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RESEARCH ARTICLE OPEN ACCESS

Design of Automatic Hand Braking System

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Abstract:

In this world of mechatronics and automation, various systems have been developed just to reduce the time and human error. The automated braking system is a part of mechatronics. Presently the vehicle has alarm system for maintaining the safe distance between moving vehicle. When the vehicle gets too close to the object, the alarm is triggered this warns the driver about an object. But this feature has many problems and is prone to human error. We have brought the facility by using the same sensor system but with the automated breaking system which restricts the backward motion of the vehicle. Our aim is to design the system which can avoid the accident in reversing the heavy loaded vehicles like trucks, buses and all the vehicles consisting of pneumatic braking system. For this purpose we have developed a model which automatic braking for four wheeler when lock the ignition switch and releasing when on the ignition switch.

Now the project mainly concentrates on designing a suitable operating system. To maintain simplicity and economy in the design the locally fabricated unit has been used.

Keywords **—Hand Braking System, Safety in Braking, Sensor, Ansys etc.**

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I. INTRODUCTION

The present invention relates to a parking brake system for motor vehicles having a control element and at least two electromechanical actuators for generating a parking brake force at in each case one wheel of the motor vehicle. An electric parking brake control unit of an electric parking brake apparatus has an input section for receiving signals for performing automatic activation and deactivation, but does not have a determination function and a circuit for inputting signals from various sensors, Which are necessary to determine Whether to start the automatic activation/deactivation control. Therefore, when used in a vehicle which does not require an automatic control function and requires only annual control function, the electric parking brake control unit can be used solely, with no signal line connected to the input section. When used in a vehicle Which requires both the automatic control function and the manual control function, the input section is connected to a second control unit that can output signals for performing automatic activation and deactivation' whereby the electric parking brake Control unit operates in cooperation With the second control unit

The present invention relates to an electric parking brake apparatus capable of activating and deactivating a parking brake of a vehicle by use of electric drive means such as an electric motor. A parking brake system for a motor vehicle comprising a control element and at least two electromechanical actuators. Each electromechanical actuator is configured for generating a parking brake force at one Wheel of

the motor vehicle. Thee electromechanical actuators are each provided With Wheel electronic systems. The control element is connected via a brake controller to the Wheel electronic system of an electromechanical actuator by at least a signal line. The control element is connected via a brake controller to the Wheel electronic system of a second electromechanical actuator by a second signal line. At least a third signal line connects the control element directly to the Wheel electronic systems or one of the electromechanical actuators to convey a driver's request. [1]

II. LITERATURE REVIEW

Tachiiriet a1. An electric parking brake control unit of an electric parking brake apparatus has an input section for receiving signals for performing automatic activation and deactivation, but does not have a determination function and a circuit for inputting signals from various sensors, Which are necessary to determine Whether to start the automatic activation/deactivation control. Therefore, when used in a vehicle which does not require an automatic control function and requires only a manual control function, the electric parking brake control unit can be used solely, with no signal line connected to the input section. When used in a vehicle Which requires both the automatic control function and the manual control function, the input section is connected to a second control unit that can output signals for performing automatic activation and deactivation' whereby the electric parking brake Control unit operates in cooperation With the second control

He is studied the A parking brake system for a motor vehicle comprising a control element and at least two electromechanical actuators. Each electromechanical actuator is configured for generating a parking brake force at one Wheel of the motor vehicle. Thee electromechanical actuators are each provided With Wheel electronic systems. The control element is connected via a brake controller to the Wheel electronic system of a first electromechanical actuator by at least a first signal line. The control element is connected via a brake controller to the Wheel electronic system of a second electromechanical actuator by a second signal line. At least a third signal line connects the control element directly to the Wheel electronic systems or to one of the electromechanical actuators to convey a driver' request.

Bensch et al. An actuating device includes a vehicle operating brake and Foreign Application Priority Data parking brake. A first braking effect is generated by the parking brake independently of a braking procedure for the operating brake. The actuating device comprises a first switched state, wherein the first braking effect of the parking brake an not be provided, and a second switched state, wherein the first (full) braking effect of the parking brake is provided. The actuating device further comprises a manually actual operating element for actuating the parking brake that comprises travel positions. The actuating device is switched to the second switched state in a first travel position when the parking brake is released and to the first switched state when the parking brake is applied. Also, the actuating device is switchable to a further switched state. In an actuating method, the actuating device is switched to the further switched state in response to an actuation.

