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STUDY THE SLIDER CRANK MECHANISM

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***Abstract*—The Slider crank mechanism is a specific barlink configuration that exhibits simultaneous rotation and rectilinear motion. This mechanism is often used to study the kinematics of machines and dynamic forces. The position, speed, acceleration and recoil generated by the sliding shaft mechanism during**

Where,
'R' is the crank length
L>R+E
operation can be determined analytically. The mechanism is capable of operating in balanced and unbalanced configurations so that the magnitude of the shaking force can be compared.

***Keywords*—Crank, Slider, Inversion, Mechanism, Rotary.**

I. INTRODUCTION

A Slider crank mechanism is an arrangement of mechanical components designed to convert reciprocating motion into rotary motion, as in reciprocating piston engines, or it is used to convert rotary motion into linear motion as in reciprocating pump. The internal combustion engine is a common example of this mechanism, where combustion in a cylinder creates pressure that drives a piston. The rectilinear motion of the piston is converted to rotation at the crank by a mutual connection, called the connecting rod. When the hand wheel geometry for cesto convert rectilinear motion into rotary motion, a recoil force is generated and applied to the crank box. Shaking forces cause vibrations that reduce engine function.

The Slider crank mechanism is used to convert rotary motion into reciprocating motion using as lewing bearing beam, connecting rod and sliding body. In this example, as of t body is used for the connecting rod. The sliding mass is not allowed to rotate and rotary joints are used to connect the bodies. While each body has six degrees of freedom in space, the kinetic conditions lead to one degree of freedom for the whole system.

A crank and slide mechanism converts the circular motion of the crank into the linear motion of the sliding body. For the crank to rotate completely, the condition L > R + E must be satisfied where R is the length of the crank, 'L' is the length of the link connecting the crank and the slider, and 'E' is the degree slider deflection. It has three rotary joints and one prismatic joint. The total distance traveled by the slider between its two extreme positions is called the path length. The kinematic reverse of the sliding crank mechanisms produces a normal quick turn mechanism.

A.INDENTATIONS AND EQUATIONS

In order for the crank to rotate fully the following condition must be satisfied,
'L' is the length of the link connecting crank & slider
'E' is the offset of the slider between its two extreme positions
i.e. Path length.

II. INVERSIONS OF SLIDER CRANK MECHANISM

Different mechanisms are obtained when we fix different links of akinetic chain and this phenomen on is called mechanism inversion. The sliding crank mechanism has the following in versions:

A. First Inversion

This inversion is obtained when link 1 is fixed and links 2and4 are made the crank and the slider respectively.

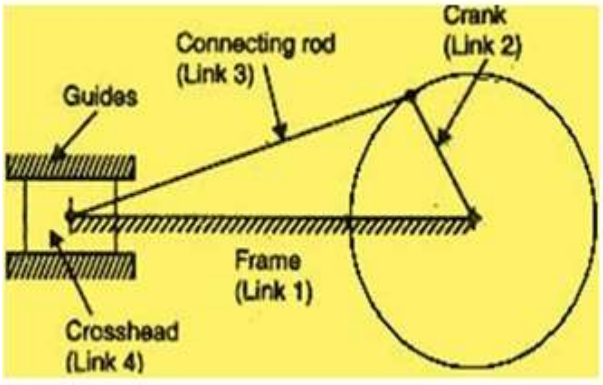

Fig.1: Reciprocating Engine

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Application: C commonly used in I.C. engines, steam engines and reciprocating compressor mechanism.

B. Second Inversion

Fixing link 2 of a slider mechanism gives a second inversion. The rotary engine mechanism or gnome engine is the application of the second inversion. It is a rotary cylinder V –type internal combustion engine used as an aero engine. The rotary engine has generally seven cylinders in one plane. The crank (link 2) is fixed and all the connecting rods from the pistons are connected to this link. In this mechanism when the pistons reciprocate in the cylinders, the whole assembly of cylinders, pistons and connecting rods rotate about the axis O,

where the entire mechanical power developed, is obtained in the form of rotation of the crank shaft.

