

Fabrication Of Mechanical Ladder Operated By Electrical Motor

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Abstract: Our project mainly intends to fabricate an electrically operated mechanical ladder actuated by electrical cum mechanical systems. Conventional method of using rope, carrier etc., in getting to a height encounter a lot of limitations like time, energy consumption, portability, storage, cost-effectiveness etc. The device can lift to an average load of 50 kg and will have maximum lift of around 6-7 meters and can be operated on a flat and inclined surface. But however we are planning to fabricate a scaled version prototype of the proposal. Our project model consists of components such as a rigid base, working platform, and electro mechanical actuation system. The rigid base forms the base of the system; carrier will be moved in the outside guide ways of the ladder. In order to obtain the desired motion electro mechanical actuation system is used.

I. INTRODUCTION

Nowadays, ladder becomes the common facilities for human. Different types of ladders are available in worldwide market such as fixed ladder, extension ladder, step ladder, orchard ladder and others. The main purpose of electro mechanical ladder is to help human to do their work especially at the high place that can't be reached and help them to keep it without using a large space. It can reduce time, increase efficiency and reduce space to store. However the existing ladders are either highly costly or bulky. Each one has its own disadvantages which makes them unsatisfactory. The electromechanical ladder we designed and fabricated can eliminate the disadvantages of the conventional ladders. Our project aims at the design and fabrication of an Electro Mechanical Ladder for the purpose of using it in small scale industries, domestic areas etc. The principle used here is that of a electrical motor which will raise the loaded carrier to heights, in our project the carrier is being raised with the help of a rope and pulley which is attached to an electric motor. Also this device is likely to be used in domestic purposes such as in houses, small paper mills etc. This electro mechanical

ladder is portable and easy to use. It can be fabricated in many sizes and design to make customer to choose which one is more suitable for them. From the advantages and disadvantages of the ladder in the worldwide market, one new product design can be created. This project reviews all the studies up to this date and hope our product will get optimum acceptance in the market.

II. LITERATURE SURVEY

Our project is simply definition of the VERTICAL LADDER for the material handling. We were inspired by the merry go round in the ESSEL WORLD, Bombay and we finally decided to implicate the merry go round concept in the vertical format for the new invention in the real world. Our project will have 10 drawers operated by the chain and sprocket arrangement technology. We chose only chain and sprocket arrangement in our project because chain is an only single arrangement which gives zero error in the synchronization. The power required to move the chain and sprocket arrangement will be provided by 12 Volt DC supply

using the DC motor. When electrical supply is available the project will run on the regular supply 220 Volt and in absence of the electric supply or during the breakdown it will work on the rechargeable battery attached.

With everlasting development of science and technology, more and more new technologies are applied to lifting appliance design. In this paper scissor ladder powered by hydraulics has been introduced. The main aim to design and analysis and construct multi-utility equipment for workers so that can carry their activities efficiently. The ladder should compact and cost effective. We expect that our ladder carry load around 150-200kg with factor of safety equal to 2.5 and lifting to height of around 7 to 8 ft. It is used for school, colleges, malls, hospital and small scale industries. The beginning aim of our project is to make marketable product in the market. To get maximum possible acceptance in the market will be our objective.

The following paper describes the design as well as analysis of a hydraulic scissor lift. Conventionally a scissor lift or jack is used for lifting a vehicle to change a tire, to gain access to go to the underside of the vehicle, to lift the body to appreciable height, and many other applications also such lifts can be used for various purposes like maintenance and many material handling operations. It can be of mechanical, pneumatic or hydraulic type. The design described in the paper is developed keeping in mind that the lift can be operated by mechanical means by using pantograph so that the overall cost of the scissor lift is reduced. In our case our lift was needed to be designed a portable and also work without consuming any electric power so we decided to use a hydraulic hand pump to power the cylinder Also such design can make the lift more compact and much suitable for medium scale work. Finally the analysis of the scissor lift was done in ansys and all responsible parameters were analyzed in order to check the compatibility of the design values

