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AUTOMATIC HAND BRAKE RELEASE SYSTEM

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Abstract- Hand brake is one of the most important components in vehicles. In general the hand brake is operated manually in our project. We are developing Automatic Hand Brake System for safety purpose. The automatic hand brake release mechanism is one of the most effective hand-braking system over the conventional systems. Generally the hand brake is manually operated whereas in our project work, we have developed an automatic handbrake release mechanism for safety purpose. This project provides a new concept design of the EMPB (electro mechanical parking brakes) system that has simple and low-cost characteristics.

Keywords—sensors, motor, microcontroller, IR sensors, relays, hand brake

1. INTRODUCTION

We have pleasure in introducing our new project " AUTOMATIC HAND BRAKE RELEASE" , 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. Automobile hand brakes usually consist of a cable directly connected to the brake mechanism on one end and to lever or foot pedal at the driver's position. The parking brake operates mostly on the rear wheels, which have reduced traction while braking but in some cases, parking brake operates on front wheel, as done in most Citroens manufactured since the end of World War II. The hand brake is instead intended for use in case of mechanical failure where the regular footbrake is inoperable or compromised. Modern brake systems are typically very reliable and equipped with dual-circuit hydraulics and low-brake-fluid sensor systems, meaning the handbrake are rarely used to stop a moving vehicle.

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. SYSTEM DESCRIPTION:

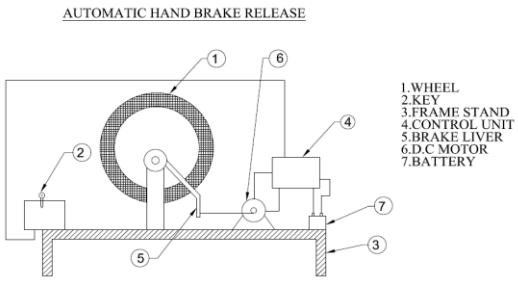


Figure 1.Block diagram of automatic hand brake release system

" AUTOMATIC HAND BRAKE RELEASE" is nothing but one of the braking systems in automobile at the time of vehicle switches off condition. In this braking system motorized operated one. In this project, the control unit is received the signal from the key switch. The key switch is ' ON' at the time of vehicle start condition. The first time clutch is applied so that the motor is rotating in forward direction for 2 sec to release the brake (Already wheel is on braking condition). The key switch is ' OFF' the motor is rotating in reward direction for 2 sec to applying the brakes.

3. COMPONENTS DESCRIPTRION:

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, max MSP).

Figure 2.ARDUINO UNO microcontroller

2. ELECTRONIC RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

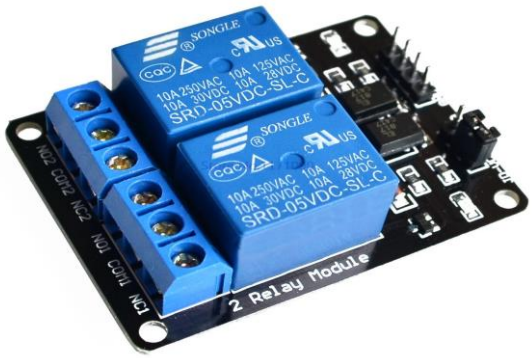


Figure 3.Electronic relay

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.

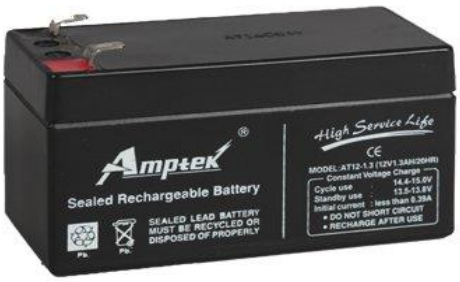
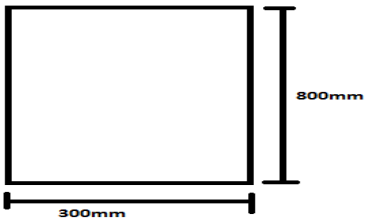


Figure 4.Lead acid battery

4. CALCULATION:

SHAFT AND FRAME CALCULATION:

1. Design of Frame:



- $\frac{M}{I}=\frac{\sigma b}{y}$ ……(1)

Bending moment (M) =force *perpendicular distance

M=4*400*9.81

Bending moment (M) =19620 N-mm

- $I=\frac{(b(h^3))}{12}$

$$I=\frac{(25(25^3))}{12}$$

I=32552.08mm4

I=32552.O8mm4

- $Y=\frac{25}{2}$

Y=12.5mm

Therefore, above value use in equation no. (1)

$$\frac{19620}{32552.08}=\frac{\sigma b}{12.5}$$

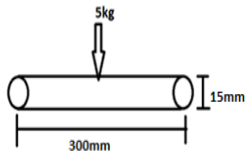
Therefore,

σ_b =7.53 N/mm^2

7.53<105

Hence design is safe.

2.Design of shaft:



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- $\frac{M}{I}=\frac{\sigma b}{y}$ **…….(1)**
- Bending moment=force*perpendicular distance

  Bending moment=5*9.81*300/2

M=7357.5Nmm

For diameter 15mm,

- $I=\frac{\pi}{64}*d^4$

  $I=\frac{\pi}{64}*15^4$

I=2485.7mm^4

Therefore ,

$$\frac{11036.25}{2485.7} = \frac{\sigma b}{7.5}$$

$\sigma_b = 8.87 * 7.5$

$\sigma_b = 22.2 N/mm^2$

$22.2 < 105\ N/mm^2$

Therefore, design is safe.

CONCLUSIONS:

The automatic hand braking system i.e. electromechanical parking brake 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. This system has complete automatic operation for easy drivability and safety. This system also gets some advanced options like hold function in head to head traffic and inclined roads, which would promise the drivers and vehicle owners with a safe pleasure drive and stops.

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