

Design and Development of Four Way Hacksaw Machine

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Abstract:

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, and Screws etc. This needs more and more number of pieces to be cut for mass production of those components. To achieve this goal the Multi-way power hacksaw machine is developed. This paper proposes the model of multi-way hacksaw machine which is able to cut four pieces simultaneously without any jerk and minimum vibrations. The model implies conversion of rotary motion into the reciprocating motion for proper working of hacksaw. This 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. We want to Manufacture Four Way Hacksaw Machine Specially For Cutting Operation. For That We Have Manufacture Hacksaw Machine Which Is Used For Cutting Four Job At Simultaneously. We Can Save Labor Time And Increase Production Rate And Since It Is Automatic, We Can Use It In Industry Very Easily Where Availability Of Labor Is Very Less.

Keywords: Multi way hacksaw, slider crank mechanism, hacksaw machine, etc.

INTRODUCTION:

The world today is moving ahead at a very fast pace.

Some of the very common examples of fast moving Objects are aero planes, high speed cars and many more. In our everyday life we come across many fast moving vehicles and so it is very important to measure the speed of these vehicles.

This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

In present condition many electrically operated power hacksaw machines of different companies with different specifications are available for the use in shop floor. These machines are so precise 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. With the help of this multi-way power hacksaw machine the four metal bars can be cut simultaneously to get high speed cutting rate and to achieve mass production for maximum profit in related companies. As this machine overcomes all the limitations and drawbacks

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.

LITERATURE REVIEW:

2.1 Four Way Hacksaw Machine-A Review Prof. Sameer Verma¹, Parvez Raza

In this project work and effort has been made to develop a modernized four way hacksaw machine and less stress full operation for cutting wood, metal and plastic materials. The aim of this work is to develop a hacksaw machine that will use a less effort to produce uniform cutting of PVC pipes, metals, wood. It is also done to show the performance difference between hands driven, pedal drive and four way hacksaw machine.

2.2 FABRICATION OF FOUR WAY HACKSAW BLADE MACHINE

Rishi Anand, Ankit Kumar Mishra, Shubham Singh, Alok Verma

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.

2.3 THEORETICAL ANALYSIS OF MULTI-WAY POWER HACKSAW MACHINE Prof. Kshirsagar Prashant R. , Rathod Nayan J, Rahate Prashant P, Halaye Prashant P, Surve Sachin S.

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. To achieve this goal the Multi-way power hacksaw machine is developed. This paper proposes the model of multi-way hacksaw machine which is able to cut four pieces simultaneously without any jerk and minimum vibrations.

SYSTEM ARCHITECTURE:

The experimental setup of our project consists of a frame on which the hacksaw blades are mounted. The hacksaw blades are mounted on the four sides of the frame. The circular cam plate is mounted in the centre of the frame which is operated by a motor. The power to the motor is given with the help of an AC supply. Connecting rods are used to connect the cam wheel and the hacksaw blades. The cam mechanism is used to convert the rotary motion into the reciprocating motion.

Hence when the motor is switched on, the power from the motor is delivered to the cam wheel. The cam wheel rotates such that the hack saw blades reciprocate. The work pieces are mounted on the machine vice firmly and the entire system is switched on. Thus the four work pieces are cut simultaneously using the motor and the cam mechanism.

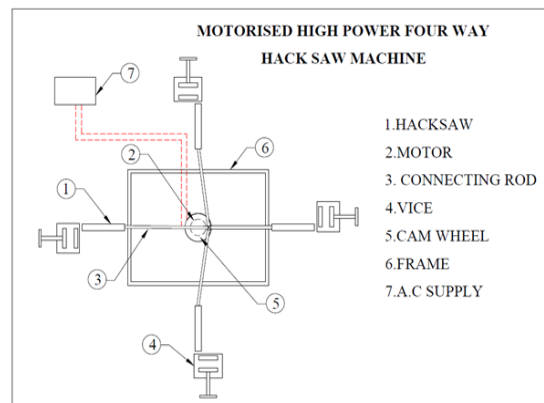


Fig: schematic of project

COMPONENT DETAILS:

FRAME:

Base frame design: WE design a basic frame for a prototype by mild steel channel (L beam), L Channel-MS Angles are L-shaped structural steel represented by dimension of sides & thickness. For e.g. 25x25x3 means, both the sides of angles are 25 mm & thickness is of 3 mm. There are various sizes of angles which are as follows :- (there are also equal & unequal angles). Equal angles: - They are angles having both the sides of equal dimensions. For e.g. refer below given diagram, in which both the sides are of dimensions "a".

