MOTORIZED CAR JACK

HARDWARE PROJECT REPORT

in

B.Tech Mechanical Engineering

by

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Table of Contents

Abstract

Tire punctures are very frequent in today's world. All vehicles come with car jacks which require the user to apply manual force to lift a vehicle. This project is targeted to analyze the development of a car jack in order to make load lifting easier by utilizing Car battery (12V) which can be used in emergency situations. In this design, the power from the car battery (12V) is used to run the DC motor and thus it is rotated. This helps move the syringe and the car jack will lift the vehicle. This modified car jack can be easily operated by any person and it saves time, hence reduce wastage of human efforts and time. The design of this car jack is being developed in Solid Works 2010 software. Manufacturing and fabrication work have been done using milling, drilling, grinding and threading machines. The modified car jack is tested and implementation of the design can solve ergonomic problems.

Keywords: Car Jack; Car battery; DC Motor; Solid Works; Ergonomics

CHAPTER – I

INTRODUCTION & LITERATURE REVIEW

1.1 Introduction

During side road emergency like a tire puncher, a car jack is required to lift the vehicle. A mechanical jack can lift all or part of a vehicle into the air for repairing breakdowns or vehicle maintenance. However, changing the flat tire is a laborious activity. These days many varieties of car jack have been developed for lifting an automobile from ground. However, available car jacks are manually operated thus requiring extra physical efforts from the user. It is also difficult for elderly and handicapped to operate such jacks. For using these jacks, operators are required to be in a prolonged squatting or bent position. Working in these positions for some duration is problematic and can lead to back problem. The automobile workstations are equipped with hi-tech car lifting system, wherein car are raised and lowered via electrically powered system. However, due to their high cost, maintenance and size, such lifts can neither be placed in car nor be owned by car owner. Motorized portable car jack not only reduce human efforts in automobile but also save time needed to repair the automobile. Such features are beneficial for repairing vehicle on the side of the roadway. This modified car jack is designed so that it can be easily operated, safe and can lift or lower the vehicle without much physical effort. This paper focuses on design and analyze of a modified car jack.

1.2 Literature Review

[1]In the paper, "Development of Motorized Car Jack", the existing car jack was developed by making small adjustments and using an electric motor to rotate power screw. The force analysis of a screw jack is conducted and a mathematical model is developed to study and understand working of a screw jack

[2] After reading the research paper on "Automated Car Jack", it was inferred that the existing design was modified by introduction of an electric motor in the power screw, connecting gear with the pinion, the electric switch connected to the motor and plugged to the automobile 12V battery source to generate power for the prime mover (motor), in order to make load lifting easier.

[3] The research paper on "Modification of the Existing Design of a Car Jack" focuses on the said Motorised Screw Jack for Vehicles, specifically the Scissors type which under goes force analysis so that its performance criterion will not fail in any sense. The main physical parameters of the design are determined through the appropriate calculations and practical assumptions.

1.3 Knowledge gained from the literature

The development of an automated car jack involves the addition of a DC motor to the existing jack and using the car battery for lifting the vehicle. Force and design analysis is performed using various parameters and materials to understand and improve the fabrication of a motorized car jack.

1.4 Gaps in the Literature

All the research papers written on the car jack involve modification, in some way or the other, of the existing screw jack. The use of hydraulics is completely ignored. All the screw jacks developed from these research papers will be require further tooling to like a power screw to automate the process.

1.5 Objectives of the Work

The basic objective of the project is to find out the solution for the reduction in manual efforts, during the maintenance of vehicles. It is a well-known fact that there is wide use of cars in the market. In case of breakdown maintenance or while replacing the tyre, minimum efforts should be required to lift the vehicle. At present mechanical toggle jacks are being used with lever operated system. With a use of this the required torque to lift the vehicle can be generated with the use of geared motor & reversible switch suction, and interlocking, that contribute to the gripping force.

1.6 Design Elements included

☐ Engineering Standards	☒ Prototype and Fabrication
☐ Design Analysis	☒ Experimentation
☒ Modelling and Simulation	☐ Software Development

1.7 Realistic Constraints to be addressed

☒ Economic	☐ Ethical
☐ Environmental	☒ Health and Safety
☐ Social	☒ Manufacturability
☐ Political	☒ Sustainability

CHAPTER –II

METHODOLOGY AND EXPERIMENTAL PROCEDURE

2.1 Methodology

Literature Survey	• Recent trends in automobile industry with respect to car jacks and related technologies.
Material/Component Selection	• Heavy Duty Steel or Nickel Chromium Moybdenum steel alloy • However, for sake of simplicity, wood will be used instead
3-D CAD Modelling	• SolidWorks 2016 Part Modelling and Assembly contruction.
Computational Simulation	• Motion Study in SolidWorks 2016
Material/component Procurement	• The materials and electrical components will be purchased from the suppliers.
Machining	• Milling, drilling, grinding and threading of material into the component specification.
Fabrication	• Assembly of the machined components and electrical components to form the car jack.
Testing	• Practical tests are performed to test the compatability of the motorized car jack in actual world applications.

CHAPTER –III

RESULTS AND DISCUSSION

PHASE I

3.1 Work to be done

- Machining
- Fabrication
- Testing

3.2 Gantt chart

MONTH	JAN 18				FEB 18				MAR 18				APR 18			
WEEK AND TASK	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
LITERATURE REVIEW																
MATERIAL SELECTION																
3-D CAD MODELLING																
MATERIAL PROCUREMENT																
MACHINING																
FABRICATION																
TESTING																
PROTOTYPE SUBMISSION TO PATENTS																

3.3 Conclusion

The car jack was developed by using the concepts of hydraulics and an electric motor. The car battery is a power source to motor, to make load lifting easier. The advantages of this modified jack are that it will save time, human efforts and it is easier to operate, thereby effectively eliminating the problems related to Ergonomics. On observing all available car jacks in the markets, this prototype has been improved by few alterations in some features and design. The objectives are to design a car jack that is safe, efficient, reliable and able to function with easy operating. Based upon testing and calculations, this car jack is considered safe to use under some specifications. Furthermore the torque supplied to the system is more than enough to lift a car weighing around 1000 kg. There are certainly weak points which can be improved in designing and fabrication which will be eliminated in a professional manufacturing environment.

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