

Design And Fabrication Of Mulch Cutting Machineusing Nonconventional Source

Prof. G.S Dhumal¹, A.P.Patwekar², S.R.Vishwakarma³, C.G.Phate⁴,
A.R.Mujawar⁵

^{1,2,3,4,5}(Department of Mechanical Engg. JSPM College of Engineering, S.P.Pune University, India)

Abstract: In the developing country like India where farming being the backbone of the economy of the country and farmers being the effecting agents of the GDP, care has to be taken for the well being of them. On a case study it was been reviewed that a major portion of the investment for farming today is taken up by the weedicides and pesticides in order to control the grass in the crops.

Hence to provide a alternate method for the removal of unwanted grass with a efficient monetary technique an idea of solar mulch cutter machine is brought forward in this paper. This project is to design and fabricate in order to minimize manual work as well as to use non conventional source of energy by using a solar panel and to overcome the above difficulties. Designing and Fabrication of SOLAR MULCH CUTTER has the following merits,

- Pollution free as solar energy is being used.
- More economical, as solar energy is abundantly available.
- Easy to handle and maintain.
- Used on a small scale for gardening.

This process started from the study of the early manufactured grass cutting machines and there designs. The 'Budding mower' manufacture in 1832 and further modified in 1850 using chains to transmit power from the rear roller to the cutting cylinder. It was called 'SilensMessor' meaning silent cutter. In US, Colonel Edwin George produced the first gasoline powered mower in 1919. Electric powered mowers and rotary cutting machines emerged in the 1920's and 1930's. Accordingly a solar panel with battery is used in this project. DC motor for working of the blades. Whereas wheels, handle and metal frame are being used to make the machine user friendly.

Keywords: Solar Panel,Reel mover,DC Motor,Battery,

I. Introduction

Now a day's pollution is a major issue for whole world. Pollution is manmade and can be seen in own homes. In case gas powered lawn movers due to the emission of the gases it is responsible for pollution. Also the cost of the fuel is increasing. Hence it is not efficient. So the solar powered lawn cutters are introduced. Solar powered lawn mower can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the moving of a lawn.

Solar energy is the renewable energy. Motor power push lawn mowers create noise pollution due to the sound of engine, And local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil even though electric lawn mowers are environmentally friendly, they too can be an in convenience .Along with motor powered lawn mowers, electric lawn mowers also hazardous and cannot be used by all. The project is an autonomous solar grass cutter that will allow the user to the ability to their grass with minimal effort. Hence we design to make a grass cutter without any power source due to reduce the power consumption.

Design a solar powered domestic lawn mower that utilizes solar power as an energy source is meant to address a number of issues that standard internal combustion engine mowers do not. An electrical lawn mower with a solar charger will by easier to use it. It will eliminate the emissions of an internal combustion mower which is mostly responsible for environmental pollution and causes the green gases effect. This is so because solar energy is green, renewable energy. Different designs have been made, each to suit a particular need or convenience. Making the power of cutting grass cutter over the years, many individuals have added modification to the original design speed, efficiency, and power of a mowing machine. The solar powered lawn mower is an improvement on cordless electric lawn mower.

II. Objective:

For the manufacturing of a solar grass cutter we referred various literature, papers etc. The review of previous method used given below. In this lawn mower uses an solar based energy source, which is easier to use more advantageous comparing to other energy sources. Which is easier to use, more advantageous comparing to other energy source especially for gas based source of power? But our lawn cutter is based on solar because this energy is a non conventional energy and it is easy to work. So we made solar powered lawn cutter. Alternatives to the use of non renewable and polluting fossil fuels to be investigated one such alternative is solar energy. In this solar based grass cutter the advantage of powering a mower by solar energy rather than by gasoline is mainly ecological. We manufactured this grass cutter because it is very easy method and many overcome produced from this type of grass cutter.

III. Solar Grass Cutter

A solar panel is a set of solar photovoltaic models electrically connected and mounted on a supporting structure. A photovoltaic module is packaged, connected assembly of solar cells .The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential application. Each module is rated by its DC output power under standard test condition (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output-an 8% efficient 230watt module will have twice the area of a 16% efficient 230 watt module .A single solar module can produce only a limited amount of power, most installation contain multiple module.

