

# BOX TRANSPORTATION USING CHAIN AND GEAR CRANK MECHANISM

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**Abstract:** Continuous demand for alternate movement of boxes in the production plants exists from the dawn of the industrial revolution. The prime objective of this activity is to design a mechanism that gives this intermittent motion using the mechanical links. The benefits of this system is to scale down the time delay and can be used to bring any alterations in the package or move the package for any other purpose and likewise. In the case of general conveyor mechanisms these actions cannot be performed if robotic module is applied to produce stop and move motion stopping of the belt which is basically costly. This chain and gear crank mechanism design model requires 24v electric motor shafts and frame where the boxes are situated and moved by fabrication of all the linkages are made by common MS (mild steel) and MS Frame adding the head where the boxes that manage to be moved through direct contact and the chain and gear crank arrangement to increase the system performance. The system is habitual to move as heavy packages as 8 to 10 KGs approximately. The main fabrication work is to transport the boxes by chain and gear crank mechanism that makes much simpler to move.

## 1. INTRODUCTION

The box transfer or displacement system has a simple mechanism, operated with chain and gear crank arrangement. Using electric motor the linkages of the shaft convert the turning motion to linear movement of the linkages, it is very simple.

The turning motion is converted in to linear motion by the crank and mechanical linkages with chain and gear crank arrangement. The transport setup is either continued movement or if the downtime 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 could be using to do alterations if required in the package or move the package for any other purpose. This product is to improve the transfer and carrying device and it is related to the moving the set of cardboard boxes from a box folding or forming machine to the operator of a wrapping the box by semi-automated machine.

Many of the famous manufacturing industries wrapped cardboard sheets used for wrapping candies, confections and cakes, cosmetics and other articles. They are equipped with the so called quadrant stopping machines by means of which a box sheet is folded or set-up into box like form. These set-up boxes are shipped by means of a conveyor to an driver, who takes up the boxes and places and centers' them on wrappers with which the boxes are to be covered. The boxes and envelopes are shipped to a box covering apparatus where the box is placed in a glued envelope is folded to it.

Generally, the operation is controlled by the motion of switch and the forming of box so it consists of certain operating limits of speeds are coexisted to one another

## 2. LITERATURE REVIEW

This paper's objective is for the effective utilization of kinematic synthesis to construct a running working model of an eight link transfer mechanism. The mechanism being constructed in its quiet form would execute the exercise of shifting boxes/articles which are being supplied towards two rails and are carried ahead one by one. The octennial bar mechanism allows shifting more than one article as compared to its four bar correspondent. Transport mechanism generally maneuver material and their application lies in various industries-manufacturing, packaging, assembly etc.

### 2.1 LINKAGE MECHANISM

2 or more than 2 levers are connected by the formation of linkage mechanism, 2 or more than 2 objects can move at the concurrent or changeable in the direction of force that is designed as a linkages.

Pins end threaded bolt with nuts and loosely fitted revits can move openly with the help of many fasteners which are connected by the linkages together. Simple linear and more complicated specialized linkages are two familiar types of links. Describing planer lines or curvy type and exciting motions of different speeds are the tasks which can be performed by a simple planer linkages and more complicated specialized links. In all the guidance books and citation the designation of the

links mechanisms gave broadly here but not accepted universally.

To provide distinct mechanical gains. This linkage can also be rotated through 360°.

### 2.2 PUSH-PULL LINKAGE

Push and pull link, make the things or objects move in the similar direction; the input link move as per the movement of output link in the identical direction .without any changes in function as 360 degrees it can rotate by the four bar linkage and is classed technically

### 3.MATERIALS USED

3.1 Wiper motor

3.2 Battery 12V

3.3 Pillow block

3.4 Steel frame

3.5 Bolts,nuts and washers

### 3.1 WIPER MOTOR

Wiper motor is generally is used in cars to wipe the water films on a glass. In this chain and gear crank mechanism it is used to move the main frame by using linkages .the capacity of the motor is 24V this helps to regulate the speed ( fast or slow ) and the rpm of this motor is 35 .It is used to give intermittent motion



Fig -3.1: Wiper Motor

### 3.2 BATTERY 12V

Battery generally provides the electric power to any electronic devices such as electric bulbs, motors, more it is used in the automobiles (horn, self-start etc...)in this mechanism it is used to run the motor which will work due to the supply of power from the battery and it is rechargeable.



