

# AN OVERVIEW OF MOTORIZED SCREW JACK

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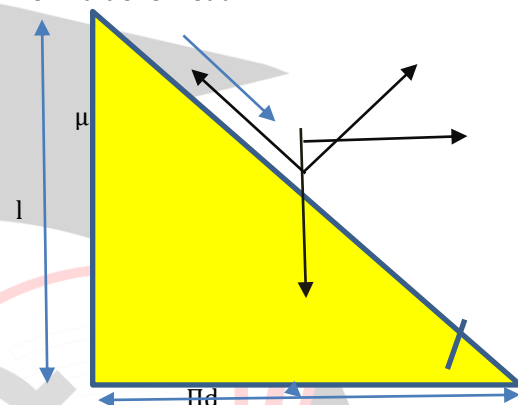
Abstract

Here we are introducing the motorized screw jack. Weight after certain limits cannot be lifted by a person, in such cases we are in need of jack. When it is motorized it becomes more convenient. In order to implement this idea, we have designed and developed a system called motorized jack operating through switch by having full control of the jack, we can easily lift it up and down by using the on/off. This helps to reduce the burden of the worker. The main reason to fabricate the motorized screw jack is to avoid the fatigue of human during lifting of the load. The project is less cost and good efficient for operating.

## Introduction

A screw jack is a portable device consisting of a screw mechanism used to raise or lower the load. The principle on which the screw jack works is similar to that of an inclined plane. There are mainly two types of jacks-hydraulic and mechanical. A hydraulic jack consists of a cylinder and piston mechanism. The movement of the piston rod is used to raise or lower the load. Mechanical jacks can be either hand operated or power driven. Jacks are used frequently in raising cars so that a tire can be changed. A screw jack is commonly used with cars but is also used in many other ways, including industrial machinery and even aeroplanes. They can be short, tall, fat, or thin depending on the amount of pressure they will be under and the space that they need to fit into. The jack is made out of various types of metal, but the screw itself is generally made out of lead. While screw jacks are designed purposely for raising and lowering loads, they are not ideal for side loads, although some can withstand side loads depending on the diameter and size of the lifting screw. Shock loads should also be avoided or minimized. Some screw jacks are built with antibacklash. The anti-backlash device moderates the axial backlash in the lifting screw and nut assembly to a regulated minimum. A large amount of heat is generated in the screw jack and long lifts can cause serious overheating. To retain the efficiency of the screw jack, it must be used under ambient temperatures, otherwise lubricants must be applied. There is oil lubricants intended to enhance the equipment's capabilities. Apart from proper maintenance, to optimize the capability and usefulness of a screw jack it is imperative to employ it according to its design and manufacturer's instruction. Ensure that you follow the speed, load capacity, temperature recommendation and other relevant factors for application.

## Formulae for load-



Effort(P): It acts in a direction perpendicular to the load (W). It may act towards right to overcome the friction and raise the load.

When load is raised,

For an equilibrium of horizontal forces,

$$P = \mu N \cos \alpha + N \sin \alpha \dots(1)$$

For an equilibrium of vertical forces,

$$W = N \cos \alpha - \mu N \sin \alpha \dots(2)$$

Dividing equation (1) by (2) we get,

$$P = W (\mu \cos \alpha + \sin \alpha) / \cos \alpha - \mu \sin \alpha \dots(3)$$

The coefficient of friction  $\mu$  is expressed as  $\mu = \tan \theta$  ....(4)

substituting equation (4) in (3) we get,

$$P = W \tan (\theta + \alpha) \dots(5)$$

The torque T required to raise the load is given by,

$$T = \tan (\theta + \alpha) \dots(6)$$

When load is lowered,

For an equilibrium of horizontal forces,

$$P = \mu N \cos \alpha - N \sin \alpha \dots(7)$$

For an equilibrium of vertical forces,

$$W = N \cos \alpha + \mu N \sin \alpha \dots(8)$$

Dividing equation (7) by (8) we get,

$$P = W (\mu \cos \alpha - \sin \alpha) / \cos \alpha + \mu \sin \alpha \dots(9)$$

