DESIGN AND FABRICATION OF BOX SHIFTING MECHANISM

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Abstract- This machine is basically works on the principle of Four Bar Mechanism. Which is the heart of this machine and it converts rotary motion into a reciprocating motion. Here we Fabricated the conveyor using crank mechanism machine, this project can be utilized in industry. Industries in worldwide use conveyors as a mechanism to transport boxes from place. This mechanism do not includes strong belts, pulleys and heavy motors to rotate the pulley to move the conveyor. As an alternative to this conveyor type, more simple and comfortable machine using four bar mechanism can be used. This box shifting machine helps in transfer of boxes smoothly by use of four bars with a simple arrangement. The four bar mechanism includes four links. One link is fixed and the other links act as crank, follower and connecting rod. The rotary motion of the crank is transferred to the follower by using connecting rod and is converted to the same rotary motion. This machine requires an electric motor to provide input to the system.

Keywords-
Mechanism,Crank,Machine .

INTRODUCTION

Industries require a fast and cheap movement of packages from one point to another. The continuous movement is may not be more important whereas the movement at isolated intervals has become more essential.There has been a serious demand for intermittent movement of packages in the industries right from the start. Though the continuous movement is more or less important in the same field the sporadic motion has become essential .The objective of our project is to produce a mechanism that delivers this stop and move motion using mechanical linkages. The advantage of our system over the conveyor system is that the system has a time delay between moving packages and this delay can be used to introduce any alterations in the package or move the package for any other purpose and likewise. While in conveyor system such actions cannot be performed unless programmed module is used to produce intermittent stopping of the belt which basically is costly. The prototype design requires electric motor, shafts and the frame of which the frame and platform on which the packages are moved is fabricated. All the links are being made of Aluminum which reduces the weight of the whole system including the head which has a direct contact with the boxes being moved. The system is expected to move as heavy packages as 2 to 3kgs approximately.

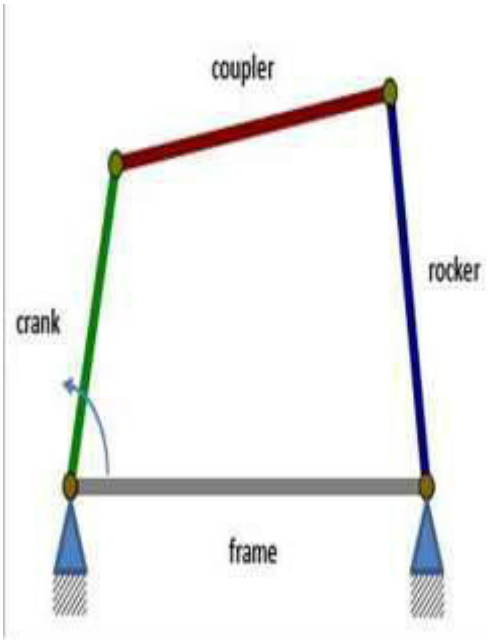

Fig: 1 Four Bar Mechani

EXPERIMENTAL SETUP

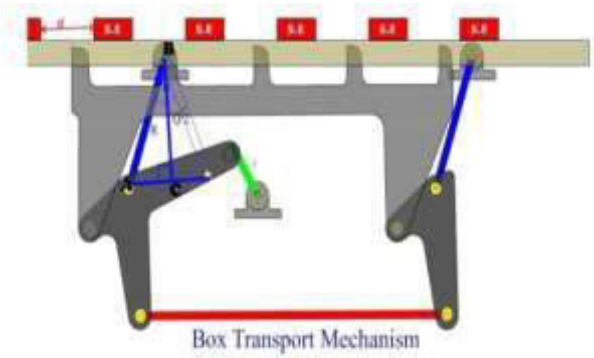

Fig:2. Box Transfer Mechanism

The functional description of the project work is explained in brief here. For better understanding, the total project work is divided into various blocks and each block explanation is provided here. The complete block diagram of this project work is provided in the next chapter. The following is the description of overall function of the module. A box shifting machine is used to transfer boxes/cartons generally on an assembly line. Industries worldwide use conveyors as a mechanism to transport boxes from place to place. This mechanism includes strong belts, pulleys and heavy motors to rotate the pulley to move the conveyor. As an alternative to this conveyor type, more simple and comfortable machine using four bar mechanism can be used. This box shifting machine helps in transfer of boxes smoothly by use of four bars with a simple arrangement. The four bar mechanism includes four links. One link is fixed and the other links act as crank, follower and connecting rod. The rotary motion of the crank is transferred to the follower by using connecting rod and is converted to the same rotary motion. This machine requires an electric motor to provide input to the system.

