

Multi-Cutter Hacksaw Machine

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Abstract -In this project we are going to design the multi cutter hacksaw machine which helps in cutting four workpieces at a time in industry. This is done with the help of using a motor of 960 rpm two pulleys a belt square pipes vice hacksaw circular rods and hollow pipes and linkages. This machine can be used in the small scale industry to reduce the production time such as cutting the angles, plates, circular rod, woods and aluminium materials etc. This machine works on the principle of scotch yoke mechanism. Which converts the rotary motion of the pulley into linear motion of the linkages and the corresponding hacksaws. This initiative is taken to reduce the cost of production and reduce the time of the operating cycle. The main advantage of this machine is we can adjust no. of working areas in the machine which are going to function, as we are going to provide an arrangement for the cutting hacksaws to disconnect the machine which is not in function or the load of production is low.

Keywords: A.C Motor of 960 rpm, Hacksaw Blades, Pulley, Vice.

I. INTRODUCTION

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. This project is about cutting the wood, metal, pipe, angle, channel, flat plates, rods and

such other things. This project is very much useful and easy to install by user.

Using a single Hacksaw was a conventional method which not only utilized all energy but it strained the hands of its user. This Multiway Hacksaw Machine uses the concept of power hacksaw which runs on A.C Motor. The term – “MULTIWAY” refers to position of more than one hacksaw in various directions. Hence more than one job is cut at a time thereby increasing the efficiency.

II. METHODOLOGY

2.1 Working principle:-

Works on the principle of scotch yoke mechanism. The rotary motion of the CRANK is converted into LINEAR motion of the hacksaws.

2.2 Material Selection:-

Ms steel and Cast Iron for pulleys.

COMPONENTS

Sr.no	Material	Dimensions
1.	Square pipe	40x40
2.	Round pipe	20mm
3.	Vices	4
4.	Nuts & bolts	M16
5.	Linkages	20 mm
6.	Hacksaw	14 inches
7.	Vbelt	Section B

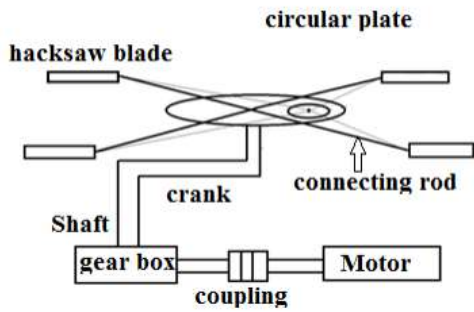


Fig.1 Layout of the project

2.4 Equipments:-

2.4.1 Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this would be the conversion of mechanical energy into electrical energy and is done by an electric generator. We use 1 horse power of 960 rpm motor.



Fig.2 Motor

2.4.2 Bench vice

An engineer’s vise, also known as a metalworking vise or fitters vise, is used to clamp metal instead of wood. It is bolted onto the surface of a workbench, with the face of the fixed jaws just forward of its front edge. The vise may include others features such as a small anvil on the back of its body.



Fig. 3 Bench vice

2.4.3 Square Pipes

We use square pipes for making the frames. The square pipes can be fold, built in horizontal and vertical version. Each square pipe must have a system of control. Square pipe is a quick and efficient way to connect two or more sections of pipe. Square pipe consists of pipe and vices.



Fig.4 Square Pipes

2.4.4 Hacksaw

A hacksaw is a fine-toothed saw, originally and principally made for cutting metal. Most hacksaws are hand saws with a C-shaped frame that holds a blade under tension. Such hacksaws have a handle, usually a pistol grip, with pins for attaching a narrow disposable blade. The frames may also be adjustable to accommodate blades of different sizes. A screw or other mechanism is used to put the thin blade.



Fig.5 Hacksaw

2.4.5 Pulley

A pulley is a wheel on a axle and a shaft that is designed to support movement and change in direction of belt or transfer of power between the shaft and belt . In case the pulley is supported by a frame that does not transfer power to shaft but it used to guide the cable or exert a force .the supporting cell is called a block , the pulley may be called as sheave .

A belt and a pulley system is characterised by two or more pulley in common to a belt . This allows for mechanical power and torque and speed to be transmitted across the axles.



Fig.6 Pulley

III. Working

As the power is supplied to the motor, the small pulley connected to the motor starts rotating. The big pulley is connected to the small pulley with the help of belt and the connector. Four rods are connected to the connector and the rods are connected to the hacksaw. The hacksaw's move in linear direction and cut the workpiece mounted on the vice.

The basic construction of this project is sun pulley is connected with the help of belt to the high speed motor. The rotary motion of sun pulley is converted into linear motion of four hacksaw. The main advantage of this system is it can effectively cut four workpieces at a time which save the runtime and production cost. And cuts the product more effectively.

The high speed Multi cutting hacksaw machine is capable of cutting more than one pieces at a times. This concept has been introduced to reduce the time which was occupied by single hacksaw.

