Fabrication of Four Way Hacksaw Machine by Using Radial Crank Mechanism

Gade Rakesh
Dept. of Mechanical Engineering, Sree Dattha Institute of Engineering and Science, Hyderabad, India
Email id: gaderakesh01997@gmail.com

Abstract— **The aim of present work is to fabricate a motorized high speed 4-Way Hacksaw Machine, to automate and modify the conventional power hacksaw machine in order to achieve high productivity of work pieces than the 1-way power hacksaw machine using crank mechanism. This machine is built with the 4 hacksaw machines such that all the machines are operated simultaneously with the help of a Motor and Radial Crank Mechanism**

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 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. A hacksaw is a fine –toothed saw, originally and principally for cutting metal. 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 can 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. In present condition many electrically operated power hacksaw machines. The hacksaw is a metal cutting machine tool designed to cut multiple metals simultaneously by applying cam mechanism. The operation of the unit is simplified to a few simple operations involving a motor and a cam mechanism. There are numerous types of cutting machines in Engineering field, which are used to fulfil the requirements.

Keywords— RPM= Revaluation per meter, HP=Horsepower, MM=Milli meter, INCH=Inches AC=Alternate current

I. INTRODUCTION (*Working principle*)

This machine is based on Radial crank Mechanism. Radial crank is a mechanism for 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. The shape of the motion of the piston is a pure sine wave over time given a constant rotational speed.

The Radial crank mechanism is best for this machine because it provides less vibration as compared to slider crank mechanism (which convert reciprocating motion into sliding motion or vice versa).

II. Individual components explanation

A. Base Frame

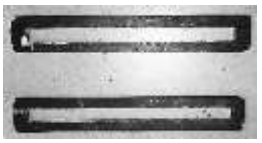
It is a balance structure made of mild steel of size 1000mm x 1000mm x 1000mm

B. Disc

A circular disc is used for converting rotary motion into reciprocating motion. This disc is made of mild steel of diameter 300mm with of thickness 10mm.

C. Slotted Bar

Slotted bar converts rotary motion of disc into reciprocating motion. It is made of mild steel of size 400mm x 55mm with of thickness 5mm.



D. Connecting Rod

It is circular rod, made of mild steel of 14mm diameter and of length 50mm. This is used for transferring reciprocating motion of the slotted bar to hacksaw.

E. Connecting Pin

It is a circular pin, made of mild steel. It is used for connecting the slotted bar and disc. With the help of pin, motion is transmitted from disc to slotted bar.

F. Plumber Block

A Plumber block is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads.

G. Pulley (10-inch, 3-inch)

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of way a pulley may also be called a sheave or drum and may have a groove between two flanges around its circumference.

*H. **Shaft***

A shaft is a rotating machine element which is used to transmit power from one place to another. The power is delivered to the shaft by some tangential force and the resultant torque (or twisting moment) set up within the shaft permits the power to be transferred to various machines linked up to the shaft.

I. ***Bush***

Bush is the mechanical element that provides smooth motion between two parts. It also guides the sliding or reciprocating parts. It may be made of many materials such as copper, brass, cast iron etc.

J. 0.75 HP Geared 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.

K. Belt

The belts or ropes are used to transmit power from one shaft to another by means of pulleys which rotate at the same speed or at different speeds.

L. Hacksaw

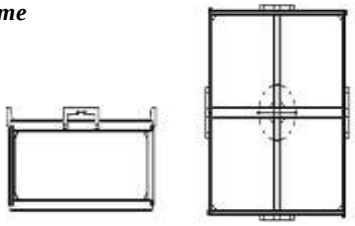
A hacksaw is a fine-tooth saw with a blade under tension in a frame, used for cutting materials such as metal. Hand-held hacksaws consist of a metal frame with a handle, and pins for attaching a narrow disposable blade.

