PEDAL OPERATED HACKSAW

Jayant khede, Rajesh kumar,Rakesh R. Poojari Assistant Professor,
Mechanical Engineering Department ARMIET,
Thane. India

ABSTRACT

In this Pedal operated hacksaw machine which can be used for industrial applications and Household needs in which no specific input energy or power is needed. This project consists of a crank and slider mechanism. In the mechanism pedal is directly connected to the hacksaw through crank and slider mechanism for the processing of cutting the wooden blocks, metal bars, pvc materials. The objective of the modal is using the conventional mechanical process which plays a vital role. The main aim is to reduce the human effort for machining various materials such as wooden blocks, steel, PVCetc. The power hacksaw machine, which runs on human power, works on the principle of the conversion of rotational motion to oscillatory motion. Importance of this project lies in the very fact that it is green project and helps us to reduce our electricity need. Secondly, this cutter can be used and transferred to our working place easily. Moreover, if we want we can generate electricity with our project by connecting it to dynamo, diode and battery.

INTRODUCTION

Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred years. Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity. Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. This project concentrates on pedal powered hacksaw machining. An individual can generate four times more power (1/4 HP) by pedaling than by hand-cranking. At the rate of ¼ HP, continuous pedaling can be served for only short periods, approximately 10 minutes. However, pedaling at half this power (1/8 HP) can be sustained for close to 60 minutes but power capability can depend upon age . As a consequence of the brainstorming exercise, it was apparent that the primary function of pedal power one specific product was particularly useful: the bicycle. Many devices can be run right away with mechanical energy.

COMPONENTS REQUIRED

I. Hack sawblade
II. Pedalarrangement
III. Stand setupparts
IV. Crank and slidermechanism
V. Hack sawassembly
VI. Metalslab

2.1) PEDAL POWERHACKSAW

The principle of pedal power hacksaw is to change circulatory motion or cycling motion into translatory motion with the help of metal cutting rod. This is mainly used for cutting metals and plastics. it is manually pedal operated system.

If we use dynamo then we can produce electricity which will be help to lighting the work piece area when electricity is not available in mechanical workshop.

A hacksaw is a fine-tooth saw with a blade under tension in a frame, used for cutting materials such as metal or plastics.

Hand-held hacksaw consist of a metal arch with a handle, usually a pistol grip, with pins for attaching a narrow disposable blade.

A screw or other mechanism is used to used to put the thin blade under tension.

It is a fine tooth hand saw with a blade under tension. It is used to cut metals and PVC pipes. It would be useful in many projects discussed on this site which used plastic pipes as materials. Blades of hacksaw are measured in TPI (Tooth Per Inch). Different TPI is needed for different jobs of cutting.

ARECIPROCATING POWER HACKSAW

Ituses a blade that moves back and forth across the work. The blade cuts on the backstroke. There are several types of feeds available.Positive feed-produces an exact depth of cut on each stroke. The pressure on the blade varies with the number of teeth in contact with the work.Definite pressure feed-yields a pressure on the blade that is uniform regardless of the number of teeth in contact with the work. The depth of the cut varies with the number of teeth contacting the work. This condition prevails with gravity feed.Feed can be adjusted to meet varying conditions. For best performance, the blade and feed must be selected to permit high-speed cutting and heavy feed pressure with minimum blade bending and breakage.

2.1.1) Selecting APower Hacksawblade

Proper blade selection is important. Use the three-tooth ruleatleastthree teeth must be in con-tact withthework.Largesectionsandsoftmaterialsrequireacoarse-toothblade.Smallorthinworkand hard materials require a fine-toothblade.
For best cutting action, apply heavy feed pressure on hard materials and large work. Use light feed pressure on soft materials and work with small crosssections.
Blades are made in two principal types: flexible-back and all-hard. The choice depends upon use.

i) Flexible-back blades -should be used where safety requirements demand a shatterproof blade. These blades should also be used for cutting odd-shaped work if there is a possibility of the work coming loose in thevise.

ii) All-hard blade -For a majority of cutting jobs, theall-hard bladeis best for straight, accurate cutting under a variety ofconditions.

