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# Design & Analysis of Box Transfer Mechanism.

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## ABSTRACT

In today's era of automation and mass production for industries to be competitive and cost effective we tried to find a solution for packaging industries. As there are number of items required in day-to-day life like soaps, confectioneries, automobile components, food items are produced in small and medium scale industries. For packaging these items using labor is quite costly affair and even production output is limited due to human abilities and there are some human errors too.

So, we have tried to find the best feasible working solution for this kind of industries. Also, we have considered the cost angle for the small and medium sized industries.

We have analyzed the change in output and overall performance of this machine.

***KEYWORDS:*** *Box transfer machine, Linkage*

## 1.PROPOSED WORK

1. First of all we have prepared the drawing for the machine transporter machine.
2. Then we make the measurement for the bed of the box transport machine.
3. We took the iron angles and cut them in the given measurements using the cutting machine.
4. Then we took those pieces and weld them in the prepared shaped drawing.
5. After making the welding of the iron angles bed for the machine was ready.
6. Then we took the mild steel plate and then taking the measurement of box transport machine we cut the pieces in the given length.
7. Other two hanger link and transporting shaft was attached to the top of the bed in the bearing gear.
8. Out box transporting machine is ready now.
9. We give the current to the electric motor and put the boxes on the top of the machine for testing it.
10. It was working well and boxes are moving to the next level.

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## 2.DESIGN CONSIDRATION

- **Linkages**
  - These linkages are made by using hylam boards done by cutting operation. A mechanical linkage is an assembly of bodies connected to manage forces and movement.
  - The movement of a body, or link, is studied using geometry so the link is considered to be rigid.
  - The connections between links are modeled as providing ideal movement, pure rotation or sliding for example, and are called joints.

• **Reverse-motion linkage**, Fig. 2, can make objects or force move in opposite directions; this can be done by using the input link as a lever. If the fixed pivot is equidistant from the moving pivots, output link movement will equal input link movement, but it will act in the opposite direction. However, if the fixed pivot is not centered, output link movement will not equal input link movement. By selecting the position of the fixed pivot, the linkage can be designed to produce specific mechanical advantages. This linkage can also be rotated through 360°.

• **Push-pull linkage,** Fig. 8b, can make the objects or force move in the same direction; the output link moves in the same direction as the input link. Technically classed as a four-bar linkage, it can be rotated through 360° without changing its function

