

Solar Operated Wood Cutter

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Abstract— This project is on the design and construction of a solar power hacksaw machine for cutting of wood to different size and length with the help of solar hacksaw. The objective of this project is to save power and time, energy in cutting woods in order to achieve high productivity and create automation in this machine. A solar panel connected to power hacksaw is considered as a solar operated power hacksaw in which sun's energy is used to drive the hacksaw in order to cut wood, metal rod etc. A solar connected to the hacksaw converts the solar energy into electrical energy which is stored in a battery as a direct current to run the motor connected to the hacksaw. The energy stored in battery is supplied to the dc motor which rotates the wheel connected to the shaft of motor.

Key words: Solar, Wood Cutter

I. INTRODUCTION

A hacksaw is a handheld tool used to cut through materials like wood, plastic tubing and metal pipes. Its cutting mechanism is provided by removable blades which feature sharp teeth along their outer edge.

In most cases, a hacksaw consists of a metal frame that resembles a downward-facing. The frame's ends feature adjustable pegs that can be tightened to secure a blade in place, and loosened to remove it.

Hacksaw blades are long, thin strips of hardened steel that feature a row of teeth along their cutting edge. Each end of the blade is punched with a small hole that fits onto the saw frame's pegs. Most blades range in length from ten to 12 inches (25.4 to 30.48 cm), although six-inch (15.24 cm) blades can be purchased to fit smaller hacksaw models. A device that applies force, changes the direction of a force, or changes the strength of a force, in order to perform a task, generally involving work done on a load. Machines are often designed to yield a high mechanical advantage to reduce the effort needed to do that work.

We have found a solar power hacksaw to be the most useful for general shop work. Modern heavy-duty hacksaw machines provide an economical and efficient means of sawing a wide range of materials and stock sizes. Power hacksaws are getting rarer all the time but they do a good job within their capacity. If you can get one that takes standard hacksaw blades then you'll have a tremendous range of blades to choose from and will be able to cut most anything. Solar Hacksaws are more tolerant to tensioning adjustment and run off. A major advantage of solar power hacksaw cutting is the relatively low capital investment required. Accuracy and finishes produced, range from fair to good depending on the material being sawed. Time saving as compared to simple hacksaw and comfortable than ordinary hacksaw.

II. SCOPE OF THE PROJECT

1. The machine can solve the problem of time consumption.

2. Waste of resources in face of labor cost is reduced.
3. The machine can be used in the industry where it is manufactured, at the packaging sector.
4. It provide alternative for industries aiming toward reducing human effort

III. OBJECTIVES OF THE PROJECT

1. Objective of this project is to increase production rate.
2. Reduce human effort.
3. Save electricity.
4. To provide alternative power source.

IV. LITERATURE REVIEW

Rithesh R. Jadhav et.al [2015] carried out design and performance analysis of hand held solar power cutter conclude that energy demand" is one the major thread for our country .finding solutions, to meet the energy demand is the great challenge for social scientist, engineers, entrepreneurs and industrialist of our country.

Kurvinen et.al [2015] ball bearing model performance on various sized rotors with and without centrifugal and gyroscopic forces bearing performance significantly affects the dynamic behaviour and estimated working life of rotating system

Archan B. Patel et.al [2016], design development of metal or wood cutting tool by using solar energy requirement of electricity of the world is increasing at very high rate because of industrial growth, increased and extensive use of electrical gadgets.

Ahijet mourya et.al [2017] fabrication of solar powered hacksaw" studied that, hacksaw is a handle tool used to cut through materials like metals pipes and wood. Its cutting mechanism is provided by removable blades which feature sharp teeth along their outer edge

Dr.Syed Azam Pasha Quadri et.al [2017],studied solar operated wood cutter conclude that, it is the need of time to replace conventional power hacksaw machine by solar powered hacksaw. Solar operated wood cutter is energy efficient as well as eco-friendly in comparison to convention hacksaw used.

Milan Gajera et.al [2017] carried out solar operated hacksaw machine introduce that it is the need of time to replace conventional power hacksaw machine solar powered hacksaw.

J Nagarjun et.al [2018] fabrication of solar powered wood and metal cutting hacksaw machine conclude that after completion of this project we gained lot of practical knowledge regarding purchasing and assembling and we also had real time industrial experience. We feel that the project work is a good solution for industries to save the energy and solar energy is also pollution less energy.

Rachit Garga et al [2018] Solar wood and metal cutting hacksaw cutter with help of sensor machine cutter will

cut the automatically as specified as the length as the user. This type of sensor will be used for determine the condition of cutter of hacksaw.

V. CONSTRUCTION AND WORKING

Solar Power Hacksaws are used to cut sections of wood. Cutting of solid shafts or rods of diameters more than fifteen millimeters is a very hard work with a normal hand held hacksaw. Therefore solar power hacksaw machine is used to carry out the difficult and time consuming work.

