

Specially Designed Pendle Type Hacksaw And Drilling Machine

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Abstract

The objective of this paper was to design, fabricate and investigate the working of Pedal Driven Hacksaw (PDH). PDH is working on Slider Crank Mechanism. The experiment was done using PDH and plywood, hollow and solid cylinder, PVC pipe etc. Work pieces... The hack saw is connected with the reciprocating rod. By pedaling the bicycle the reciprocating rod moves to and fro, the hack saw will be moving with the rod. The plywood, hollow and solid cylinder, PVC pipe etc. to be cut is placed under the hack saw. Thus the plywood, hollow and solid cylinder, PVC pipe etc. can be cut without any external energy like fuel or current... The results indicate that the PDH had given better, accurate and faster cuts when compared with hand hacksaw at different rpm... When compared to the Power Saw the PDH requires only manual power thereby reducing the utility bill considerably. Experimental result shows that cutting depth of about 15 mm can be obtained in one cycle of strokes for around 100rpm. The radial drill also linked with the rotating rod through bevel gear and pulley mechanism also can perform drilling up to 10mm thickness. Here is also possible to convert liner motion into reciprocating. This sentence is apply on our drilling machine. Drilling machine is working on belt drive mechanism, so that while apply peddle force belt is circulation movement and spindle is rotate and cutting tool is rotate and to crate hole in workpiece. we are also used Dynamo. This Dynamo Concept is to convert mechanical energy into electrical energy. This electrical energy is use for light tube and fan. so that worker is very healthful and provide full facility by this machine.

Keywords- Bevel gear, Radial Drilling Machine, Hacksaw Blade, Electrical Dynamo, Bering and Bering Socket, bolts, Rechargeable betray.

I. INTRODUCTION

In Country like India requires development of Small Scale Industries. Majority Small Scale Industries grows then potential source will be Increase. In rural area electrical Power source is serious problem. Our Project Works without electricity, so above problem will be solve. . Our Project is work only Man power only, so man with low technical knowledge can also operate it. Our Project has work only man power, not required any type of electrical source and not required fuel & gas also.

II. PRINCIPLE AND LIST OF COMPONENTS

The principle of pedal power hacksaw and drilling machine is to change circulatory motion or cycling motion into translatory motion with the help of shaft via pulley. Bevel gear is used to transmit circulatory motion of shaft to a shaft attached at right angles to it through which the drilling m/c pulley receives motion via belt and pulley. 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.

Table-1: Component List

M S Angle	Fan
Shaft	Rechargeable betray
Cast Pulley	Bering and Bering Socket
C F L Tube and Holder	Bicycle sheet and Pendle
Bolt and extra	Radial Drilling machine
Bevel gear	Electrical Dynamo.
M S Disc	Hacksaw Vise
Hacksaw Blade	C Clamp
Hacksaw Holder	

III. COMPONENTS OF THE MACHINE

(A) MS Angle: - It is use for total Project chassis and fabrication.

(B) Shaft: - Shaft working is to transmit power by rotational movement of belt through pulley. Bright steel bar comes in many steel specs with, in increasing strengths, mild steel, medium carbon and low alloy steels probably of most interest .For your more heavily loaded shafts and axles look at through hardened, low alloy steel bright bar these are common and are just about hacksaw-able when hardened moderately although getting the supplier to cut to length in diameters of 1/2" upwards helps a lot. In common heat treated forms they have strengths about 3 x that of mild steel and are drill & tap-able - but they are more expensive.

Here We have use shaft of 5 feet of the length.

(C) Bevel gear.

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

Bevel gears are useful when the direction of a shaft's rotation needs to be changed. They are usually mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well.

The teeth on bevel gears can be **straight**, **spiral** or **hypoid**. Straight bevel gear teeth actually have the same problem as straight spur gear teeth -- as each tooth engages, it impacts the corresponding tooth all at once.



