SOLAR POWERED GRASS CUTTER

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ABSTRACT

The rapid development of numerous high-tech instruments and equipment allows us to complete our tasks in a more pleasant and efficient manner. The goal of the project is to create a grass cutting machine system that is based on the grass cutter.Solar energy is used to power the motor. Because of the ever-increasing expense of gasoline and the impact of emissionThis demanded the utilization of the abundant solar energy from the sun to reduce the emissions of gases from the burned fuel into the atmosphere. The sun can be used to power a grass cutter. Based on the findings, a solar-powered lawn cutter was devised and constructed.This seminar is about the creation of a solar powered lawn cutter and

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includes information on the general theory of mowing.of direct current (D.C) motor, a rechargeable battery, solar panel, a stainless steel blade

Keywords

Solar Panel, Grass, Cutter, Motor, Rotor Battery etc.

INTRODUCTION

Due to continuous increase in the cast of fuel and effect of emission of gases from the burnt fuel into atmosphere. This necessitated the use of solar energy from the sun as a source of power to drive a grass cutter.The solar power grass cutter machine comprises of direct current motor rechargeable battery ,solar panel ,stainless steel blade and control switch (on\off). The solar grass cutter is moving is achieved by the current DC motor which provide the required torque needed to drive the blade which is directly couple to the shaft of DC motor the sun provide amount of energy used for various aim on atmospheric earth system.The solar powered grass cutter is operated by the switch on the board which close the circuit and allows the flow of current to motor which in turn drive the blade used for moving the battery recharge through the solar charging controller .Solar grass cutter can operate manually and motor driven reel cutter of grass cutter is given adjustable height solar grass cutter is a very use full Device which is very simple in manufacturing. A solar grass machine that uses sliding blades to cut the grass at even length. Power consumption become essential for future. It is used to maintained and keep lawn , gardens, collages etc. It reduced cost. Our main aim in pollution control is attained through this. Currently, manually handled devices works on non-renewable sources of energy. Recently we are facing problems like air pollution, noise pollution, power cut problems, etc. If the climatic conditions are not suitable for the solar panel to generate power and if the user wants to operate the machine at that time, then there is an alternative source of power through battery. Due to high environmental impact, it was the most expensive cutter used by engine.

OBJECTIVE:

The aim and objective of this project is to design and fabricate a solar grass cutter which would be powered by solar energy.

The specific objective are as follows

- To study the design parameter of solar grass cutter.
- Fabrication of the solar grass cutter.
- Testing of the solar grass cutter.
- To analyze the solar grass cutter and compare its performance with gasoline operated mowers.

LITERATURE REVIEW

In this paper they have prepared manually handle device which is capable cut grass. It consist off linear blades an it does not affected by climatic condition they have used following components for preparing grass cutter.

Sr. no	Item	Quantity	Remark
1.	DC motor	2	Rotating the blade
2.	Battery	1	Power supply for motors
3.	wheel	4	Moving the robot
4.	Solar panel	1	Power supply for batteries

The main objective of this paper is move the solar grass cutter is different direction to prepared various design as per requirements. By using linkmechanism the height of cut can be adjusted. The unskilled person can easily operate this device. They have used solar panel so it is not required to charge battery externally and battery is continuously charge at constant voltage when grass cutter is in working. The battery is charge in day time by using solar panel and it is store so we can use grass cutter at night time also.

Solar plate which is placed above the grass cutter generates solar energy and used this energy for working the grass cutter solar panel batteries, DC motor and blades these components are used for preparing solar grass cutter dew to seasonal condition if batteries not charge they can provide solar panel to charge the battery instantly.

It is prepared by manually handle device the battery can be charge by using solar panel as well as external power supply, and DC motor which is controllable is used for changing the direction of grass cutter as per need are used they have used less number of moving components so there is less maintenance this solar grass cutter will give much more physical exercise to operator and it will easily handle. They have prepared manually operated solar grass cutter with linear blades increase the efficiency of cutting for adjusting the height blade cutter is components placed on grass cutter. This solar grass cutter used to cut the grass uniformly and also it can cut the different types grasses

The battery performs charging and discharging action between the solar panel and motor. The electric circuit ensures power transfer from the battery to run the DC motor, while the solar panel power, and continuously recharge the battery while in operation. The solar panel is a photovoltaic cell that generates currents when lights falls on its surface. The DC motor forms the heart of machine and provided driving force for the cutting the blades. The concepts examined were for a trapped shaped blade, for a flat blade design and for a sickle like shaped blade. After the design analysis,concept two which involved the use of a sickle liked shaped blade was selected for the solar grass cutter. The machine was designed to be operated by the electric motor. The solar grass cutter made use of batteries which were either charged by electric power sources or by solar energy by exposing it to the sunlight insolation. In the design, the solar panel connected by the ridge of the panel was raised above the electric motor. The solar panel consisted of multiple solar cells that produced the required

