



DESIGN & MANUFACTURING OF WHEELCHAIR LIFTER

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Abstract: The study deals with the design and development of a mechanism to lift the wheelchair to carry the person to the podium. This project evaluates the design and analysis of industrial scissor lift. In this project, the lifting mechanism is used in which the platform is lifted vertically with the help of scissor mechanism. The main objective of the scissor mechanism is to reach the desire height or level. The design is developed by keeping in mind that the lift can be operated by mechanical means by using a linear actuator so that the overall cost of the scissor lift is reduced. In this case, the design of the lift works with electric power. Also, such design can make the lift more compact and much suitable for medium scale work. Scissor lifts, a staple of mechanical design, especially in competitive robotics, is a type of linkage that can be used to raise a load to some height, when acted upon by some force, usually exerted by the linear actuator. The position of this actuator, however, can affect the mechanical advantage and velocity ratio of the system. Hence, there needs to be a concrete way to analytically compare different actuator positions.

Keywords – Scissor Lift, Wheelchair Lifter, Linear Actuator.

I. INTRODUCTION

A lift table is defined as a scissor lift used to stack, raise or lower, convey and/or transfer material between two or more elevations. The main objective of the devices used for lifting purposes is to make the table adjustable to a desired height. A scissor lift provides most economic dependable & versatile methods of lifting loads; it has few moving parts which may only require lubrication. This lift table raises load smoothly to any desired height. The scissor lift can be used in combination with any of applications such as pneumatic, hydraulic, mechanical, etc. Lift tables may incorporate rotating platforms (manual or powered); tilt platforms, etc, as a part of the design. Scissor lift design is used because of its ergonomics as compared to other heavy lifting devices available in the market. The frame is very sturdy & strong enough with increase in structural integrity. A multiple height scissor lift is made up of two or more leg sets. These types of lifts are used to achieve high travel with relatively short platform.

II. LITERATURE REVIEW

Georgy Olenin, 2016 [1] conducted the study at Saimaa University of Applied Science, the goal of this study was to apply the knowledge obtained from studying in the university and solve the substantial task of creating design of the linear actuator lifting platform. This paper described the design and analysis of scissor lifting platform for both highest and lowest position.

M Kiran Kumar, 2016 [2] This paper is mainly focused on force acting on the hydraulic scissor lift when it is extended and contracted Hence, the analysis of the scissor lift includes Total deformation load, Equivalent stress, was done in Ansys and all responsible parameters were analyzed in order to check the compatibility of the design value. The computational values of two different materials such as aluminium and mild steel are compared for best results.

Krebs et. al, 2007 [3] The purpose of this paper is to present the design and the study of linear actuator. Linear actuators, with very specific features for industrial processes, are needed much more for an increase in reliability and dynamic. To reach the wanted features, the actuator has to be designed and its performance has to be quantified with good accuracy and reasonable computation time.

III. PROBLEM DEFINITION

In today's scenario during events or any cultural programme it's very difficult for a handicapped person to climb the stage and they need to face problems for the same which eventually decreases their moral. So there should be a lift which can carry the handicapped person to the top without any man power or stress for the same.

Objectives:

- Help handicapped person climb the stage.
- Handicapped person can climb the stage independently.
- Simple operating mechanism.
- Reduced Maintenance.

IV. PROPOSED METHODOLOGY

To overcome the problem which handicapped person face we are designing a wheelchair lifter, which can help them to climb the stage independently. The wheelchair lifter works on linear actuator which will help the lifter to reach the stage height. With an easy scissor lift mechanism, the lifter has a capacity to carry the person with his wheelchair and take him up to the stage. The person who will escort the wheelchair will have the control of the entire power drive.

4.1 Working Principle

Proposed Methodology to operate the scissor lift mechanism are hydraulic jack, chain drive, pneumatic lifter and linear actuator. Let's discuss briefly above methods to operate the scissor lift mechanism .



Fig. 2.1 Proposed CAD Model

4.1.1 Linear Actuator

Linear actuators are mechanical devices used to move items through a system. The device uses energy to develop force and motion in a linear manner, as opposed to a rotational motion in an electric motor. Linear actuators offer advantages including a simple design with minimal moving parts. The amount of output power developed depends upon the flow rate, the pressure drop across the actuator and its overall efficiency.



Fig. 2.2 Linear Actuator

4.1.2 Hydraulic

A hydraulic lift table raises and lowers when hydraulic fluid is forced into or out of the hydraulic cylinder. As hydraulic fluid is forced into a cylinder, the cylinder strokes outward forcing the scissor legs apart. Since one end of both the inner and outer legs are connected to the base and platform, the platform rises vertically as the scissors legs open. Any time a lift table is raised, it is being supported by a column of fluid. The lift table remains in a raised position because the fluid is held in the cylinder by a simple check valve.



Fig. 2.3 Hydraulic

4.1.3 Pneumatic

The Pneumatic Series Scissor Lift is ideal for applications where hydraulic scissor lifts are not preferred. Capable of capacities ranging up to 30,000 pounds, this particular scissor lift is in a class that is set apart from all others. The Uni-Craft Pneumatic Scissor Lift Series has a powerful heavy-duty construction to handle the heaviest industrial applications. A quiet air bag lift mechanism functions without hydraulics or electricity, making the Pneumatic Lift a versatile option for various facilities in any business.

4.1.4 Chain Drive

The zip chain lifter is a new lift table that maximizes the zip chain and sprocket mechanism to move it forward and backward. The working of zip chain lifter is basically dependent on the chain and sprocket mechanism, the zip chain is mounted over sprocket which rotates both anticlockwise and clockwise direction to provide forward and backward motion. The zip chain is provided with scissor metal lifter and roller bearings to provide the required support for the lifting or lowering of load. This Ground breaking, Electrically driven lifting mechanism gives multiple time the energy efficiency compare to conventional hydraulic lifter.



Fig. 2.4 Chain Drive

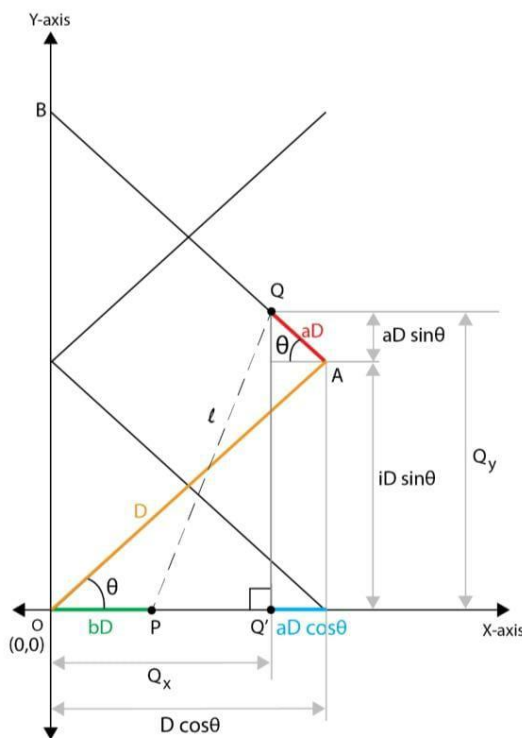


Fig. 2.5 Calculation of Two-Stage Scissor Lift Diagram

V. CONCLUSION

The design of a wheelchair lifter is elevated by a linear actuator. The scissor lift can be designed for high load also if a suitable high-capacity actuator is used. The device affords plenty of scope for modifications for further improvements and operational efficiency, which can make it commercially available and attractive. Thus, it is recommended for the engineering industry and for commercial production.

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