Figure-1: Bevel Gear

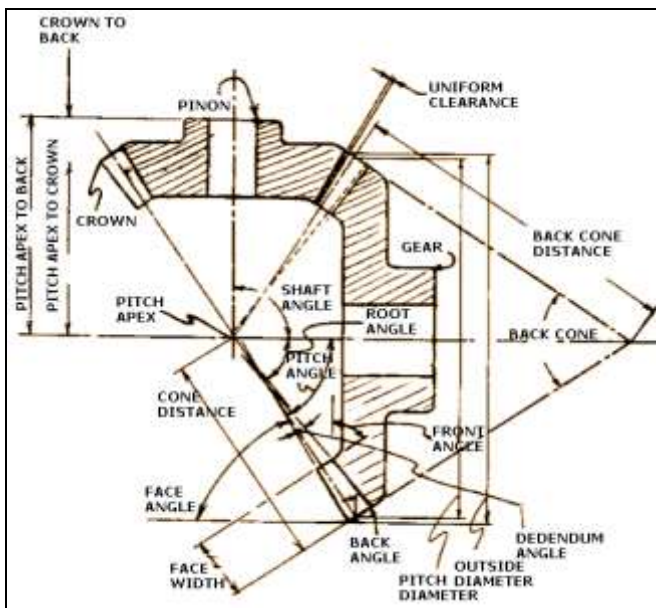


Figure-2: Nomenclature of Bevel Gear

Applications

The bevel gear has many diverse applications such as locomotives, marine applications, automobiles, printing presses, cooling towers, power plants, steel plants, railway track inspection machines, etc.

The gears in a bevel gear planer permit minor adjustment during assembly and allow for some displacement due to deflection under operating loads without concentrating the load on the end of the tooth.

Spiral bevel gears are important components on rotorcraft drive systems. These components are required to operate at high speeds, high loads, and for a large number of load cycles. In this application, spiral bevel gears are used to redirect the shaft from the horizontal gas turbine engine to the vertical rotor.

Electrical Dynamo

A small generator is sometimes fitted to a bicycle to provide electricity for the lights at night. The generator is called a bicycle dynamo.

How does Bicycle Dynamo Work?

Inside the dynamo a permanent magnet is rotated in the middle of some coils of wire. Rotating the magnet instead of the coils has the advantage that slip rings are not needed. The rotating magnet produces a changing magnetic field and this generates electricity in the coils of wire.

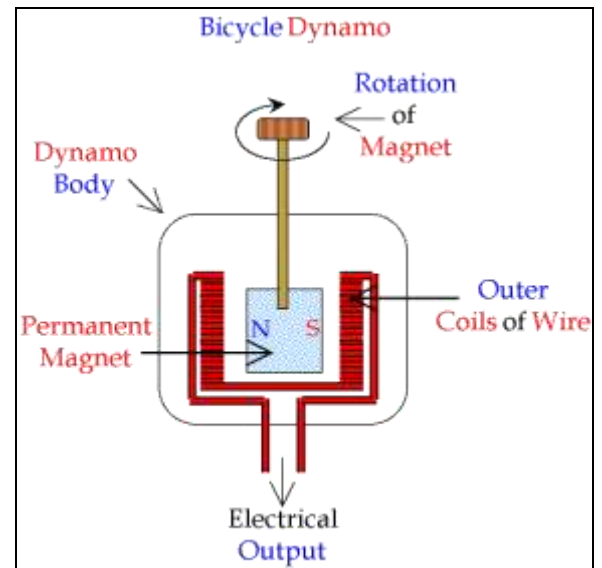


Figure-3: Construction and working of Electric Dynamometer

IV. Rechargeable battery

A rechargeable battery, storage battery, secondary battery or accumulator is a type of electrical battery. It comprises one or more electrochemical cells, and is a type of energy accumulator used for electrochemical energy storage. It is also known as a secondary cell because its electrochemical reactions are electrically reversible. Rechargeable batteries come in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network. Several different combinations of chemicals are commonly used, including lead-acid, nickel cadmium (NiCad), nickel metal hydride (NiMH), lithium ion (Li-ion), and lithium ion polymer (Li-ion polymer).

Rechargeable batteries have a lower total cost of use and environmental impact than disposable batteries. Some rechargeable battery types are available in the same sizes as common consumer disposable types. Rechargeable batteries have a higher initial cost but can be recharged inexpensively and reused many times.