voltage and current. The blade assembly for solar grass cutter which produced efficient mulching of the grass was revied. It also reduced the risk of injuries caused by obstacle which were flung outward, such as rock, sticks, or by engagement of foot in the path of the rotating blade. The solar grass cutter was designed which was contained an electricmotor, a rechargeable battery and photovoltaic cells panel that was attached on the handle of solar grass cutter. A solar powered grass cutter was compared and studied with the gasoline powered grass cutter from the effectiveness point of view. Both the grass cutter were compared and concluded that the soler powered grass cutter were more efficient, noiseless, and had minimum energy cost. As it was solar powered, no air pollution was caused as gasoline grass cutter produced a lot of noise and affected the environment. In this concept they cut the grass on the agricultural land or small plants in lawn and garden.The main function of solar charger is increased current during batteries are charging and also disconnect when they are fully charged. Circuit's breakers are used to start or stop the motor. By considering ground clearance they can adjust the height of grass.The average height of grasses after moving was lesser than the expected after the machine have been adjusted to a height for four species of grasses. Less time required for cutting the grass. The efficiency is also increases.

METHODOLOGY:

DESIGN AND FABRICATION: Several design factors should be taken into account for the economical and efficient development of a solar lawn mower. These are considerations that should be put in place during the fabrication process so as to ensure optimal productivity of the machine. Listed below are the design consideration:

i.The blade geometry and shape.

ii. Materials consideration of the blade.

. iii. Ther.p.m consideration.

iv. The deck size.

v. The power rating of the solar panel.

Because of the design of the planned lawn mower, a flat-shaped blade will be used. They really are.Standard blades are those that are designed to generate adequate lift to move the grass out of the way.Area of the mower deck Other blade configurations for the mower include tapered blades and sickle bar blades.However, a flat blade is selected for this project due to its mass, which is appropriate given the project's size and complexity.the machine's weight and the motor's speed Blades with a tapered or sickle shape provide a higher cutting pressure.However, the mass is quite low. Because the shaft that rotates the blade has a large mass, the blade must also have a large mass.To keep the blade from wobbling, add bulk. Solar energy is a time dependent energy that occurs at irregular intervals. Therefore energy has to be stored so it can be readily available for use when there is no further supply of the sun energy. The solar panel (or photovoltaic cell) harnesses the solar energy when the sun is available during the day. The sun produces constant amount of energy with a solar radiation intensity of about 6.33x107 W/m2 at the surface of the sun. Photovoltaic modules and arrays produce direct-current (DC) electricity and current combination. Solar photovoltaic cells are essentially semi-conductors, which have electrical transmission properties like metal or salt water and insulators like rubber. Solar panels are constructed with sheets of doped silicon, primary element in beach sand with impurities added like phosphorus that allows the flow of electron. To charge the battery, a solar panel is expected to tap the solar energy from the sun and convert it to electric energy that will be put away in the battery connected to it. At the point when the protons from the sunlight based energy hit a photovoltaic cell, a progression of electrons begins which can be drawn off by a connectedwires, this generates direct current. Various sun oriented cells electrically connected with one another and mounted in a support structure or edge is known as a photovoltaic module. Modules are intended to flexibly supply a specific voltage. The current created is predominantly proportional to the amount of light striking the module.A charge regulator that will be wired between the solar board and the battery is likewise required. The

reason for the controller is to prevent the battery from the solar panel when there is no insulation or production of electricity. It likewise prevents excessive charging when the battery gets fully charged and furthermore controls the voltage getting to the battery.In selecting the solar panel the following were considered; i. The average sun hours per day (insolation). ii. Battery capacity iii. Current draw of the motor. iv. Mower operation duration.

CONSTRUCTION:

SOLAR PANEL: A solar cell or photovoltaic cell , is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect which is a physical and chemical phenomena light shining on the solar cell produce both a current and a voltage two generate electric power

Figure. solar panel

BATTERY:A battery is used for storing the solar energy which will be converted into electrical energy. Solar cell modules produce electricity only when the sun is shining and do not store energy. It is therefore necessary to store some of energy produced. Solar power can be store in the rechargeable battery and can be further used for the grass cutting machine to run.

Figure. Battery

MOTOR: The motor is used for the rotating the blade and when the blade is rotated the grass is cut.The device is converts electrical energy into mechanical energy. The blade is connected to the D.C motor. When the motor switched ON the blade rotate at higher speed and cut the grass.

Figure..DC motor

BLADE:A blade is the part of tool or machine with an edge that is designed to cut scrape surface.

Figure. Blade

CASTER WHEEL: We used the caster wheel for moving the body. Caster wheel are used to move high load object. With the help of caster body move easily.

Figure. Caster wheel

SWITCH: We have used the ON OFF the blade.

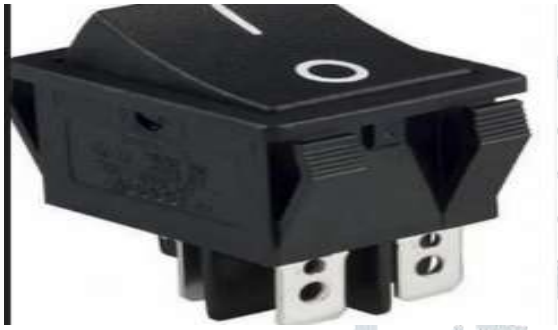

Figure. Switch

WIRE: We have used the wire for giving different connection in motor, battery, solar panel etc.