2.1.2) Mounting a Power Hacksawblade

The blade must be mounted to cut on the power (back) stroke. The blade must also lie perfectly flat against the mounting plates. If long lifeand accurate cuts are to be achieved, the blade must be properly tensioned
Many techniques have been developed for properly mounting and tensioning blades. Use a torque wrench and consult the manufacturer's literature. If the information (proper torque for a given blade on a given machine) is not available, the following methods can be used:
Tighten the blade until a low musical ring is heard when the blade is tapped lightly. A high- pitched tone indicates that the blade is too tight. A dull thud means the blade is too loose.
The shape of the blade pin hole can serve as an indicator of whether the blade is tensioned properly. When proper tension is achieved, the pin holes will become slightly elongated,
Thebladewillbecomemorefirmlyseatedafterthefirstfewcutsandwillstretchslightly.Theblade will require retensioning(retightening) before further cutting can bedone.

2.1.3) Selecting a Band SawBlade

Band saw blades are made with raker teeth or wavy teeth. Most manufacturers also make variations of these sets. The rakersetis preferred for general use.
Tooth pattern determines the efficiency of a blade in various materials. The standard tooth blade pattern is best suited for cutting most ferrous metals. A skip tooth blade pattern is preferred for cutting aluminum, magnesium, copper, and soft brasses. The hooktooth blade pattern also is recommended for most nonferrous metallic materials.

2.2) PEDALARRANGEMENT

A pair of pedals is attached to the stand setup in which the power will be generated manually. A typical Bicycle arrangement is used.

2.2.1) PEDAL

A bicycle pedal is the part of a bicycle that the rider pushes with their foot to propel the bicycle. It provides the connection between the cyclist's foot or shoe and the crank allowing the leg to turn the bottom bracket spindle and propel the bicycle's wheels.

Fig 4- pedal

Pedals were initially attached to cranks connecting directly to the driven (usually front) wheel. The safety bicycle, as it is known today, came into being when the pedals were attached to a crank driving a sprocket that transmitted power to the driven wheel by means of a rollerchain.

Pedals usually consist of a spindle that threads into the end of the crank and a body, on which the foot rests or is attached, that is free to rotate on bearings with respect to the spindle.

2.3) CRANK AND SLIDERMECHANISM

This mechanism is used to convert the rotary motion of the crank into the reciprocating motion of hacksaw. The lengths of the crank and connecting rods are made using trial and error method.

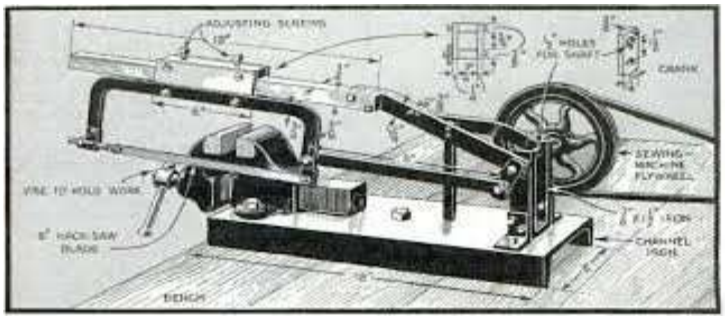

Fig 7- crank and slider mechanism

The hack saw is guided by an aluminum plate. The vertical movement of the hacksaw will be guided by to iron rods. The vertical movement will act as a feeding unit.

2.4) BICYCLESEAT

Fig 10- bicycle seat

A bicycle seat, unlike a bicycle saddle, is designed to support the rider's buttocks and back, usually in a semi-reclined position. Arthur Graford is credited with inventing the padded bicycle seat in 1892, and they are now usually found on recumbent bicycles.

Bicycle seats come in three main styles; mesh, hard shell and combination

i) MESH

A typical mesh seat consists of a metal frame with mesh stretched over it and secured with adjustable straps, zip ties, string or shock cord.

ii) HARDSHELL

Hard shell seats are normally made of a composite material such as GRP or carbon fiber although metal and wood versions do exist. A hard-shell seat is normally covered with some-form of padding, this is usually closed or open cell foam although some extreme racing machines do not have any padding on the seat to reduce weight and increase efficiency. Hard-shell seats are generally used at more reclined angles than mesh seats.

iii) COMBINATION

A combination seat has a padded hard seat base with a mesh back.

