



Box Transfer Mechanism with Application of Solar System

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ABSTRACT

The objective of this study is to design a system that delivers this stop and move motion using the mechanical linkages and mechanism. The advantage of this system over the conveyor system is that the system has a time delay between moving packages and this delay can be used to alterations in the package or move the package for any other purpose and likewise with the application of solar system. While in the normal conveyor mechanism such actions cannot be performed unless programmed module is used to produce in between stopping of the belt which is costly. The aim of the project work is to design and fabrication a box moving mechanism that makes much easier to move with the so called quad staying machines by means of which a box blank is set-up into box like form.

Keywords: *Solar System, conveyer mechanism, box moving, mechanical linkage, etc.*

1. Introduction

Box moving or shifting set up has a simple mechanism, operating with crank and links arrangement in system. As by the electric motor rotary motion is converted into the Backward and Forward motion of the linkages, The rotary motion is converted in to linear motion by the crank and mechanical by linkages arrangement. This conveyor system is either continuous movement or if the time delay is to be produced there will be definite requirement of software programming which will be costly. So, a basic module of moving packages is designed with time delay which can be used to do alterations if required in the package. This invention relates to improvements in transfer and conveyor system, and it relates particularly to devices for transferring set-up cardboard boxes from a box folding to the operator of a semi-automatic box wrapping. A great many manufacturers of fancy wrapped or cardboard boxes used for packaging candies, cakes and other cosmetics. In the scope of industry, automation is a step beyond mechanisms. Whereas mechanization provided to human operators with machinery to assist them with the muscular requirement when working, automation reduces the human sensory and mental requirements. Processes and systems can also be automated. Automation plays important role in the world economy and in daily usage. Engineers try to combine automated devices with mathematical and organizational method to create complex systems for a rapidly expanding range of applications and human activity.

2. Problem statement

It is found that power consumption is higher in the belt conveyors due to rolling resistance. As belt conveyors require large space for installation and installation cost of belt conveyors is very high. The maintenance cost is very high for belt conveyors. In small industries belt conveyors are not affordable.

So, we can solve this problem by using solar energy as a power source.

3. Objectives

1. To find an alternative for the convectional conveyor belt system.
2. To reduce the transportation and operational cost of the product.
3. To reduce accidents, happen during material handling in industry.
4. To find the effective and easy ways of material handling system in small industries.
5. Understand the design and fabrication techniques in a mechanical workshop.
6. Understand the usage of various mechanical machine tools and measuring tools.

4. Literature

The need of moving the manufactured components of industrial plant is one of the basic needs that need to be fulfilled in order to ensure the efficiency of the plant. The box shifting machine is a simple machine, as it operating on a crank and links arrangement. As by the electric motor rotary motion is converted into the forward and backward motion of the linkages, the linear motion is obtained by change of rotary motion by the use of cranks and mechanical linkages.

Box Shifting Mechanism and without Gear Power Transmission system. These mechanisms are very unique yet simple in nature and have their own significance in industry. So, the Box Shifting Mechanism, it is a simple mechanism which is operating with the help of a crank and link arrangement. In this mechanism, the rotary motion of a Crank results into linear motion of the Linkage Mechanism. This backward and forward linear motion of Linkage Mechanism helps to move on the conveyor belt.

Accidently may happen because of manual material handling system and sometimes this leads to serious health problems of workers that's why according to many ergonomics experts there should be a proper system for the transportation of material and products to reduce the human effort and to increase the productivity and efficiency. In small industries belt conveyors are not affordable so many industries directly go for manual transportation. In the case of wheel trolley, a large time is required to transport material as a result productivity reduces.

The box shifting set up has a simple mechanism, operating with crank and links arrangement. As by the electric motor rotary motion is converted into the forward and backward motion of the linkages. The rotary motion is converted in to linear motion by the crank and mechanical linkages arrangement. The conveyor system is either continuous movement. So, a basic module of moving packages is designed with time delay which can be used to do alternative if required in the moving the package for any other purpose.

5. Methodology

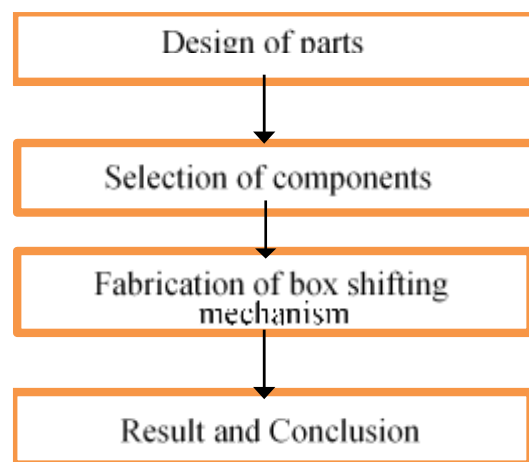


Fig: Methodology

Design of Parts

Design Of frame:

Frame is designed for smooth transportation. The principle of material handling 'Gravity' is used to decrease the transport cost. The total length of the frame is 1465mm from 900mm is for pushing the boxes using mechanism and remaining is for sliding. Section of length 77.73 and height 20mm in the diagram is designed for mounting of the motor. The slider of length 816.77mm is used to slide boxes. Slider is arranged such that by using gravity boxes can easily slide without any external force. Boxes are kept on the frame and according to the application and size of boxes the distance between two sides of the frame is different.