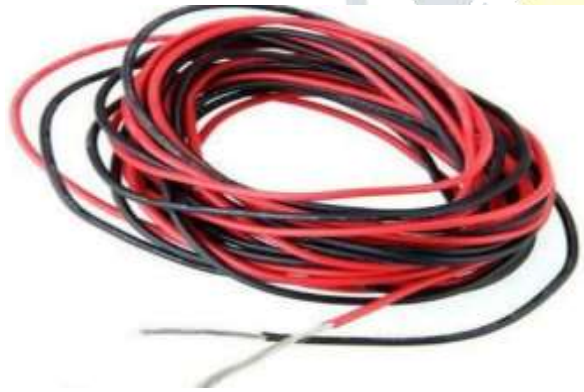

Figure. Wire

CALCULATION:

Place	Time	Voltage with load	Voltage without load	Current with load	Current without load
RITM Lucknow	10:28 am	9.23 V	11.48 V	1.412 A	1.136 A
RITM Lucknow	11:30 am	9.75 V	12.3 V	1.513 A	1.2 A

Average voltage $(V_{av})=(V_1+V_2)/2=(9.23+9.75)/2=9.5V$

Average current of with load$=(I_1+I_2)/2=(1.136+1.2)/=1.168A$

Power = $V\times I$ $=9.5\times1.168=11.96$watt

Tarque of cutting motor.

N=motor rpm=600rpm

$P=2\pi NT/60$ watt

Torque $=P\times60/2\pi N$

$T=(11.096\times60)/2\pi600=0.176$ N-m

Cutting force on blade $=(T\times2)/$blade length$=(2\times0.176)/0.3$

F=1.1733N

Cutting grass area$=\pi/4\times L^2=706.5cm^2$

CAST ESTIMATION:

SR.NO	COMPONENT NAME	COST
1.	Elbow	180
2.	T Joint	480
3.	+ Joint	100
4.	Caster Wheel	440
5.	DC Motor	400

6..	Battery	300
7.	Solar Panel	530
8.	Nut Bolt	40
9.	Mild Steel Blade	20
10.	Bush	20
11.	PVC Pipe	700
12.	Tag\Clamp	80
13.	Switch	20
		TOTAL
		3310 (INR)

RESULT AND DISCUSSION:

The solar powered grass cutter was fabricated and tested. During the machine operation electrical energy of battery watch converted to mechanical energy through the blade to achieve cutting operation. The electric circuit insured that power was transferred from the battery to run the DC motor, while the solar panel continuously charge the battery during operation. The blade generated power from the DC motor at a speed of 3000 rpm. When the switch is on , the electrical energy from the battery powers the DC motor which in turn actuates the blade. The solar panel generates current to recharge the battery, thereby compensating for battery discharge. The rotating blade continuously cuts the grass as the mower is propelled. To cut the grasses at different height using an adjustable lever mechanism attached to deck area to the machine during the operation .

CONCLUSION : Because it uses nonrenewable energy sources, the total energy obtained from the sun greatly exceeds our energy needs. It was designed to be a green alternative to the popular and environmentally disastrous gas-powered vehicles.It's like a lawnmower, but it's more efficient.It is also easily handled by non-skilled individuals. It can be done with simple switches or predetermined programming.be simple to handle and control in a short period of timeBecause itrecognizes the obstruction and adjusts the path or stops, it is extremely efficient and precise.working in accordance with the instructions As a result, equipment should be protected from damage and the risk of failure should be minimized hazard to humans :

FUTURE SCOPE : Light sensors can be used to secure the solar panel. As a result, depending on how the sun is arranged, the panel will be slanted so that the sun rays areincident normally (at 90 degrees) on the solar panel. As a result, the device would be capable of capturing solar energy at all times, even when the sun's light is weaker. If a panel is used, Because the machine has a large wattage, it can be utilised for garden illumination or room lighting at night.can amass greater strength At night, though, you keep it separate. As a result, the battery's power can be increase for this purpose.

Advantages:

- Low weight and easy to move anywhere.
- Very easy to use.
- Design of it is compact simple.
- More life of solar panel.
- As it is working on solar no fuel cost.
- It does not cause any environmental pollution.

Application:

- It can be used in garden at home.
- It can be used in public park.
- It can be used in college.

REFERENCES:

[1] P. Amrutesh et al. Int. Journal of Engineering Research and Applications ISSN : 2248- 9622, Vol. 4, Issue 9(Version 3), September 2014, pp.10-21

[2] International Journal of Engineering and Technology Volume 3 No. 10, October, 2013 [3] International Journal of Scientific & Engineering Research, Volume 5, Issue 6, June-2014 ISSN 2229-5518

[4] ISSN NO :2348-4845 International Jouranal and Magazine of Engineering, Technology, Management Research. ISSN No: 2348-484

BIBLIOGRAPHY

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