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Design and Fabrication of Seat Belt Assisted Hand Brake Lever

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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 hand brake when Seat belt is not acquired off for safety purpose. A 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 ignition. This project 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 'HAND BRAKE REALESE" concept.*

Keywords: Design and Fabrication of Seat Belt Assisted Hand Brake Lever

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. PROBLEM STATEMENT

In today's world accidental rate is increased and the main reason of causing severe injury is not acquiring seat belts. Due to unawareness of not using seatbelts many people have faced the disastrous events. After all these years of practice it has been neglected which is not ignorable for the driver's safety.

Objective

- To ensure the safety of the driver.
- Both seat belt wearing and brake release is done in single operation.
- The cost is low.
- To get habitual with acquiring seat belt.

Scope

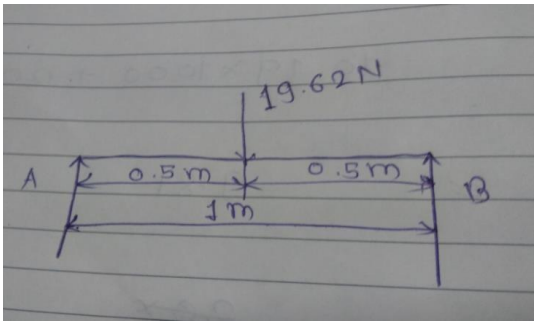
As this system is cheap and easy to use so, it can be used in further vehicle to ensure the safety of the occupant and the driver itself.

Calculation

Motor selection:
Consider weight applied by the human=2kg
So the force applied is equal to = 2x9.81 newton. F= 19.62 N
Hence, the torque required = 19.62 x 600 = 11772 N-mm=11.77N-m
So we have considered the 12v 11Amp wiper motor which has 19 N-m torque.

Shaft Design

We are doing simple SFD and BMD calculations for the shaft we have selected Considering 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 bending moment and shear force acting on the shaft



As we know for shear force equation
Sum of horizontal forces, Σ Fx= 0, Σ Fy = 0 Ra + Rb – W = 0
$\therefore$ Ra + Rb = 19.62 NAL = 0
Moment about A and B = 0 AR = 9.81 N
Ma= (Rbx 1) – (19.62 x 0.5) CL = 9.81 N
As we know, CR = -9.81 N
Rb = 9.81 NBL = -9.81 N
Ra + Rb = 19.62 N BR = 0 N
Ra = 9.81 N

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Bending moment at point load, Bending moment at point C,
Mc= (Ra x L) = (9.81 x 0.5) = 4.905 Nm F=19.62N
Maximum bending moment= WL/4
= 19.62 X 1000 / 4 = 4905 N-mm
Moment of inertia= $\pi/64$ D^4
= 19175 mm4
M/I = σb / y
σb = 3.19 MPa
This stress is less than the yield point strength of the material hence the design is safe

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 a bearing according to ISO 281 is
L10 = (C/P)p
Where, L10 = basic rating life (at 90% reliability), millions of revolutions C = basic dynamic load rating, kN
P = equivalent dynamic bearing load, kN p = 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
L10s = [(Pi x Dw) / 1000)] x $(C/P)^p$
Where, L10s = basic rating life (at 90% reliability), million km Dw = mean wheel diameter, m
From design data book V.B.Bhandari-Page no-15.65 we can select bearing for the shaft diameter 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=25mm Outer diameter of bearing=38mm Width of bearing=15 mm
Basic load ratings(C)=15500 N and (C0) =13200 N

III. COST ESTIMATION

Cost estimation may be defined as the process of forecasting the expenses that must be incurred to manufacture a product. These expenses take into a consideration all expenditure involved in a design and manufacturing with all related services facilities such as pattern making, tool, making as well as a portion of the general administrative and selling costs.

Sr. No	Part	Total Cost
1	M.S. Material	1500
2	Other Component	1500
3	Electronic Systems	2000
4	Transports / Machining Cost	3500
5	Labour cost	1200
Total		9700

Total Cost = Components Cost + Cost of Machining = 9700 Rs.

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