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DESIGN AND FABRICATION OF SEAT BELT ASSISTED HAND BRAKE LEVER

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Abstract: One of the most vital parts of every car is the hand brake. The hand brake is often controlled by hand. In our project, we're working on a hand brake that can be used when the seat belt isn't used for safety reasons. Carelessness in driving safety is one of the leading causes of fatality in road accidents. In 2012, more than half of the those killed on Utah's roads were not wearing seatbelts. As a result, seat belt use may have decreased major collision injuries and even saved lives. As a result, the "Driver Assistive Safety System" (DASS) is made up of strategies that instil necessary safety procedures through ignition. This project is about a safety mechanism that assures the driver and co-passenger wear seat belts when driving a car.

I. INTRODUCTION

The most important part in the automobile is the handbrake which is also known as a latching brake. It is used generally when the automobile is parked, thus the alternative name that is parking brakes is used to keep the car stationary also called as automobile e-brakes. The most column used of a parking brake is to keep the vehicle motionless when it is parked. The main function of brake system is to decelerate the vehicle, to maintain vehicles speed during downhill operation and finally to park the vehicle stationary either on a flat or slope road condition. In cars the hand brake is a latching brake usually used to keep the car stationary. Automobiles e-brakes usually consist of a cable directly connected to a brake mechanism on one end and to some type of mechanism that can be actuated by the driver on the other end of mechanism is often a hand operated lever, on the floor on either side of the driver, a pull handle located below and near the steering wheel column, or a pedal located far apart from the other pedals. In road vehicles the parking brake also called as hand brake, emergency brake or e-brake is used to keep the vehicle stationary. In normal vehicles a hand brake is consist of a cable connected to two wheel brakes at one end and the other end to a pulling mechanism which is operated by human with hands.

Seat belt implemented in cars to ensure drivers safety. The increase in loss of life in accidents due to driver's negligence to wear seat belt though it is strictly enforced by government rules. The aim of our project is to make seat belt wearing compulsory for vehicle movement.

The main purpose of this project is to ensure drivers safety through a modified handbrake in car. A handbrake is an additional braking mechanism installed on all commercial vehicles that's completely separate from foot pedal operated. In cars the parking brake, also called hand brake, usually used to keep the vehicle stationary. Most commonly used to prevent the vehicle from rolling when it is parked. Automobile hand brakes consist of a cable directly connected to the brake mechanism on one end and to a lever at the driver's position. Using your handbrake to stop a moving car can damage the brake system.

In this project we have designed the mechanism which is used to operate hand brake using seat belt assist. While removing the hand brake this mechanism or system ensures that seat belt is plugged in by the driver. As the driver acquire seat belt the hand bake gets free and can be removed.

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II. LITERATURE SERVEY

WEARING OF SEATBELT IS MANDATORY FOR IGNITION OF ENGINE

Prof. Hemal Patel , Chauhan Abhijeetsinh , Badreshiya Deepak , Patel Harsh
In this research paper they say, An Major causes of death in road accidents are carelessness in safety while driving. In 2012, more than half of all people who died on Utah's roadways weren't buckled. Hence wearing seat belts might have reduced serious crash related injuries and saved life. Hence "Driver Assistive Safety System" (DASS) comprises of techniques which inculcate the mandatory safety precautions via alarm, visual indicator, ignition and speed control. This paper describes safety system which ensures that the driver and co-passenger wear safety seat belt while driving a car. The driver assistive safety system works on 'ignition interlocking" and "speed control" concept.

AUTOMATIC HAND BRAKE SYSTEM

Akash D. Singh , Siddhesh P. Rahate , Amit V. Pawaskar, Ravindra K. Ambekar
Research paper say, as we know human life are gets more busy and complicated due to their work and development. So in today's advance technology maximum inventions or research is done to reduce human effort and for providing comfortable life to them. We know in today's vehicles a normal steering system is replace by power steering system for reducing some human effort and providing comfortable ride as compare to normal system. In this paper we are discuss how to reduce a human effort which is required to apply the hand brake while parking of vehicle.

In road vehicles the parking brake also called as hand brake, emergency brake or e- brake is used to keep the vehicle stationary. In normal vehicles a hand brake is consist of a cable connected to two wheel brakes at one end and the other end to a pulling mechanism which is operated by human with hands. In this case human effort is required to pull the mechanism and apply the brakes. To minimize this human effort is the main aim of our project with help of hydraulic system .In some cases people are forget to apply hand brakes while parking the vehicle which results in moving the vehicle and causes accidents. To avoid this we develop such system in which hand brakes are control with ignition system of vehicle.Means a hand brake mechanism and ignition system of vehicle is connected each other with simple hydraulic system for applying the hand brake while parking. Developing automatic hand brake system is the most effective solution for reducing human effort which is required for applying manual hand brake. This system can provide highly parking safety and braking effect. It provide quick braking and also simple in operation. It can be developed to use in case of failure of main braking system of the vehicle.

