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Table Cum Trolley Construction Using Lead Screws

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Abstract

The capacity to assign a service life without failure and cost-effective manufacturing are two of the most crucial characteristics of engineering goods. With a few criteria in mind, we focused on creating and researching the scissor-screw chain-drive concept for various automotive L.M.V. sectors. The efficiency and customer satisfaction of the automotive industry are of utmost importance. We also want to retain the strength and service life of the scissor-screw chain drive while developing and optimising it. After researching failure modes, we developed an analytical mathematical model for a novel, adaptable scissor-screw chain drive that can be used to various L.M.V. vehicle sector models.

Keywords*: - Lead Screws, Trolley Construction, L.M.V vehicle, Automotive Industry*

INTRODUCTION

The aerial work platforms used in the application are performing appropriately with their apparatus given the existing industrial environment. Scissor lifts are currently used in sectors with both hydraulic and pneumatic operation.

These sorts of lists are very practical and simple to use. But both hydraulic and pneumatic lifts lack them in terms of price and safety.

As a result, it becomes important to add additional accessories and safety precautions as well as come up with a different way to operate aerial scissor lifts.

The lead screw technique and the rack and pinion method are the two methods that may be used to operate mechanically operated scissor lifts. [1-3]. The current innovation also demonstrates the scissor lift's dynamic and static stability, as well as a brief design process for a mechanically driven scissor lift based on the idea of a lead screw. The present invention will, to a certain extent, improve the performance of the aerial scissors and lifts in terms of performance, dependability, and efficiency.

As seen in the image, scissor lifts are a type of device that enables the vertical displacement of some weight by the use of linked, folding supports arranged in a "X" pattern. This pattern is known as a pantograph (or, simply, a scissor mechanism). It often operates in a straightforward vertical manner. The lift is moved by applying pressure to the bottom supports along the crossing pattern as the jack opens and folds shut. They form a diamond shape when closed. Scissor jacks are straightforward devices used to move heavy objects across short distances. [4-8]

A scissors mechanism is used by a scissors lifting table to raise or lower objects, including people. Lift tables are often used to move large, heavy objects a relatively short distance. Pallet handling, truck loading, job placement, automated production lines, distribution lines, etc. are examples of common usage. By properly relocating work at a comfortable height for operators, lift tables are a proposed strategy to help reduce the occurrence of musculoskeletal issues.

OBJECTIVES OF THIS STUDY

In order to develop a modified lead screw-operated table-top trolley that is very stable, can carry enough weight on uneven terrain, and is allowed some tilt, a basic scissor screw is designed, analysed, and changed along with structural adjustments. We'll examine the screw's stress, effectiveness, and life expectancy as part of the research. Our objective is to create a screw that is affordable, durable, and resistant to abuse.

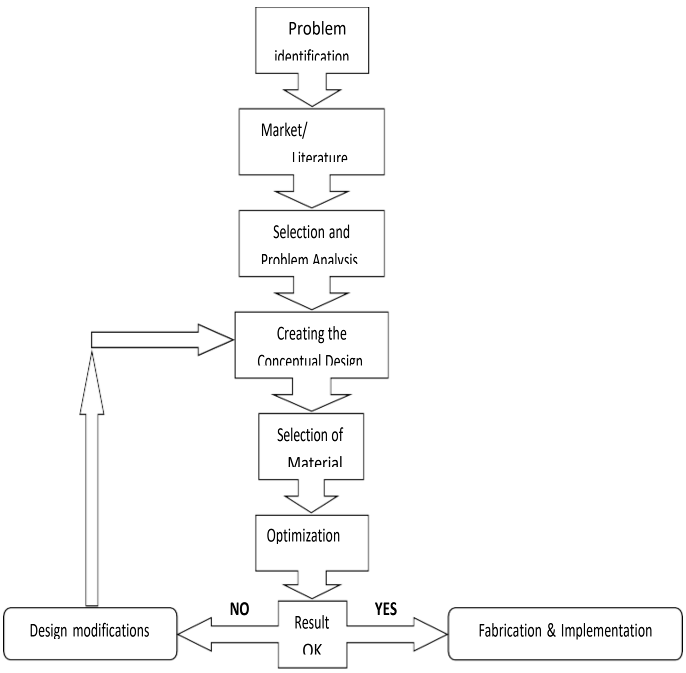
LITERATURE SURVEY

In the little community of Coati Lac, close to Quebec, 24-year-old Frank Henry Sleeper created the lifting jack in the early 1880s. Like da Vinci's Jack, it was a technological invention that converted rotational motion into linear motion using gearing and a screw to move the load. It was based on the ball bearing concept for supporting a load. The device was easy to use and both reliable and effective. It was mostly used by the railroad sector to lift locomotives and train cars during bridge construction.