Substituting equation (4) in (9) we get,

$$P = W \tan (\theta - \alpha) \dots(10)$$

The torque T required to raise the load is given by,

$$T = \tan (\theta - \alpha) \dots(11)$$

## Design with required instruments

The following instruments are used for the MOTORIZED SCREW JACK

1. LEAD SCREAW
2. DC MOTOR
3. CONTROL SWITCH

#### 4. CONTROL CABLES

#### 5. BASE FRAME

#### Lead screw:

A lead screw is a portable device consisting of a screw mechanism used to raise or lower the load. The lead screw can be short, tall, fat or thin depending on the amount of pressure they will be under and space that they need to fit into. It is made of various types of metals but the screw itself is made of lead. A large amount of heat is generated in it and long lifts can cause serious overheating. To retain the efficiency, it must be used under ambient temperatures, otherwise lubricants must be applied. These are oil lubricants intended to enhance the equipment's capabilities. Apart from proper maintenance, to optimize the capability and usefulness of lead screw it is imperative to employ it according to its design and construction.



#### D.C motor:

An electric motor is a machine which converts electrical energy into mechanical energy. Its action is based on the principle that when a current carrying conductor is placed on a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. D.C motors are also like generators classified into shunt wound or series wound or compound wound motors.



#### 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. Control cables These are used in order to connect the battery to the motor and the switch.

#### Base and Frame:

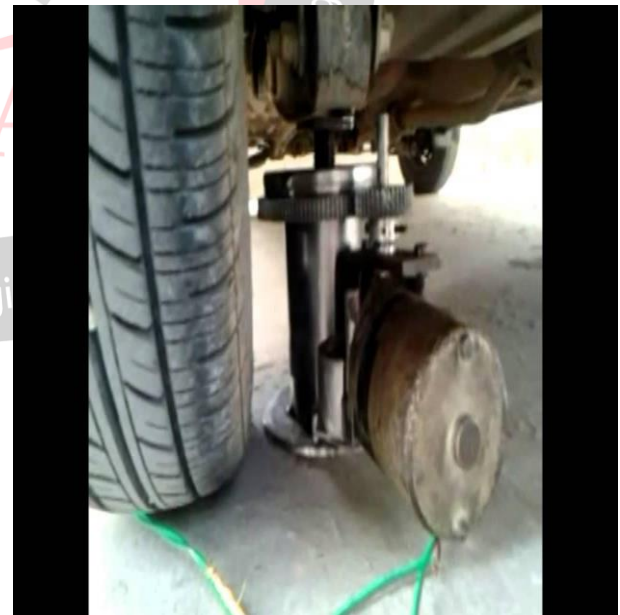
A base for the entire set-up has also been made. The motor is mounted on an inverted U shaped support frame. Ball rollers are attached to four ends of the base for movement and are electrically controlled by switch.

#### How does it work??

The jack's screw rod is fixed to the motor shaft, the motor gets power from the power source. The on/off switch keys are interface with control circuit with power supply. And we are connecting the dc motor with the mechanical model for the up and down movement when we press the ON & OFF switch. It will send power to motor to rotate in right direction & it will rotate in opposite direction respectively. Using this equipment we can easily access the lifting of load in various purpose of our need. By alternating the motor with higher torque the jack can lift heavy load easily.

#### 3.6 Results and conclusions

The project carried out by us made an impressive task in the field of automobile and automobile workshops. It is very usefully for the workers to work in the automobile workshop are in the service station. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also provided.



#### Recent Advancements

1. There is a scope of improvement that is by replacing the remote control with Bluetooth operating technology.

2. The device can also be designed to operate using android application.

### Conclusion

The motorized power jack can be widely used in low cost automation in manufacturing industries. The weight lifting is quick and effortless, which reduces the physical fatigue (tiredness) felt by the worker. The project carried out by us made an impressive task in the field of automobile and automobile workshops. It is very useful in the service stations. And also reduced the cost involved in the concern.

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