

# FABRICATION OF FOUR WAY HACKSAW BLADE MACHINE

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## ABSTRACT

*This paper presents the fabrication and concept of four way hacksaw blade machine mainly carried out for production based industries. Industries are basically meant for production of useful goods and services at low production cost, Machinery cost and low inventory cost. This project consists of a crank and slider mechanism, linear bushing. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investment and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. We have developed a prototype model, we have decided to use almost 1/10 th of the scale for the system. These machines can be used in remote places where electricity is regular. It is designed as a portable one which can be used for cutting in various places. It can be used for operating on materials like thin metals, wood.*

**Keyword** :- Crank and Slider Mechanism, Linear Bushing

## 1. INTRODUCTION

There are many industrial applications where round bar or square bars are required to be operated on different machines to make machine components such as Shafts, Bolts, Screws etc. This needs more and more number of pieces to be cut for mass production of those components. Four way hacksaw blade machine is basically a cutting device, which cut in four directions at a same time [1]. A hacksaw is a fine –toothed saw, originally and principally for cutting metal [2]. They can also cut various other materials, such as plastic, wood and steel etc. This paper proposes the prototype model of four-way hacksaw machine which is able to cut four pieces simultaneously without any jerk and minimum vibrations. The prototype model implies conversion of rotary motion into the reciprocating motion for proper working of hacksaw. This prototype model overcomes the limitations of conventional hacksaw machines which can cut single piece at a time. It is able to cut metal bars of different materials at same time and will be helpful in many industries due its compatibility, reliability and efficiency. In present condition many electrically operated power hacksaw machines [3] of different companies with different specifications are available for the use in shop floor. These machines are so precious that they can cut metal bars with minimum time made up of different materials but they have one and major disadvantage that those are able to cut single piece of bar at a time. For industries to achieve the mass production, it is necessary to cut metal bars with high rate. So, it is impossible to depend upon conventional single frame power hacksaw machines and need the improvement in technology and design of such machines.

Four way hacksaw machines overcome all the limitations and drawback of conventional hacksaw machines. It is also helpful for small scale industries due to its simple working and operating conditions along with its compatibility, efficiency and affordable price.

### 1.1 Problem Identification

Present scenario of industry focuses on the high production rate with less consumption of resources. To achieve this we need to minimize idle time and machine time per unit. The four way hacksaw blade machine improves those factors by reducing time per unit to increase the production. In present situation electrical as well as hydraulic operated machines are used but the output from them is not satisfactory as it has low cutting rate.

## 2. LIST OF COMPONENTS WITH MATERIALS DETAILS

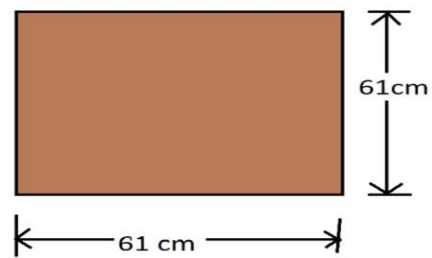
Following are the important parts of four way hacksaw machine prototype model:-

No.	COMPONENTS	MATERIAL DETAILS
1	Frame Base	Wood (2 Feet Square)
2	Electric Motor	Johnson motor (60 rpm)
3	Disc	Acrylic
4	Four Hacksaw Blade	Bi-metallic
5	Four Guide Ways	MS
6	Connecting Rods	MS
7	Bearings	High C-Cr steel
8	Bushing	MS
9	Holder (for grabbing the cutting material)	MS & Wood
10	Battery	12 V

**Table:** list of prototype model components with details

### 2.1 Frame Base

We take 61cm x 61cm [2 feet] square wooden frame base. We take 61 cm in base length because; we want to give stability our prototype model of four way hacksaw machine not get lot of vibration when the machine in running condition.



**Fig 1:** Frame Base

## 2.2 Electric Motor

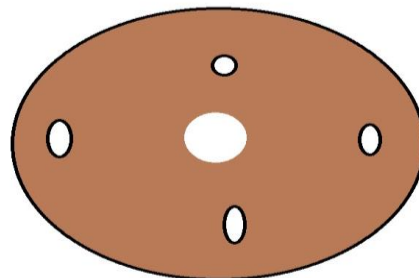
The motor we have used is a Johnson DC motor of 60 rpm.