In solar operated wood cutter solar energy is converted in the form of electrical energy. This energy is stored in battery. One motor is rotated by the supply of voltage from battery and this rotary motion of motor shaft is converted into linear motion by using slider crank mechanism. And hacksaw blade is act as a slider and this hacksaw has frame and cutting fore given to hacksaw by using pneumatic cylinder. In forward strike piston apply cutting fore on hacksaw. When completion of wood cutting is take place position of hacksaw is sane by sensor and retract motion of pneumatic cylinder get start so hacksaw goes to upper side these motion of pneumatic cylinder is control by direction control valve

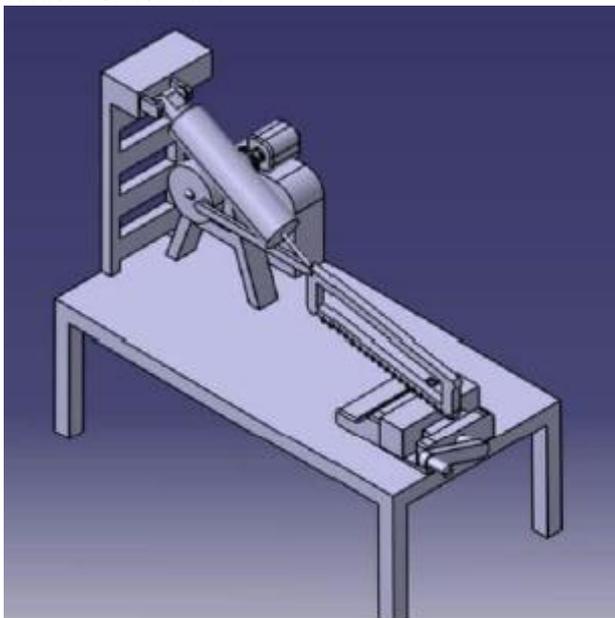


Fig.4.1. Concept of automatic power hacksaw machine

VI. SPECIFICATION OF COMPONENT

Motor- 70rpm
Solar panel- 12 V
Battery- 7-9 mega A
Pneumatic cylinder-
Diameter 20 mm.
Stroke length-150 mm
Pressure- 6 Bar

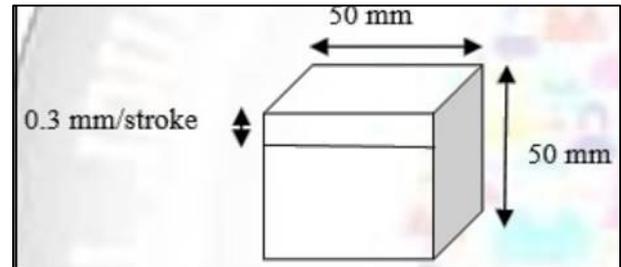
VII. DESIGN FOR CUTTING FORCE-

A block of dimensions 50×50 mm has been taken and the stroke length is 0.3 mm/stroke. After this from the table given below we have considered the value of maximum shear stress

and assumed that our machine can cut any wood specie. This is done in order to calculate power requirement of motor.

Species (Types of Wood)	Shear stress (MPa)
Loblolly pine	9.6
Sitka pine	7.9
Red oak	12.3
Yellow poplar	8.2
Balsa	2.1

Table 1: Types of permeable woods
Table 1: Mechanical Properties for Five Wood Species Properties of wood (Encyclopedia of Materials: Science and Technology, ISBN:0-08-0431526,pp. 9732-9736) For all wood we take $\tau_{\text{shear}} = 20 \text{ MPa}$



$$\begin{aligned} \text{Depth of Cut (d)} &= 0.3 \text{ mm/ stroke} \\ \text{Force Required (F)} &= \tau_{\text{shear}} \times \text{area} \\ &= 20 \times 0.3 \times 50 \\ &= 300 \text{ N} \end{aligned}$$

VIII. ADVANTAGES AND LIMITATION

A. Advantages

1. There is no need of giving feed during every cut due to the presence of weight.
2. The cutting speed can be varied according to our needs by adjusting the timer.
3. It does not have any Prime mover, like electric motor related to the unit.
4. As the air is freely available, we can utilize the air to cut the metal and hence it is economical.
5. Simple in construction than mechanical hacksaw.
6. It is a compact one
7. Less Maintenance

B. Limitation

1. Only smaller size and soft metal can be cut
2. It is costlier than the mechanical hacksaw because of compressor unit.
3. Less efficiency when compressed to mechanical device.
4. Leakage of air affects the working of the unit.

IX. CONCLUSION

- 1) it is the need of time to replace conventional power hacksaw by solar power hacksaw
- 2) solar operated wood cutter is energy efficient as well as ecofriendly in comparison to conventional hacksaw
- 3) This machine is light in weight and thus it is portable.
- 4) An advancement that can be implemented in solar operated wood cutter that the user can also make it automated using required mechanisms and sensors

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