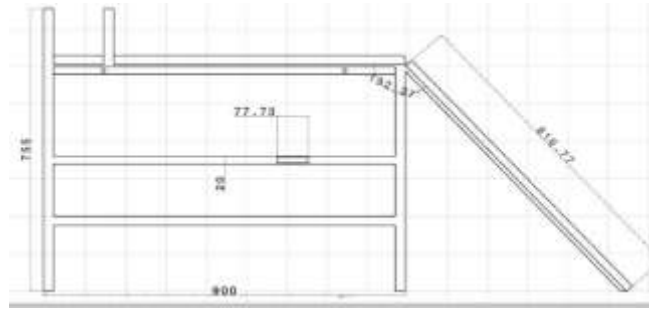


Fig. 1: Front view of the frame.

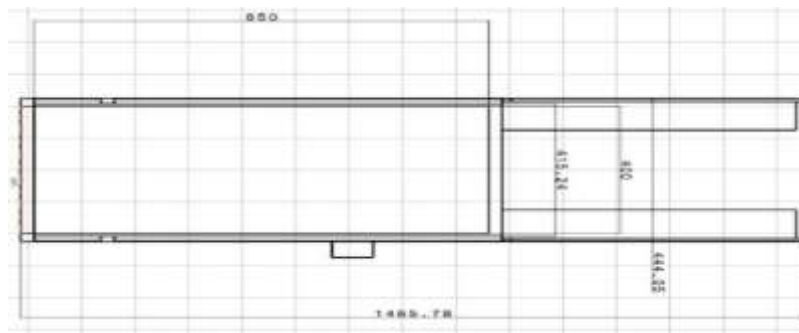


Fig: Top view of the frame

Selection of material and components

The box shifting mechanism is used to transferring box from one place to another. With the help of mechanical linkage with application of solar energy which is stored in battery by solar plate and this stored energy is utilized by the DC motor to drive the mechanical linkage.

The main components of the system:

1. Solar Plate
2. Battery to store the energy power
3. Mechanical linkages
4. DC motor

Component and Specification

DC Motor Speed: 10 RPM

Box Size: 220 mm x 80 mm x 80 mm

One to other box distance: 86 mm (inner), 246 mm (outer)

Rail distance: 44 inches (length), 36 inches (height)

Mechanism: Crank with linkages

Crank Angle: 220 degrees

Materials: MS (Mild Steel) and Wood

Total mechanism weight: 10 Kg (approx.)

Box transmission: Step wise movement (delay between moving boxes)

MATERIALS	DIMENSIONS /QUANTITY USED
MS rod	ϕ 16 mm, length 170 mm -4 NO.; 6 mm length 100 mm - 3 NO.; 10 mm, length 70mm - 1 NO.; 60 mm, length 15 mm - 4 NO.
Flats	80 X 25 mm -1 NO; 25 X 25 mm - 1 NO, 150 X 25 mm -1 NO.
Plywood Sheet	530 X 300 mm -2 NO.
Wooden Blocks	300 X 50 X 32 mm - 4 NO.; 200 X 45 X 25 mm NO.; 250 X 45 X 25 mm - 1 NO.
Bolts and nuts	1/4" inch - 2 NO.
Nails	20 NO.
Ball Bearings	ϕ 16 mm - 2 NO.
Bevel Gears	ϕ 16 mm - 2 NO.

Table 1.1 Materials and quantity used.

Functional Description of The Project

The operational description of this project work is explained in brief. For better understanding purpose, the total project work is divided into different section explanation is provided here. A box shifting machine is used to transfer boxes generally on an assembly line by conveyor belt. Industries worldwide use conveyors as a mechanism to transport boxes from one place to another. This mechanism including strong belts, pulleys and heavy motors to rotate the pulley to move the conveyor belt. As an alternative to this conveyor system, simpler and comfortable machine using four bar mechanism can be used. This box shifting or moving machine helps in transfer of boxes smoothly by using four bars mechanism with simple arrangement. The four-bar mechanism includes four links. One link is fixed and the other links rotating or moving, follower and connecting rod. The rotary motion of the crank is transferred to the follower by using connecting rod. This system requires an electric motor to provide input power to the system.

Linkages are classified with their primary functions:

- Function generation: the relative motion in between the links connected to Frame.
- Path generation: the path of a tracer points with arrangement.
- Motion generation: the motion of coupler link in system.

Function of linkages

The function of a link mechanism is to give rotating, oscillating or reciprocating motion from the crank. Stated that specifically linkages may be used to convert:

- 1) Continuous rotation into nonstop rotation, with a variable angular velocity ratio.
- 2) Continuous rotation into oscillation, with a constant or different velocity ratio.
- 3) Oscillation into oscillation, or reciprocating into reciprocating, with a constant or dynamic velocity ratio.

Conclusion and Future Work

Conclusion:

The box shifting mechanism plays a vital role in many small-scale industries, the process of moving parts from one place to another was to be maintained by using conveyors only by using our project we have another kinetic mechanism which can be constructed and maintained easily.

1. For 15 kg boxes and 40 Nm motor torque design is safe.
2. The magnitudes of stresses developed in links of the mechanism are higher than that of stresses developed in the frame. So, material having high strength should use for links in system.
3. This mechanism can used for the motion from one place to another place of boxes in industries.

Scope and Future work:

1. By using various materials and motors this mechanism can be used for the movement of heavy materials.
2. If the design of the frame is changed then other materials having different shapes and size can transport by using this system.
3. The power required for easy operation can be reduced by converting some links into rigid links.
4. Reconstruction techniques are not performed in this project; it will be very useful in many projects. Therefore, it is highly demanding.

Acknowledgment

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