

Design and Fabrication of Material Lifting Mechanism

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Abstract— The most important aim of our project is to design and fabricate a hand operated material lifting mechanism joined with ladder for the purpose of material lifting at required height at faster rate as normal. Our main target is labours working at building constructions sites in India. They works so hard for lifting material whether it is bunch of bricks, mixture of cement and concrete in building construction sites from one floor to next floor while building is under construction, so as to reduced their work effort at the site we are fabricating this mechanism. As our ladder type material lifting mechanism is hand operated the cost of our mechanism also get reduced and affordable for builders. By using worm gear, wire rope, moveable lifting platform and sliding mechanism we are fabricating this material lifting mechanism.

Key words: Lifting Mechanism, Worm Gear, Wire Rope, Lifting Platform, Sliding Mechanism

I. INTRODUCTION

History - Before developing material lifting equipment, in industries or on construction sites labour have to lift all the material, products etc. by manually. So there is requirement of labour is gets increased and their wages also get increased. Also while lifting materials labours have to put much energy and that leads to less efficient work by labour and damage of material also happened. So, as the automation is developed in 18th and 19th centuries over remedies of this problem, industries and various constructional sites are started using mechanism, machines which are fully automated or semi-automated and this development is still going on. But as we mentioned our main target is labour working at construction sites in India where builder does not want to spend any extra expense along with labour wages, for any automated or semi-automated mechanism. So for reducing labour effort and that is within low cost for builders can afford, that is why we are fabricating our material lifting mechanism.

II. CONSTRUCTION

A. Raw Material:

- Mild steel bars for base and ladder
- Mild steel bars for rotating shaft
- Mild steel bars for lifting platform

B. Ready Items:

- Ropes
- Pulleys
- Moving platforms
- Paint

C. Joining Assembly:

- Nut and bolts

D. Machines and Tools

- Lathe machine
- Cutting machine
- Welding machine
- Radial drilling machine
- Grinder
- Hand grinding
- Screen holder
- Hammer

III. EQUIPMENTS

A. Worm Gear:

A worm gear is a mechanical gear. It is used when reduction of large gear is needed. It is common for worm gear to have a reduction of 20:1 to 300:1 and even greater. A worm gear is gives a good speed whenever it is used in any mechanism. A gear is consisting of spirally threaded shaft and the wheel with marginal teeth that meshes into it. The toothed wheel of this gear is called as a worm gear. The compact structure of this gear provides less mounting space.



Fig. 1: Worm gear

B. Rotating Shaft:

Rotating shaft is a component on which lifting effort is applied so as to reach required height. Rotating shaft is attached with a worm gear whose rotation gives the rotary movement to pinion for achieving vertical movement. So, it will help to lift material lifting platform in up and down direction.



Fig. 2: Rotating shaft

C. Wire Ropes:

Wire rope is several strands of metal wire twisted into a helix forming a composite rope in a pattern known as “laid rope”. It is a way to transmit mechanical power from one place to another place. These are used dynamically for lifting and hoisting in cranes and elevators. It is simply used for transmit material lifting platform to desired height. Diameter of wire rope is 5mm and 1400mm long with double support.



Fig. 3: wire rope

D. Bearing:

Bearing is a device to permit constrained relative motion between two parts. It is use to reduce wear and provide high speed. It is fixed with shaft as well having contact with frame. It is help to move material lifting platform efficiently.



Fig. 4: Bearing

IV. WORKING

Initially lifting platform is at bottom position. As material which is to be lift is place on lifting platform, one person is started to rotate a rotating shaft. When person rotate it in anticlockwise direction the platform started to lift upward. The rotary movement of rotating shaft gives motion to worm gear. This worm gear converts rotary movement of shaft in vertically sliding movement of lifting platform. The bearing attached to the movable platform shaft is allows flexible and non-frictional movement of lifting platform. So as rotating shaft is rotate the lifting platform is lift vertically upward and reached desired height. Basically this mechanism is supported with ladder through which whole mechanism is slides vertically up and down.



Fig. 4: Actual Model of Project

Now for bring back platform at bottom position a person rotate a rotating shaft in clockwise direction and the platform started slides back to vertically downward direction. In this way mechanism works. Also there is a fixed platform

at the base on which thus whole mechanism is mounted. Three wheels are attached with this fixed platform one at front side and other two at backside of the platform base. The front wheel is rotate through 360 degrees so as to move mechanism from one place to another easily.

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