Secondary cells encompass the same mechanism as the primary cells with the only difference being that the Redox reaction of the secondary cell could be reversed with sufficient amount of energy placed into the equation. The figure below illustrates the mechanism of a charging secondary cell. The Charger shown on the top of the

diagram is pulling the negative charges toward the right side of the separator. This makes it seem like the positive charges are compiling on the other side of the cell which is not allowed to pass the separator. This disequilibrium is the representation of the cell potential that, when allowed, could once again approach equilibrium through the transferring of the electrons.

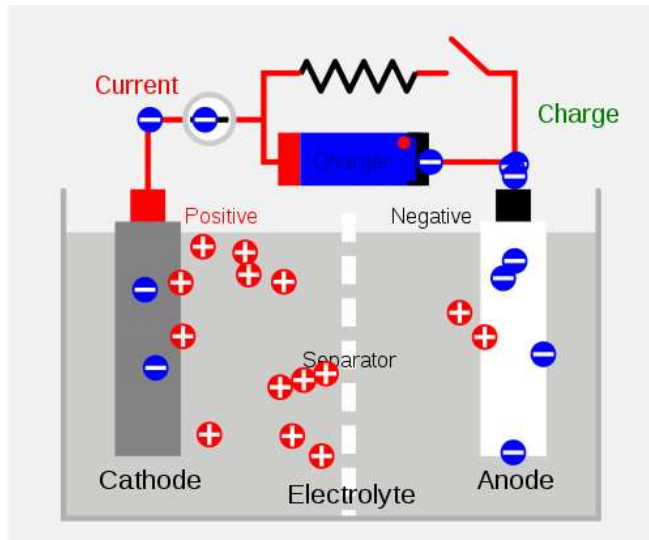


Figure-4: How to rechargeable battery work?

In addition to the features available in battery chargers, there are solid benefits that come from using rechargeable batteries as well.

- 1-Convenient
 - 2-BetterPerformance
 - 3-EarthFriendly
 - 4-SaveTime
 - 5-SaveMoney
- Here use 12 volt battery.

Radial Drilling machine

A machine in which the drilling head is mounted to slide along a radial arm which can be rotated, rose, or lowered on vertical mast to adjust the position of the drill above the work piece.

Machine for making holes with removal of chips. Drilling machines are used for drilling, boring, counter sinking, reaming and tapping. Several types are used in metal working:

Drilling machine operation

- Reaming
- Boring
- Counter boring
- Counter sinking
- Spot facing
- Tapping

Drill Materials

The two most common types are:

- 1. HSS drill – Low cost

- 2. Carbide- tipped drills – high production and in CNC machines

Other types are:

Solid Carbide drill, TiN coated drills, carbide coated masonry drills, parabolic drills, split point drill. Accurate way of sizing and finishing the pre-existing hole.

Accuracy of $\pm 0.005\text{mm}$ can be achieved

Cutting Speed (v):-

It's the peripheral speed of the drill :- $v = \pi * D * N$ where (D = dia of the drill in mm N = Speed of rotation in rpm)

Feed Rate (f):- It's the movement of drill along the axis (rpm)

Depth of Cut (d):- The distance from the machined surface to the drill axis

$$d = D / 2$$

Material Removal Rate:- It's the volume of material removed by the drill per unit time

$$MRR = (\pi D^2 / 4) * f * N \text{ mm}^3 / \text{min}$$

Machining Time (T) :- It depends upon the length (l) of the hole to be drilled , to the Speed (N) and feed (f) of the drill.

