Moterised Circular Cum Reciprocating Hacksaw Machine

Dr. I.S.PHANI SUSHMA[1], R.KURMA RAO[2],SHAIK MOHAMMAD KAIF[3], KOIRI AKSHAY[4], MARE CHINNA[5]

[1]Dr. I.S.PHANI SUSHMA,MECH & UNIVERSITY COLLEGE OF ENGINEERING NARASARAOPET, JNTUK

[2]R. KURMA RAO,MECH & UNIVERSITY COLLEGE OF ENGINEERING NARASARAOPET, JNTUK

[3]SK. MOHAMMAD KAIF,MECH & UNIVERSITY COLLEGE OF ENGINEERING NARASARAOPET, JNTUK

[4]K. AKSHAY,MECH & UNIVERSITY COLLEGE OF ENGINEERING NARASARAOPET, JNTUK

[5]M. CHINNA,MECH & UNIVERSITY COLLEGE OF ENGINEERING NARASARAOPET, JNTUK

ABSTRACT:

The reciprocating cum rotary hacksaw cutting machine is a versatile cutting machine ,where we can perform reciprocating cum rotary cuttings at a time. This machine integrates both reciprocating and rotary cutting applications across a range of metals and materials by using Beam engine mechanism. The reciprocating movement of the saw blade obtains from end of crankshaft ensures precise linear cuts, as the rotary cutting saw is directly connected to motorshaft this rotary action increases cutting speed and effectiveness, applicable for heavy-duty tasks. Its modern design allows the Machine to accommodate various cutting demands, gives high-quality outcomes with reduced tool wear. Powered by the electric motor, the system feature advanced beam engine mechanisms to manage the blade's speed and movement. This cutting machine is especially useful in sectors such as manufacturing, construction, and metalworking, where precision and productivity are required .With its hybrid construction and versatile design,the reciprocating cum rotary hacksaw cutting machine offers a cost-efficient and dependable solution

1. INTRODUCTION

The reciprocating cum rotary hacksaw cutting machine represents solution aimed to improve the efficiency and accuracy of material cutting operations as well as timber at faster rates, in industrial applications. This advanced machine has conventional reciprocating motion, recognized for its ability to cut in straight lines, with rapid rotary motion, facilitating faster and more effective cutting. The dual-motion mechanism allows operators to execute cutting tasks on a diverse material such as metals and non-metals, ensuring high precision and minimal waste. Conventional hacksaws often face challenges related to speed and efficiency, particularly where dealing with brittle and tough materials. The advent of the reciprocating cum rotary addresses challenges leveraging benefits design these by the of both motion types. The reciprocating motion delivers a consistent and accurate while action the cut, rotary enhances cutting speed.

Need for new project development

Generally reciprocating cuts are obtained from reciprocating hack saw machine and circular cuts are Obtained from rotary hack saw machine

separately if We replace crank by rotary hack saw in reciprocating hack saw machine then we can achieve both rotary and circular cuts at a time.