Vehicles, in particular utility vehicles, have service breaks for driving operation and parking brakes for immobilizing the vehicles. A so-called first braking action can be generated by means of the parking brake independently of a braking process of the service brake. A known actuating device that is part of the vehicle brake system actuates the parking brake. The known actuating device has a manually actuated control element for actuating the parking brake. If the parking brake is engaged, the actuating device can be switched into a first switching state in which the parking brake is released. The control element has a plurality of defection positions. Ina first defection position, if the parking brake is released, the actuating device can be switched into a second switching state in which the parking brake is engaged. A brake system equipped with the known

actuating device can have at least one further braking function, for example a trailer testing function, a trailer braking function and/or an anti-jacking braking function. Controlling a multiplicity of functions of the brake system can be confusing for the vehicle driver and is often not possible in a readily intuitive manner.

III. CONSTRUCTION & WORKING OF SYSTEM

A. Parts used in the project

- Hand brake lever
- D.C. motor 12V
- Battery 12V D.C.
- Micro Switch
- Ignition Switch
- Indicator bulb

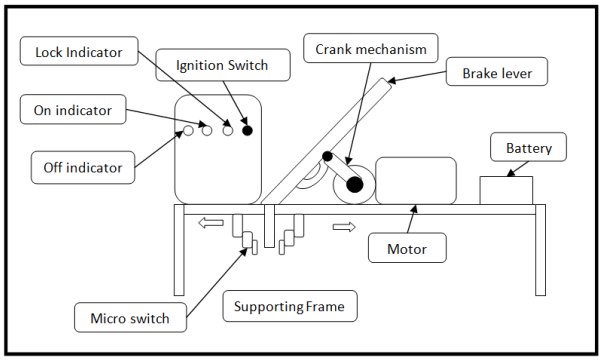

Fig.1 Diagram of Automatic Hand braking System

B. Working of the project

Working of developed a model which is Automatic braking for four wheeler when lock the ignition switch then automatically hand brake lever in braking condition and the releasing when ON the ignition switch. Generally speaking, it is an object of the present invention to provide for simple and intuitive control of a vehicle brake system. This is achievable by means of an actuating device of the general type under consideration, which can be switched into a further switching state, and by means of an actuation method, wherein in response to an actuation, the actuating device is switched into the further switching state. The actuating device can be switched into the first switching state, the second switching state and the further switching state by the same control element. By the further switching state, it is possible, for example, for a trailer testing function and/or a trailer braking function and/or an anti-jacking braking function to be selected by one and the same control element, or a function that prevents an automatic engagement of the parking brake upon the deactivation of an ignition can be selected by means of the actuating device, in particular by one and the same control element. The actuating device has, aside from the control element, at least one electronic system for providing switching states. The actuating device may however also have further components of the brake system, in particular control electronics, power electronics and brake actuators. The control element of the actuating device according to embodiments of the invention can be controlled intuitively and more easily than the control element of the known actuating device, by means of which a trailer testing function can be selected, or by means of which, in combination with a separately arranged further control element, a trailer braking function and/or an anti-j jacking braking function or deactivation of an automatic engagement of the parking brake upon the deactivation of the ignition can be selected. Simple and intuitive control is also possible in the case of a further control element, which is actuated separately, for deactivating the automatic engagement of the parking brake upon the deactivation of the ignition.[2]

IV. DESIGN AND DESIGN CONSIDERATION OF THE PROJECT

Project design may be defined as the iterative decision making activity to create a plan or plans by which the available resources are converted, preferably optimally, into systems, processes or

devices to perform the desired functions and to meet human needs. In fact project design has been defined in many ways but the simplest ways to define project design as

"An iterative decision making process to conceive and implement optimum systems to solve society's problems and needs."

Project design is practical in nature and must be concerned with physical reliability, or economic and financial feasibility Design is essentially a decision-making process. If we have a problem, we need to design a solution. In other words, to design is to formulate a plan to satisfy a particular need and to create something with a physical reality.

A. Design of the project

1. Selection of Battery

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work.

Battery: 7.2 Amp Hour 12 Volts Sealed Lead Acid Battery

2. Selection of Motor as battery specification

Motor 12V DC 30 RPM An electric motor is a machine which converts electric energy into mechanical energy. Its action is based on the principle that when a current carrying conductor is placed in magnetic field, it experiences a mechanical force whose direction is given Fleming's Left Hand Rule.

3. Design of the Motor

We know,

Specification of the DC motor,

Toque (T) = 5 N-m

Speed (N) = 30 rpm

We know,

Power (P) = $2\pi NT/60$

$= (2\times3.14\times30\times5)/60$

= 15.7 watt

Power of the motor (P) = 15.7 watt.