In 1940, Duff-Norton created the first worm gear screw jack, which is still commonly used today, to modify the height of milling machines and truck loading platforms. The first version could be used in tandem and had a lifting capacity of 10 tonnes. It could be powered by air, electric, or even manual motors. Since then, the device has grown to push, pull, lift, lower, and position weights weighing anywhere from a few kilogrammes to hundreds of tonnes with increases of 2" or 4" A unique Power Jacks E-Series equipment that is rated for 350 tonnes – even in seismic circumstances for the nuclear sector – is one of the largest single screw jacks produced to date.

For screw jacks, more recent innovations have changed the lead screw and gearbox design possibilities in order to increase efficiency and durability. However, a screw jack with an integrated motor has been referred to as a "linear actuator." Thanks to developments in motion control, loads may now be positioned using screw jacks with a micron-level of accuracy. Screw jacks are now a competitive alternative to hydraulics in terms of duty cycles, speed, and dependability thanks to developments in gear technology and the addition of precise ball and roller screws.

METHODOLOGY



SPECIFICATIONS

The term "scissor screws" refers to a wide variety of devices, all of which lift objects using crossed beams. The lift on the right side elevates the object from the left side, and so on, in order to accomplish this.

The screw may be kept flat with the diagonal beams when not in use, then enlarged as needed. Depending on the holding configuration, power screws can be applied in two different ways. In other cases, the screw spins in its bearing while the nut travels axially. This applies to the lathe's lead screw as well.

ASSEMBLY

The construction of a screw consists of two base ends, four major metal pieces, and a pair of shears. The four metal pieces are joined together at their corners by a bolt, which allows the bolts to revolve. Each of the four corners of this arrangement has a screw thread that extends across and through it. When the screw arms are closed, they pass over the screw thread, collapse, or join together, forming a straight line. They raise their hands and unite after turning around and returning the opposite way. The four metal arms of the screw contract as it is turned, coming together in the centre to raise the screw. The screw flattens out or shuts after it is closed, causing the arms to spread out once more.

We have produced a final design that will live up to the expectations of our clients with the help of well specified technical criteria. The following paragraphs serve as a summary of all of our work. It was discovered that stability, comfort, noise level, and hand control were the most important requirements.

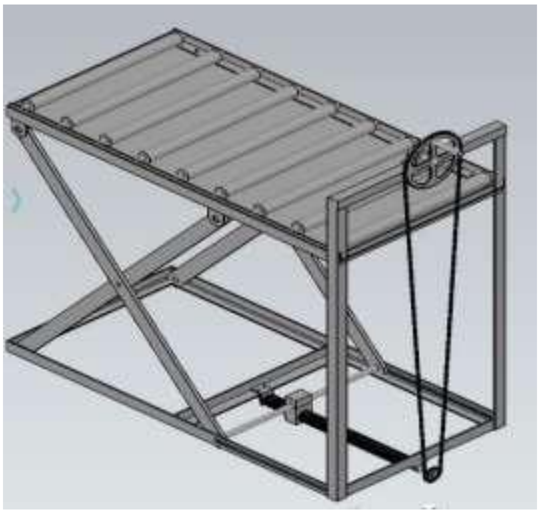
When creating our first designs, all of these factors were taken into account. These designs were then modified to create the final product. Due to the work we put into it, our manufacturing method ultimately produced a valuable final product. We set up this similar method to ensure that our work could be replicated. last lift verification

Testing produced results that exceeded sponsors' and customers' expectations. The scissor lift, seat mechanism, lean bar frame, and wheel locking mechanism are the four components that make up the final design. We produced each of these components separately in the machine shop and assembled them in accordance with the above-described plan. These elements were then merged to create our final model.

Come Lead Screw Table The tool for moving goods weighing anywhere from a few kilogrammes to hundreds of tonnes is a trolley. The need for a better automotive vehicle jack has long existed. It should be possible to operate an IA jack from both within the car and from a secure area away from the road where the car is parked. Such a jack should ideally be light and compact enough to fit inside the trunk of a car, be easy to lift and move to the location of use by most individuals,

The jacking mechanism needs to be secure, simple to use, and reachable from a safe distance. It need to be straightforward to move into position, either below the axle of the car or on another reinforced support surface designed to be grasped by a jack. The product was therefore developed with the aforementioned requirements in mind.

This motorised screw jack system enables Ds to be raised and lowered. Systems that employ a chain to convey power or rotation to a different shaft are known as chain drive systems. Here, the table is raised using lead screws that are rotated by chain sprockets.



WORKING

The scissor screw depends on the fundamental idea of gears to provide power. When the screw portion is spun, the screw's two ends draw closer together.

