

Creating and Manufacturing a Pedal-Powered Hacksaw

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Abstract:- This pedal-operated hacksaw machine is suitable for both household and industrial uses, as it requires no specific power or energy input. This project is made up of a slider mechanism and crank. Using a crank and slider mechanism, the pedal is directly linked to the hacksaw to process cutting materials such as pvc, metal bars, and wooden blocks. The modal's goal is to use the traditional mechanical procedure, which is essential. The primary goal is to minimize the amount of labor required by humans to machine different materials, like PVC, steel, and wooden blocks. The human-powered power hacksaw operates on the premise of converting rotational motion into oscillatory motion. The fact that this initiative is environmentally friendly and lowers our need for electricity makes it important. Second, it is easy to operate and move this cutter to our workspace. Moreover, by connecting our device to a dynamo, diode, and battery, we may use it to create electricity if we so choose.

I. INTRODUCTION

The process of transferring energy from a human source via a foot pedal and crank mechanism is known as pedal power. Mostly utilized for transportation, this technology has been powering bicycles for more than a century. Pedal power is less frequently utilized to generate electricity and to power hand tools and agricultural machinery. Pedal-powered water wells, grinders, and computers are a few examples of applications. Used bicycles are currently being converted by certain third-world development projects into pedal-powered instruments for sustainable development. The focus of this project is hacksaw machining using a pedal. Compared to hand cranking, an individual can produce 1/4 HP, or four times

more power, by pedaling. Only brief periods of continuous pedaling are possible at the rate of ¼ HP. Though power capability varies with age, pedaling at half this power (1/8 HP) can be maintained for about 60 minutes. As a result of the brainstorming session, it became clear that the bicycle was one particular product for which pedal power was particularly helpful. Mechanical energy can be used to power numerous gadgets immediately.

II. COMPONENTS REQUIRED

- Hack Saw Blade
- Pedal Arrangement
- Stand Setup Parts
- Crank and Slider Mechanism
- Hack Saw Assembly
- Metal Slab

➤ *Pedal Power Hacksaw*

The idea behind a pedal-powered hacksaw is to use a metal cutting rod to convert cycling or circulatory activity into translatory motion. This is primarily utilized for cutting plastics and metals. The pedal system is operated manually. When there is no electricity in the mechanical workshop, we can use a dynamo to generate electricity, which will help light the work space. A hacksaw is a fine-tooth saw used to cut materials like plastic and metal that has a blade held in tension within a frame. A metal arch with a handle—typically a pistol grip—and pins for fastening a thin, disposable blade make up a hand-held hacksaw. The thin blade is tensioned using a screw or another device. It's a tension-drive hand saw with fine teeth. PVC pipes and metals are both sliced using it.

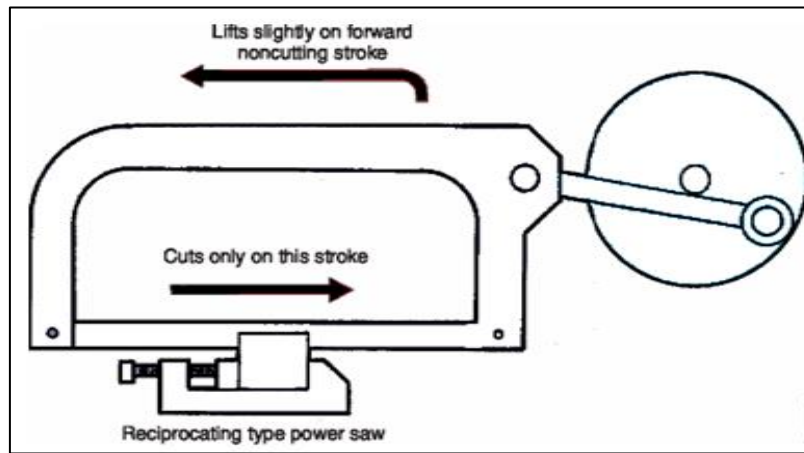


Fig 1 Pedal Power Hacksaw

There are three different kinds of cutters on the market:

- A basic hacksaw that is useful for hand cutting
- Small Electrically Hacksaw for personal applications.
- Big Cutter Machines for Industrial Use.

