Portable Four Way Hack Saw Design Approach

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Abstract— This paper describes the manufacture and design of a four way hacksaw system primarily for manufacturing related industries. Industries are mainly intended to manufacture valuable goods and services at low cost of production, cost of machinery and low cost of inventory. This project consists of a crank and slider mechanism, linear bushing. Today every task in this world has been made faster and faster due to technological advancement but this advancement also requires enormous investment and expenditure, every industry wants to make high productivity rates maintaining the quality and standard of the product at low average cost. We've developed a prototype model, we've decided to use almost 1/10th of the scale for the system. These machines can be used in remote locations where there is regular electricity. It is designed as a portable one that can be used for cutting in different places. It can be used for materials such as thin metals, wood.

Keywords: Hack Saw, Guide ways, Bushings, Mild Steel, Electric Motor

I. INTRODUCTION

There are many industrial applications where round bars or square bars are required to be operated on different machines for the manufacture of machine components such as shafts, bolts, screws, etc. This requires more and more pieces to be cut for the mass production of these components. Four way hacksaw blade machine is basically a cutting device that cuts in four directions at the same time. A hacksaw is a fine-toothed saw, originally and principally for cutting metal. They can also cut a variety of other materials, such as plastic, wood and steel, etc. This paper proposes a prototype model of a four-way hacksaw machine which can cut four parts simultaneously without any jackasses and minimal vibrations. The prototype model involves translating rotary motion into reciprocating movement for proper hacksaw activity. This model of a prototype overcomes the limitations of traditional hacksaw machines which can cut a single piece at a time. Due to its compatibility, reliability and efficiency, it is capable of cutting metal bars of different materials at the same time and will be useful in many industry. Several hacksaw machines which are powered electrically are currently in use. The hacksaw is a metal cutters instrument designed for multiple cutting.

The operation of the unit is simplified to a few simple operations involving the engine and the cam mechanism. In the Engineering field, there are numerous types of cutting machines used to meet the requirements. We are interested in introducing multiple hacksaw cutting operations in the Hacksaw machine. This hacksaw unit has the primary purpose of cutting thin and soft metals by motor control.

A. Objective

This project's main goal is to will human effort to automate different materials. The aim of this project's concepts is to save man power and time in cutting materials so that high efficiency can be achieved. Implementation with latest technologies.

- To show an revolutionary concept of the current method.
- Use of readily available electronic part and chipset.
- Reliable and cost-effective program planning and.

II. REVIEW OF LITERATURE

The far reaching writing audit will assist with clarifying the standards, hypotheses and various components impacting machine effectiveness. Alok Verma, et al (2016) examines the possibility of a four way hacksaw sharp edge framework that is fundamentally utilized for assembling related ventures. Enterprises are for the most part proposed to make important merchandise and ventures effortlessly of creation, cost of hardware and minimal effort of stock. Consciousness of constructed a model of machine extension ought to be prepared to do all the while leading different tasks, so it would be financially powerful. Such gadgets can be utilized in remote zones where there is every day power. This is planned as a reduced one that can be accustomed to cutting in different spots. Prashant P et al (2015) guaranteed that it comprises of a solitary advance, unbendingly mounted vertical electric engine at the focal point of the given metallic base. With power 2HP, the engine shaft turns at 90-100 rpm. With the guide of key and key opening plan, the round plate is mounted on the engine shaft. Rakesh Ambade, et al (2015) takes note of that it is a pedal driven machine framework that has a fundamental chain and sprocket course of action working instrument. The chain is put on haggle teeth. The pole is determined to heading with platforms. Nitinchandra R. Patel et al (2013) First mechanical connection is disposed of by evacuating connection for penetrating of the nut and screws and v belt drive.

The appear differently in relation to conventional force hacksaw machines and the self-sufficient hack saw was clarified by V. Sabariananda et al (2014), "Item determination and testing of hacksaw edge dependent on mechanical properties" asserted that the right observed cutting edge must be chosen by choosing the quantity of teeth per inch for better activity and fine cut. There are four sorts of cutting edges dependent on material, to be specific high carbon steel, combination steel, bi-metallic strip and steel sharp edges of rapid. Of these four, bi-metallic edge dependent on material properties is unmistakably appropriate for cutting hard materials, for example, gentle steel bar and aluminum.

III. METHODOLOGY

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

Sl No	Component	Material
1	Frame Base	Mild Steel
2	Four Hacksaw Blade	Bi-metallic
3	Electric Motor	Johnson motor
4	Four Guide Ways	Mild Steel
5	Disc	Acrylic
6	Connecting Rods	Mild Steel
7	Bushing	Mild Steel
8	Holder (Vices)	Mild Steel
9	Battery	100 watt

Table 1: List of prototype model components

The single stage vertical electric engine is unbendingly mounted at the focal point of the upheld wooden base. Johnson engine's s haft turns at 60 rpm with 12 V power. Utilizing key and key opening arrangement, the round plate is fixed onto the engine shaft. The erratic point on the circle plane is given with the goal that the ideal cutting stroke (around 4-5 inches) is accomplished. At this flighty point one finish of each interfacing bar is rotated by the utilization of right bearing. Another finish of every pole is joined to the hacksaw sharp edge notoriety utilizing straight bushing to acquire vertical and even level of rotational opportunity for legitimate cutting activity. The framework model is appeared in the Fig 1.