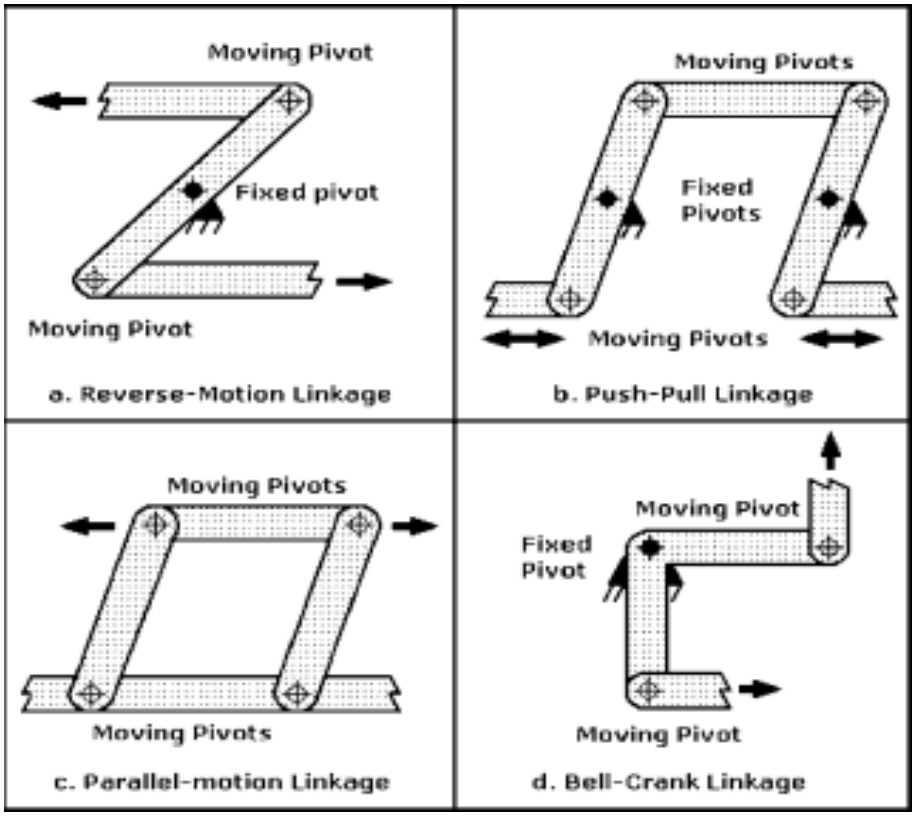


**Figure 1.2 Functions of four basic planar linkage mechanisms**

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• **Parallel-motion linkage,** Fig. 2, can make objects or forces move in the same direction, but at a set distance apart. The moving and fixed pivots on the opposing links in the parallelogram must be equidistant for this linkage to work correctly. Technically classed as a four-bar linkage, this linkage can also be rotated through 360° without changing its function. Pantographs that obtain power for electric trains from overhead cables are based on parallel-motion linkage. Drawing pantographs that permit original drawings to be manually copied without tracing or photocopying are also adaptations of this linkage; in its simplest form it can also keep tool trays in a horizontal position when the toolbox covers are opened.• **Bell-crank linkage,** Fig. 2, can change the direction of objects or force by 90°. This linkage rang doorbells before electric clappers were invented. More recently this mechanism has been adapted for bicycle brakes. This was done by pinning two bell cranks bent 90° in opposite directions together to form tongs. By squeezing the two handlebar levers linked to the input ends of each crank, the output ends will move together. Rubber blocks on the output ends of each crank press against the wheel rim, stopping the bicycle. If the pins which form a fixed pivot are at the midpoints of the cranks, link movement will be equal. However, if those distances vary, mechanical advantage can be gained

There are three inversions of four bar mechanisms, which are obtained by fixing different links of the kinematic chain.

They are:

a) Double Crank Mechanism

b) Crank Rocker Mechanism

c) Double Rocker Mechanism

d) Parallel Crank Mechanism

## 3. FABRIVATIONAND DRAWING

### 3.1 Dc motor

- It is used run the whole linkages. The blade is swung back and forth over the glass, pushing water from its surface.
- The speed is normally adjustable, with several continuous speeds and often one or more "intermittent" settings.
- Most automobiles use two synchronized radial type arms, while many commercial vehicles use one or more pantograph arms.

### 3.2 Steel Frame

- Steel frame is a building technique with a "skeleton frame" of vertical steel columns and horizontal I-beams, constructed in a rectangular grid to support to the various links and components of the transfer mechanism which are all attached to the frame.
- The frame is made up of the pipes of galvanized iron having circular, rectangular, square with hollow cross section. Steel frame supports the all moving parts of the machine. It carries the saddle also.

