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RESEARCH ARTICLE

REMOTE CONTROLLED SCISSOR JACK TO LIFT THE VEHICLE

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Abstract

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 scissor 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 principle on which it works is similar to that of an inclined plane. The mechanical advantage of a screw jack is the ratio of the load applied to the effort applied. The scissor jack is operated by turning a lead screw. 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. In this project, an electric motor will be integrated with the scissor jack and the electricity needed for the operation will be taken from the battery of the vehicle and thereby the mechanical advantage will be increased.

INTRODUCTION

Screw type mechanical jacks were very common for jeeps and trucks of World War II vintage. For example, the World War II jeeps (Willys MB and Ford GPW) were issued the "Jack, Automobile, Screw type, Capacity 1 1/2 ton", Ordnance part number 41-J-66. This jacks, and similar jacks for trucks, were activated by using the lug wrench as a handle for the jack's ratchet action to of the jack. The 41-J-66 jack was carried in the jeep's tool compartment. Screw type jack's continued in use for small capacity requirements due to low cost of production raise or lower it. A control tab is marked up/down and its position determines the direction of movement and almost no maintenance.

The virtues of using a screw as a machine, essentially an inclined plane wound round a cylinder, was first demonstrated by Archimedes in 200BC with his device used for pumping water.

There is evidence of the use of screws in the Ancient Roman world but it was the great Leonardo da Vinci, in the late 1400s, who first demonstrated the use of a screw jack for lifting loads. Leonardo‟s design used a threaded worm gear, supported on bearings, that rotated by the turning of a worm shaft to drive a lifting screw to move the load - instantly recognizable as the principle we use today. We can‟t be sure of the intended application of his invention, but it seems to have been relegated to the history books, along with the helicopter and tank, for almost four centuries. It is not until the late 1800s that we have evidence of the product being developed further.

With the industrial revolution of the late 18th and 19th centuries came the first use of screws in machine tools, via English inventors such as John Wilkinson and Henry Maudsley The most notable inventor in mechanical engineering from the early 1800s was undoubtedly the mechanical genius Joseph Whitworth, who recognized the need for precision had become as important in industry as the provision of power .A screw jack that has a built-in motor is now referred to as a linear actuator but is essentially still a screw jack. Today, screw jacks

can be linked mechanically or electronically and with the advances in motion-control, loads can be positioned to within microns. Improvements in gear technology together with the addition of precision ball screws and roller screws mean the applications for screw jacks today are endless and a real alternative to hydraulics in terms of duty cycles and speed at a time when industry demands cleaner, quieter and more reliable solutions.

II.EXISTING SYSTEM

A.USAGE OF POWER SCREWS:

A power screw is a mechanical device used for converting rotary motion into linear motion and transmitting power. A power screw is also called translation screw. It uses helical translatory motion of the screw thread in transmitting power rather than clamping the machine components.

The main applications of power screws are as follows:

(i) To raise the load, e.g. screw-jack,

(ii) To obtain accurate motion in machining operations, e.g. lead-screw of lathe,

(iii) To clamp a workpiece, e.g. vice, and

(iv) To load a specimen, e.g. universal testing machine.

There are three essential parts of a power screw, viz.screw, nut and a part to hold either the screw or the nut in its place. Depending upon the holding arrangement, power screws operate in two different ways. In some cases, the screw rotates in its bearing, while the nut has axial motion. The lead screw of the lathe is an example of this category. In other applications, the nut is kept stationary and the screw moves in axial direction. Screw-jack and machine vice are the examples of this category. Power screws offer the following advantages:

(i) Power screw has large load carrying capacity.

(ii) The overall dimensions of the power screw are small, resulting in compact construction.

(iii) Power screw is simple to design

(iv) The manufacturing of power screw is easy without requiring specialized machinery. Square threads are turned on lathe. Trapezoidal threads are manufactured on thread milling machine.

(v) Power screw provides large mechanical advantage. A load of 15 KN can be raised by applying an effort as small as 400 N. Therefore, most of the power screws used in various applications like screw-jacks, clamps, valves and vices are usually manually operated.

(vi) Power screws provide precisely controlled and highly accurate linear motion required in machine tool applications.