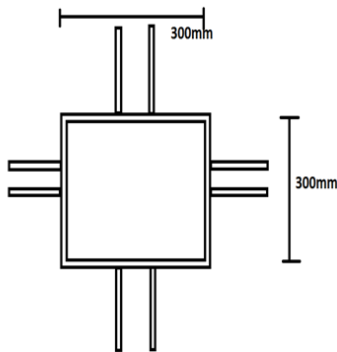


Fig. base frame dimensions in mm

A.C.Motor:

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or AC or AC electrical windings.

Circular Disc:

In mechanical engineering, an eccentric is a circular disk fixed to a rotating axle with its centre offset from that of the axle (hence the word "eccentric", out of the centre). It is used to convert rotary motion. In this project circular disc using because of rotary motion. It is connected to shaft.

Design calculations

Base frame safety design

$$M/I = \sigma b / y \dots \dots \dots (6)$$

$$\text{Bending moment}(M) = \text{force} * \text{perpendicular distance} \\ = 30 * 300 * 9.81$$

$$\text{Bending moment}(M) = 88290 \text{Nmm}$$

$$I = ((b(h^3)))/12 = 32552.08 \text{mm}^4$$

$$Y = 25/2 = 12.5$$

Therefore above value use in equation no(6).

$$88290 / 32552.08 = \sigma b / 12.5$$

$$\text{Therefore, } \sigma b = 33.90 \text{Nmm} \quad 33.90 < 105$$

Hence design is safe.

2. Design of plate:

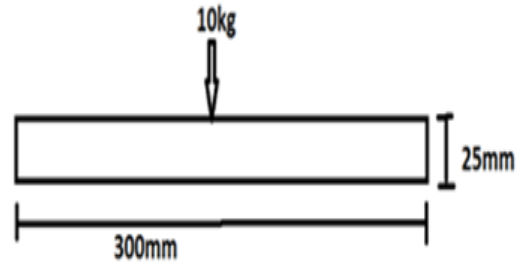


Fig. Plate

$$M/I = \sigma b / y$$

$$\text{Bending moment}(M) = \text{force} * \text{perpendicular distance} \\ = 10 * 400 * 9.81$$

$$\text{Bending moment}(M) = 29430 \text{Nmm}$$

$$I = ((b(h^3)))/12 = 675 \text{mm}^4$$

$$Y = 3/2 = 1.5 \text{mm}$$

Therefore above value use in equation,

$$29430 / 675 = \sigma b / 1.5$$

$$\text{Therefore, } \sigma b = 65.4 \text{Nmm}$$

65.4 < 105 Hence design is safe.

3. Design of disc:



$$D = 80 \text{mm}$$

Fig.disc

$$M/I = \sigma b / y$$

$$\text{Bending moment}(M) = \text{force} * \text{perpendicular distance} \\ = 10 * 9.81 * 40$$

$$\text{Bending moment}(M) = 3924 \text{Nmm}$$

$$I = ((M(R^2)))/4 = 39240 \text{mm}^4$$

$$Y = 80/2 = 40$$

Therefore above value use in equation no(8).

$$3924/39240 = \sigma_b/40$$

Therefore, $\sigma_b = 4Nmm$, $4 < 105$ Hence design is safe.

ADVANTAGES AND APPLICATIONS:

ADVANTAGES

- Four Blades can operate at the same time.
- Hence saves time.
- Saves labor required.
- Increases productivity

APPLICATIONS

- In small scale industries of manufacturing and fabrication.
- In colleges and professional workshops etc.

CONCLUSION AND FUTURE SCOPE:

As per the above discussion we concluded that to overcome problems in conventional hacksaw machines, due to high efficiency, easy to operate and affordable price the proposed model of multi-way power hacksaw machine is helpful and completes all the expectations needed in the mini industries.

Future scope of proposed research work to increase the production rate, cuts the metal bars easily. It can withstand the vibrations, no hazards from jerk, no special training required to operate it.

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