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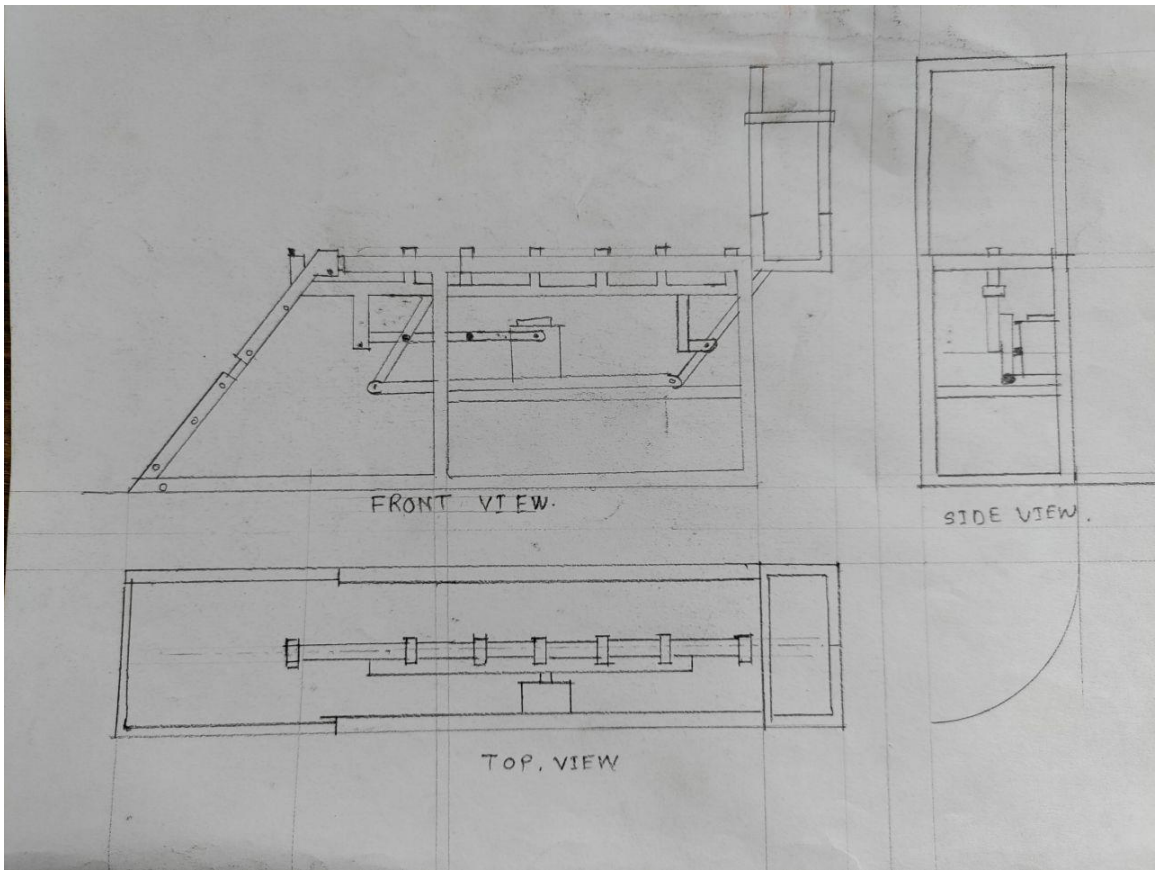
**3.3 Bolt and Nut**

- A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten two or more parts together. The two partners are kept together by a combination of their threads' friction.
- The most common shape is hexagonal, for similar reasons as the bolt head - 6 sides give a good granularity of angles for a tool to approach from (good in tight spots), but more (and smaller) corners would be vulnerable to being rounded off. It takes only 1/6th of a rotation to obtain the next side of the hexagon and grip is optimal.
- Manufacturing of various components and assemblies will be carried out by using suitable manufacturing processes.

The fabricated mechanism will be tested for the suitability to intended application. This experimental testing will include the testing of machine at actual site.



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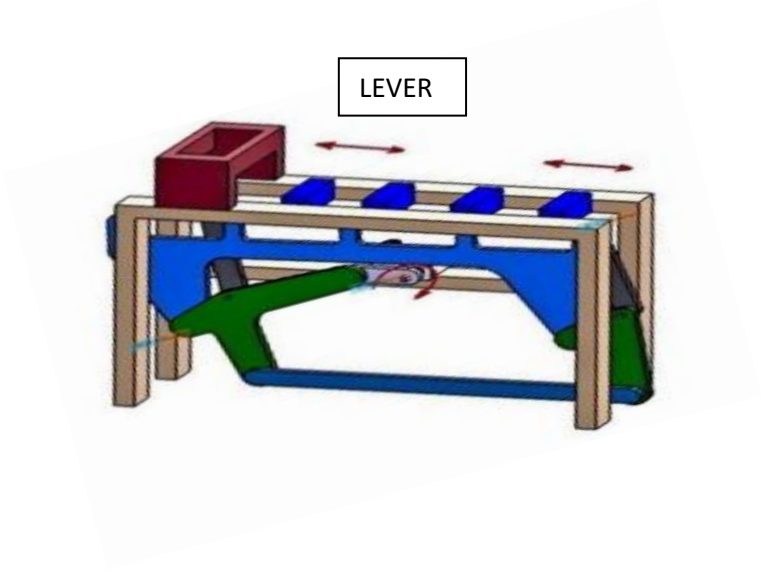