WORKING PRINCIPLE

It consists of the pedal arrangement which rotates the crank and through it slider consists of oscillating mechanism. The power is transmitted to the crank and slider mechanism. This mechanism is used to rotate the crank disc; the disc which is having an extended rod is connected to the sliding portion of the hacksaw directly by means of a linkage. The hacksaw is passed through the guide ways by means of maintaining the cutting axis. As the user operated the pedal, the hack saw cuts the various materials automatically with less power. The dead weight is for compressive force while the user operated the foot pedal.

Fig 11- working

RESULT

4.1) BASE FRAME

Plan view of frame in support position. All pieces 3/4" (19mm) steel angle.

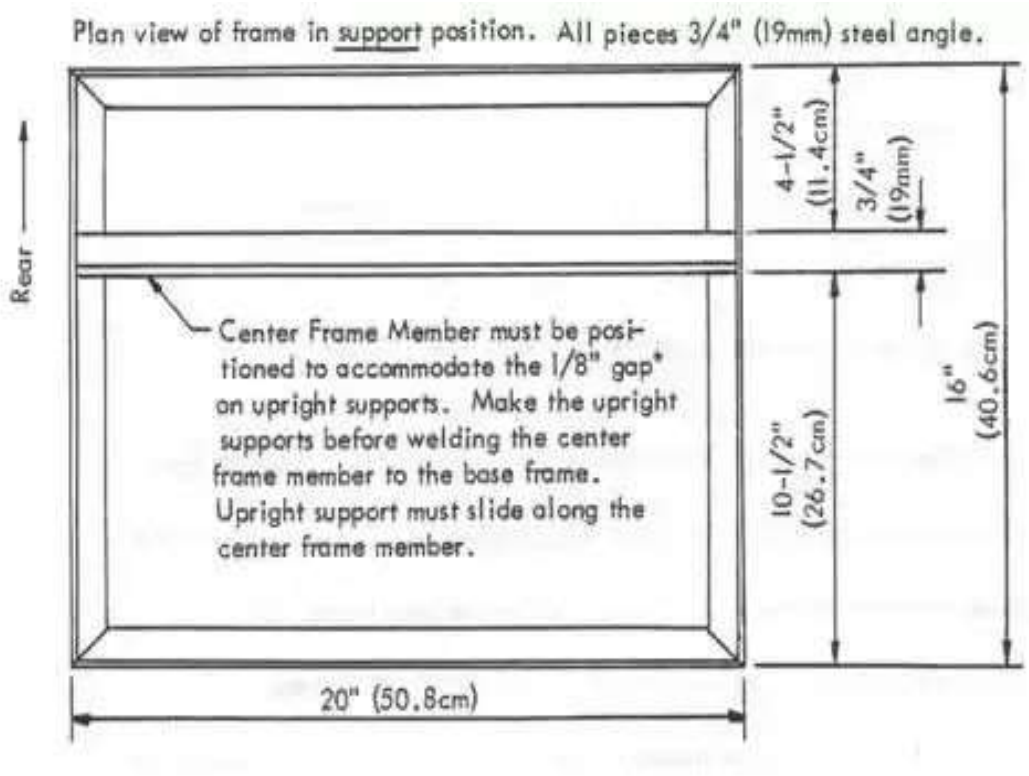

Fig 12-Base Assembly

4.3) HACKSAW BLADE

LENGTH=15 inch=36 cm
WIDTH =1 inch

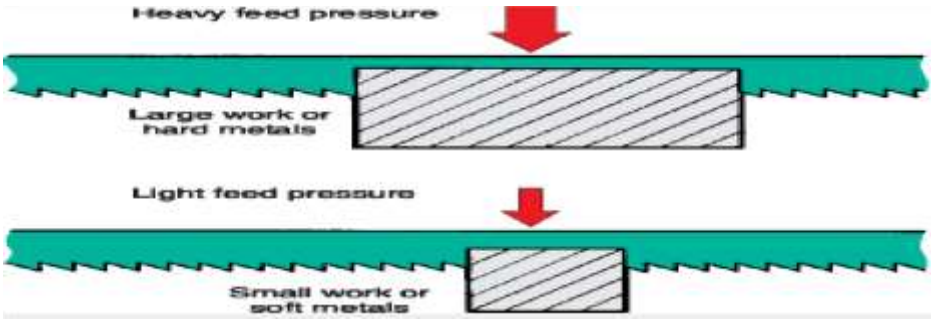

Fig 14- hacks blade

4.4) DESIGN CONSIDERATIONS

When designing our attachment, the following considerations were taken into account

1. The device should be suitable for local manufacturingcapabilities.
2. The attachment should employ low-cost materials and manufacturingmethods.