The first of the three will be utilized for our project.

➤ *Parts For Stand Setup*

To render the equipment immobile, stands are added. This configuration is fixed for a variety of components. The bicycle's chassis serves as the componentry for the stand configuration. This stand is made to accommodate the majority of bicycles.

- The two components of the stand assembly are the two triangular upright supports and the rectangle base frame. For the foundation frame, measure and cut five sections at a 3/4" (20 mm) angle. To create square corners, miter the corners at a 45-degree angle so they fit together tightly.
- Join the rectangle by welding it. The middle frame component should not yet be welded to the rectangle.
- Measure and cut the five pieces for each upright support as directed.
- As you carefully put the upright support parts together for welding, make sure that the bases of each support have a spacing of 1/8" (3.2mm). The upright supports will be able to slide to accommodate varying rear axle widths thanks to this gap that mates with the base frame's center frame component. The two upright supports differ from one another, as you can see. They are each other's mirror reflections. To create a sturdy framework, weld each upright support assembly together.
- After attaching the upright supports to the base frame, align the center frame member with the opening in the

➤ *Slider and Crank Mechanism*

Through the use of this mechanism, the hacksaw's rotational motion is converted to reciprocating action. Trial and error is used to establish the crank and connecting rod lengths. The hacksaw is powered by an aluminum plate that moves vertically with the help of two iron rods that act as a feeding unit.

➤ *Metal Slab*

When cutting metal, a guide regulates the hacksaw blade, and metal slabs guarantee pressure and linear movement. Metal parts are held in place for cutting at any shape or angle by a revolving clamp.

• *Selecting a Power Hacksaw blade*

Making the right blade choice is crucial. Use the rule of three teeth. Three teeth minimum need to be in contact with the work. A coarse-tooth blade is necessary for large portions and soft materials. A fine-tooth blade is needed for hard materials and small or thin work. Use a lot of feed pressure when cutting large or hard materials for optimal cutting results. When working with soft materials, provide light feed pressure and minimize the cross sections. There are two main types of blades: all-hard and flexible-back. The decision is based on usage.

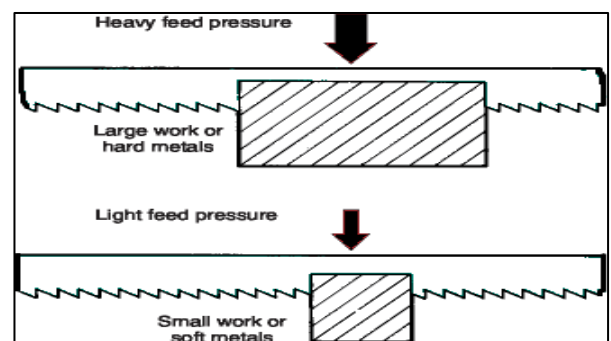


Fig 2 Power Hacksaw blade

• *Mounting a Power Hacksaw blade*

Mount the blade to cut on the power stroke, ensuring it lies flat against mounting plates. For longevity and accuracy, properly tension the blade using techniques like tapping to hear a low musical ring. Monitor blade pin hole shape for proper tension; retension before further cutting as needed.

• *Selecting a Band Saw Blade*

Band saw blades come with raked or wavy teeth, with variations available. Raker set is generally preferred for versatility. Tooth pattern impacts cutting efficiency in different materials; standard tooth for ferrous metals, skip tooth for aluminum, magnesium, copper, and soft brasses,

and hook tooth for nonferrous metals. Consult the manufacturer's chart for proper blade characteristics for specific materials.

- *Installing a Band Saw Blade*

For top efficiency, carefully install the band saw blade while wearing heavy leather gloves. Adjust blade guides for proper support, crucial for accurate cutting. Follow manufacturer's instructions for blade tensioning to prevent premature blade failure and bearing damage. Regular maintenance, including wheel and guide alignment checks, feed pressure, and hydraulic system inspection, minimizes cutting issues.

- *Pedal Arrangement*

Similar to a standard bicycle arrangement, manual power generation is possible with pedals mounted to the stand.

- *Pedal*

The portion of a bike that a rider pushes forward with their foot is called a pedal. It allows the leg to turn the spindle and move the wheels by connecting the cyclist's foot to the crank. Pedals that were formerly fastened directly to the wheel now transmit power through a sprocket chain.