The screw's gears are pushing up the arms to exert greater force. When the crank handle is twisted with some effort, the brace arms move across and toward one another. This causes the arms to lift. The mass of the car alone cannot shut or stop the screw from spinning since there is no force acting on it.

Even if your weight is a negligibly small part of the weight of the automobile, applying pressure to the crank or leaning on it would prevent it from spinning.

APPLICATIONS

Power screws may be used for the following purposes:

Good examples are using a screw-scissor, for instance, to raise the load, a lead-screw on a lathe, for instance, to clamp a workpiece, a vice, and a universal testing machine, for example, to load a specimen. A power screw is made up of three components: a screw, a nut, and a holding device. Depending on the holding configuration, power screws can be applied in two different ways. In other cases, the screw spins in its bearing while the nut travels axially.

This category includes items like the lathe's lead screw. In other applications, the screw travels axially while the nut remains fixed. Examples in this category include machine vices and screw-scissors.

ADVANTAGES

- Power screws offer the following advantages:
- The power screw has a large load-carrying capacity.
- The overall dimensions of the power screw are small, resulting in a compact construction.
- The power screw is simple to design.
- The manufacturing of power screws is easy without requiring specialized machinery. Square threads are turned on the lathe. Trapezoidal threads are manufactured on a thread milling machine.
- Power screw provides a large mechanical advantage. A load of 15 k N can be raised by applying an effort as small as 400 N. Therefore, most of the power screws utilized in diverse applications like screw-jacks, clamps, valves, and vices are generally manually operated.
- Power screws provide precisely controlled and highly accurate linear motion required in machine tool applications.
- Power screws give smooth and noiseless service without any maintenance.
- There are only a few parts in the power screw. This reduces cost and increases reliability.
- Power screws can be designed with the self-locking property. In a screw- jack applicate ion, a self-locking characteristic is required to prevent the load from descending on its own.

DISADVANTAGES

Other than the lead screw, it is not used in machine tools for continuous lead transmission due to its low efficiency. Providing irregular motion, such as when lifting a weight or turning on a gadget, is the lead screw's main purpose.

If the threads are subjected to excessive friction, the screw or nut will soon wear out. They are frequently utilised because soft, replaceable nuts are required for square threads. To account for wear in trapezoidal threads, split nuts are utilised. Lead screw wear is a significant problem as a result.

FUTURE SCOPE

We have produced a final design that will live up to the expectations of our clients with the help of well specified technical criteria. The following paragraphs serve as a summary of all of our work. It was discovered that stability, comfort, noise level, and hand control were the most important requirements.

When creating our first designs, all of these factors were taken into account. These designs were then modified to create the final product. Due to the work we put into it, our manufacturing method ultimately produced a valuable final product. We set up this similar method to ensure that our work could be replicated. Final lift validation testing produced results that exceeded sponsors' and customers' expectations. The scissor lift, seat mechanism, lean bar frame, and wheel locking mechanism are the four components that make up the final design.

We produced each of these components separately in the machine shop and assembled them in accordance with the above-described plan. These elements were then merged to create our final model. Come Lead Screw Table The tool for moving goods weighing anywhere from a few kilogrammes to hundreds of tonnes is a trolley. The need for a better automotive vehicle jack has long existed.

It should be possible to operate an IA jack from both within the car and from a secure area away from the road where the car is parked. It would be ideal for such a jack to be light and compact enough to fit in the trunk of a car, be easily lifted and carried by most persons to the location of use, The jacking mechanism needs to be secure, simple to use, and reachable from a safe distance. It needs to be straightforward to move into position, either below the axle of the car or on another reinforced support surface designed to be grasped by a jack.

The product was therefore developed with the aforementioned requirements in mind. This motorised screw jack system enables Ds to be raised and lowered.

CONCLUSIONS

The focus of the present endeavour has been on developing a belt-drive scissor lifting table that an operator can stay on while building a typical handling line and replacing two commercial lifting tables with a machine that can match the new functional standards. The design process resulted in the creation of five macro-parts: the top and bottom frames, the scissors, the four cams, and the safety system. The motion analysis was performed to establish the amount of force and motor power required to raise the weight and draw the belt without it snapping.

Two flat belts with a width of 120 mm and a thickness of 3 mm are required to lift a 1000 kg weight; this knowledge has allowed the belts' design. Additionally, a weight of 1000 kg results in a lift time of 11.70 s and a stroke length of 1000 mm. According to the structural analysis, there is negligible structural deformation since the stress on the structure is significantly less than the material's yield strength, and both the open and closed lifting table satisfy the safety criteria required by the standard. According to the structural study, neither the open nor closed lifting tables fall short of the standard's required safety factors since the stress on the structure is significantly less than the material's yield strength. For the construction, a weight limit of around 1100 kg has been established. The table's design possesses the qualities of being straightforward, affordable, and capable of satisfying all practical demands.

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