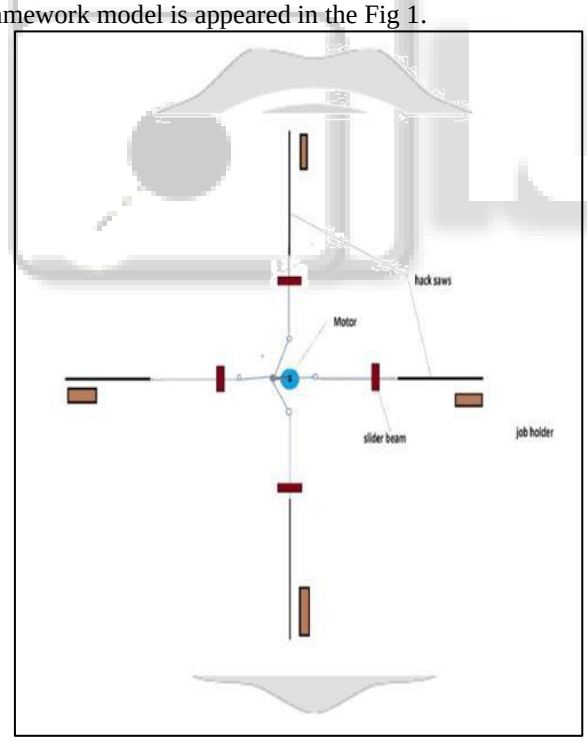

Fig. 1: Model of the system

The frame of hacksaw slides on the manner given by the guide. When the motor is ON and the disc starts rotating, the metal rod is cut, which is firmly fixed in vice, due to the reciprocating motion of the hacksaw frame. The automatic feeding of the coolant reduces the heat produced by friction which also prevents the jerk.

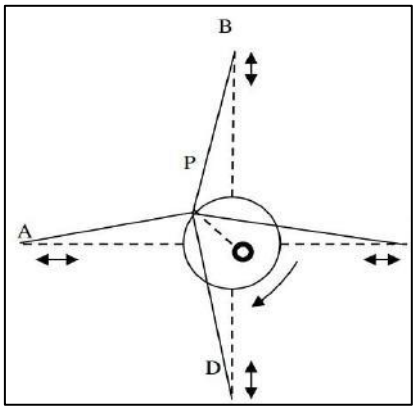

Fig. 2: Top view of power hacksaw machine

IV. DESIGN CALCULATIONS

A. Torque Calculation

From Velocity Diagram, Considering Cutting stroke 5 inches = 125 mm (Value taken by referring to the catalog of the hacksaw manufacturer)
As we know l = 2r; where r = crank radius
Then r = 62.5 mm
The connecting rod length = 300 mm
Speed = 90 rpm (as per catalogue)
So angular velocity, ω = 9,424 rad / sec
Here OP = crank radius OA = OB = OD= connecting rods = 9,42rad / sec.
Since op= 0.0625m
So velocity of p wrt o
Vpo = Vp = 9.42 × 0.0625 = 0.588 m/sec

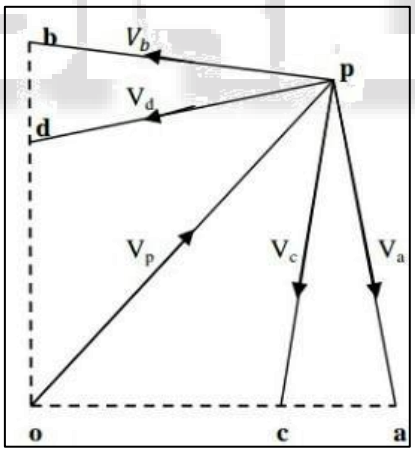

Fig. 3: Velocity Diagram (Scale 0.588m/sec=50mm)

From velocity diagram, we get velocities of slider
Vap = 4.4 cm/sce = 0.44 m/sec Vbp = 4.1 cm/sec = 0.41 m/sec Vcp = 4.4 cm/sec = 0.44 m/sec Vdp = 4.1 cm/sec = 0.41 m/sec

B. Required Torque

We know forces at A,B,C,D FA=FB=FC=FD= 500 N
Power output = To × ωpo

= To × 9.42 Nm/sec
Power input = (Fa × Va) + (Fb × Vb) + (Fc ×Vc) + (Fd × Vd)
= (500 × 0.44) + (500 × 0.41)
+(500 × 0.44)+ (500 × 0.41)
=850 Nm/sec

Neglecting losses power input is equal to power output
So,
To × 9.42 = 850 Nm/sec
To = 90.23 Nm. Available Torque
T =573.24 Nm.

V. CONCLUSION

So a low cost and quick four-way hacksaw blade system eliminates human effort, so we don't need to waste too much time cutting material logs. This basic concept of traditional design that can improve day-to-day household needs and day-to-day uses and can also be used to allow high productivity for industrial applications.

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