

Inbuilt Motorized Screw Jack for Vehicle

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Abstract - In side road emergencies like tyre puncture or vehicle maintenance and repair, conventional car jacks used mechanical advantage to allow human power to raise the vehicle by manual force. This project shows modification of current mechanical manual jack with the use of an electric DC motor in the screw in order to make load lifting easier. This system can be placed in every in automobile under any operating condition. This project will reduce human effort and time.

With the increasing levels of technology, the efforts being put to produce any kind of work has been continuously decreasing. The efforts required in achieving the desired output can be effectively and economically be decreased by the implementation of better designs. Power screws are used to convert rotary motion into translatory motion. A mechanical jack is an example of a power screw in which a small force applied in a horizontal plane is used to raise or lower a large load. The advantage of a mechanical jack is the ratio of the load applied to the effort applied. The height of the jack is adjusted by turning a lead screw and this adjustment can be done either manually or by integrating an electric motor.

Index Terms - Mechanical Jack, Screw, DC motor.

1.INTRODUCTION

In day-to-day life it is very tedious job to operate the jack manually and it is also a very time-consuming work as well. The general idea of project is to minimize the human effort while operating the jack. The main purpose of this project is to reduce human effort and avoid accident risk. When tyre is puncture; to repair or replacing tyre jack is required especially at rear wheels it is difficult to operate jack. Because on front side it easy to remove tyre by adjusting steering. Also, at rear wheels lot of human effort is required to operate jack and remove the tyre so to reduce human effort the motorized operated jack is placed at rear end of car chassis. In case of puncture once driver knows tyre is puncture a switch is provided. When driver

switch on button motor start running and shaft of jack is connected to motor. Hence by employing a motor jack is operate and lift the vehicle from rare end and this is easy to remove tyres of rare end.

2.COMPONENTS

1) C channel

The structural channel, also known as a C-channel or Parallel Flange Channel (PFC), is a type of (usually structural steel), used primarily in building construction and civil engineering. Its cross section consists of a wide "web", usually but not always oriented vertically, and two "flanges" at the top and bottom of the web, only sticking out on one side of the web. It is distinguished from I-beam or H-beam or W-beam type steel cross sections in that those have flanges on both sides of the web.

Steel Channel is a Hot Rolled product (typically grade ASTM A36). When looking at a cross section it has a vertical web with horizontal top and bottom flanges. It comes in a wide varying range of sizes and web thicknesses. The shape of this type of product provides a great amount of structural strength, making it an ideal product for making frames and bracing. Typically, it is used in the manufacturing of machinery, enclosures and vehicles. It is also used in the construction of buildings for structural support. The Structural Channel, also known as a C-Channel is distinguished from I-beam or H-beam or W-beam which has flanges on both sides of the web.

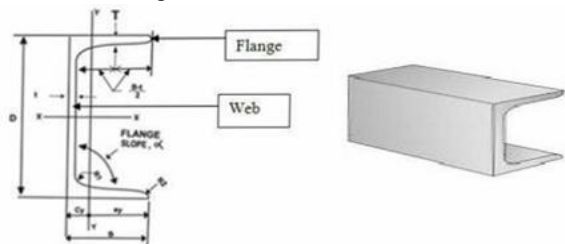


Fig no. 1 C channel

2) DC Motor:

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left-hand rule.

The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. When a motor is in operation, it develops torque.



Fig no. 2 Dc Motor

3) Screw Jack:

A jack is a mechanical lifting device used to apply great forces or lift heavy loads. A mechanical jack employs a screw thread for lifting heavy equipment. A hydraulic jack uses hydraulic power. The most common form is a car jack, floor jack or garage jack, which lifts vehicles so that maintenance can be performed. Jacks are usually rated for a maximum lifting capacity (for example, 1.5 tons or 3 tons). Industrial jacks can be rated for many tons of load. Scissor car jacks usually use mechanical advantage to allow a human to lift a vehicle by manual force alone.

The jack shown at the right is made for a modern vehicle and the notch fits into a on a unibody. Earlier versions have a platform to lift on a vehicle's frame or axle.

Electrically operated car scissor jacks are powered by 12-volt electricity supplied directly from the car's cigarette lighter receptacle. The electrical energy is used to power these car jacks to raise and lower automatically. Electric jacks require less effort from the motorist for operation



Fig no. 3 Screw jack

4) Control switch:

It is used in order to start or stop the entire operation of the object lifting jack. The type of switch that is used is known as a toggle switch. The toggle switch is a class of electrical switches that are manually actuated by a mechanical lever, handle, or rocking mechanism. This is designed to provide the simultaneous actuation of multiple sets of electrical contacts, or the control of large amounts of electric current or mains voltages.