4. Design of Hand lever

We know,

Effort on the lever

P = 300 to 400 N

Step I

Torque induced in shaft

Torque = Effort × Length of effort arm

T = P × Le

Also according to equivalent torque and shear stress theory,

T = π/16 × ζ × d3

Step II

Bending moment in shaft

M = P × l

Step III

According to maximum principle shear stress theory and equivalent torque theory

Te = √ (M^2+T^2)

Te = π/16 × ζ × d13

Step IV

Diameter of boss

db = 1.6d

Step V

Length of boss

lb = 1.5d or d

Step VI

Thickness of boss

tb = 0.3d

Step V

Design of lever

Maximum bending is near the boss

Momemt = Effort × (Length of lever × Diamter of boss/2)

M = P×(Le × db/2)

σb = M/Z

σb = 6[P×(Le × db/2)]/(tb2)

B. ANSYS Result Data

FORCE- 120 KG

SUBJECT: STRUCTURAL ANALYSIS

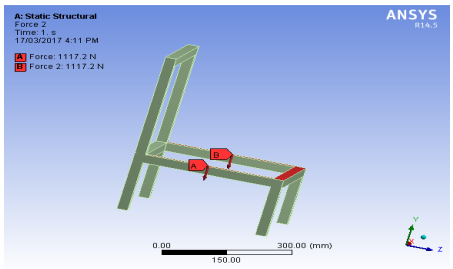

Fig. 2 Structural Analysis of frame

Total Deformation
Subject: Structural Analysis
Comments: Max Deformation = 0.0004018 mm

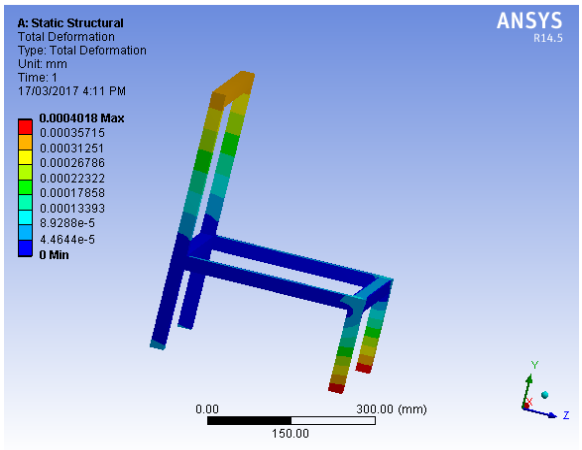

Fig. 3Structural Analysis of frame

Equivalent Stress
Subject: Structural Analysis
Comments: Max Equivalent Stress = 0.072442 MPa

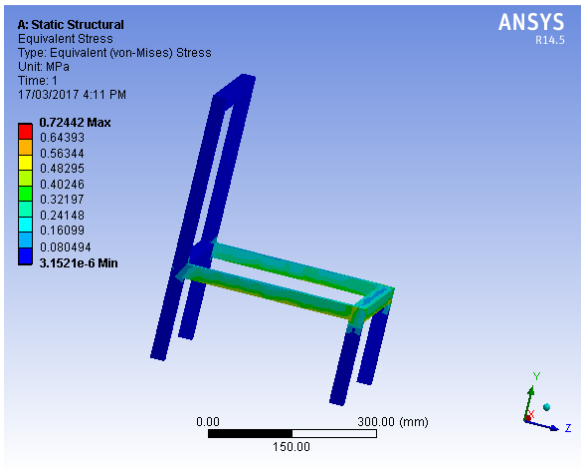

Fig. 4Structural Analysis of frame

Here,
Material used for frame design is Mild Steel.
Maximum Equivalent Tensile Strength = 0.72442 MPa
But, Tensile Yield Strength of MS = 375 MPa
Maximum Equivalent Tensile Strength < Tensile Yield Strength of MS
Hence, Design is Safe.[3]

V. CONCLUSIONS

The present invention therefore provides a system which, compared to the known concepts, permits considerably greater availability with an extremely simple and favorable structural concept. “Greater availability” is understood tomean that the parking brake is to be as far as possible always capable of operating. In one advantageous development, a fourth signal line is provided which connects the two wheel electronic systems of the electromechanical actuators directly to one another and In one preferred embodiment of the invention, the control element is equipped with at least three channels, and it outputs the driver’s request in the form of at least three switching information items. The control element is supplied and/or evaluated from the brake controller or from the further controller. The control element has preferably electronic semi-Conductor components. In a

further advantageous development of the subject matter of the invention, a redundant power supply of the parking brake system is provided. Here, the redundant power supplies formed by two batteries together with a charging circuit. Alternatively, the redundant power supply is formed by management system for a vehicle on-board voltage supply.

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