

# Application of laser cutting by creating a Box Transport Mechanism

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**Abstract** - This paper deals with the utilization of laser cutting and kinematic synthesis (type, dimensional and number) to fabricate a working physical model of an box transport mechanism by means of laser cutting. This would give the better application of it. The mechanism to be developed in its simplest form would perform the function of transporting boxes/articles which are being fed onto two rails and are moved ahead one by one. The eight bar mechanism allows moving more than one article as compared to its four bar counterpart. Transport mechanisms generally move material and their application lies in various industries manufacturing, assembly, packaging etc. There has been serious demand for intermittent movement of packages in the industries right from the start.

1. **Function generation:** the relative motion between the links connected to frame.
2. **Path generation:** the path of tracer point.
3. **Motion generation:** the motion of a coupler link.

Some important concepts in link mechanism are :

1. **Crank:** can rotate a full 360 degrees.
2. **Rocker:** can rotate through a limited range of angles which does not include 0° or 180°.
3. **Crank-rocker:** can rotate through a limited range of angles which includes 0° but not 180°.
4. **Double-crank mechanism:** can rotate through a limited range of angles which includes 180° but not 0°.

Some basic nomenclature in a linkages are as follows :

1.  $s$  = length of shortest bar.
2.  $l$  = length of longest bar.
3.  $P, q$  = lengths of intermediate bar.

Cas e	$1+s$ Vs $p+q$	Shortest bar	Type
1	<	Frame	Double- crank
2	<	Side	Rocker-crank
3	<	Coupler	Double-rocker
4	=	Any	Change point
5	>	Any	Double-rocker

Table no. 1 classification of linkages

## 1. INTRODUCTION

There has been a serious demand for intermittent movement of packages in the industries right from the start. 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. The prototype requires the electric motor, linkages made of acrylic which is cut by laser cutting machine. This invention relates to improvements in transfer and conveying devices, and it relates particularly to devices for transferring set-up cardboard boxes from a box folding or forming machine to the operator of a semi-automatic box wrapping machine.

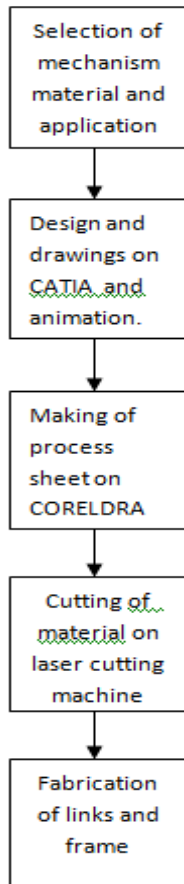
## 2. LITERATURE REVIEW

This papers objective is for the effective utilization of kinematic synthesis to construct a running a running model of box transport mechanism made of acrylic material as an application of laser cutting.

### 2.1 Linkages

Linkages have many different functions, which can be classified according on the primary goal of the mechanism:

### 3. METHODOLOGY



### 4. ASSEMBLY DRAWING

After selection and designing the various linkages criteria above the links are made on the CREO 3.0 software .Shown below the assembly drawing of various links which we designed. we had find our dimensions of links of our mechanism by trial and error method , but by taking the relations between them as granted.

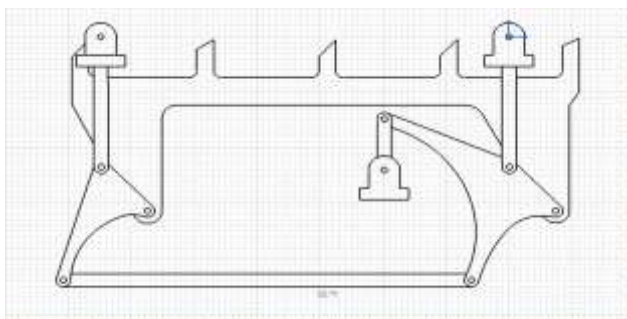


Fig.1 Assembly of box transport mechanism

### 5. MANUFACTURING AND ASSEMBLY

The acrylic material is selected based on its properties like high density, light weight and transparency so that it helps to understand the actual working of the mechanism. By using LASER cutting machine all the linkages, frame and spacers are cut from production drawing.

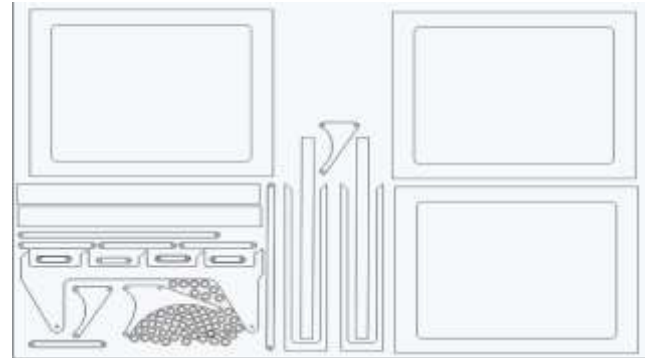


Fig.2 production sheet

#### 5.1 COMPONENTS

After cutting assembly is done with the help of acrylic sheet, adhesive, screws, nuts and bolts, angles. A 100 rpm gear motor is used to rotate the shortest link by supplying power through 12V DC adapter. Thus, to control the speed of motor he control circuit is used.



Fig.3 Components

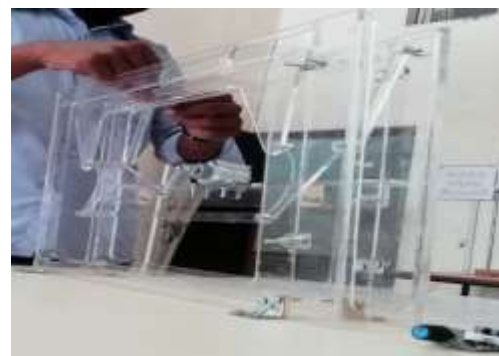


Fig.4 Actual assembled view

## 6. APPLICATIONS

1. We can use this mechanism in cold drinks production companies.
2. We can use this in bottle filling companies.
3. We can use this mechanism in box corrugation industries.

[2] Kinematics and dynamics of machinery, R.L Norton, Tata McGraw Hill Publishers, 1st Edition, 2009.

[3]<http://www.mekanizmalar.com/transport01.html>

[4]<http://projectseminars.org/report-box-transportmechanism-project-report-in-pdf>.

## 7. ADVANTAGES

1. Lubricants not required.
2. Simple construction.
3. Low speed motor required.
4. Easy maintenance.
5. Less skilled operator can also handle it.
6. Noise free operation is there.

## 8. FUTURE SCOPE

A computer based design and simulation gives better understanding regarding rigid system parameter. there is much scope in development of an accurate mathematical model and subsequent simulation for the kinematics and dynamics of mechanical application industries.

## 9. CONCLUSIONS

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.

The crank unit is defined in this paper, and the important role of the crank unit is discussed in the process of modular design and production of the Crank group Driving Mechanism.

## 9. REFERENCES

[1] Theory of Machines, S.S. Rattan, Tata McGraw Hill Publishers, 3 rd. Edition, 2013.