**Fig 2:** Johnson Motor (60rpm)

## 2.3 Disc

We use the acrylics transparent disc in circular shape ( radius of 7.5 cm). On this disc all the bearing is happen. It helps to convert the rotary motion to linear movement



**Fig3:** disc

### 2.4 Hacksaw Blade

Hacksaw blade is made of Bi-metallic. In hacksaw like most frame saws, the blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting. Action on either the push or pull stroke. In normal use, cutting vertically downwards with work held in a bench vice, hacksaw blade should be set to be facing forwards. Some frame saws, including fret saws and piercing saws, have their blades set to be facing the handle because they are used to cut by being pulled down against a horizontal surface, by the help of crank shaft mechanism[4]. The hacksaw blade is connected to the link bar by the help of linear bushing.

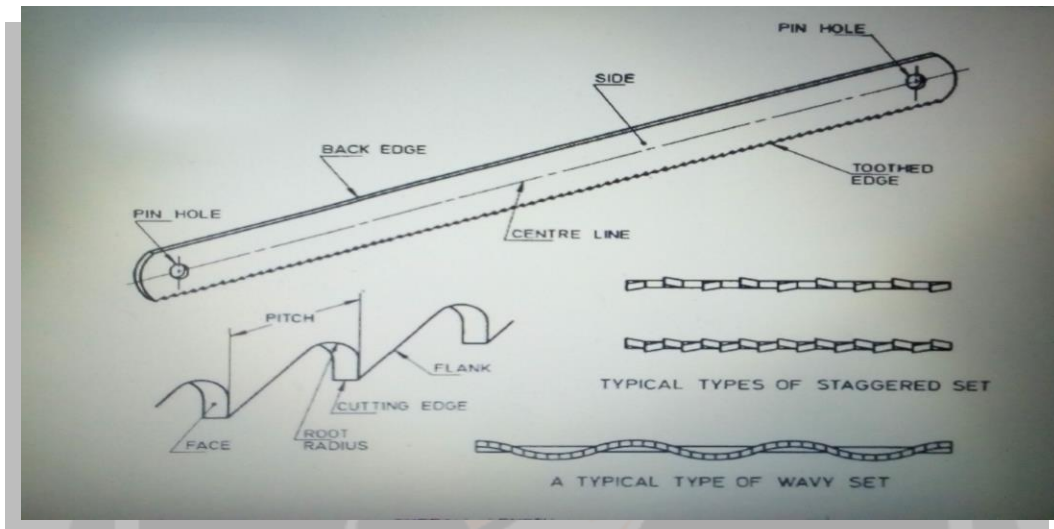


Fig4: Hacksaw blade full description

### 2.5 Guide Ways

This is a support beam with a slider joint mechanism at its top which holds the shaft to slide. As the project work is for four way hack saw, we will attach four of these beam.

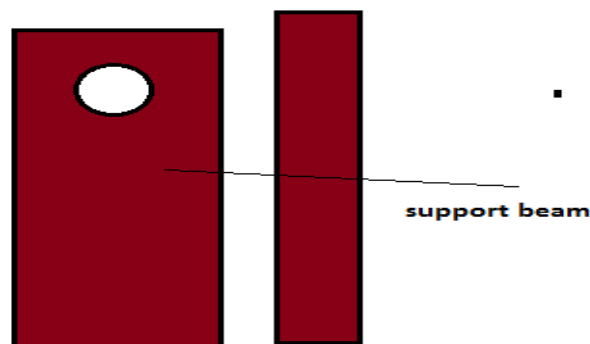
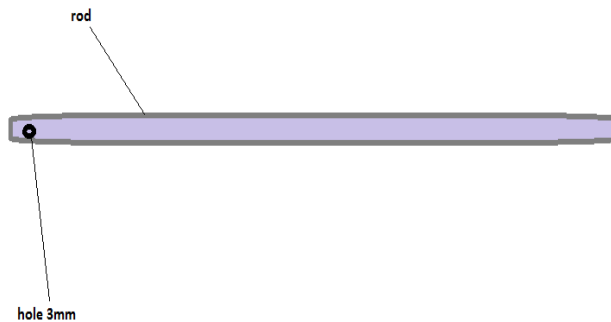


Fig5: Guide ways (supporter beam)

## 2.6 Connecting Rods

A hole on at the end of this rod is made for joints and link connections. we have used four of these shaft for four side hack saw. Sliding rod: this is a smooth rod



**Fig6:** Connecting Rodes

## 2.7 Bearings

Bearing is the device that help to connect the connecting rod to the disc.