Experimental Set Up

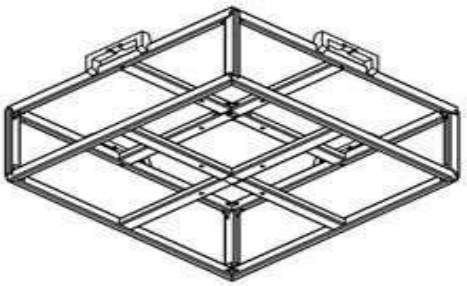
FOUR-WAY HACKSAW MACHINE BY USING RADIAL CRANK MECHANISM

Design Part

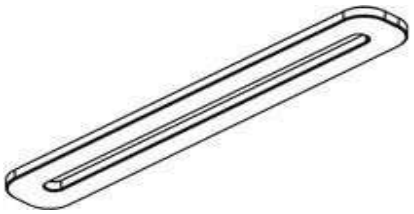
Base Frame



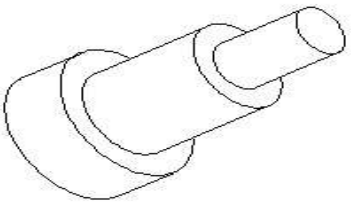
Structural member



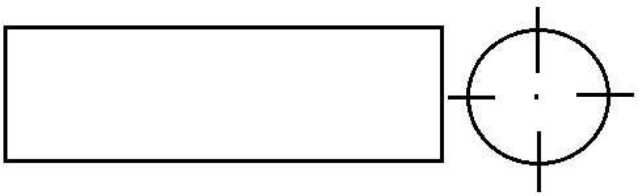
Slotted Bar



Connecting Pin



Shaft



Bill OF Material

Sr. No.	Name	Specification	Material	Quantity
1.	AC Motor	Three phase, 0.75HP, 1440rpm	Cast iron, Copper	1
2.	Base Frame	650mm x 350mm x 650mm	Mild Steel	1
3.	Disc	Dia. 300mm	Mild Steel	1
4.	Shaft	Dia. 20mm, Length 440mm	Mild Steel	1
5.	Plumber Block	Dia. 20mm	Stainless Steel	2
6.	Pulley 1	Dia. 10 inch	Cast Iron	1
7.	Pulley 2	Dia. 3 inch	Cast Iron	1
8.	Connecting Rod	Dia. 14mm, Length 45mm	Mild Steel	8
9.	Bush	Dia. 14mm	Mild Steel	8
10.	V Belt	Length 55 inch	Neoprene Polyester	1
11.	Hacksaw Frame	For 12 inch (Blade)	Mild Steel	4
12.	Hacksaw Blade	12 inch	High Speed Steel	4
13.	Connecting Pin	Dia. 16mm	Mild Steel	2
14.	Nut	Dia. 9.6mm	Mild Steel	20
15.	Bolt 1	Length-3inch, Dia.9.5mm	Mild Steel	12
16.	Bolt 2	Length-5inch, Dia.9.5mm	Mild Steel	8
17.	Washer	Dia. 10mm	Mild Steel	20
18.	Groove Screw	Length-1inch	Stainless Steel	8
19.	Bench Vice		Stainless Steel	4
	TOTAL			**107**

Advantages

- It is easy to operate.
- It reduces the work of labour.
- Easy to make because of simple construction.
- High production rate.
- Cost is less.
- Easy maintenance and maintenance cost is less.
- **7**.It resists all atmospheric effects.

Disadvantages

- Speed variation is required for cutting the different metal

Applications

- In engineering industry.
- In construction industry.
- In Workshop

Conclusion:

It is known that conventional hacksaw machine can be replaced with an automatic four way cutting hacksaw machine. Automatic four-way hacksaw machine gives high productivity in short time period in comparison with the conventional hacksaw machines. The major advantage of this machine is that intervention of labour is reduced to maximum level. In this rapid emerging industrial era, the use of automatic four-way Hacksaw machine is wide. Time and labour plays a major role in production process this can be overcome by using this type of automatic machines. The automatic four-way hacksaw machine can be made use of at any of the industries like pump manufacturing industries that involve bulk number of shafts that have to be cut frequently. The range of size of work pieces that can be cut using the automatic four- way hacksaw machine can be varied by changing the blade size. Currently, the machine uses 12-inch blade for cutting.

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