The idea to design and fabricate a multipurpose ladder is come from a supervisor that gives a task and a title for this project. To design and fabricate this multipurpose ladder, the existing product in market must be compared first to know the latest designs that have been created. The information about current design for multipurpose ladder must be search or find from magazine, newspaper, catalog or internet. From all the information, idea to design and fabricate can be created. It includes many things about multipurpose ladder that want to be design such as portable and foldable. This because, some of the current ladder is heavy, uses a lot of space to stored and not stable. The whole of the project involve various methods like the concept design, the designing and also the fabrication process. After the fabrication process is completed, the multipurpose ladder is tested to make sure the product is functional and achieves the objectives successfully.

Overall, this project can bring a motivation and experience, train to work under the pressure, apply knowledge that have been learned and soft skill ability like time management, planning the task, and negotiation skill to make sure this project goes smooth as plan and done at correct time.

III. OBJECTIVE

- ✓ The project is aimed at designing and constructing an electrically powered mechanical ladder to raise and lower working equipment with ease and in the most economical way.
- ✓ The lift is expected to work with minimal technical challenges and greater comfort due to its wide range of application.
- ✓ The device can easily be handled to the site to be used.
- ✓ Between the heights of lift (i.e. the maximum height) the device can be used in any height with in this range and can be descend immediately in case of emergency, and can be operated independent of a second party.
- ✓ The aim of this study is to design a lifting device that can be used in the Domestic and Industrial sector.
The design conditions are to meet the following specifications;
- ✓ The device is limited to an average load of 50 Kg.
- ✓ The device will have a maximum lift of 6-7 m.
- ✓ The system can be operated on any surface.

IV. COMPONENTS SELECTED

The major components that are effectively involved in the Fabrication of the Electro mechanical ladder are as follows.

- ✓ Ladder
- ✓ Electric Motor
- ✓ Load carrier(Platform)
- ✓ Wire rope
- ✓ Pulley

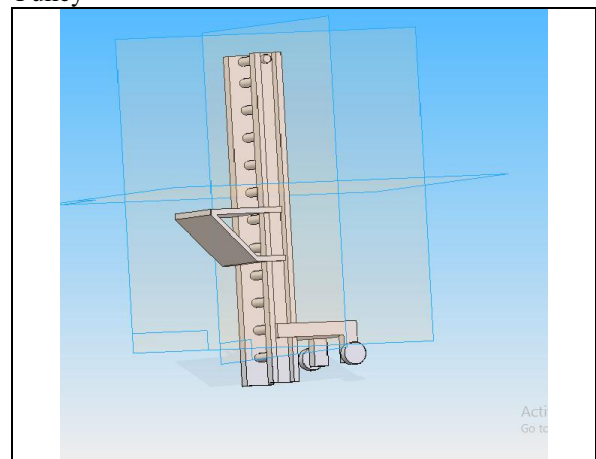


Figure 1: 3D model

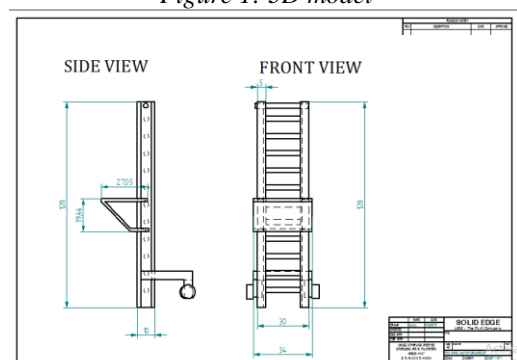


Figure 2: drawing

V. WORKING

It consist of aluminium ladder, electric motor, wire rope, load carrier of mild steel material, and pulley to run the rope, the base is provided with wheel and the remote is provided to control the operation .When electric current supply is provided and remote is operated then motor will start. Motor runs at designed speed and tends rope to pulls the load carrier up by running through pulley. When reverse button is pushed then rope will tends load carrier to move down this processes can lift load up and down which is kept on load carrier. Load can be stop according to required height by operating remote .emergency button is provided to stop the operation if emergency occurs.



Figure 3: Assembly model

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