IMPLEMENTATION OF MAGNETISM IN MATERIAL HANDLING SYSTEM

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Abstract: *The project focuses on the design and production of a ground floor crane fitted with a load locking unit at any level as a special feature, to address the problem of failure due to a fixed load. The mobile crane is designed to carry a maximum load of about 5 kg, and a counterweight of 50 kg. The materials used are; sheet metal, profile bars, bolts, nuts, metal rolls etc. Processing procedures include cutting, filling, welding and assembling. For permanent contact, the arc welding process was used. As mentioned earlier, a ground floor crane gains its value in the transport of heavy machine parts inside and outside the workspace. It can also be used to load and unload machine parts onto trucks.*

Keywords: **Material Handling, Uses of Magnets in Crane, Mobile Floor Crane, Manufacturing Processes**

1. INTRODUCTION

These low-performance cranes provide an efficient, cost-effective alternative property management equipment. They are sturdy, durable, strong and built with high quality, these cranes are controlled by loading, unloading and changing heavy loads. Crane structure consists of a pillar, boom, magnetic hook, wheels and magnetic mechanism attached to the cylinder. The crane can carry loads effectively, avoiding damage under the rough and unskilled to manage. The mobile floor crane is a machine with portable features that make it attractive and it is recommended for both internal (workplace / storage area) and external purposes, so that one purpose for lifting and moving heavy objects from one place to another. Some of them features found in it include; a flexible boom, pillar and balance due to the construction of the rest base. These elements are adjustable to suit the various lengths and sizes of the items to be made raised.

2. FLOOR CRANE

The crane is equipped with the magnetic mechanism which will help in lifting the load upward. The pole of the crane is attached with the boom. For the movement during lifting purpose, pulleys are used to easify the job. The four Castor wheels are provided for the mobility of the crane. The crane is also equipped with the counter weight for balancing the load.

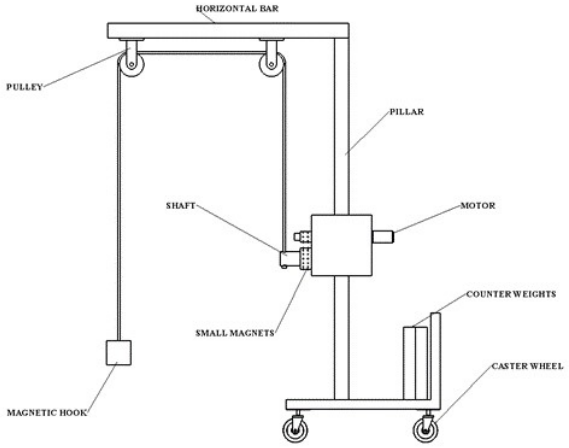


Table 1. Name of the components

Sr no.	Name of components
1	Horizontal Bar
2	Pillar
3	Base
4	Magnetic Hook
5	Wheels
6	Counter Weights
7	Motor
8	Shafts

Table 2. Specifications

Sr no.	Name of the component	Specifications
1	Horizontal Bar	~ Length = 45.72 cm
2	Pillar	~ Length = 76.2 cm
3	Base	~ Length = 35.35 cm
4	Wheel	~ Diameter – 38mm
5	Motor	~ 12V 6000 RPM
6	Counter Weights	~ 5 kg each
7	Magnets	~ 10 x 2 mm

The mobile crane has following components:

1) Base: It is a plate that provides support to the design. It is used for carrying the total weight of the model. It is made of mild steel.

2) Pillar: This is mounted on the base plate in longitudinal direction. It is made of mild steel.

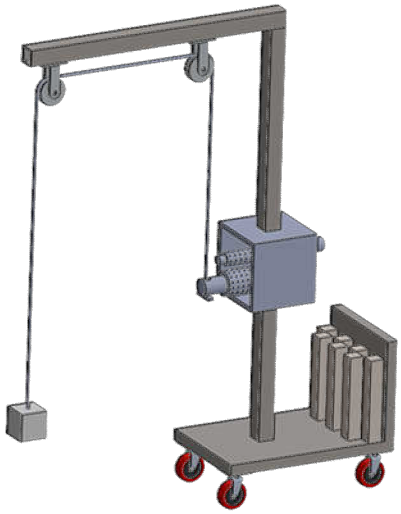
3) Magnetic Hook: The hook is attached to the rope supported by pulley. The magnetic hook provides the grip to the load.