**Fig7:** Bearing

## 2.8 Bushing

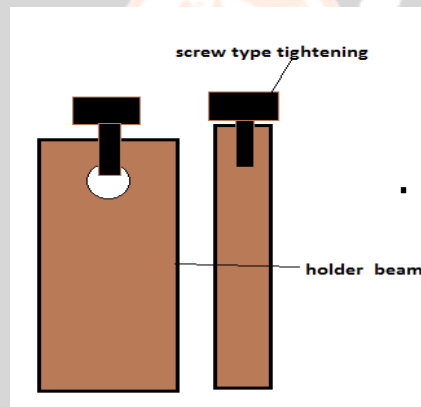
Bushing is the device that provides smooth motion of any movement part. In our project, bushing is provide the longitudinal motion of the sliding shaft to get very smooth motion and no higher vibration.



**Fig 8: Sliding Rods & bushing**

### 2.9 Holder (for grabbing the cutting material)

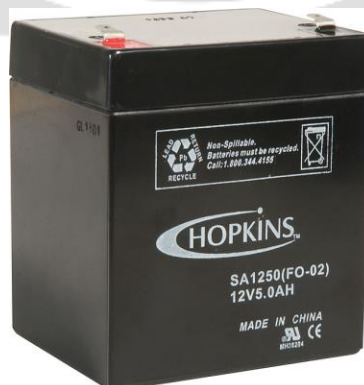
We use the holder that made of some part by wood and some part by mild steel. We have holder beams also for holding the job piece, four in quantity. In this we use screw type tightening and holder beam.



**Fig9: Holder**

### 2.10 Battery

We use 12 v dc battery for run our motor.



**Fig10: 12 v battery**

### 3. REVIEW OF LITERATURE

The vast review of literature will help to understand the concepts, theorems and different factors affecting the performance of machine.

#### 3.1 Theoretical Analysis Of Four Way Hacksaw Blade Machine

Rishi Anand, Khomesh, Shrawan Kumar, Alok Verma, April 2016 :

In this paper presents the concept of four way hacksaw blade machine mainly carried out for production based industries. Industries are basically meant for production of useful goods and services at low production cost, Machinery cost and low inventory cost. Knowledge about developed a model of a machine reach would be capable of performing different operation simultaneously, and it should be economically efficient. These machines can be used in remote places where electricity is regular. It is designed as a portable one which can be used for cutting in various places. It can be used for operating on materials like thin metals, wood.

#### 3.2 Theoretical Analysis of Multi-way Power Hacksaw Machine

Kshirsagar Prashant R, Rathod Nayan, Rahate Prashant P, Halaye Prashant P, April 2015 :

In his research paper stated that it consist of single phase vertical electric motor rigidly placed at the center of metallic foundation provided. The shaft of motor rotates at 90-100 rpm with the power 2HP. The circular disc is mounted on the shaft of motor with the help of key and key slot arrangement.

#### 3.3 Design & Fabrication of Human Powered Multi-Purpose Machine

Rakesh Ambade, Amit Sartabe, Meghraj Arekar, Vaibhav Khachane, Prajakta Gawali, April 2015:

In their paper states that it consist the pedal powered machine setup , has a simple mechanism operate with chain and sprocket arrangement. The chain is placed on the teeth of the wheel and pinion. The shaft is mounted on pedestal bearings. First mechanical linkage is removed by removing nut and bolts and v belt drive drilling attachment.

#### 3.4 Design and Fabrication of Automated Hacksaw Machine

D.V.Sabariananda, V.Siddhartha, B.Sushil Krishnana, T.Mohanraj, April 2014:

It is known that conventional power hacksaw machine can be replaced with automated power Hacksaw machine. Automated power hacksaw machine gives high productivity in short time period in comparison with the conventional power hacksaw machines. The major advantage of this machine is intervention of labor is reduced to maximum level. In this rapid emerging industrial section the use of power Hacksaw machine is wide, time and labor plays a major role in production process .

