

### Motivation/ Introduction

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.

### Significance 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.

### Experimental Work and 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.

### Fabrication of Component

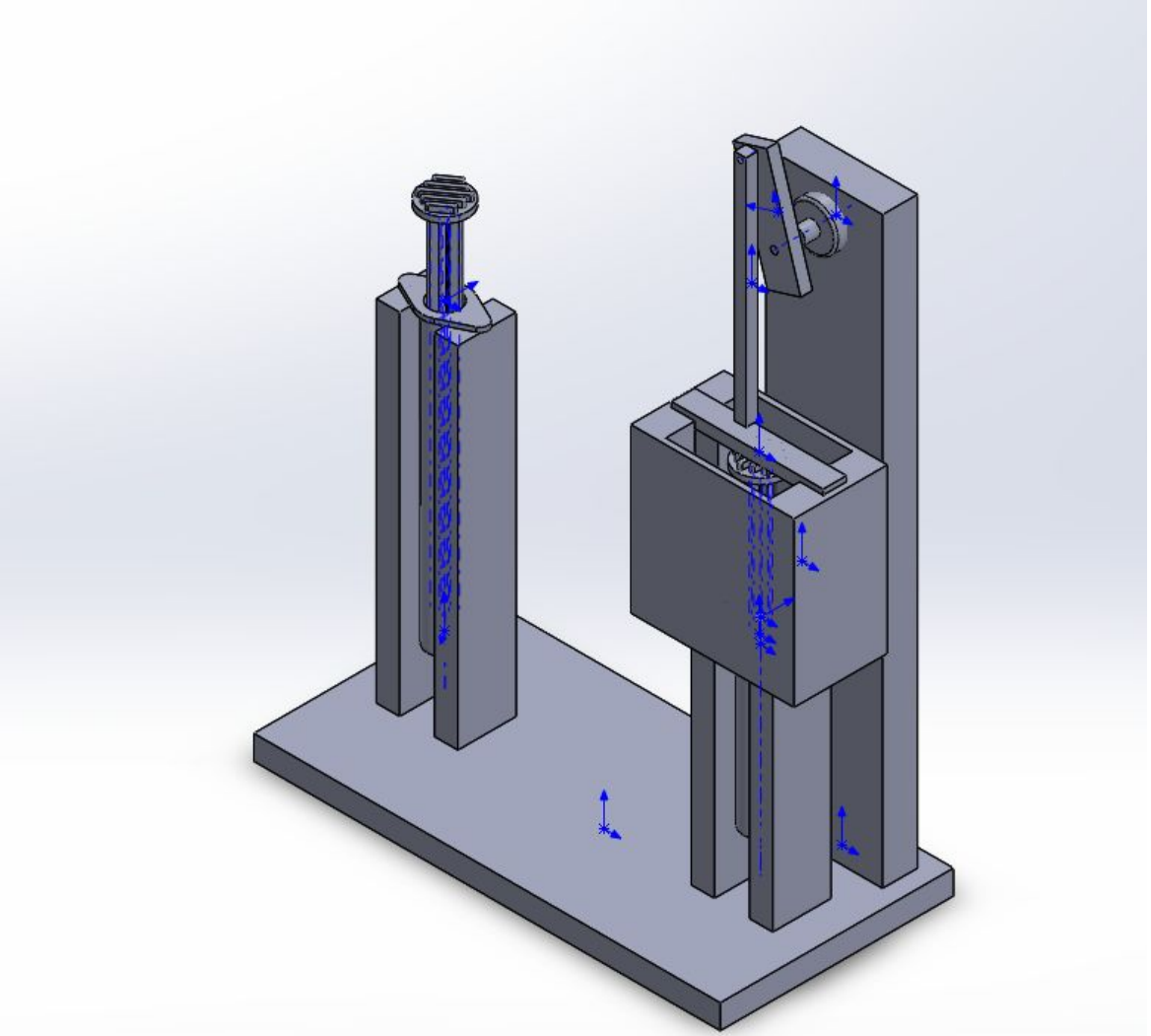
The model developed has 10 components which include a base plate, 4 stand up supports, 2 syringes of different capacity, a reciprocator, a connecting rod and a rotor.

The syringes are made of plastic as they are easily available. For industrial applications, they can be developed of a stronger material, thus providing stability and increased strength.

The base plate, 4 stand-up supports, reciprocator, connecting rod and the rotor are made of wood as they are easier to fabricate. For industrial applications, Heavy Duty Steel or Nickel Chromium Moybdenum steel alloy can be used to provide greater loading lifting capacity.

The motor used is a 12V motor easily available in hardware stores.

The car battery (12V) will be used for turning the motor and hence lifting the object using the car jack developed.



### Model / Component Developed

The model is hence developed based on the required specs and needs.

The model developed was tested and it was found to be able to lift loads upto 100kg

Weights were used kept on a wooden stool weighing approx 5kgs. Weights were added one at a time until finally at around 100kg overall, the model broke down. This break can be associated with the failure of wood used to make the model and not the model itself.

Thus making the model using stronger material such as heavy duty steel, iron or as commonly used in car jacks - Nickel Chromium Moybdenum Steel alloy



### Mechanisms Developed / Understood

The motor drives the rotor which moves the reciprocating piece via the connecting rod. This pushes the first piston which due to the hydraulics developed uses the liquid in the bottle and pushes it into the second bigger piston. The bigger piston acts as the car jack and lifts objects.

The concept of hydraulics is also heavily used. The use of ball bearings in the syringes ensure a the conversion of the tubes to one way valves. The one way valves ensure no back flow of the water takes place. This ensures steady rise of the car jack without damages and leakages.

### Conclusion/ Summary

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.

### Contact Details

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### Acknowledgments/ References

[1]Choudhary S, Ravi Kumar D, Pasbola D and Dabral S, “Development of Motorized Car Jack”, Journal of Applied Mechanical Engineering, 2016

[2] Manoj Patil, Gaurav Udgirkar, Rajesh Patil, “Automated Car Jack”, International Journal of Current Engineering and Technology, Vol 4, No 4, 2014