This research paper says that, Seat belt is implemented in car to ensure drivers safety. The increase in number of loss of life in accidents is due to driver's negligence to wear seat belt though it is strictly enforced by law. The aim of our paper is to make seat belt wearing compulsory for vehicle propulsion. We can achieve it by using pneumatic setup along with handbrake. The modification to be done ensures that the driver wears seat belt during driving.Here the seat belt of the car activates the hand brake (parking brake) through a pneumatic cylinder. When the seat belt activates the push button type DC valve an outward stroke is been obtained in the pneumatic cylinder through an air compressor which is used to release the hand brake. Similarly during the retracing stroke of the piston the hand brake is been engaged.

Research paper say that, According to a survey of leading car manufacturer of India, 75 percent vehicle users in India do not wear seat belt causing 15 deaths and numerous injured every day. Not wearing seat belt causes jeopardize of safety of passengers in vehicle. Passive safety which consists airbags and seat belt has a active role in protecting the safety of a car. With a pneumatic circuit connected to modified handbrake or parking brake, seat belt wearing will be made compulsory for a driver to drive a vehicle and with the help of sensors, co-driver or passenger wearing seatbelt will be made compulsory. Hence Safety of passengers in car is achieved which satisfies main aim of project that is to assure safety.

Seat belt implemented in cars to ensure drivers safety. The increase in loss of life in accidents due to driver's negligence to wear seat belt though it is strictly enforced by government rules. The aim of our project is to make seat belt wearing compulsory for vehicle movement.
The main purpose of this project is to ensure drivers safety through a modified handbrake in car. A handbrake is an additional braking mechanism installed on all commercial vehicles that's completely separate from foot pedal - operated. In cars the parking brake, also called hand brake, usually used to keep the vehicle stationary. Most commonly used to prevent the vehicle from rolling when it is parked. Automobile hand brakes consist of a cable directly connected to the brake mechanism on one end and to a lever at the driver's position. Using your handbrake to stop a moving car can damage the brake system.

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III. METHODOLOGY

MODEL PREPRATION:

Step 1: - We started the work of this project with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about Automatic Bottle Packing.
Step2: - After that the components which are required for our project are decided.
Step 3: - After deciding the components, the 3 D Model and drafting will be done with the help of CATIA software.
Step 4: - The components will be manufactured and then assembled together.
Step 5: - The experimental observations will be taken; calculations will be done and then the result will be concluded

CATIA:

CATIA is a leading product design platform created by company headquartered in France.It's an excellent tool for companies to come up with designs, do a comprehensive analysis, and manufacture new products which can be helpful in product development. CATIA can be beneficial to OEMs and manufacturers from various industries since they can utilize this tool in ensuring quicker analysis, design, and creation of new products. The revolutionary software integrates different approaches in the design and development of products, allowing for various disciplines to use their current tools in different stages of product development, hence, making CATIA handy for systems architects, engineers, and industrial designers.

MAIN FEATURES OF CATIA

- Social Design Environment
- Global Collaboration
- Instinctive 3D Experience
- Capture Manufacturing Process Intent

IV. WORKING

This system uses microcontroller and electric motor powered by DC battery which transfers the power to four bar linkage mechanism to operate the hand brake lever shaft for engaging and dis-engaging the hand brake. Engaging of hand brake takes place when ignition is off and the seat belt is removed, and dis-engaging of hand brake takes place when the ignition is ON and seat belt is fastened and also foot brake pedal is pressed. Below 3D cad model is representation of actual seat belt assisted hand brake system, where electric battery transfers the current to microcontroller unit, this microcontroller unit having cable connections linked with components of vehicle like ignition switch, seat belt, and brake pedal via push button, when all these components cable connections meet the criteria as per above table. Microcontroller unit sends the signal to electric motor to rotate motor shaft clockwise and anti-clockwise accordingly. The electric motor shaftis been connected to four bar linkage mechanism. When motor rotate clockwise the four bar link push the linkage forward and converts to rotary motion, thus four bar linkage which is connected to the brake lever is pulled back to apply the brake. Similarly, when motor rotates counter clockwise direction four bar link is pulled backward and converts to rotary motion. As a result, hand lever is falling down, thus disengaging the brake.

V. CALCULATIONS

Motor selection:

Consider weight applied by the human=2kg

So the force applied is equal to = 2x9.81 newton.F= 19.62
Hence, the torque required = 19.62x 600

= 11772 N-mm=11.77N-m

So we have considered the 12v 11Amp wiper motor which has 19 N-m torque.