2. LITERATURE REVIEW

Mr. Sushildopekar,[1] designed and fabricated human powered wood cutting machine without power supply. This design ensures smooth operation during the cutting process. It is light weight potable machine.Mr.Prajyotkarker [2] Designed and fabricated beam engine powered reciprocating hacksaw machine. It involves only reciprocating cutting operations.According to Patel et al. [3] (2016), the Scotch yoke mechanism has gained popularity in modern hacksaw machines for its simpler construction and smoother operation compared to the traditional crank and slotted lever mechanism. The design ensures a uniform cutting stroke and improved efficiency, making it ideal for small-scale workshops. Sharma et al. [4] (2019) developed a pneumatic reciprocating hacksaw machine, using compressed air to drive the blade mechanism. Their study demonstrated increased cutting speed, reduced manual labor, and enhanced safety. Pneumatic systems were found to be particularly suitable for cutting lightweight materials in assembly line environments. In a related study, Rathore and Mishra [5] (2017) proposed a fully automatic hacksaw machine usingsystem reduced operator involvement and provided consistent cutting performance. The authors emphasized the potential of automation in small-scale industries to increase production without large capital investments. a Geneva mechanism and electric motor. Their system reduced operator involvement and provided consistent cutting performance. The authors emphasized the potential of automation in small-scale industries to increase production without large capital investments.Kumar and Reddy [6] (2018) introduced a solar-powered reciprocating hacksaw machine capable of cutting mild steel rods. Their design incorporated solar panels to power a DC motor, aiming to reduce reliance on non-renewable energy sources. The model demonstrated efficient cutting capabilities under optimal sunlight conditions. Nair et al. [7] (2020) conducted a study on the influence of blade material and tooth pitch on the cutting efficiency of hacksaw machines. They concluded that bi-metallic blades with medium pitch sizes offered the best compromise between speed and surface finish when cutting mild steel. Their study also highlighted the importance of proper lubrication and cooling to enhance blade life. Yadav and Gupta [8] (2015) explored the concept of a multi-blade reciprocating hacksaw machine, capable of performing multiple cuts simultaneously. Their experimental model showed significant time savings in repetitive cutting operations, especially in batch production scenarios. However, they also noted increased maintenance challenges due to synchronization issues between blades. While various innovations have improved performance, certain issues persist.

Deshmukh et al. [9] (2021) pointed out the recurring problem of vibrations and blade misalignment, which can lead to poor surface finish and reduced blade life. Moreover, there is limited research on real-time monitoring using IoT or sensor-based feedback systems to prevent breakdowns and optimize cutting parameters.

3. HARDWARE DEVELOPMENT

a. **DC Power Source Function:** The DC motor is used to facilitate the rotational movement of the cutting blade. When electric supply is given DC voltage is applied, it generates a magnetic field within both the rotor and stater, resulting in the rotation of

the roto, by using DC controller, we can regulate direction and speed of motor which modifies the voltage delivered to the motor. For effective cutting operations, it is essential to maintain the rotary motion at a precise speed, a capability that the DC motor can deliver with accuracy

B. **Rotary hacksaw** The rotary hack saw is directly connected to the end of the motor shaft. As it directly connected to the motor shaft the speed of the rotary hacksaw equal to the motor speed.

b. Beam Engine Mechanism

The beam engine mechanism is the application of single slider crank mechanism. It consists of crank, connecting rod, rocker arm, crankshaft. Initially

Crank driven by motor as the big end of connecting rod pivoted to crank so it starts oscillating, the small end of connecting rod is pivoted to rocker arm, the center of rocker arm is pivoted to vertical column. The other end of the rocker arm is pivoted to crankshaft, whose other end so pivoted to reciprocating hacksaw. When the motor starts then crank rotates through this mechanism reciprocating motion transferred to the reciprocating

c. **Reciprocating hacksaw.** Reciprocating hacksaw is directly connected to end of the crankshaft, which reciprocates along the work piece

6. Work holding devices Generally, vices are used as work holding devices.

4. WORKING

a. Power Supply to the Motor: The machine is powered by electric motor power required for both hacksaws obtained from motor. When the electric supply given to motor it starts rotating b. Rotary Action As the rotary hacksaw is connected to the end of the motor shaft, when the motor starts rotating then this hacksaw rotates continuously and performs cutting operation. The work under this hacksaw is adjusted by the vice.

b. Reciprocating Action A mechanism, which includes a crankshaft and beam engine, transforms the motor's rotary motion into reciprocating motion. This mechanism causes the blade to reciprocate along the work piece. This reciprocating hacksaw