$$t = L / f N \text{ min}$$

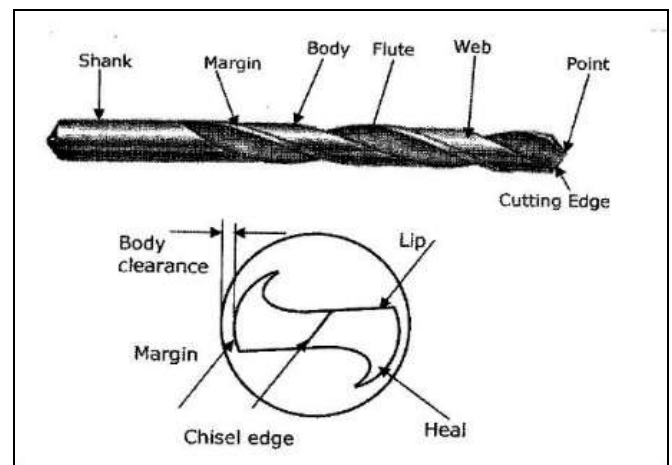


Figure-5: Drilling tool and its nomenclature

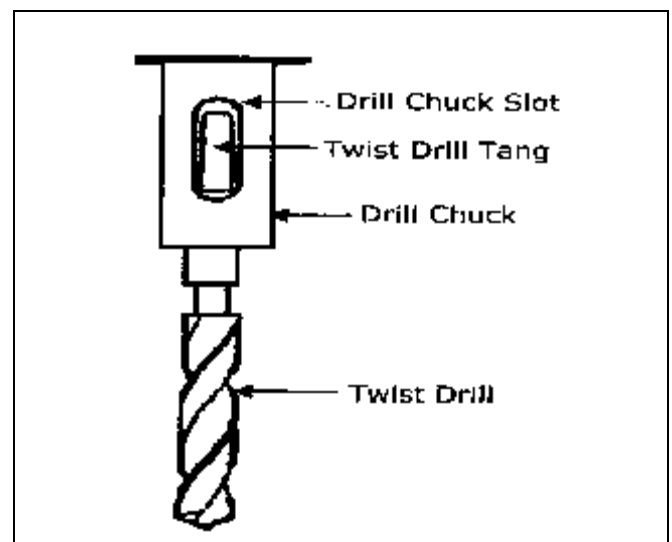


Figure-6: Drilling tool with different parts

ADVANTAGES OF RADIAL DRILL

1. Only Man Power Use.
2. Electricity is not used.
3. Any type of gas and fluid not used.
4. Economical.
5. Simple in operation.

DISADVANTAGES OF RADIAL DRILL

1. RPM is less. Hard material is not removed.

HACKSAW BLADE

Hacksaw blade use to cut metals upto 10 mm thickness like pipe, wood, PVC pipe, wires.

When m s disc rotate then rotational movement is convert into the reciprocating motion of the blade through links attached between.

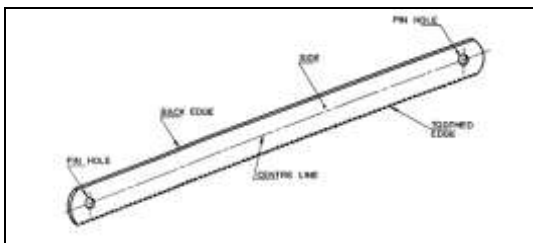


Figure-7: Detailed Hacksaw blade

V.BERING AND BERING SOCKET

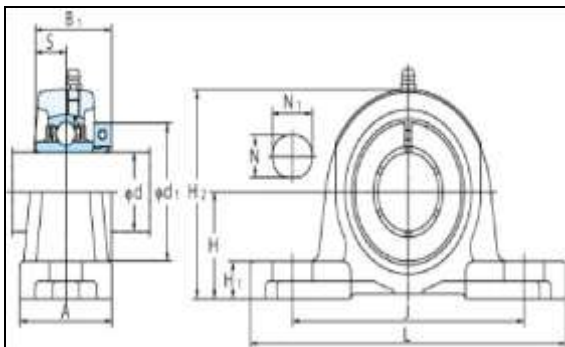


Figure-8: Detail drawing of Bearing

VI.WORKING PRINCIPLE AND CONTRUCTION OF PENDLE TYPE HACKSAW AND DRILLING MACHINE

The Pedal Driven Hacksaw (PDH) is working on Slider Crank Mechanism. The PDH is used to cut ply wood in small scales. PDH helps to obtain a less effort uniform cutting. It can be used in places where electricity is not available. It is designed as a portable one which can be used for cutting in various places. The main parts of PDH are hack saw, reciprocating rod welded to the pedal of a bicycle, flywheel, sprocket and chain drive. The hack saw is connected with the reciprocating rod. By pedaling the bicycle the reciprocating rod moves to and fro, the hack saw will be moving with the rod. The plywood to be cut is placed

under the hack saw on a work piece holder. Thus the plywood can be cut without any external energy like fuel or current. Since this uses no electric power and fuel, this is very cheap and best.

It consists of the pedal arrangement which rotates the larger belt as well as the smaller belt. The smaller belt rotates and 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.

