

Design and Fabrication of Multi Process Machine using Scotch Yoke Mechanism

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Abstract - Multi operational mechanical machine this work was mainly carried for manufacturing and fabrication industries. The machine which is used to produce the product with high accuracy and quality and produce the goods in an economical way. It makes the inventory cost less. The multipurpose machine has performed different operations simultaneously with high possibility. The scotch yoke mechanism which is attached with the main drive shaft directly attached then it is used for different operation. Number of operations has been performed by a single drive system. The main focus of the work is to reduce power usage and increase the productivity reduced floor space. Portability is an important quality in any machine in today's world; every field of science and engineering has got portability as one of its most important advancements. Therefore, the machine we have designed satisfies this principle with respect to the manufacturing industry.

I. INTRODUCTION

In a multipurpose machine has a fine-toothed hacksaw for cutting the metals with high speed of operations. There are hand saws and power hacksaws. The hacksaws are adjustable and can hold a number of blades within a specified limit under tension. The blade is mounted on the frame with either the teeth facing towards or away from a point on the frame, finally cutting action takes place either by means of push or pull the cutting teeth. Suppose a work piece requires many operations to be done at the same time but the tools are situated in various locations in the plant layout, a multi operational machine can be devised that does the job effectively and efficiently.

II. MATERIAL CHARACTERISTICS

The materials chosen for this analysis is Cast Iron and Mild steel is a medium high strength. Good flow characteristics provided by high Steel content leads.

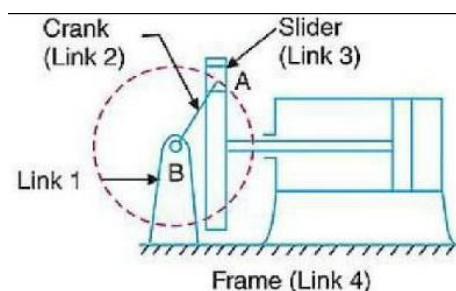
III. WORKING PRINCIPLE

To operate the machine, energy is required. The value of power supply is 230v AC. The rotation of the crank and the sliding of the pin inside the yoke and also moves the yoke forward. The rotation of the crank in a clockwise direction results in the yoke getting displaced in a forward direction. The maximum quantum of displacement will be equal to the length of the crank. As soon as the crank completes the rotation of the yoke will come back to its initial position. At the next rotation, the yoke will moves in the reverse direction. On completion of a full rotation by the crank, the yoke will moves back to its original position. The yoke moves across a length are equivalent to double the crank for a complete rotation. To change the crank length, displacement of yoke only need be changed.

IV. MAIN PARTS AND DESCRIPTION

1. Base
2. Pulley
3. Hacksaw
4. Main shaft
5. AC Motor
6. Power supply 230v
7. Drilling
8. Bearings
9. Shaping

V. MECHANISM



This Mechanism is an inversion of Double Slider Crank Mechanism. The inversion is obtained by fixing either the link 1 or link 3. In figure, link 1 is fixed. In this mechanism when the link 2 (which corresponds to crank) rotates about B as center, the link 4 (which corresponds to the frame) reciprocates. The fixed link 1 guides the frame.

VI. SIMPLE HARMONIC MOTION

This mechanism converts the rotary motion into the translatory motion which is simple harmonic in nature. From the mechanism, we have the following relations- Component of tangential velocity in Y-direction is given by, $U = \text{Reciprocating velocity of U-slot}$. If 'a' is the angle made by the tangential velocity with X-axis at any point of time, Component of tangential velocity in Y-direction is

$$U = r\omega \sin(a) \quad U = v \sin(a)$$

As a result, Velocity of U-slot is a function of sine function of a. Now, as we know that a is directly proportional to the time. This implies that the velocity of u-slot is a sine function of a so the motion of U-slot is a simple harmonic motion.

VII. SCOTCH YOKE MECHANISM

The Scotch yoke mechanism is a reciprocating motion mechanism, converting the linear motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. In many internal combustion engines, linear motion is converted into rotational motion by means of a crankshaft, a piston and a rod that connects them. The Scotch yoke is considered to be a more efficient means of producing the rotational motion as it spends more time at the high point of its rotation than a piston and it has fewer parts.



SAFETY, CARE AND MAINTENANCE

Before starting the operation, check the following items check the mechanism for proper operation.

Check the alignment of crank drives, crushing plate and bearing in the unit. Don't insert the any material or object between machines during operation of crushing. Check the lubrication of bearing drive in the unit. Handle carefully while crushing the work

ADVANTAGE

It gives a high torque output with small cylinder size and few moving parts that enable smoother operation. There is no necessity for piston skirt in Combustion engines since side loading due to sine of connecting rod is nil. Also scuffing is eliminated.

APPLICATION

It is used in IC engines namely Bourke and SyTech engine also in valve actuator mechanisms in high pressure applications. It was used in crude shapers

FEATURES OF THIS PROJECT

1. It is compact in size.
2. It can be move.
3. Low electrical power consumption.
4. It can be utilized at our Place.

CONCLUSION

We have presented the development of multipurpose machine in various modes by which it can actively be adopted. We have explained the various parts and components of multipurpose machine using scotch yoke mechanism. Special categories of additional and verity of tools that can be implemented on multipurpose machines. The requirement for the invention of a multipurpose machine is significant in the delay it takes in using hand tools to carry out jobs. Moreover, the cost of a lathe machine is too high for an average user. These machines will aid in reducing costs, increasing rate of production and skill.

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