The main advantage of this machine is we can adjust no. of working areas in the machine which are going to function, as we are going to provide an arrangement for the cutting hacksaws to disconnect the machine which is not in function or the load of production is low. We are planning this for a low scale industries to make the batch production easy and more convenient and to reduce the cost of production, energy, man power and the skilled

There were following steps in manufacturing of this machine.

The drawing of the machines was made and the requirement of the materials were noted down as per the idea.

Materials such as square pipes were purchased and cutted into required dimensions. Welding rods were purchased along with the welding equipment was took on rental basis. We did the calculations of the belt the pulley and the linkages etc shown on the following paper

Welding and assembling was done in workshop and thus the base was made by welding the square pipes. The square vertical pipes of length 2 inches are welded to the base we did

the drilling work to insert the screws and fitted the linkages on all four sides with the help of nut and bolts. In the middle again we did the welding of the 4 square rods and flat ms seat to mount the main pulley which divides the power into four linkages to operate all the four hacksaw and their blades and after that we fitted the bench wise to cut the materials.

Before that we purchased the belt of Class C of belt width 14.5m and V Cross section for the better grip on the pulley and less slip. We choosed the motor on the trial and error basis.

First we took 1440 rpm motor. But as it was too fast the blades used to heat up and break very frequently thefore we reduced the speed of the motor to 960 Rpm.

We gave the final touch and the project is ready. Secondly again we fitted the rubber cork is fitted at the centre to bear the vibrations while cutting the workpieces and providing the strength accordingly. Certain arrangements were made for the material strength in the bench vice as in the bench wise was provided more of a strength by welding the hacksaw cutter on the linkages and holding it on the metal arm palced on one side of the bench vice. We took the calculations such as feed rate, depth of cut, cost of cutting, electricity consumption and amount of workpieces cutted in hour hour as well as the velocity of the hacksaw and different other calculations of the pulley and the dimensions in next page.

IV. Advantages.

- To reduce the time required to do the work
- To make the batch production rapid
- Economizing the production
- To reduce the manpower
- To make it possible to be used by the unskilled labouers
- Products with better cutting rate.
- This machine is intervention of labour is reduced to maximum level.
- It increase the rate of machining process.
- At the time for different material cut
- Only one operator is required to handle all the processes.

V. Calculations

Feed rate :-

- 1.) Aluminium - 50 mm/s
- 2.) Wood - 30 mm/s
- 3.) Steel rod - 70 mm/s

Depth per cut :- 10mm

Machine Cuts 1 piece at a time

Cutting cost = 3Rs per piece

Transportation Cost = 2Rs per piece

Total Cost = Cutting cost + Transportation Cost

= 5Rs per piece

Machine Cuts Four pieces at a time ,

Cutting Cost = 8Rs for four pieces (Including Labour, Electricity & Machine Cost)

For one piece Cutting Cost = $8/4 = 2Rs$ Per Piece



Fig. 7 Final project

VI. Future scope

It can be made hydraulically power operated by installing the gear oil pump at the place of air compressor and pneumatic cylinder arrangement.

It can be made rack and pinion operated or spring and lever operated by replacing the pneumatic circuit by rack and pinion arrangement by the square threaded screw and a nut arrangement .

The place where there is a scarcity of the electricity the electric motor operate compressor is replaced by and IC engine installed compressor .

Thus infuture there can be made so many modification which can make to survive the huge global world of competitions

VII. Conclusions

- The existing hacksaw machine have been studied and thus with new design and fabrication, very economical four-way hacksaw machine has been successfully developed
- Testing and performance of the machine is up to the mark which satisfy the objectives.
- After testing these four way hacksaw machine increase the production rate as compare to existing hacksaw machine.
- It reduces the labor cost and labor efforts.
- To decrease the weight of machine, aluminum alloy can be used instead of low carbon steel.
- To increasing accuracy of machine we can used hydraulic piston cylinder.
- In this project we have demonstrated four-way hacksaw machine, but by increasing the capacity of motor as well as using of power hacksaw machine, production rate can be increase significantly.

Applications:-

- Cutting four wood workpieces at a a time

- Cutting Mild steel workpieces
- Low scale industries etc.

VIII.References

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- Rishi Anand, Khomesh, Shrawan Kumar, Prof.AlokVerma,| Theoretical Analysis Of Four Way Hacksaw Blade Machine,| International Journal of Advance Research and Innovative Ideas in Education, ISSN(O)-2395-4396, Vol-2 ,Issue- 2 ,April2016
- Gorde Ganesh (2014):- It is often required to machine a round and square rod on different machines to make various products like shaft, screws, bolts etc. There is also a requirement of cutting raw materials into number of pieces and this is traditionally done using a power hacksaw machine or simple hacksaw machine which consumes more time. To reduce this machining time a four way hacksaw machine is proposed. This model helps us