Fig -3.2: Battery

### 3.3 PILLOW BLOCK

A pillow block is generally constructed with a anti friction bearing. It can be mounted where the seated shaft is in a parallel plane to the mounted surface, and vertical to the middle line of the mounted holes, with many types of projected blocks. A pillow block may consists of ball bearings, i.e., used to move the shaft freely and gives the support to shaft



Fig -3.3: Pillow Block

### 3.4 STEEL FRAME

Steel frame are used to construct the structure of any skeleton by arranging in horizontal and vertical manner as per the dimensions and structure is build according to the database



Fig -3.4: Steel Frame

### 3.5 BOLTS NUTS AND WASHERS

Bolts and nuts are used to joining the two links and the nut is usually of metallic block these are available in most common structures like square or hexagonal which the hole is designed by threading and this can be mated together with a bolt. And the washers are used to prevent the slippages, this can give the tightness to the joints etc. and are available in different types such as flat rings, leather, metal, rubber



Fig -3.5: Bolts,nuts and washers

### 4. PROCEDURE

- ❑ Prepare the drawing for the box transport mechanism using any modeling software
- ❑ Find out the optimum dimensions for the bed of box transport mechanism from the CAD model.

- ❑ Take the iron angles and cut them to required dimensions using steel plate cutter
- ❑ By procuring the appropriate size of M.s sheet, and utilizing the CAD database prepare a design for the links, frame, etc.,
- ❑ After preparing a CAD model sync the design parameters with a numerically controlled plasma arc cutting machine
- ❑ Perform the machining operation on a lathe and prepare a shaft according to the required design
- ❑ Take the iron angles and drill holes using drilling machine according to the dimensions of CAD database
- ❑ Arrange all the components required to build the model at a convenient point. And start associating it.
- ❑ Construct the model according to the dimensions of CAD model by assembling it using fasteners
- ❑ Fix the motor at an appropriate location and connect the shaft to extrude it to required length.
- ❑ After fixing the motor, fix one side of crank to motor and another one to base link.
- ❑ Take the hanger link and fasten it to base link and affix it to pillow block on atop
- ❑ Attach the frame to the base link and fasten it using bolts and nuts.
- ❑ Two other hanger links was also attached to the shafts.
- ❑ Perform the same procedure of fixing as mentioned above on the adjoining side as well.
- ❑ After link and frame is allied using fasteners install chain and sprocket on the motor shaft and on the adjoining shaft accompanied on the pillow block
- ❑ Lock the chain and sprocket using the cotter pin for efficient movement of mechanism
- ❑ Power is given to the motor to operate the box transport mechanism and results are noted down.

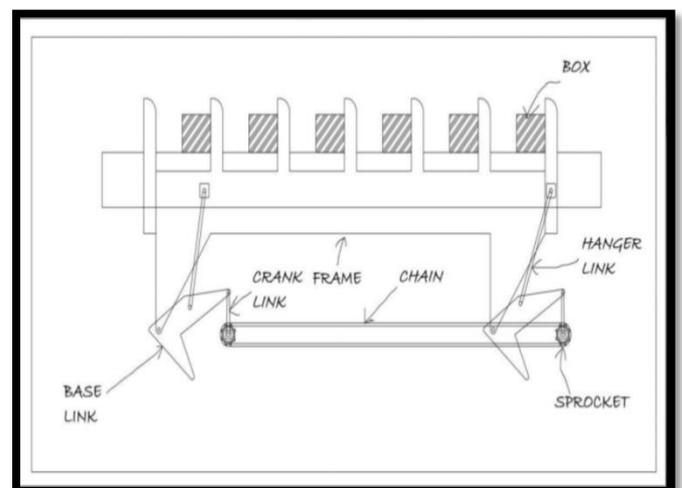


Fig -4.1: Assembled CAD model



**Fig -4.2:** Actual assembled view

## 5. FUTURE SCOPE

Dynamic analysis is one of the very important Phase in design the systems. A computer base design and simulation gives better understand regarding rigid system parameter. There is a much scope in developing of an accurate mathematical model and subsequent simulation for the kinematics and dynamics analysis of the mechanical for the precise application in industry.

### 5.1 CONCLUSION

The box conveying mechanism plays a dominant role in industries, the process of transporting or shifting products from one place to another was to be maintained by conveyors only. So it is successfully modified this with a box relocation mechanism using the kinematics links and a motor.

We as a whole team just implemented our basic mechanical knowledge and designing skills for designing and fabricating this project successfully. Thus this project work might be useful in all industries. For practical applications this is fabricated for light duty operation. Its height, weight and other mechanical designs may be not suitable for any other heavy operation or work on hardened material.

It is a really proud moment for us as a team that we have accomplished the work with the limited time successfully. The project works with satisfactory conditions.

We are able to recognize 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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