## 4. TESTING

To test and confirm the working of developed mechanism for box transfer mechanism, we have taken practical demonstration at nearby factory. Also we have collected the feedbacks and improvements points in developed model.

### 4.1.1 Readings of 6 * 4-inch box

| Sr. no. | Velocity of motor in rpm | Size of a box | Weight of a box | Output number of boxes per minute |
|---|---|---|---|---|
| 1 | 60 | 6/4 | 500 | 50 |
| 2 | 60 | 6/4 | 475 | 50 |
| 3 | 60 | 6/4 | 450 | 51 |
| 4 | 60 | 6/4 | 425 | 51 |
| 5 | 60 | 6/4 | 400 | 52 |
| 6 | 60 | 6/4 | 375 | 52 |
| 7 | 60 | 6/4 | 350 | 53 |
| 8 | 60 | 6/4 | 325 | 54 |
| 9 | 60 | 6/4 | 300 | 55 |
| 10 | 60 | 6/4 | 275 | 55 |

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### 4.1.2 Reading of 9*4-inch box

| Sr. no. | Velocity of motor in rpm | Size of a box | Weight of a box | Output number of boxes per minute |
|---|---|---|---|---|
| 1 | 60 | 9/4 | 500 | 50 |
| 2 | 60 | 9/4 | 475 | 50 |
| 3 | 60 | 9/4 | 450 | 51 |
| 4 | 60 | 9/4 | 425 | 51 |
| 5 | 60 | 9/4 | 400 | 52 |
| 6 | 60 | 9/4 | 375 | 52 |
| 7 | 60 | 9/4 | 350 | 53 |
| 8 | 60 | 9/4 | 325 | 54 |
| 9 | 60 | 9/4 | 300 | 55 |
| 10 | 60 | 9/4 | 275 | 55 |

### 4.1.3 Reading of 9/6 inch box

| Sr. no. | Velocity of motor in rpm | Size of a box | Weight of a box | Output number of boxes per minute |
|---|---|---|---|---|
| 1 | 60 | 9/6 | 500 | 50 |
| 2 | 60 | 9/6 | 475 | 50 |
| 3 | 60 | 9/6 | 450 | 51 |
| 4 | 60 | 9/6 | 425 | 51 |
| 5 | 60 | 9/6 | 400 | 52 |
| 6 | 60 | 9/6 | 375 | 52 |
| 7 | 60 | 9/6 | 350 | 53 |
| 8 | 60 | 9/6 | 325 | 54 |
| 9 | 60 | 9/6 | 300 | 55 |
| 10 | 60 | 9/6 | 275 | 55 |

### 4.2 Testing points and concluded points as below: -

| Sr. no. | Box sizes | Speed in rpm | Output max | Output min |
|---|---|---|---|---|
| 1 | 6/4 | 60 | 55 | 50 |
| 2 | 9/4 | 60 | 55 | 50 |
| 3 | 9/6 | 60 | 55 | 50 |

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## Remarks

From above reading it is seen that we can utilize this machine to transfer different size of boxes , but as the weight of the boxes increases , the output in terms of number of boxes reduces.

## 5. CONCLUSION

At the end of this analysis the concluded remark is , this box transfer mechanism using four bar linkage mechanism is so useful in packaging industries.

The main outputs and conclusions remarks are as bellow :-

- The developed model operates successfully and it meets all the parameters of test rig.
- From above readings it is seen that this machines can be used for all 3 size of boxes.
- Test time required minimized and standard procedure adopted for testing.
- Chances of equipment failures are less.
- Test media can be reused and transferred to other place after testing.
- Skilled and semi skilled personnel can carry out test.

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