DESIGN AND FABRICATION OF MANUAL SOLAR GRASS CUTTER

[1]SHIVENDRA SINGH, [2]KRISHN PRAKASH YADAV,

[3]VINEET RAI

[12]UG Students,[3]Assistant Professor, Department of Mechanical Engineering

Institute Of Technology and Management, Gida, Gorakhpur, India.

ABSTRACT

Our tasks are more comfortable and sophisticated thanks to the rapid rise of numerous high-tech instruments and equipment. The goal of the project is to create a lawn cutting machine system that uses solar energy to power the grass cutter. Based on the main principle of mowing, a solar powered lawn cutter was created and built. This lecture will cover the design of a solar-powered grass cutter, which includes a direct current (DC) motor, a rechargeable battery, a solar panel, a stainless-steel blade, and a control switch. The solar grass cutter is controlled by a switch on the board that closes the circuit and allows current to flow to the motor, which drives the mowing blade. The solar charging controller recharges the battery. Different varieties of grasses were used to test the performance of the produced machine.

Key words: Solar Charger1, Solar panel2, Dc motor3 and Cutter blade4.

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1. INTRODUCTION

Because of the rising cost of fuel and the effect of gas emissions from burned fuel into the atmosphere, it became necessary to use the sun's abundant solar energy as a source of power to drive a lawn mower Based on the general concept, a solar-powered lawn mower was designed and developed The mowing principle The solar lawnmower is made up of direct drive components a direct current (DC) motor, a rechargeable battery, a solar panel, and a stainless steel blade to switch The D.C motor provides the necessary power for moving .Torque is required to drive the stainless steel blade, which is connected to the motor directly the D.C motor's shaft.

The solar lawnmower is controlled by a switch on the board that closes the circuit and allows electricity to pass to the motor, which then drives the mowing blade. The battery is recharged by solar power controller. The performance of the developed machine was assessed using grasses of many sorts

The sun provides a steady supply of energy for different purposes on Earth, including the atmospheric system. The only variation is how the energy source is used. It is expected that a lawnmower powered by solar will be more efficiency address several challenges that the traditional internal combustion engine and Lawn mowers with electric motors do not.

A lawnmower powered by solar energy is more convenient to operate since it avoids downtime caused by repeated journeys to the gas station for fill-ups and the risk of gasoline leakage. The hazardous emissions produced by the gasoline spill and those of the Internal combustion engines emit no pollution into the atmosphere. The solar system Air pollution will be reduced by using a motor lawnmower. As a result, a solar grass cutter is employed.

2. LITERATURE REVIEW

Reference [1]" created a basic self-propelled lawn mower that is both portable and simple to use. An alternator was built in his design to recharge the D. C. battery that powers the electric motor. The system's blades are powered by several pulleys attached to the motor. Overall, it's a cordless electric power mower with a cutting efficiency of 89.55 percent. A manually operated cylindrical lawn mower was created and built by "Reference [6]." An internal gear arrangement in the mower transfers torque to the blade. The machine's performance was evaluated on a sports field, and the machine's cutting efficiency was determined to be 91 percent with 0.244KN human effort. A solar mower was designed by "Reference [11]."

The blades are powered by a direct current (D.C) motor attached to the battery, and the energy needed to operate the mower is generated by a photovoltaic panel. The design was evaluated using a field capacity of 1.11x10-4 ha/hr nm and 93 percent efficiency was obtained. [12] Created and investigated a rotational lawn mower. A new product (simple lawn mower) was proposed that is both cost effective and basic in design. ANSYS workbench was used to analysis the frame and adjustable module. The results demonstrated that the frame is safe and reliable under loading conditions. A simulation of an improved solar lawn mower machine was created by "Reference [7]."

In Nigeria, the focus was on improving solar lawnmowers using locally available materials. The ability of the programme to foresee the circumstances in which failure is likely to occur was indicated as a factor in the lawn mowers efficiency. The intended model was simulated using SOLIDWORKS 2014 and the finite element method (FEM). In comparison to internal combustion engine lawnmowers, "Reference [5]" reviewed and assessed three (3) different types (solar, electric, and gasoline) of lawnmowers and determined that solar powered lawnmowers have above 90% cutting efficiency and cause no air pollution or noise. They also discovered that the angle of sunlight landing on the solar panel influences the way the system gets charged.

3. PARTS USED IN PROJECT

I. Solar Panel

Sun, also known as Sol by astronomers, is usually the most powerful source of light accessible. Some scientists refer to them as photovoltaic, which simply means "light-electricity." This is the foundation conversion of solar energy into electrical energy is known as photovoltaic conversion. A photovoltaic cell or solar cell is made Solar panels, as seen in are devices that transform light into power. They're named "solar" panels because the up of a mix of n-type and p-type semiconductors. All of these cells have a direct rate. desired, current that can be converted to alternating current. Future cells could make use of materials like the Gallium arsenate, copper sulphate, cad sulphide, and other semiconductors the device that was used to use the Solar cell is a photovoltaic effect.

