Design and Fabrication of Spring Operated Material Handling Equipment

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Abstract: Material handling equipment is the media of transportation of material from one location to another in a commercial space. Spring operated material handling equipment has huge load carrying capacity, large covering area simplified design, easy maintenance and high reliability of operation. This paper is mainly based on for material handling is not required external power i.e., electrical. On account of this, a machine and its physical description is covered here with some basic calculation.

Keywords: Material Handling, Less Cost, No Power Required, Less Maintains

I. INTRODUCTION

Basically material handling equipment is used to the picking an object from one location and travel to it and place at another location without much power of man wasting. Material handling equipment is generally separated into four main categories: storage and handling equipment, engineered systems, industrial trucks, and bulk material handling. According to industrial review the power which has been utilized for production out of which 32 to 35% of power is only utilized for material handling during the production which is unnecessarily wasted and hence the total cost of final product will increases. So if we want to decrease the total cost as well as the unnecessary power consumption either we have to reduce material handling or try for alternative handling. As the first option has several limitations we are trying for alternative handling system so are stepping towards a concept of potential energy of material to be handled as every material has its potential energy in the form of its weight.

II. METHODOLOGY

Step 1: Identification of problem: In day-to-day life electrical energy have evolved as one of the most basic needs of human being. We know that for the material handling we need to more human effort and need of more electrical energy. Today we required material handling equipment should be cheap and challenge to safe. To reduce material handling cost so we choose material handling equipment for our project work.

Step 2: Literature Survey: Various studies have been made in different industries to indicate that the cost of handling alone accounts for about 20-25% for the total manufacturing cost.

Step 3: Design of Mechanical Part: This phase involves the design of various elements such as spring, shaft & gear.

Step 4: Software Modeling: Detailed drawing using AUTO-cad software, creo software ANSYS software. Designed part is drawing using AUTO-cad.

Step 5: Fabrication: All the designed elements are manufactured in the workshop such as frame, shaft as per design and also select the part as per specification for e.g. rack and pinion, support rod chain and sprocket etc. Upper frame, lower frame, cross bar are manufacturing in workshop

Step 6: Assembly: All the manufactured and selected parts are assembled together. The assembly of the equipment is in two steps

1. Assembly of main frame with Rack & Pinion.
2. Assembly between main frame and cross bar tension mechanism.

III. CONSTRUCTION

Following are the part names:

1. Base plate
2. Main frame
3. Rack & pinion mechanism
4. Supporting rod
5. Chain & sprocket drive

Figure 1: CAD Drawing of Equipment
6. Cross bar  
7. Helical tension spring  
8. Shaft (12mm)  
9. Wheels  

A. Assembly of Main Frame with Rack & Pinion Mechanism

- The main frame is joined by the process of welding.
- After that the Rack is connected to upper plate with the help of welding.
- It is aligned by the corner ruling plate.
- Then Rack is guided by the supporting rod with the help of bush.
- Pinion is mounted on the shaft which is horizontal and approximately 50 mm apart.
- On the same shaft of pinion a chain & sprocket drive is also mounted which further transmit motion to wheel.

B. Assembly between Main Frame and Cross Bar Tension Mechanism

- After assembling the Rack & pinion the next step is to mount a return mechanism.
- The one end of both the bar pivoted at respective corner i.e. at top and bottom.
- The other end is free to slide on the guide rail of main frame.
- The free end is placed on rail with Single groove  
- Ball bearing to ease in sliding and for minimum friction between rails and bar end.
- In between these two bar two helical tension spring are mounted.
- One is at top and another is at bottom and likewise another side is also placed.

IV. WORKING

At the initial stage the base plate is at upper most position. The vehicle is at first station from where the object is to be carried. As soon as when an object is placed on the upper plate properly as the upper plate is sliding in nature it starts to travel downward. As the rack is attached to the upper plate it also moves down ward which further rotates to pinion. The pinion and sprocket of chain drive is mounted on the same shaft that is why the sprocket is also rotate at the same speed of pinion. Further motion is transmitted to wheel with the help of chain and sprocket drive. Likewise the vehicle is transports object from one place to another place.

The return motion of the vehicle is achieved by the help of Cross bar tension spring mechanism. When an object is picked up from the upper plate it try to move upward because of tension spring mechanism. The same mechanism will operate in reverse direction i.e., the Rack will move in up word direction that is why the pinion were rotate in opposite direction that motion is further transferred to the wheels with the help of chain drive hence the wheel is rotates in opposite direction and the vehicle comes to its original position.

CONCLUSION

Here we conclude that we completed the project named “Design and fabrication of spring operated material Handling Equipment.

- It works on the self weight of job or object which has to be transfer from one machine station to other machine station without consumption of any type of fuel or electricity.
- Hence this equipment is best suitable alternative for existing material handling equipment.

By the use of this type of equipment we reduce the energy consumption which also helpful for overall cost reduction. The most important thing we conserving our energy sources which are much useful in future growth and development.
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