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Design and Development of Prototype of Industrial Conveyor using Four Bar Mechanism

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***Abstract*: This machine is basically working on the principle of Single Slider Crank Mechanism and it converts rotary motion into a reciprocating motion. Here Fabricated the conveyor using a crank mechanism machine, this project can be utilized in industry. Industries in worldwide use conveyors as a mechanism to transport boxes from a place. This mechanism does not include 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 the four-bar mechanism can be used. This box shifting machine helps in transfer of boxes 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 a crank, follower and connecting rod. The rotary option of the crank is transferred to the follower by using a connecting rod and is converted to the same rotary motion. An electric motor is required to provide input to the system.**

***Keywords*: CNC Plasma, operating parameter, nozzle were, surface roughness, material removal rate.**

1. Introduction

Continuous demand for intermittent movement of packages in the industries right from the start. The continuous movement is more or less important in the same field the sporadic motion has become essential. The objective of this system is to produce a mechanism that delivers this stop and move motion using mechanical linkages. The prototype design requires an electric motor, shafts and the frame on which the frame and platform of the packages are moved is fabricated. All the links are made from Aluminum which reduces the weight of the system including the head. The system is expected to carry heavy packages as 2 to 3 kgs approximately.

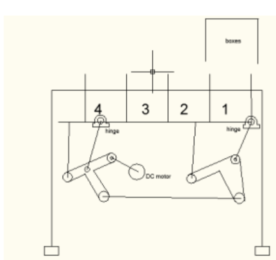

Fig. 1. Crank rocker mechanism

A. Problem Statement

This machine is basically working on the Single Slider Crank Mechanism which is the heart of this machine and it converts rotary motion into a reciprocating machine to crush the Cans/Plastic bottles. In this system, link 1 is fixed and link 2 which is a crank is rotating about fixed link 1 and converts this rotary motion into the reciprocating motion of slider (corresponds to the link 4) by means of the connecting rod which corresponds to the link 3. This is the inversion of single slider crank which is obtained by fixing the link.

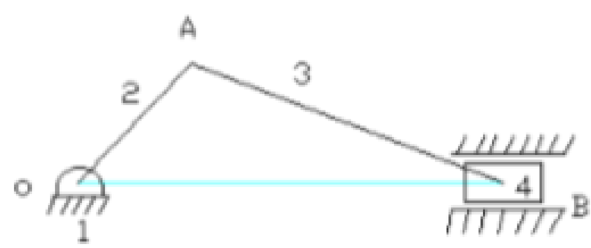

Fig. 2. Single slider crank mechanism

It has been estimated that the average material handling cost is roughly 20 to 60 % of the total cost. It thus, becomes clear that the cost of production of an item can be lowered considerably by making a saving in the material handling cost.

B. Objectives

1. Preparation of Prototype sample of “Design and Development fabrication model box transfer conveyor using linkage arrangement"
2. Experimental workout of “Design and Development fabrication model box transfer conveyor using linkage arrangement"
3. Study of a comparative result of “Design and Development fabrication model box transfer conveyor using linkage arrangement"

C. Theory

1) Slider mechanism

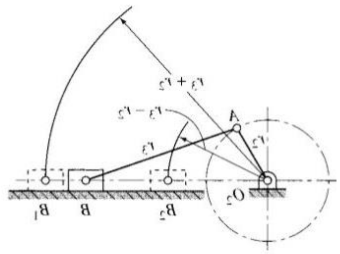

Fig. 3. Slider crank mechanism

It is evident from Figure 3, that, while the crank arm rotates through 180°, the piston moves from the position known as top-center (TC) to the other extreme, called bottom-center (BC). During this period the piston travels a distance, S, called the stroke, which is twice the length of the crank. For an angular velocity of the crank (ω), the crank pin A has a tangential velocity component ω S/2. The resulting lateral force component normal to the cylinder wall gives rise to frictional forces between the pistons rings and cylinder.

The position of the piston with respect to the crank centerline problem for the control is given by x = (S/2) cos + Lcos Ø [ft | m] ……. (1)

yA = (S/2) sin = L sinØ

X/L = (S/2L) cos + [1- (S/2L) sin] ½

Thus, the axial component of the motion of the crank pin is simple harmonic, XA= (S/2) cos, the motion of the piston and piston pin is more complex.

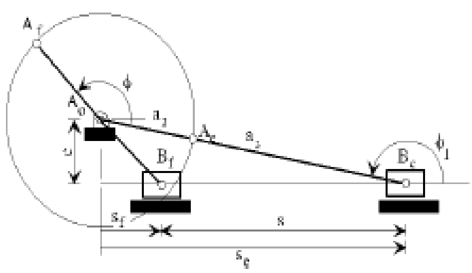

Fig. 4. Geometry and notation for the crank slider

It may be seen from Equation (2), however, that as S/L becomes small, the piston motion approaches simple harmonic. Equations (1) and (2) may be used to predict component velocities, accelerations, and forces in the engine. The swept volume by the piston as it passes from TC to BC is called the piston displacement, disc. Engine displacement, DISP, is then the product of the piston displacement and the number of cylinders, DISP = (n)(dips). The piston displacement is defined as the product of the piston cross-sectional area and the stroke. The cylinder inside diameter (and, proximately, also the piston diameter) is called its bore. Cylinder bore, stroke, and the number of cylinders is usually quoted in engine specifications along with or instead of engine displacement.