5) Battery:

An automotive battery or car battery is a rechargeable battery that is used to start a motor vehicle. Its main purpose is to provide an electric current to the electric-powered starting motor, which in turn starts the chemically-powered internal combustion engine that actually propels the vehicle. Once the engine is running, power for the car's electrical systems is still supplied by the battery, with the alternator charging the battery as demands increase or decrease. We are going to use this battery in our project for supply power to DC motor.



Fig no. 4 Battery

6) Electrical wires and sockets

A car's wiring has to distribute power from the battery to devices located all over the car. It also has to transmit data on a data bus, as well as a variety of digital and analog signals from switches and sensors. there are many different types of wires used in automotive industry. Some wires that transmit signals from switches or sensors carry almost no current. Those that provide power to large electric motors carry lots of current.



Fig no.5 Electrical wires

Specification and dimensions of material:

1. DC motor (Power window motor)

Mounting holes	3
Speed	95 rpm
Voltage supply	12 V
Type	D.C

2. C channel:

Total Length	3 feet
weight	12 kg
Web length	77 mm
Flange length	40*2 mm

3. Battery:

Voltages	12 V
Manufacturing	Gulf Pride

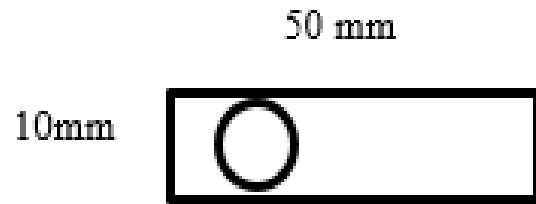
4. Screw jack:

Dimension of jack is dynamic because of up and down movement.

1. Length of jack when it is closed = 300mm
2. Height of jack when it is closed = 140 mm
3. Length of jack when it is opened = 200mm
4. Height of jack when it is opened = 270 mm
5. Manufactured coupler dimensions

Length of coupler = 50mm

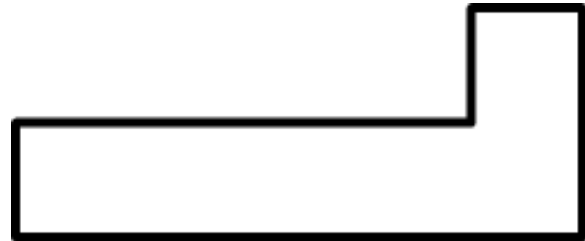
Width of coupler = 10 mm



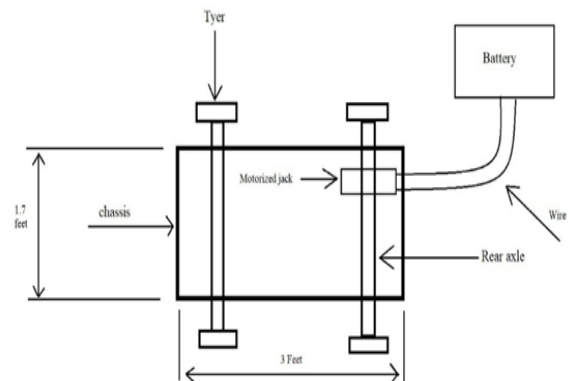
6. Manufactured bracket dimension

Web length = 90.5 mm

Width length = 30 mm



3. DESIGN OF MODEL



4. FINAL MODEL



- [3] <https://en.wikipedia.org/wiki/Jackscrew>
- [4] <https://www.kelstonactuation.com/knowledge/screw-jack-working-principles>
- [5] <https://www.indiamart.com/proddetail/a2212-brushless-motor-bldc-for-quadcopter-1000-1400-1800-2200-kv-22210307048.html>
- [6] <https://www.indiamart.com/proddetail/dc-motor-2120393155.html>

5. CONCLUSION

After completion of this project, we successful to achieve following points

1. The project carried out by us made an impressive task in the field of automobile industry.
2. Our project basically reduces an effort which is required to replace the punctured stepney automatically simply by pressing the control switch which will be placed inside the vehicle.
3. This project is very useful for women and old aged persons who drive cars.

6. ACKNOWLEDGMENT

We take this opportunity to thanks all those who have contributed in successful completion of this Capstone-project work. I sincerely wish to express gratitude to our Project Guide “Mr. M. J. Thorat” for full support, expert guidance, and encouragement and kind cooperation throughout the project work. I am greatly indebted to her for his help throughout Capstone-project work.

REFERENCE

- [1] Research journal of design and fabrication of automated motorized mechanical jack by Asst Prof. Anand A. Kulkarni¹, Avinash V. Roy²
- [2] Research Journal of Design Modification and Analysis of Electrically Operated Screw Jack for Light Motor Vehicles by Shashikant A. Pekhale¹, Prof. S. V. Karanjkar²