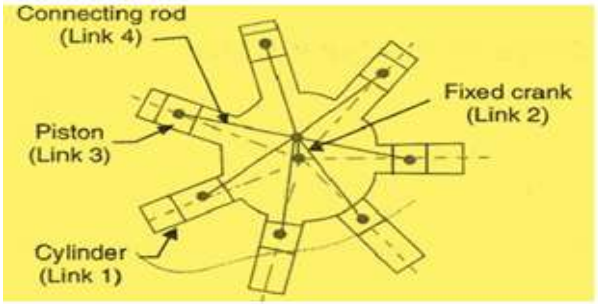


Fig.2: Rotary Engine

Application: Rotary engine mechanism orgnome engine

C. Third Inversion

By fixing the link 3 (connecting rod) of the slider crank mechanism we can obtain third inversion. It is used in hoisting engine mechanism and also in toys. In hoisting purposes, its main advantages lie in its compactness of construction as it allows simple method of supplying steam to the cylinder.

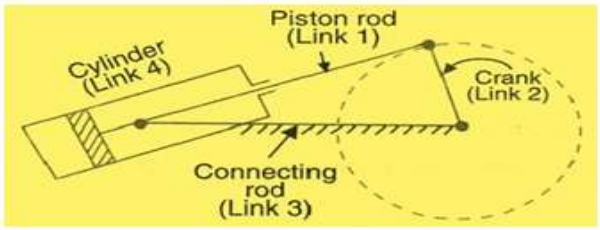


Fig.3: Oscillating Engine

Application: It is used in hoisting engine mechanism and also in toys.

D. Fourth Inversion

By fixing the link 4 of the slider crank mechanism we canobtain the fourth inversion of slider crank. Fixing the slider means that the slider should be fixed in position and also should be fixed in respect to rotation. In this case, the cylinder will have to be slotted to give passage to piston pin of connecting rod as the cylinder slides over the piston. Due to this difficulty, the shapes of the cylinder and piston are exchanged as shown in figure below.

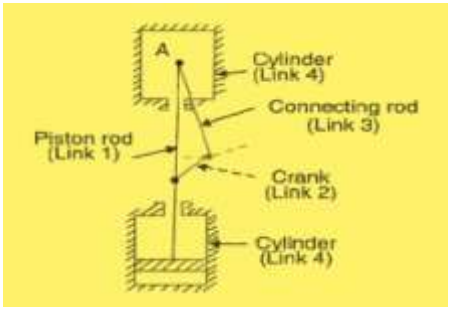


Fig.4: Hand Pump Application: handpump.

III. DESIGNING USING 3DS OF TWARES

For better understanding and to know how these inversions actually take placed, we designed the slider crank mechanism model on 3d software like Solid works and Auto desk 360 Fusion.

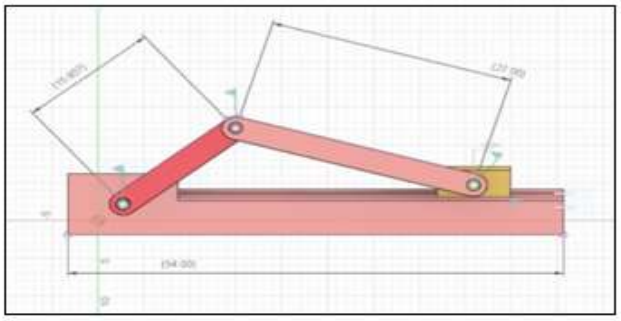
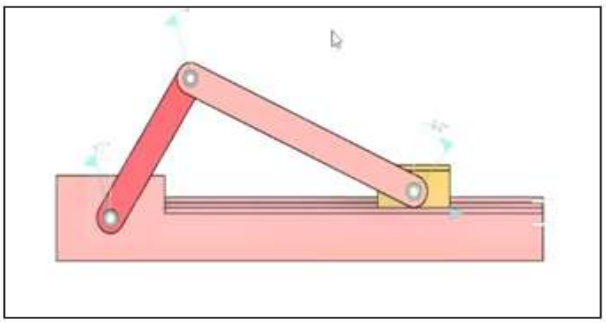


Fig.5:3 Dmodel of Slider Crank

And then by fixing each of the component we obtain different motions.