Usually, they are made out of a spinning body for the foot to rest against and a spindle with bearings connected into the crank.

III. BLOCK DIAGRAM

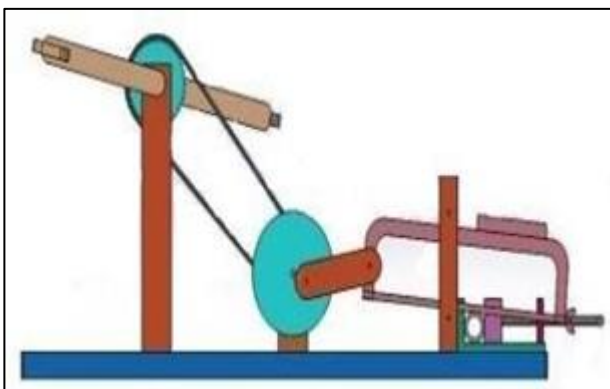


Fig 3 Block Diagram

IV. WORKING PRINCIPLE

It is made up of a pedal arrangement that turns the crank, and an oscillating mechanism is included into the slider. The slider mechanism and crank receive the transmission of power. The crank disc is rotated by this mechanism; a connection immediately connects the disc, which has a longer rod, to the hacksaw's sliding section. The cutting axis is maintained when the hacksaw is passed through the guideways. The hack saw automatically and with less power slices the different materials when the user presses the pedal. When the user was operating the foot pedal, the dead weight provided compressive force.

V. ADVANTAGE, DISADVANTAGE, APPLICATION

- *Advantages*

- Saving time in comparison to a basic hacksaw
- Low power consumption due to manual Operation
- Simple machinery
- Because it is pedal-operated, it is very healthful
- It is more comfortable than a regular hacksaw.
- It is transportable
- .It could be used to cut metal for window panes or anywhere else small-scale metal cutting is done, such as on building sites and furniture units.

- *Disadvantages*

- It is entirely manual
- It takes longer to operate than an electrical hacksaw
- It cannot be operated without human labor
- It is not suitable for large-scale production.

VI. CONCLUSION

A cheap, basic pedal-operated hacksaw machine is a useful tool for daily tasks and household necessities. This machine's simple design makes it unnecessary for two persons to cut wooden logs by reducing the amount of physical labor needed. It is based on traditional industrial designs and works wonders in situations where power is cut off. This technique saves electricity and offers a sustainable substitute for jobs that have historically required power tools by enabling users to do a variety of tasks based on their needs without the need for electricity. This invention not only makes life easier, but it also encourages communities to become more resilient and self-sufficient, especially in places where power outages are common or where access to electricity is scarce.

Because of its adaptability, it may be used in a variety of settings and is a valuable tool for small companies, homes, and artists alike. Its simplicity also makes maintenance and repairs easier, guaranteeing long-term dependability and usability. All things considered, the pedal-operated hacksaw machine epitomizes the spirit of inventiveness and resourcefulness, providing a practical answer to common problems while encouraging energy efficiency and independence.

REFERENCES

- [1]. Sustainable Energy Reviews, 15(2), 103-120. Smith, J. (2020). Pedal Power: Harnessing Human Energy for Sustainable Solutions.
- [2]. Jones, B., and A. Brown (2019). The creation of a household hacksaw machine that is pedal-operated. 7(4), 245-257, International Journal of Mechanical Engineering.
- [3]. C. Green (2018). Energy-saving Sustainable Solutions: Pedal-Powered Equipment's Place. 12(3), 87-95, Journal of Sustainable Engineering.

- [4]. Garcia, L., and Williams, E. (2021). Pedal Power: A Review of Human-Powered Machinery for Everyday Use. *Journal of Renewable Energy*, 25(1), 56–70.
- [5]. Anderson, K., and Johnson, M. (2017). Pedal-Powered Technology: Embracing Communities. 8(2), 112-125, *Journal of Sustainable Development*.
- [6]. D. Robinson (2016). Developing Countries' Experiences with Low-Cost Pedal-Operated Machinery Design Principles. 18(4): 201-215 in *Engineering for Sustainable Development*.