The grass cutter is made up of an electrical motor, a battery, an alternator, linear blade, and a link mechanism .the power and charging system comprise of an alternator which charges the battery while in operation. The electric motor forms the heart of machine and provides the driving force for the driving blades. This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower. The system is powered by an electrical switch which completes the circuit comprise the electrical motor and the battery. Solar power as an energy source will address a number of issues that slandered internal combustion engines do not. An electric grass cutter with a solar charger will be easier to use. There is no messy dangerous gasoline to deal with most importantly it eliminates the emissions of an internal combustion mower. A grass cutter is a device which by mean of one or more revolving blades issued to grass cut or other plants. Grass cutter employing a blade that rotates about a vertical axis are rotary mowers. While employing blade assembly that rotates about a horizontal axis are known as cylinder or reel mowers.

The main components of the solar powered grass cutter are

- Solar panels
- Electrical motor
- Mechanism used
- Blade
- Batteries

Frame:

The mild steel rod was used in the construction of the frame due to its workability, availability and cost effectiveness. The frame supports for the electric motor, battery as well the handle frame. The length of the frame is 80 cm and is also made up of two handles. The first handle supports at the hand and the second handle is for hands to move the arrangement. The frame supports for the electric motor, battery as well as the handle frame. The handle is allowed to handle the equipment and the blade is move to the grass.

Cutting Patterns:

The grass cutters have three types of cutting styles due to using three types of blades twisted, inclined , straight. The user will place this machine. In the center of their lawn and let it cut. To achieve this cutting pattern.

Handle:

- Handle (grip) attached to an object for using or moving the object
- Handle, a unique arrangement for grass cutting

Advantages:

Precise torque and speed control without sophisticated electronics

Several Limitations:

- Expensive
- Speed limitations

IV. Experimental Investigation

Solar Energy

Solar energy is radiant light and heat from the sun using a range of ever technologies such as solar heating, solar photo voltaic, solar thermal energy, solar architecture and artificial photosynthesis. It is an important source of renewable energy and its technologies are broadly as either passive solar or active solar depending on the way they capture and distribute solar energy or convert it to solar power. Active solar techniques include the use of photo voltaic systems. Passive solar techniques include orienting a building to the sun, selecting materials with favorable thermal mass or light dispersing properties and designing spaces that naturally circulate air.

Solar Panel

The solar panels are used to generate electric power. A panel design to absorb the sun rays as a source of energy for energy generating electricity. Photovoltaic module used light energy (photons) from the sun to generate electricity through the photovoltaic effect.

Maximum power: 25 watt

Maximum Voltage: 17.60 v

Maximum current: 1.4 A

Tolerance: $\pm 5\%$

Dimensions: 55*35 cm



Battery

The batteries are used as a storage device for solar energy which can be further converted into electrical energy. Battery can be in the interior of the lawn mower or on the outside.

Specification:

Cycle use: 14.4-15 volt

Max. Charging current: 2.25Amp

Charging capacity: 7.5 AH

DC Motor

It is the rotary electrical machine that converts direct current electrical energy into mechanical energy. Brushless DC electric motor also known as electronically commutated motors are synchronous motors powered by DC electricity via an inverter/ switching power supply which produces and AC/bi- directional electric to drive each phase of motor via closed loop controller.



Blades:

The horizontal blades are easy to remove and sharpen or replacing existing trimmer suffers from high power consumption. Mower blades are the cutting components of lawn mowers. They are usually made of sturdy metals as they must be able to withstand high- speed contact with averity of objects in addition to grass. The blade may be made from ceramic or other materials. Here we use reer blade. We are using three types of blades with adjustable arrangement for effective cutting of grass. Main modification A blade is that portion of a tool, weapon or machine with an edge that is designed to cut materials. The blade is seldom sharp enough to give a neat cutting; the blade simply tears the grass resulting in brown tips. However of our project is the blade adjustable arrangement and not a height adjustment which is in common grass cutting machine.