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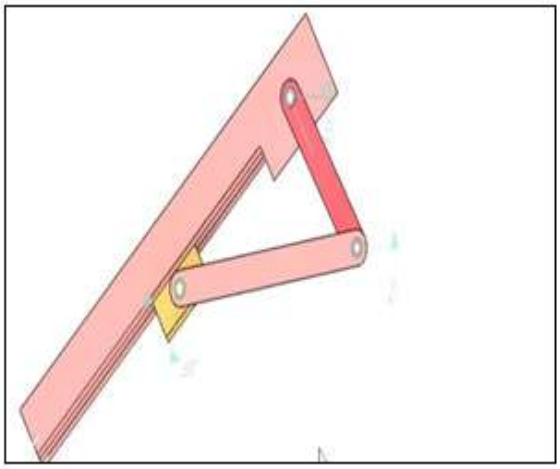
IV. OBSERVATION AND RESULT

Inversion	**Observation**
1st Inversion: Ground Link Fixed	Connecting rodoscillates, crank rotates, And slider reciprocates.
2nd Inversion: Crank Fixed	The ground and Connecting rod rotate about their joints on the crank, and Slider reciprocates.
3rd Inversion: Connecting Rod Fixed	Link 2 acts as crank and link 4 oscillates.
4th Inversion: Slider Fixed	Link 1is reciprocating where as link 3is Oscillating about its pivot on the slider.



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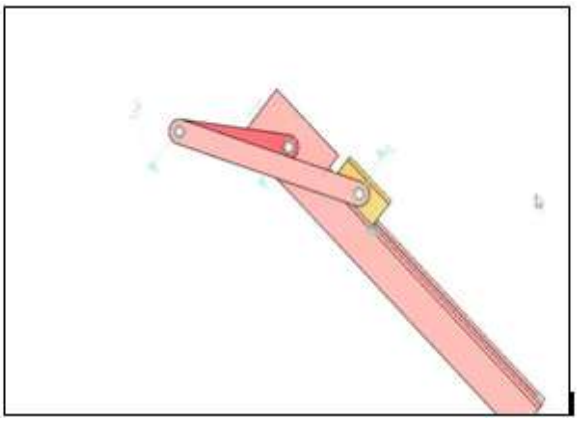
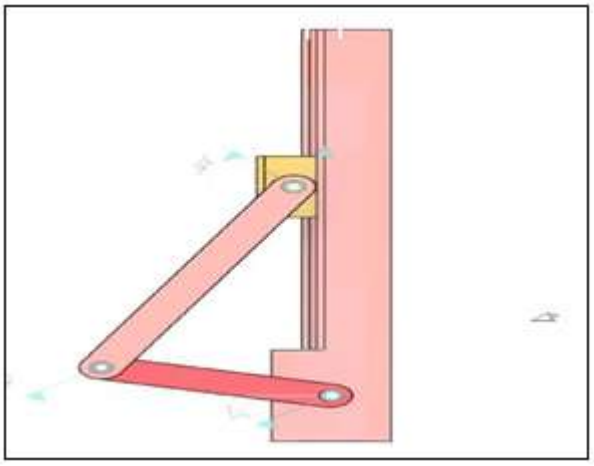


c.



d.

Fig.6.(a)1st Inversion (b)2nd Inversion (c) 3rd Inversion (d) 4th Inversion

IV. CONCLUSION

The dynamic behaviour of a slider-crank mechanism with a flexible connecting rod is investigated. Slider-crank mechanism converts rotary motion into reciprocating motion by means of a rotating driving beam, a connection rod & sliding body. The use of this mechanism in the wide range of machines like pumps and compressors is observed.

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