III.DISADVANTAGES OF EXISTING SYSTEM

The disadvantages of power screws are as follows:

(i) Power screws have very poor efficiency; as low as 40%.Therefore, it is not used in continuous power transmission in machine tools, with the exception of the lead screw. Power screws are mainly used for intermittent motion that is occasionally required for lifting the load or actuating the mechanism.

(ii) High friction in threads causes rapid wear of the screw or the nut. In case of square threads, the nut is usually made of soft material and replaced when worn out. In trapezoidal threads, a split- type of nut is used to compensate for the wear. Therefore, wear is a serious problem in power screws.

IV.PROPOSED SYSTEM

A.USAGE OF SCISSOR JACK INSTEAD OF POWER SCREW:

Jacks are of mainly two types;

1. Mechanical jack and

2. Hydraulic jack. They vary in size depending on the load that they are used to lift.

B.SCISSOR JACK:

A scissor jack is a device constructed with a cross-hatch mechanism, much like a scissor, to lift up a vehicle for repair or storage.

"REMOTE CONTROLLED SCISSOR JACK" is modified form of conventional screw jack that helps to lift the load by using motor as a source of energy with the help of remote to operate the screw jack. A scissor jack is a device constructed with a cross-hatch mechanism, much like a scissor, to lift up a vehicle for repair or storage. It

typically works in just a vertical manner. The jack opens and folds closed, applying pressure to the bottom supports along the crossed pattern to move the lift. When closed, they have a diamond shape.

B. Parts of Motorized Screw Jack

The main parts of the motorized screw jack are as follows:

Description of 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. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.

Fleming's Left Hand Rule: Keep the force finger, middle finger and thumb of the left hand mutually perpendicular to one another. If the fore finger indicates the direction of magnetic field and middle finger indicates direction of current in the conductor, then the thumb indicates the direction of the motion of conductor.

Principle of Operation of Dc Motor:

A uniform magnetic field in which a straight conductor carrying no current is placed .The conductor is perpendicular to the direction of the magnetic field. The conductor is shown as carrying a current away from the viewer, but the field due to the N and S poles has been removed. There is no movement of the conductor during the above two conditions. When the current carrying conductor is placed in the magnetic field, the field due to the current in the conductor supports the main field above the conductor, but opposes the main field below the conductor. The result is to increase the flux density in to the region directly above the conductor and to reduce the flux density in the region directly below the conductor. It is found that a force acts on the conductor, trying to push the conductor downwards as shown by the arrow. If the current in the conductor is reversed, the strengthening of flux lines occurs below the conductor, and the conductor will be pushed upwards.

C.WORKING OF THE PROPOSED SYSTEM:

A scissor jack uses a simple theory of gears to get its power. As the screw section is turned, two ends of the jack move closer together. Because the gears of the screw are pushing up the arms, the amount of force being applied is multiplied.It takes a very small amount of force to turn the crank handle, yet that action causes the brace arms to slide across and together. As this happens the arms extend upward. The car's gravitational weight is not enough to prevent the jack from opening or to stop the screw from turning, since it is not applying force directly to it. If you were to put pressure directly on the crank, or lean your weight against the crank, the person would not be able to turn it, even though your weight is a small percentage of the cars.

D.SPECIFICATIONS:

- Maximum capacity: 1 ton
- DC Voltage: 12V
- Maximum current: 13A
- Range of lift height: 120mm - 350mm

Fig: model of proposed system

V.CONCLUSION

Scissor Jacks are the ideal product to push, pull, lift, lower and position loads of anything from a couple of kilograms to tons. The need has long existed for an improved portable jack for automotive vehicles. It is highly desirable that a jack become available that can be operated alternatively from inside the vehicle or from a location of safety off the road on which the vehicle is located. Such a jack should desirably be light enough and be compact enough so that it can be stored in an automobile trunk, can be lifted up and carried by most adults to its position of use, and yet be capable of lifting a wheel of a 4,000-4,500 pound vehicle off the ground. Further, it should be stable and easily controllable by a switch so that jacking can be done from a position of safety. It should be easily movable either to a position under the axle of the vehicle or some other reinforced support surface designed to be engaged by a jack.

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