Mounting the Blade

This is the most important part and when designing for this safety as a major factor was put in to consideration as the blade when in operation can be hazard. Also the weight of the blade and how to mount it on the motor shaft is also a key consideration. More over the sharpness of the blade is another important aspect and this will depend on the power and the rpm of the motor used. We will mounting the blades on circular disc which is having slot to adjust different types of blades to fit in this and this disc attached to motor shaft with mechanism.

Materials and Methods

The cutting blade, the force required to cut the lawn as well as the force acting on the blade was considered. The force required by any sharp object to have impact on the grass is less than 10 Newton. It is also depend on the height, density and the area covered by the object. Therefore in designing the blade of the solar powered lawn mower, the force required for effective moving should be greater than 10 Newton. A stainless steel was used in the construction of the cutting blade because of its strength and weight which can transmit same speed as that of the dc motor or a little less cause of friction.

V. Working of the set-up:

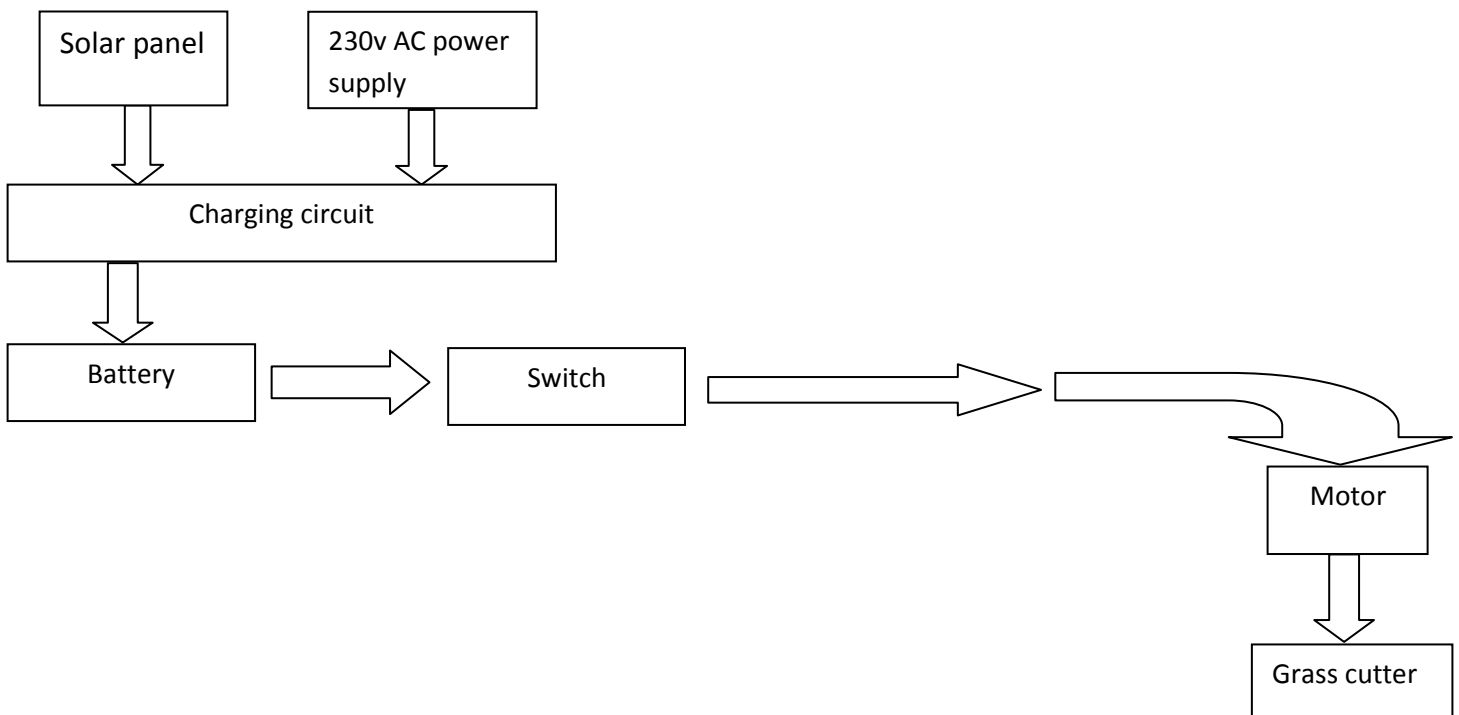
Photovoltaic Principles

The photo voltaic effect can be observed in nature in variety of materials that have shown best performance in sun light is the semi conductors as stated above. When the photons from the sun absorbed in a semiconductor, that creates free electron with higher energies then the created there must be an electric field to induce these higher energy electrons to flow out of the semi-conductor to do useful work. A junction of materials, which have different electrical properties, provides the electric field in most solar cells for the photo interaction in a semi conductor.