This mechanism is used to convert the rotary motion of the crank into the reciprocating motion of hacksaw. The hack saw is guided by an m s disc.

Two sets of belt drives are made. The primary belt drive will transmit the power from the pedal to the secondary belt drive. The secondary belt drive will increase the speed of the rotation.

Here is also possible to convert liner motion into reciprocating. This sentence is applied on our drilling machine. Drilling machine is working on belt drive mechanism, so that while apply peddle force belt is circulation movement and spindle is rotate and cutting tool is rotate and to crate hole in work piece. Work piece is clamp by "C" Clamp. We are also used Dynamo. This Dynamo Concept is to convert mechanical energy into electrical energy. This electrical energy is use for light tube and fan. so that worker is very healthful and provide full facility by this machine.

Figure-9, gives the variation of number of strokes with rpm of PDH. It is observed that the number of strokes increases uniformly with the pedal rpm. The variation in the obtained plot is due to errors in observation and due to power transmission losses.

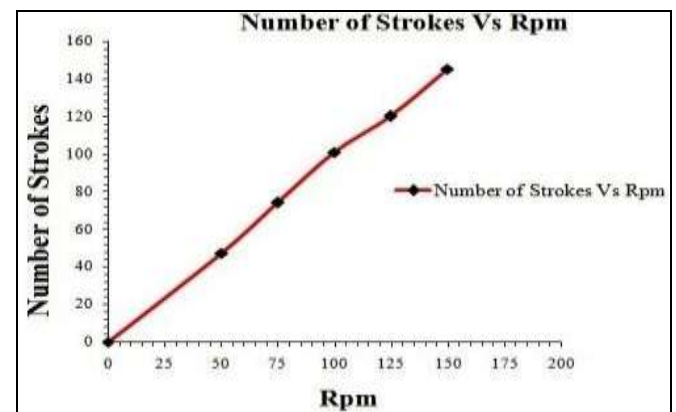


Figure-9: Variation of number of strokes with RPM

Figure-10 shows the variation of cutting depth with rpm of PDH. It is observed that the cutting depth increases with the pedal rpm.

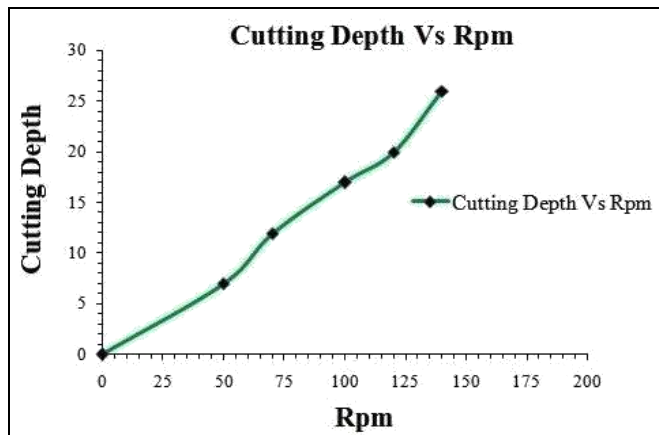


Figure-10: VaRIATION OF Cutting Dept with RPM

VII. ADVANTAGES & DISADVANTAGES

(A) ADVANTAGES

- i. Completely Peddle type Operate System.
- ii. Metal cutting process will be done.
- iii. Drilling process will be done.
- iv. The Electricity produced by dynamometer and store in Battery, so fan and lighting can be use while require.
- v. Time saving as compared to simple hacksaw.
- vi. Power saving as it is manually operated
- vii. Easy machinery used
- viii. As it is pedal operated so good for health
- ix. Comfortable then ordinary hacksaw.

(B) DISADVANTAGES

- i. It's totally manually operated.
- ii. Time consuming as compared to electrical power hacksaw.
- iii. Without human effort it's not operated.
- iv. Not fit for heavy production.

CONCLUSIONS

Pedal driven hack saw helps to obtain less effort uniform cutting. The results indicate that the PDH had given better, accurate and faster cuts when compared with hand hacksaw at different rpm.

PDH can be used in remote places where electricity is not available. It is designed as a portable one which can be used for cutting in various places.

The work piece can be cut without any external energy like fuel or current. Since PDH uses no electric power and fuel, this is very cheap and best.



Figure-11:

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