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Implementing the Pedal-Craft Sawing Machine

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Abstract:- The purpose of this project is to design and build a pedal-powered hacksaw cutting machine. This project aims to offer a more contemporary and effective way to cut wood, metal, and plastic. It is highly beneficial to the lathering, furniture-making, and PVC material (pipe) cutting sectors. Because it uses a slider crank mechanism to transform the flywheel's rotational movement into the hacksaw's reciprocating motion while the user cycles, this tool can also be used as a fitness training machine while cutting. Following testing, the device showed a perfect mechanical advantage and overall good efficiency.

Keywords:- *Hacksaw, Pedal Power, Reciprocating Motion.*

I. INTRODUCTION

- *The Primary Uses of a Pedal-Powered Hacksaw Machine are for Hand Metal, Wood, and Plastic Cutting.*

The fundamental working principle of the hacksaw propelled by pedals is a chain and sprocket arrangement. When the pedal is depressed, the wheel's spinning action is transformed into the hack saw's . That's underlying concept behind the slider crank mechanism. It has a bicycle-like form and size, yet it can run on very little power because it requires very little pedal power. Power is transmitted with less loss because of the simplex chain mechanism used in the transmission process. The chain and crank configuration is lubricated using a very high viscosity oil, such as SAC 20 or SAE 30. Additionally, the flywheel is used by the system to lessen speed changes brought on by pedaling fluctuations.

The flywheel also acts as a reservoir for energy, releasing energy when the system needs it and storing it when there is an excess of it.

- *Goal*

This project aims to build a pedal-operated hacksaw that can reliably cut through a range of materials, such as PVC pipes, metal, and wood. The device also aims to function as a fitness exerciser, motivating users to move while doing do-it-yourself tasks. The requirement for multipurpose, health-conscious equipment in both home and business contexts is addressed by the integration of these functionalities. Efficiency, safety, and user-friendliness will be given top priority in the design by applying the principles of mechanical engineering. The suggested pedal-driven hacksaw promotes physical exercise through its creative design in addition to providing a sustainable and environmentally responsible replacement for conventional power instruments. This work advances the development of do-it-yourself tools by fusing functionalities with characteristics that promote health, appealing to to the evolving needs of modern consumers.

- *Benefit of Study*

This research project's main goal is to alleviate the physical strain and fatigue that are frequently brought on by cutting technical materials by hand. Through converting the cutting process into a physically demanding activity, this research seeks to improve accuracy and efficiency while simultaneously encouraging users' physical fitness. One innovative method that has several advantages is the incorporation of fitness components into engineering tool designs. A prototype pedal-driven hacksaw will be created by an extensive investigation of mechanical principles, ergonomic issues, and exercise science. By using their lower body strength and cardiovascular endurance to power the cutting mechanism, users of this novel device will be able to reduce pressure on their upper body while also getting a great workout.

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➢ *Limitation of the Machine*

- Unsuitable for large-scale production
- It requires more time in comparison to electricity-powered hacksaw machines.
- It is entirely operated by hand.

II. EXAMINING THE DESIGN

- Design Data: Human energy expended say 70Kg (150 1b) person: for cycling @ 15Km/hr (16-24Km/h)=1.62KJ/Kg, theaverage cycling speed = 15.5km/h. the cycling speed in r. p. m = 120 rpm.
- Design Calculations
- Velocity Ratio

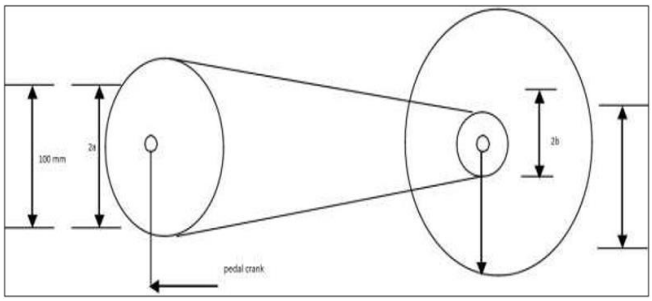

Fig 1 Design

V.R = effort distance = length of crank pedal
Load distance=
:. V.R = 0.65 which is less than 1.
– Efficiency of The Machine

$$\text{Efficiency} = \frac{\text{M.A}}{\text{V.R}} = \frac{\text{IMA}}{\text{V.R}} \times 100\%$$

Where I.M.A = Ideal Mechanical Advantage
0.5 (as calculate earlier)

$$\text{Efficiency} = \frac{0.5}{0.65} \times 100\%$$

III. RESULTS AND DISCUSSION

Three different materials were put through rigorous testing as part of the machine's experimental evaluation: plastic, wood, and mild steel pipes. With an optimal mechanical advantage of 0.5, a strong power output of 5.72 kW, and an astounding efficiency rating of 76.9%, the machine proved to be an extremely powerful and effective device. A comparative study with current versions highlighted its excellence as a cutting tool as well as a workout machine. Careful design considerations, such as the best possible mechanical advantage and power output, guaranteed its adaptability and efficiency with a variety of materials. These characteristics enhanced its use as a cutting tool while simultaneously positioning it as a powerful tool for physical exercise.

IV. RECOMMENDATIONS

- This pedal-powered device can run small machines or farm implements at up to 800 RPM. Chain drives and V-belts can operate at high speeds (500–800 RPM), but they need to be correctly tensioned to provide sufficient torque without slipping.
- Roller-chain drivers are advised for applications requiring very high torque, including grinding, and at speeds under 500 RPM. Greater diameter pulleys can be used to reach speeds above 800 RPM.
- If belts or roller chains are not properly tensioned, belts will slip and chains will derail.
- Because flywheels retain energy, they are frequently useful. Flywheel use is advised for metal cutting and grain grinding.
- As a result, it's critical that the load or feed rate correspond with the pedaler's pace. Avoid overloading yourself, as this disrupts your pedaling rhythm and typically results in a less consistent and interior work.
- It's crucial to select pulleys and sprockets with sizes that result in drive ratios that allow the user to sustain the intended pedaling pace, which is often between 50 and 60 RPM.

V. CONCLUSION

After the design, build, and extensive testing stages were completed, the result was a really satisfying pedal-powered hacksaw machine. The machine embodied efficiency and inventiveness, made possible by the utilization of locally accessible raw materials and well-established fabrication procedures. Extensive tests including the cutting of several materials, such as plastics, wooden pieces, and metal pipes, clearly showed the machine's capabilities. Its versatility and dependability were highlighted by its ease of handling a variety of materials. Furthermore, a methodical evaluation of the machine's performance versus existing models confirmed its superiority in terms of efficacy and efficiency.

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