2. Double crank mechanism

The mechanism of coupling rod of a locomotive which consists of four links as shown in figure 5. The link CD acts as a coupling rod and the link AB is fixed in order to maintain a constant enter to center distance between them. This mechanism is transmitting rotary motion from one wheel to other wheels.

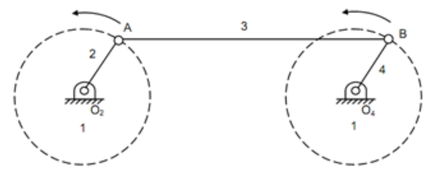

Fig. 5. Double crank mechanism

3. Single planar linkage

A. *Reverse-motion linkage*

Fig. 6a 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, the output link movement will not equal the input link movement. This linkage can also be rotated through 360°.

B. *Push-pull linkage*

Fig. 6b. make the objects or force move in the same direction; the output link moves in the same direction as the input link. Technically classified as a four-bar linkage, it can be rotated through 360° without changing its function.

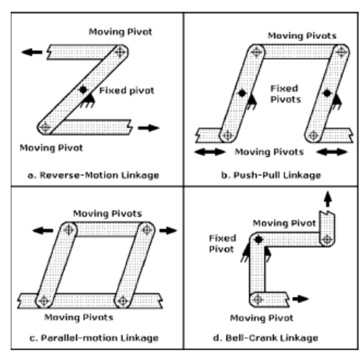

Fig. 6. Functions of four basic planar linkage mechanism

C. *Parallel-motion linkage*

Fig. 6c 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 the linkage to work correctly. This linkage can be rotated through 360° without changing its function. Drawing pantographs that permit original drawings to be manually copied without tracing or photocopying are adaptations of this linkage; n its simplest form it can also when the toolbox covers are opened keep tool trays in a horizontal position.

D. *Bell-crank linkage*

Fig. 6d, can change the direction of objects or force by

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90°.This linkage rang doorbells before electric appears were invented. This was done by pinning two bell cranks bent 90° in opposite directions together to form tongs. Rubber blocks at the output ends of each crank press against the wheel rim, stopping the bicycle. If the pins which form a fixed pivot midpoints of the cranks, link movement will be equal.

4. Crank rocker mechanism for product

Transport The four-bar linkage is the simplest and often times, the most useful mechanism. As we mentioned early, a mechanism composed of rigid bodies and lower pairs is called a linkage (Hunt 78). In planar mechanisms, there are only two kinds of lower pairs and revolute pairs and prismatic pairs. The simple closed-loop linkage is the four-bar linkage which has four members, three moving links, one fixed link, and four pin joints. A linkage that has one fixed link is a mechanism. This mechanism has four moving links. Two links are pinned to the frame which is not shown in this picture. In InDesign, links can be nailed to the background thereby making them into the frame.

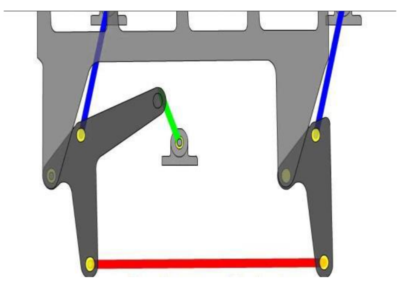

Fig. 7. Crank rocker mechanism

5. Four link mechanism

A variety of useful mechanisms can be formed from a four-link mechanism through slight variations, such as changing the character of the pairs, proportions of links, etc. Furthermore, many complex link mechanisms are combinations of two or more such mechanisms. The majority of four-link mechanisms fall into one of the following two classes: 1. The four-bar linkage mechanism, and the slider crank mechanism. Definitions: In the range of planar mechanisms, the simplest group of lower pair mechanisms are four bar linkages. A four bar linkage comprises four bar-shaped links and four turning pairs as

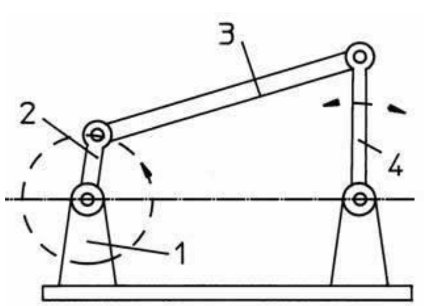

Fig. 8. Four bar crank mechanism

The opposite link the frame is called the coupler link and the links which are hinged to the frame are called side links. A free link is free to rotate through 360 degrees with respect to a second link will be said to revolve relative to the second link (not necessarily a frame). If possible for all four bars to become simultaneously aligned, such a state is called a change point. Some important concepts in link mechanisms are Crank, Rocker, Crank-rocker mechanism, Double-crank mechanism:

6. Conclusion

The process of modular design and production of the Crank Group Driving Mechanism plays an important role of the crank unit is discussed in the. A method of achieving inertia force balancing the Crank-group Driving Mechanism is proposed according to the special structure of the mechanism. The factors influencing the mass moment of the balancing weights and its calculation method are elaborated.

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