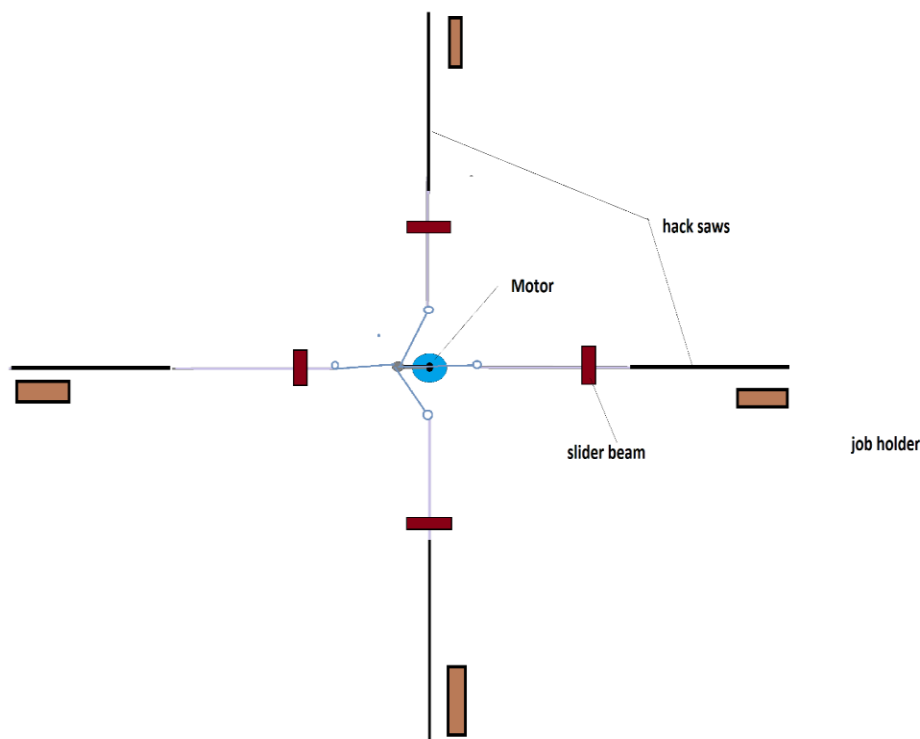
#### 3.5 Material Selection and Testing of Hacksaw Blade Based on Mechanical properties

Nitinchandra R. Patel, Md. A. Vasanwala, Balkrushna B.Jani, Miteshkumar D. Rathwa, Ravi A. Thakkar, June 2013

In his research paper “Material selection and testing of hacksaw blade based on mechanical properties” stated that the appropriate saw blade must be selected for better operation and fine cutting by selecting number of teeth per inch. There are four types of blades based on material nnamey High Carbon steel, Alloy Steel, Bi-metallic strip and High speed steel blades. Out of these four the best suitable for cutting hard materials like Mild steel bar and Aluminum is Bi-metallic blade on the basis of Properties of materials, Wear resistance and Cutting performance.

#### 4. METHODOLOGY

The single phase vertical electric motor rigidly placed at the center of wooden foundation provided. The shaft of Johnson motor rotates at 60 rpm with the power 12 V. The circular disc is mounted on the shaft of motor with the help of key and key slot arrangement. The eccentric point on the plane of disc is provided such that the desired cutting stroke is achieved (around 4-5 inches). One end of each connecting rod is pivoted at this eccentric point by the use of suitable bearing. Another end of each rod is connected to the hacksaw blade frame with the help of linear bushing to get vertical and horizontal Degree of Freedom of rotation for the proper cutting operation. The hacksaw frame slides on the guide ways provided. When motor is ON and disc starts rotating, due to the reciprocating motion of hacksaw frame the metal rod is cut which is firmly fixed in vise. The automatic feeding of coolant is provided to reduce heat generated due to friction which also avoids the jerk [5]. The layout of the system is given in the diagram below:



**Fig11:** layout of prototype model of fourway hacksaw blade machine

#### 5. CONCLUSIONS

Thus a low cost and simple design four way hacksaw blade machine reduces the human effort and hence we don't need spend too much time to cut the material logs. This simple design of conventional design which can enhance day today household needs and daily day to day purposes and it can be also used in for industrial applications to make high productivity.



## 6. ACKNOWLEDGEMENT

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