VI. Working Principle of Solar Powered Grass Cutter:

The working principle of solar grass cutter is it has a panel arrangement at an in such a way that can receive solar radiation with high intensity easily from the sun. The solar panel converts solar energy into electrical energy. This electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panel while batteries are charging. The motor is connected To batteries through connecting wires. Between these mechanical circuit breaker switch is provided. It starts and stops the working of the motor. From this motor, power transmits to the mechanism and this makes the blade to rotate on the shaft this makes to cut the grass.

The designed solar powered lawn mower comprises of direct current (dc motor), a rechargeable battery, solar panel, a stainless steel blade and control switch. Rotation is achieved by the electrical motor which provides the required torque needed to drive the stainless steel blade which is coupled to the shaft and to the gears to the motor. Gears are to increase the rpm and to reduce the power consumption. The solar powered lawn mower is a operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. The battery recharges through the solar charging controller, performance evaluation of the developed machine was carried out with different types of grasses.



VII. Mechanical Arrangements

In this first phase we just considered only about the mechanical arrangement, which is responsible for rotating dynamo. For this team members divided the work in to two divisions. The mechanical arrangement consist of

- External frame work
- solar frame
- Shaft with free wheel bearing
- Dc motor
- Blade
- Battery

External Frame Work:

The external frame work is having 80 cm cylindrical hollow pipes are welded. at the end of the pipe we have attached electric motor with gears arrangement and shaft to the blades.

Solar Frame Work:

To avoid weight on the frame the solar panel is separated from the panel. The solar panel is 17 watts which is connected to the battery.

VIII. Working of Solar Grass Cutter:

The rechargeable grass cutter was manufactured and developed. The solar energy is generated due to solar panel and the energy is stored in battery. Which convert the solar energy in to the electrical energy? The blades with dc motor connected to the battery. This solar grass cutter cut all types of grass. The test was carried out using the species of grass. The average height is according to the manual arrangement.

IX. Advantages:

1. Main advantage is the we use three types of reer blade so different types of grass cutting are done with this three blades.
2. Easy to use, because it is cordless.
3. With battery powered grass cutter, there is no more messy oil & smelly gasoline.
4. Now we are safety with no pollutants emitted. There are also no air filters & spark plugs to bother it.
5. The cost of electricity to recharge the battery is minimal compared to the high cost of gasoline, oil, air filters & spark plugs.
6. High conversion efficiency.
7. Has less moving parts
8. Less space required
9. Noise less operations so readily accepted in residential areas.

X. Disadvantages:

1. The eventually disposal of batteries is problematic.
2. The motors in cordless cutter lend to be less powerful than gasoline motors of the same total weight.

XI. Applications:

The project work is a very useful tool for

1. for cricket ground
2. for football ground
3. All garden
4. for agriculture purpose

XII. Conclusion:

It will be easier for the people who are going to take the project for the further modifications. The project is more suitable for common man as it is having much more advantages i.e., no fuel cost, no pollution, and no fuel residue. Different types of grass cutting are done with this machine due to adjustable blades. This will give much more physical exercise to the people and can be easily handled. This system is having facility of charging the batteries while the solar powered grass cutter is in motion. So it is much more suitable for grass cutting also. The same thing can be operated in night time also, as there is a facility to charge these batteries in day light. The frame which we use doesn't have height adjustment. If operator cannot handle this machine with this solar arrangement, we also provide another arrangement is manually operating machine, simply remove the motor and disc connecting belt. The project which we have done surely reaches the average families because the grass can be trimmed with minimum cost and with minimum time. Finally the project may give an inspiration to the people who can obtain better results.

XIII. Acknowledgement

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