4) Nuts and Bolts: Nuts and bolts are the fasteners which are used to fasten the various different parts.

5) Wheels: This is the component of the machine that makes mobility possible for which four wheels are used.

3. DESIGN

The designing work was carried out using SOLIDWORKS software. The required dimensions were taken as per the design equations. SOLIDWORKS is widely used design software which helps in designing 2D as well as 3D dimensional models.



4. PROCESSES

4.1) Manufacturing

The mobile floor crane which is manufactured has the parts as follows, there are base plate, Vertical Column, Magnets, Shafts, Motor, Hook, Nuts and Bolts, Wheels. Base plates are made of mild steel. The rods are cut according to the dimensions and they are welded using metal arc welding. Motor is selected according to the power required and weight of load which is to be lifted. Manufacturing of crane involves various process such as FABRICATION.

4.2) Fabrication

Manufacturing process in which an item is made from raw or semi-finished materials instead of being assembled from ready-made components or parts. It involves cutting, grinding and assembly process.

Fabrication involves following process:

1) **Metal Cutting:** Metal cutting is basically done to get the right dimensions and size as per the required design, using machines that have single point cutting tool. Initially the dimensions are marked and then the metal cutting operation is done.

2) **Metal Welding:** Arc welding is one of several fusion processes for joining metals. By applying intense heat, metal at the joint between two parts is melted and caused to intermix - directly, or more commonly, with an intermediate molten filler metal. Upon cooling and solidification, a metallurgical bond is created. Since the joining is an intermixture of metals, the final weld element potentially has the same strength properties as the metal of the parts. This is in sharp contrast to non-fusion processes of joining in which the mechanical and physical properties of the base materials cannot be duplicated at the joint. In arc welding, the intense heat needed to melt metal is produced by an electric arc. The arc is formed between the actual work and an electrode that is manually or mechanically guided along the joint. The electrode can either be a rod with the

purpose of simply carrying the current between the tip and the work or it may be a specially prepared rod or wire that not only conducts the current but also melts and supplies filler metal to the joint. Most welding in the manufacture of steel products uses the second type of electrode.

3) **Surface Finishing:** Surface finishing is done mainly by abrasive sand paper, in order to remove the dust particles and the rusting which gets formed because of the exposure to the moisture using a sand paper. We can obtain the shiny surface and the other operations become much easier and convenient marking can be done easily for cutting welding and drilling operations.

5. CALCULATION

5.1) Magnetic Flux Density : -

Disc magnet N42 of dimensions
Diameter = 10 mm
Thickness = 2mm
Area = πr^2 = 3.14*5*5
= 78.5 mm2
Magnetic Flux Density (B) = 1.242 T

5.2) Magnetic Flux : -

So, Magnetic Flux for N42 for given dimensions are
= Area * Magnetic Flux Density
= A * B
= 1.242 T * 78.5 mm2
= 97.497 T mm2

5.3) Magnetic Field Strength : -

Distance From Magnet, x = 0.196 inch
Thickness of Magnet, L= 0.0787 inch
Diameter of Magnet, D= 0.3937 inch
Residual gauss of Magnet, Br= 13200 gauss
As, magnetic field strength is gives as,

$$B(X) = \frac{Br}{2}\left[\frac{L+X}{\{R^2+(L+X)^2\}^{\frac{1}{2}}} - \frac{X}{\{R^2+X^2\}^{\frac{1}{2}}}\right]$$

B = 948.8 Gauss

5.4) Calculation for pulley : -

We need to lift the load of 5 kg (or) 49.05 N –
Mechanical Advantage = 2
MA = OF/IF
IF = 5/2 = 2.5 kg = 24.525 N
We need to apply force of 24.525 N to string to raise the object.

6. CONCLUSION

The objective of the project was to design the floor crane in which the hydraulics mechanism has to be replaced by the magnetic mechanism. The design of floor crane is built to carry the load of 5 kg using the mechanisms of magnets. Principle used in the design is the zero contact transmission by using magnetics.

7. REFERENCES

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