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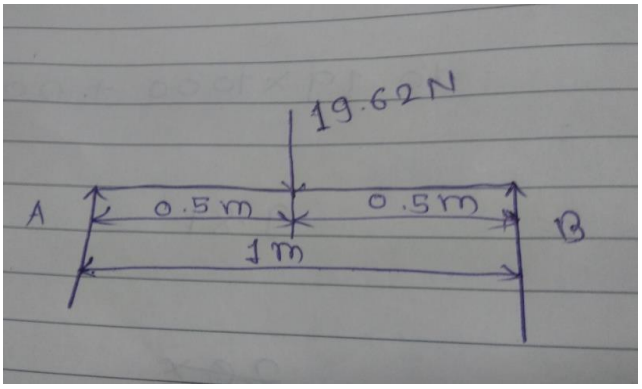
Shaft Design:

We are doing simple SFD and BMD calculations for the shaft we have selectedConsidering load acting on the shaft is 2kg (load of tyre)
So, F= m x g F= 2 x 9.81
F= 19.62 N

Shaft is simply supported from both the ends

So we consider simply supported beam calculations for finding the maximum bendingmoment and shear force acting on the shaft



Sum of horizontal forces, x= 0, y = 0

$R_a + R_b - W = 0$

$R_a + R_b = 19.62$ N

Moment about A and B = 0 $M_a = (R_b \times 1) - (19.62 \times 0.5)$
As we know,

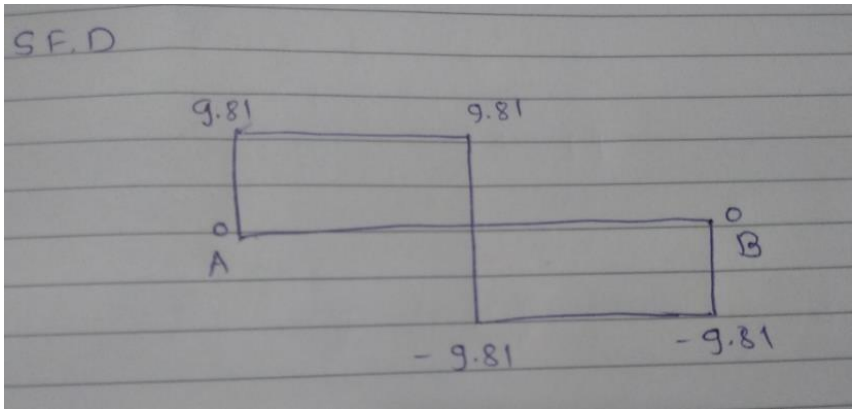
$R_b = 9.81$ N

$R_a + R_b = 19.62$ N

$R_a = 9.81$ N

AL = 0

AR = 9.81 N CL = 9.81 N CR = -9.81 NBL = -9.81 NBR = 0 N



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1) Bending moment at point load,Bending moment at point C,

Mc= (Ra x L) = (9.81 x 0.5) = 4.905 Nm

2) Selection of bearing:

For simplified calculations and to obtain an approximate value of the bearing life, the so- called "handbook method" is used to calculate the basic rating life. The basic rating life of abearing according to ISO 281 is
Where,

L10 = basic rating life (at 90% reliability), millions of revolutionsC = basic dynamic load rating, kN
P = equivalent dynamic bearing load, kNp = exponent for the life equation
= 3 for ball bearings

= 10/3 for roller bearings, as used typically in axlebox applications

The basic rating life for a specific bearing is based on the basic dynamic load rating according to ISO 281. The equivalent bearing load has to be calculated based on the bearing loads acting on the bearing via the wheelset journal and the axlebox housing. For railway applications, it is preferable to calculate the life expressed in operating mileage, in million km

$L_{10s} = [(Pi \times D_w) / 1000)] \times (C/P)^p$

Where,

L10s = basic rating life (at 90% reliability), million kmDw = mean wheel diameter, m

From design data book V.B.Bhandari-Page no-15.65 we can select bearing for the shaftdiameter of 25 mm.
Here we select single row deep groove ball bearing designated as-6304(SKF)Dimensions, load capacities of bearings is given as,
Inner Diameter of bearing=25mmOuter diameter of bearing=38mmWidth of bearing=15 mm
Basic load ratings(C)=15500 N and (C_0) =13200 N

VI. FINAL MODEL

In this project we have introduced a controller that can be used in Wireless EV charging systems to charge electric vehicles without wires. The proposed controller is capable of self-tuning the switching operations of the converter to the resonance frequency of the WPT system, and therefore eliminates the need for switching frequency tuning. Also, it enables soft-switching operations in the converter, which will result in a significant increase in the efficiency of the power electronic converter. Contactless electric vehicle (EV) charging based on inductive power transfer (IPT) systems is a new technology that brings more convenience and safety to the use of EVs. Since it eliminates the electrical contacts, it would not get affected by rain, snow, dust and dirt, it is a safe, reliable, robust and clean way of charging electric vehicles, reduces the risk of electric shock.

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