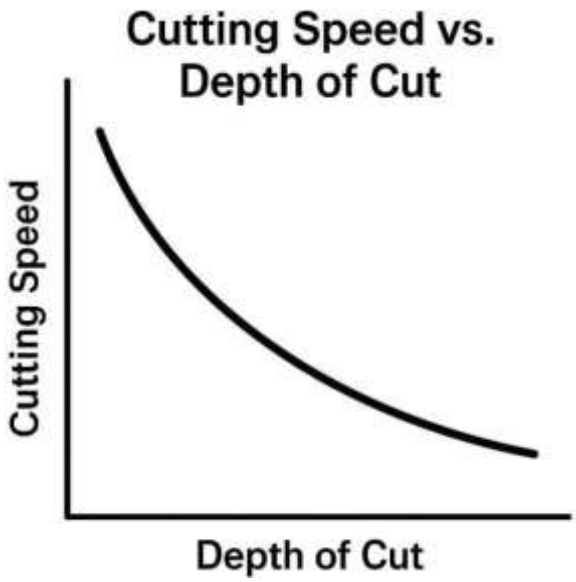
is made in the form of circular disc, but motion is restricted to reciprocating type. The reciprocating action enhances the machine's ability to penetrate materials, facilitating deeper cuts, efficient chip removal, and improved cutting performance,especially in harder materials like metal or resilient plastics.

c. Integration of Both Motions The rotary motion performs continuous cutting, while the reciprocating motion guarantees that the saw blade interacts with the material during each stroke. This interaction results in a smoother cut and minimizes excessive heat accumulation, which can lead to blade failure. When the motor starts rotating both reciprocating and rotary cuttings are done at a time. When we want to perform rotary cutting only then we simply dissemble the connecting rod from the motor, to minimize the energy loss, which is supplied to reciprocating hacksaw and maximize the rotary cutting. The continuous rotation and the back-and- forth reciprocating motion is particularly advantageous for slicing through thick or resilient materials, as it combines the strength of continuous rotation with the effectiveness of repeated impacts.

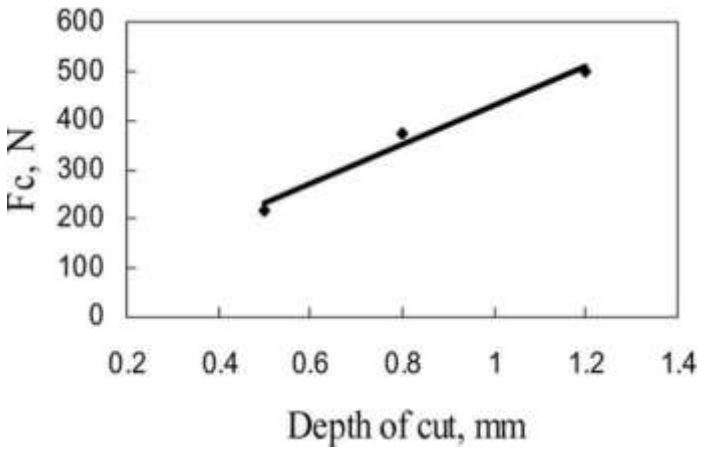
d. Control of Speed and Stroke As the different materials requires various cutting speeds, the speed of motor can be adjusted by the controller unit for efficient working of. machine

e. cooling and Lubrication Mechanisms As there is metal contact so that there is a possibility of heat generation which causes failure of blade that is why we need to provide sufficient lubrication while cutting takes place

5. ANALYSIS:



1. In this circular cum reciprocating hacksaw machine Cutting speed is inversely proportional to depth of cut the material ,it can be effected by coolant supplied by external source



2. cutting forces and depth of cut are directly related If the depth of cut increase then forces intensity Will be increases

3. It means forces required for cutting is increases Which increases power consumption ,which is Undesirable

6. APPLICATIONS

- It can be used where reciprocating cum rotary cuts Are required

7. ADVANTAGES:

- We can perform rotary cum reciprocating cuts at a time Mass production can be obtained
- We require only one motor to run the whole mechanism
- It can be cut almost all the materials

8. LIMITATIONS

- As single motor is used to run both hack saws we require more power
- Accuracy is very less

9. CONCLUSION & FUTURE SCOPE

The main objective of this project this project is introduce how the beam engine mechanism of reciprocating cutting machine is converted into rotary cum reciprocating hacksaw cutting machine with single motor

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