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SLIDER CRANK MECHANISM

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ABSTRACT

Slider-crank mechanism is a particular bar linkage configuration that exhibits both linear and rotational motion simultaneously. This mechanism is frequently utilized to investigate machine kinematics and resulting dynamic forces. The position, velocity, acceleration and shaking forces generated by a slider-crank mechanism during operation can be determined analytically. The mechanism is capable of operating in balanced and unbalanced configurations so that the magnitude of shaking forces can be compared.

Keywords: Connecting Rod, Crank, Linear Motion, Rotational Motion, Slider

I.INTRODUCTION

Slider-crank Mechanism is an arrangement of mechanical parts designed to convert straight line motion to rotary motion, as in a reciprocating piston engine, or it is used to convert rotary motion to straight line motion as in a reciprocating pump. Internal combustion engines are a common example of this mechanism, where combustion in a cylinder creates pressure which drives a piston. The linear motion of the piston is converted into rotational motion at the crank through a mutual link, referred to as the connecting rod. As the geometry of the crank forces the conversion of linear motion to rotational, shaking forces are generated and applied to the crank's housing. The shaking forces result in vibrations which impede the operation of the engine.

Slider-crank mechanism is used to transform rotational motion into translational motion by means of a rotating driving beam, a connection rod and a sliding body. In the present example, a flexible body is used for the connecting rod. The sliding mass is not allowed to rotate and revolute joints are used to connect the bodies. While each body has six degrees of freedom in space, the kinematical conditions lead to one degree of freedom for the whole system.

A slider crank mechanism converts circular motion of the crank into linear motion of the slider. In order for the crank to rotate fully the condition L> R+E must be satisfied where R is the crank length, 'L' is the length of the link connecting crank and slider and 'E' is the offset of slider. It has three revolute joints and one prismatic joint. The total distance covered by the slider between its two extreme positions is called the path length. Kinematic inversion of slider crank mechanisms produce ordinary a quick return mechanism.

II.INDENTATIONS AND EQUATIONS

In order for the crank to rotate fully the following condition must be satisfied,

$$L > R + E$$

Where, 'R' is the crank length

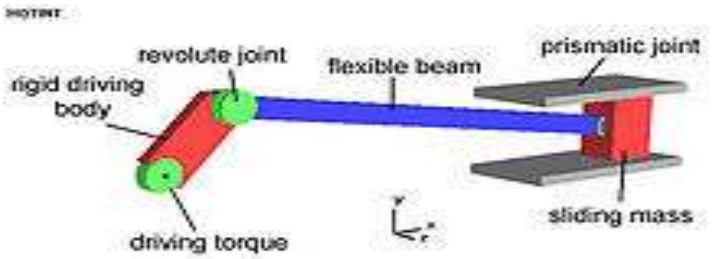
'L' is the length of the link connecting crank & slider

'E' is the offset of the slider between its two extreme positions i.e. Path length

Applications

1. Reciprocating Engines/Pumps: The slider-crank mechanism which converts straight-line motion to rotary motion and vice-versa, this principle is used in reciprocating engines/pumps.
2. Combustion Engines: Slider-crank mechanism is used in piston cylinder assembly in combustion engines and converts reciprocating motion into circular motion and vice-versa.
3. Rotary Engines: Fixing the crank in the Slider-crank mechanism it can be used to form rotary engines. Rotary engines are used in cars.
4. Oscillating cylinder Engine: Fixing the connecting rod in the Slider-crank mechanism it can be used to form oscillating cylinder engines.
5. Hand Pump: Fixing the slider in the Slider-crank mechanism it is use to form hand pumps.

III. FIGURES AND TABLES



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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