. Relay is supplied with 12V DC and switches the motor to rotate either clockwise or anticlockwise. As the motor rotates, it produces some electrical noises and high voltage. So to prevent microcontroller components from damage due to this noise

and high voltage, we are using opto-coupler in between microcontroller and relay board.

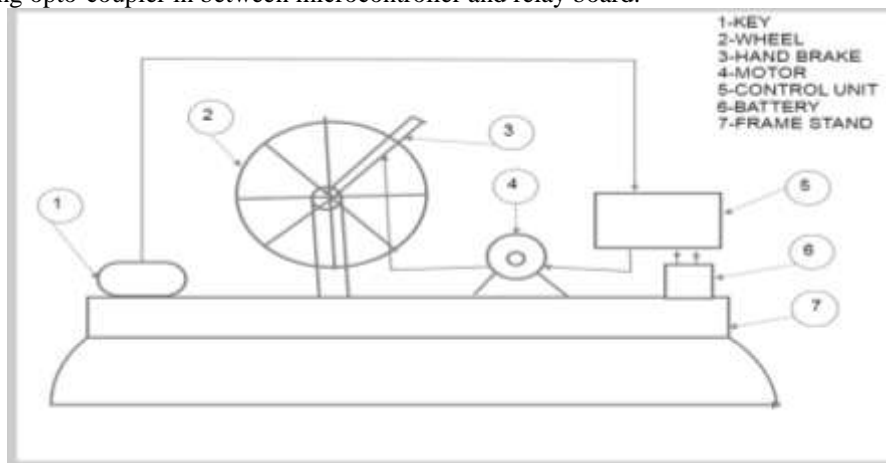


Figure 1-Block diagram of circuit operated hand brake

#### IV. COMPONENTS AND SYSTEM DESIGN:

##### 1. Control Unit:

In automotive electronics, Electronic Control Unit (ECU) is a generic term for any embedded system that controls one or more of the electrical system or subsystems in a motor vehicle.

##### Arduino Uno Microcontroller

Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP). The open-source IDE can be downloaded for free (currently for Mac OS X, Windows, and Linux).

##### 2. Relay

Two channel relay driver project can be controlled by feeding 2-12V trigger voltage, Very useful project for application like Micro-Controller based projects, Remote controller, Lamp on off, and any circuits which required isolated high current and high voltage switching by applying any TTL or CMOS level voltage. Two LED works as operation indicator while in, 3 pins screw terminals to connect load and provides both normally open and normally closed switching.

##### 3. Wheel Arrangement:

The simple wheel and braking arrangement is fixed to the frame stand. Near the brake drum, the pneumatic cylinder piston is fixed. This wheel arrangement is setup for showing the successful working of our project. But the real implementation can be done in the automobile and the brakes can be applied to all the four wheels.

##### 4. 12 volt lead acid battery

The lead-acid battery was invented in 1859 by French physicist Gaston Planté and is the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors.

#### V. CONCLUSION:

The circuit operated hand brake system help with automatic parking brake application based on engine ignition condition. This will provide safe braking is assured in slopes and hill starts with the help of "HOLD" function. The working of project is as per expected as the brake is applied by switching off the key and brake is released when key is on. This will reduce human efforts and human errors while parking or starting the vehicle. The system has greater relative advantages over the conventional parking system and will find maximum application in the future because of its significance. the system is less costly and more effective hence can be adapted to any vehicle.

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