A. Four-bar linkage- A four-bar linkage also called a four-bar is the simplest movable closed chain linkage. It consists of four bodies, called bars or links connected in a loop by four joints. Generally, the joints are configured so the links move in parallel planes and the assembly is called a planar four-bar linkage. If the linkage has four hinged joints with axes angled to intersect in a single point, then the links move on concentric spheres and the assembly is called a spherical four-bar linkage. Bennett's linkage is a spatial four-bar linkage with hinged joints that have their axes angled in a particular way that makes the system movable.

B. Inversion of Four bar Mechanism -A mechanism is one in which one of the links of a kinematic chain is fixed. Different mechanisms can be obtained by fixing different links of the same kinematic chain. These are called as inversions of the mechanism. By changing the fixed link, the number of mechanisms which can be obtained is equal to the number of links. Excepting the original mechanism, all other mechanisms will be known as inversions of original mechanism. The inversion of a mechanism does not change the motion of its links relative to each other. One of the most useful and most common mechanisms is the four-bar linkage. In this mechanism, the link which can make complete rotation is known as crank (link 2). The link which oscillates is known as rocker or lever (link 4). And the link connecting these two is known as coupler (link 3). Link 1 is the frame.

C. Inversions of class 1 four bar mechanism:

-When link 'b' is fixed : Crank Rocker or Crank Lever mechanism, in the shortest link rotates 360 degree whereas the other link oscillates.

-When link 'a' is fixed : Crank Rocker or Crank Lever mechanism, in the shortest link rotates 360 degree whereas the other link oscillates.

-When link 'd' is fixed : Drag link or Double crank mechanism in which the links 'a' and 'b' undergoes complete 360 dig motion.

- When link 'c' is fixed: Double rocker or Double lever mechanism in which no link makes a complete rotation about its joints. In such case it is similar to class 2 four bar mechanisms.

- A mechanism has been defined above as a kinematic chain in which one of the links is fixed. From the four bar mechanism, different versions of each of them can be obtained by fixing any one of the links p, q l or s. Such different versions, which can be obtained by fixing any of the different links, are called its “Inversions”. Many a time, a particular inversion of a mechanism may give rise to different mechanisms of practical utility, when the proportions of the link lengths are changed. By this principle of inversion of a four bar chain, several useful mechanisms can be obtained.

D. Design of four bar mechanisms- The synthesis, or design, of four bar mechanisms is important when aiming to produce a desired output motion for a specific input motion. In order to minimize cost and maximize efficiency, a designer will choose the simplest mechanism possible to accomplish the desired motion. When selecting a mechanism type to be designed, link lengths must be determined by a process called dimensional synthesis. Dimensional synthesis involves an iterate- and- analyze methodology which in certain circumstances can be an inefficient process; however, in unique scenarios, exact and detailed

procedures to design an accurate mechanism may not exist. The picture shown below is for illustration purpose only. The actual model may not be exactly same as shown in the previous figure.

[1]Selection of Materials
[2]Linkages
[3]DC motor
[4] M.S. Frame
[5] Bearings

ADVANTAGES

[1] Lubricants not required.
[2] Simple to construct.
[3] Low speed motor is sufficient
[4] Easy maintenance.
[5] Less skilled operator is sufficient.
[6] Noise of operation is reduced.

CONCLUSION

The box shifting mechanism plays a major role in industries, the process of transporting or shifting products from one place to another was to be maintained by conveyors only. So we just successfully altered this with a box shifting mechanism using the kinematics links and a motor. We used basic mechanical knowledge and design capabilities to make it possible. Thus this project work will be useful in all industries. For practical application it's height, weight are suitable for light duty operations. But with time and with few modifications as the prototype will demand in future, it's efficiency and capabilities could be enhanced. The project works with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities.

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