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AUTOMATIC HACKSAW

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ABSTRACT

The objective of this work is to automate the conventional power hacksaw machine in order to achieve high productivity of work-pieces than the power hacksaw machine using Double hacksaw blade. The operator need not measure the length of the work-piece that is to be cut. The machine feeds the work-piece with the help of a shaft, which is driven by a DC motor. A DC motor is used to bring about the reciprocating motion required for cutting the work-pieces. 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. This project is very much useful and easy to install by user. The reference number should be shown in square bracket

Keywords: Scotch Yoke Mechanism, Multipurpose, Sliding Mechanism

1. 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. The reference number should be shown in square bracket [1]. However, the authors name can be used along with the reference number in the running text. The order of reference in the running text should match with the list of references at the end of the paper.

2. LITERATURE SURVEY OF HACKSAW MACHINE

The saw was one of the first great innovations of the Metal Age. It was developed with smelted copper, from which a blade could be cast. Many of the early copper saws have the general appearance of large meat-carving knives. Egyptian illustrations from about 1500 BC onward show the saw being used to rip boards, the timber being lashed to a vertical post set into the ground. Though there is no evidence of the type of saw used, Egyptians were able to saw hard stone. The blade, was probably

toothless, and rode on an abrasive material such as moistened quartz sand. The 7 1/2-foot granite coffer still in the Great Pyramid carries saw marks. During the Bronze Age, saws became much more widespread in woodworking. It was in this time that the modern form of the saw began to come into play. Some of the saws used resembled hacksaw blades of today. Iron saws started to be produces in the mid-7th century BC. The Romans, added many improvements to simple says which made them easier to work with. For example, they added a rib to the back of saws to reduce the buckling of the thin blade. Hacksaws today use similar ribs to those on the ancient Roman saws. While saws for cutting metal had been in used for many years, significant improvements in longevity and efficiency were made in the 1880s by George N. Clemson, a founder of Clemson Bros., Inc of Middletown, New York, USA, Clemson conducted tests which involved changing the dimensions, shapes of teeth, styles of set, and variable heat treatments of blades. Clemson claimed enormous improvements to the cutting ability of blades and built a major industrial operation manufacturing hacksaw blades sold under the trade name Star Hack Saw. In 1898, Clemson was granted US Patent 601947, which details various improvements in the hacksaw.

3. MOTIVATION

When we searching for our project in market we show the demand of hacksaw blade is considerably increasing day by day with the growth of industrialization, engineering sector, real estate, automobile sector etc. It is used in almost every sector for cutting of materials like angle, channel, flat plates, rods and such other things. It is also required in auto repairing shops, general repairing workshops, fitting shops, welding shops and technical institutes. Govt. department like Railway, Defense, PWD, Postal & Telegraph and others are one of the main users of it. In India large nos. of small enterprises are engaged in its manufacturing. By considering its demand, new production unit has great prospect. So from that we have concluded that the future base hacksaw machine is use for very costly machinery and in locomotives. User can use this project in small industry, which cannot afford costly machinery.

4. LITERATURE SURVEY

4.1 Definition

Hacksaw Machines offered by us are used for metal cutting ranging from transportable model to giant size machine. Owing to smooth & speedy functioning abilities, these hacksaw machines operations spontaneously for aiding the worker in consistently carrying his work with ultimate competence. The sewing machine is a machine tool designed to cut material to a desired length or contour. It functions by drawing a blade containing cutting teeth through the work piece. The sewing machine is faster and easier than hand sawing and is used principally to produce an accurate square or mitered cut on the work piece.

4.2 Scotch Yoke Mechanism

Scotch yoke 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 Scotch yoke (also known as slotted link mechanism) is a reciprocating motion mechanism, 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 location of the piston versus time is a sine wave of constant amplitude, and constant frequency given a constant rotational speed. Machines are mechanical devices used to accomplish work. A mechanism is a heart of a machine. It is the mechanical portion of the machine that has the function of transferring motion and forces from a power source to an output. Mechanism is a system of rigid elements (linkages) arranged and connected to transmit motion in a predetermined fashion. This setup is most commonly used in control valve actuators in high-pressure oil and gas pipelines. Although not a common metalworking machine nowadays, crude shapers can use Scotch yokes. Almost all those use a Whitworth linkage, which gives a slow speed forward cutting stroke and a faster return. It has been used in various internal combustion engines, such as the Bourke engine, SY Tech engine, and many hot air engines and steam engines. Theterm scotch yoke continues to be used when the slot in the yoke is shorter than the diameter of the circle made by the crank pin. For example, the side rods of a locomotive may have scotch yokes to permit vertical motion of intermediate driving axles.

4.3 Construction

The scotch yoke mechanism is constructed with iron bars. Here the crank is made in some length and the yoke is also made using the same material. It is noted that the minimum length of the yoke should be double the length of the crank. The crank and yoke is connected with a pin. Iron bars are welded to both sides of the yoke to get the reciprocating motion. The yoke with the iron bars is fixed on the display board with the help of c clamp. Now the crank is welded to the end of the shaft of the motor. Now the pin on the crank is connected to the yoke. The pin used to connect yoke and crank is a bolt.