3. It should be accessible and affordable by low-income groups, and should fulfill their basic need for mechanicalpower
4. It should be simple to manufacture, operate, maintainandrepair.
5. It should be as multi-purpose as possible, providing power for various agricultural implements and for small machines used in ruralindustry.
6. It should employ locally available materials and skills. Standard steel pieces such as steel plates, iron rods, angle iron, and flat stock that are locally available should be used. Standard tools used in machine shop such as hack saw, files, punches, taps & dies; medium duty welder; drill press; small lathe and milling machine should be adequate to fabricate the parts needed for the dual-purposebicycle.
7. It should make use of standard bicycle parts whereverpossible.
8. The device should adapt easily to as many different bicycles as possible. No permanent structural modification should be made to thebicycle

ADVANTAGES

I. Time saving as compared to simplehacksaw
II. Power saving as it is manuallyoperated
III. Easy machineryused
IV. As it is pedal operated so good for health
V. Comfortable then ordinaryhacksaw
VI. It isportable

DISADVANTAGES

I. Its totally manuallyoperated
II. Time consuming as compared to electrical powerhacksaw
III. Without human effort its notoperated
IV. Not fit for heavyproduction

Cost Estimation

SR.NO.	NAME OF COMPONENT	PIECES	PRICE/PIECE	TOTAL
1	Pedal	2	200	400
2	Stand	1	350	350
3	Base frame	1	750	750
4	Crank& Slider mechanism	1	900	900
5	Clamp	2	130	260
6	Hacksaw	1	550	550
7	Nut & Bolt	7	10	70
8	Welding cost	-	380	380
			TOTAL	3660

FUTURE SCOPE

Following all types of operation can be carried out by the proper pedal attachment as per the requirement. Here are some operation.

CONCLUSION

Thus a low cost and simple design pedal operated hacksaw machine is fabricated. This machine reduces the human effort and hence we don't need two persons to cut the wooden logs. This simple design of conventional design which can enhance day today household needs and daily day to day purposes and it can be also used in for industrial applications during power shut down scenarios. By using this method we can do any operation as per our requirement without the use of electricity. so we can save the electricalpower.

REFERENCES

1 David Gordon Wilson "UNDERSTANDING PEDAL POWER" ISBN: 0-86619-268-9 [C] 1986, Volunteers in Technical Assistance" Technical paper 51 VITA 1600 Wilson Boulevard USA.

2 EJ Yerxa Taylor & Francis "Occupational science: A new source of power for participants in occupational therapy"- Journal of Occupational Science ISSN 1442-7591 Volume: 13, Issue: 1, April 1993pp254-259.

3 Jon Leary "Putting Research into Practice: From a Steel City Drawing Board

4 S. Berlijn, S. Markalous and K. Ström, "Web-based PD monitoring of a Generator in Loforsen Sweden," in *International Conference on Condition Monitoring and Diagnosis*, Beijing,2008.

5 P. Nyeng, J. Østergaard, C. A. Andersen, J. Dall and C.Strunge, "Reactive power control with CHP plants - A demonstration," *Proceedings of the CIGRE session*,2010.

6 D. Pudjianto, C. Ramsay and G. Strbac, "Virtual power plant and system integration of distributed energy resources," *Renewable Power Generation, IET*, vol. 1, no. 1, pp. 10-16, March2007.

7 N. Ruiz, I. Cobelo and J. Oyarzabal, "A Direct Load Control Model for Virtual Power Plant Management," *IEEE Transactions on Power Systems*, vol. 24, no. 2, pp. 959-966, May2009.