

## DESIGN AND FABRICATION OF FOUR WAY HACK-SAW MACHINE

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**Abstract** In this paper we have designed an automated Four Way Hack-saw Machine which uses Motor, Linkages, Saw mechanism, Steel rods, etc. which are used to mount the linkages on the Hack-saw mechanism. In small scale industries the raw materials such as PVC pipes, wooden blocks, metal pieces need to cut into pieces for various applications. For such work hack saw blade is used to cut the work-piece into desired pieces. In some industries this work is done manually by labors working there. This results in decreasing the efficiency of the industry as labors are not able to work all day in any industry. In some industry hack-saw machines are used for cutting purpose. But the biggest drawback of those machines is that only one work piece can be cut at a time on a single machine. This reduces the load on labors but is not so efficient as only one work-piece can be cut at a time. To deal with this problem we have designed a four way hack-saw machine. This machine consists of four hack-saw blades mounted in four directions. At a time four work-pieces can be mounted on the machine. We have used a D.C. motor for rotating the Cam which is linked with the Connecting Rods. The motor is used to rotate the linkages on which the hack-saw is mounted. This mechanism helps in reducing time of cutting the work-piece and also gives a better efficiency and provides safety.

**Key Words:** D.C. Motor, Linkages, Connecting Rods, Cam.

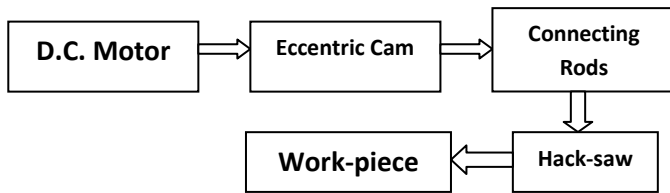
**1. INTRODUCTION:-** In small scale industries, due to more demand workers usually face huge work load and they reach a stage of fatigue. To reduce such work load industry implements new machineries. It is a conventional machining process which works on the principle of metal cutting. One motor is used for doing four number of operations at a time. The demand of hacksaw blade is considerably increasing day by day with the growth of industrialisation, engineering sector, real estate, etc. This mechanism will reduce the time required for cutting. The basic principle we are using is

conversion of rotary motion into sliding motion used for cutting the tool. We are using single motor which will be centrally mounted and on which all the linkages would be connected which would help in transferring the motion to the hack-saw blade. This machine will basically do multi-purpose work at a time which will increase the efficiency of the industry and on the other hand will increase the rate of production by almost four times. It can be used in a small workshop and industry as it is available in very low price and its smaller size and high efficiency. Disc is rotated with DC motor, rotary motion of wheel is converted into the reciprocating motion of the cutting tool (hacksaw). This reciprocating motion is used to obtain the linear motion of blades and material is cut. Bed is provided for placing the work-piece to be cut.

### 3. SPECIFICATIONS

1. Base frame = 610\*610 mm
2. Height from base frame to hack-saw frame = 457 mm
3. Length of holding vice connecting rod = 610 mm
4. Cross-section area of base frame pipe = 25.4\*50.8 mm sq.
5. Cross-section of holding vice connecting rod = 25.4\*50.8 mm sq.
6. Cutting stroke length = 150 mm
7. Thickness of Blade = 1.4 mm
8. Length of Blade = 304.8 mm

#### 4. BLOCK DIAGRAM



$$100 = \frac{2 \cdot \pi \cdot 100 \cdot T}{60}$$

$$T = \frac{360000}{328}$$

$$T = 573.24 \text{ Nm/sec}$$

Fig -1: Block Diagram of Four Way Hack-saw Machine

#### 4.1 Hardware Description

- D.C. Motor :-** In this project we have used D.C. Motor. By the use of motor, the cam rotates. Due to rotation of this cam the connecting rod produces a linear motion in the guide-ways.
- Eccentric Cam :-** In this project eccentric cam has been used to produce a back and forth motion onto the guide-ways. This cam is attached on shaft of motor. Connecting rods are attached on this cam with the help of universal joints.
- Connecting Rods :-** Connecting rods are used to connect the eccentric cam and the hack-saw frame.
- Guide-ways :-** Guide-ways are used to provide support for the hack-saw frame and also to provide sliding motion for the frame.
- Hack-saw Frame :-** Hack-saw frame is attached to connecting rod and given support via guide-ways.
- Holding Vice :-** In this project, holding vice are used to hold work-pieces.

#### 5. CALCULATION

With the given power and speed of D.C. motor, we will calculate the torque given out by the motor.

$$P = \frac{2 \cdot \pi \cdot N \cdot T}{60}$$

Where,

Power,  $P = 100$  watts

Speed,  $N = 100$  rpm

Torque,  $T = ?$

#### 5.1 Time Calculations

Time required for cutting a wooden job of 50 mm base and 25 mm thickness manually = 30.2 sec.

Time required for cutting the same job on single hack-saw blade of the machine = 27.8 sec.

#### 6. CONCLUSIONS

From above discussion we conclude that model of four way hacksaw is helpful to overcome the problems of conventional hacksaw with high efficiency it's easy to operate and simple in construction. By increasing the motor power and dimensions of eccentric cam the size of material to be cut can be increased. By using limit switches or sensors. Automatic feeding mechanism for material can be introduced. Automatic lifting up mechanism for frame when cutting operation can be achieved by using hydraulic piston and cylinder.

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