5. HACKSAW MACHINE

5.1 Types of Hacksaw Machine

(1) Light duty hacksaw machine.
(2) Hydraulic hacksaw machine.
(3) Power hacksaw machine.
(4) Circular band hacksaw machine.
(5) Horizontal swing type band saw machine.
(6) Band hacksaw machine.
(7) Jigsaw machine.
(8) Universal type circular hacksaw machine.

Fig -5: Hacksaw Machine [1]

5.2 Working principles of hacksaw machine using scotch yoke mechanism

A hacksaw machine is work on principle of SCOTCH YOKE MECHANISM in this rotary motion of shaft is to be convert into the reciprocating motion of hacksaw frame. Working principle of hacksaw machine is very simple. First of all the hacksaw machine is put on ground and after that whatever metal, wood, pvc, is cut is fixed on vice at required length, after that the electric motor is connect with electricity. Now start the electric motor so due to that the shaft of motor and hollow disc will be rotate and also rotate the eccentric Centre and link connect to it. Due to rotation of links the hacksaw frame will be reciprocate on the metal and cutting of metal is done.

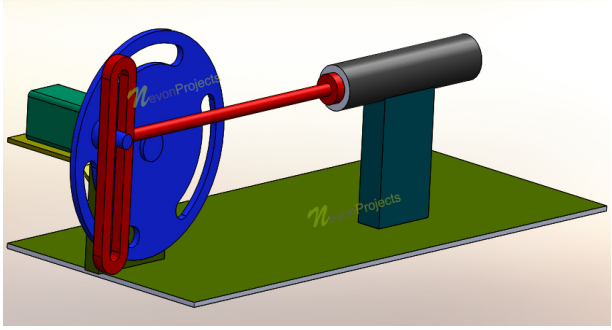

Fig 5.2: Scotch Yoke Mechanism [2]

5.3 Assembly of Hacksaw Machine

For assembly of hacksaw machine first of all on base plate electric motor is mount vertically, hollow disc having internal circle radius is same as the radius of shaft of motor is fit on shaft and also the disc have eccentric centre, metal bar is weld at the eccentric centre. The links one end is connect with the end of hacksaw frame and second end is connecting with the metal bar of eccentric centre. The buckle type elements are connecting at the end of hacksaw frame and link is connecting in this buckle, pipe provides support to the hacksaw frame, the pipe is connecting to the base. Vice is also fit on pipe and which also connect with the base [3].

5.4 Characteristics of Hacksaw Blade

The hacksaw blade has 2 main characteristics:

1. Teeth pitch which is the number of teeth per 25 mm.
2. Blade length which is the length between the centers of its pin holes.
3. Blades are available in standardized lengths, 10 or 12 inches (254 or 305 mm) for standard hand hacksaw
4. The pitch of the teeth can be anywhere from fourteen to thirty-two teeth per inch (tpi) for a hand blade, with as few as three tpi for a large power hacksaw blade.
5. Hacksaw blades are normally quite brittle, so care needs to be taken to prevent
6. brittle fracture of the blade.
7. For several decades now, hacksaw blades have used high speed steel for their teeth, giving greatly improved cutting and tooth life.
8. Hacksaw blades have two holes near the ends for mounting them in the saw frame and the 12 inch / 300 mm dimension refers to the center to center distance between these mounting holes.

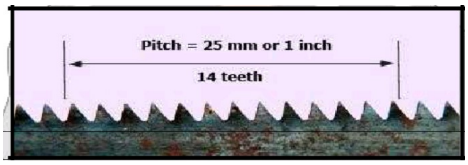

Fig 5.4: Characteristics of Hacksaw blade [4, 5]

6.COST TABLE ESTIMATE

S.NO	COMPONENTS	COST IN RUPEES
1	DC MOTOR	**3000**.00
2	ALUMINIUM STRIPS AND IRON ROD	800.00
3	SQUARE TABLE	**150**0.00
4	HACKSAW	200.00
5	NUT BOLT	100.00
6	SWITCHES	50.00
7	PLYWOOD	**10**00.00
8	PULLEY AND DISCS PLATE	**5**00.00

9	POWER SUPPLY BLOCK	**50**0.00
	TOTAL	**7650**.00

TOTAL COST:

Labour cost:
Lathe, Drilling , welding and power hacksaw cost
Labour cost =Rs. 800

Overhead charges:
The overhead charges are **a**rrived by "manufacturing cost "
Manufacturing cost = Rs.**7650** +Rs.800 =Rs. **8450**

Fig6: Processing of Hacksaw Blades [6]

7. CONCLUSIONS

1. 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.
2. 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.
3. After studying this report we have know that how a hacksaw machine will work, and knowing the construction and how mechanism work in the machine. We learnt how the theoretical design is possible in practical.
4. Other hacksaw machine is only cut one part at one time but this machine cut the four parts at a time, this hacksaw machine has lighter weight compare to other machine.
5. The cost of machine is less and easy to operate so it affordable for all industry.

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