Fig; - Solar panel

II. Battery

Batteries convert chemical energy straight to electrical energy. A battery is made up of a certain number of voltaic cells. The chemical reactions take place in these voltaic cells, which are made up of certain chemical compositions. A conductive electrolyte comprising anions and cations connects two half cells in each cell. One half-cell includes electrolyte and the negative electrode, the electrode to which anions (negatively charged ions) migrate; the other half-cell includes electrolyte and the positive electrode to which cations (positively charged ions) migrate. The battery is powered by redox processes. During charging, cations are reduced (electrons are added) at the cathode, while anions are oxidized (electrons are withdrawn) at the anode. During discharge, the procedure is reversed. The electrodes do not touch one other, but are electrically the electrolyte connects.

Fig; - DC Battery

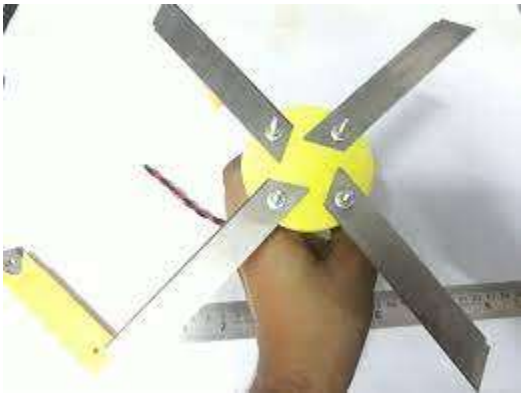
III. DC Motor

A DC motor is an electric motor that is physically commutated and runs on direct current (DC). By definition, the stator and its current are both stationary in space. The commentator switches the current in the rotor such that it is also stationary in space. The highest torque is generated by keeping the relative angle between the stator and rotor magnetic flux approximately 90 degrees. A rotating armature winding (winding in which a voltage is induced) but a non-spinning armature magnetic field, as well as a static field winding (winding that produces the main magnetic flux) or permanent magnet, are found in DC motors. Distinct field and armature winding connections provide different speed/torque regulation features**.**

Fig; - DC Motor

IV. Blades

The cutting components of lawn mowers are mower blades. They're frequently built of tough metals because they have to resist high-speed contact with a number of substances besides grass. The materials utilized (as well as the blades' size, thickness, and design) differ per manufacturer. The cylinder cutting gear on the first known lawn mower was composed of iron. It was used to mow athletic fields and large gardens. Cutting mechanisms developed and evolved as manufacturers changed the form and structure of mowers, including cylinder/reel blades, deck blades, mulching blades, and lifting blades.



Fig; - Blades

V. Solar Charger

Charge controller, voltage regulator, charge-discharge controller, or charge-discharge and load controller are all terms used to describe the power charge regulator. Between the array of panels, the batteries, and the equipment or loads, the regulator sits. The regulator avoids overcharging and over discharging by monitoring the voltage of the battery. Solar regulators should be linked in series to minimize overcharging and over discharging. Switches are used to connect and detach devices, and they can be electromechanical (relays) or solid state (bipolar transistor).

Fig; - Solar charger

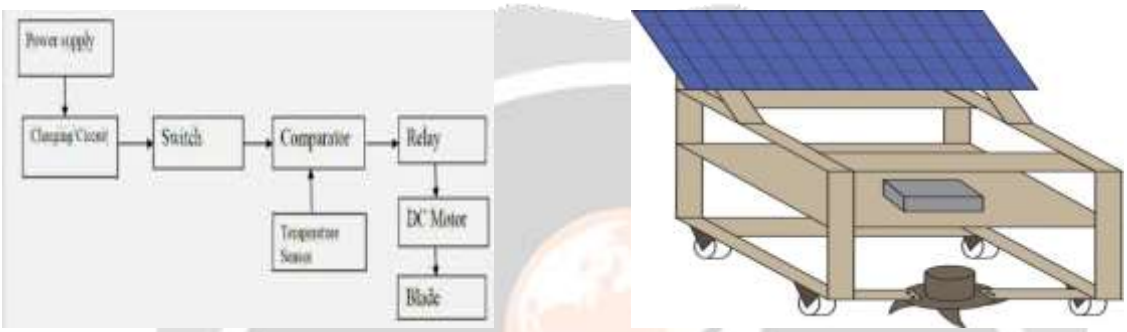
5. WORKING

The key development direction in the field of intelligent information appliances is Irrigation field appliance control we created a wide and admirable line of Solar Grass Cutters that include solar panels. Because energy is so vital in

today's world, it should be discussed as often as possible. Even yet, all of these lawn mowers and grass cutting machines require the same components to function properly: a motor, a rotating blade, a moving, and a means of disposing of grass clippings.

The entire system is controlled by turning on the DC motor that is connected to the grass cutting blades. The complete model is divided into two sections: a managing portion and a designing section. Rechargeable battery, relay switches, and solar panel make up the control part. The motor can be controlled by a relay switch depending on the charging circuit. Solar energy is stored in a battery and then used to power the motor via a relay switch.

6. BLOCK DIAGRAM



Fig; -Block Diagrams

7. APPLICATIONS

The solar grass cutter is a really helpful device that is also extremely simple to build. It's utilized to keep lawns in gardens, schools, and colleges looking good. We made some improvements to the old equipment to make it easier to use and less expensive. This is how we achieve our major goal in pollution reduction.

8. RESULTS AND CONCLUSION

The solar lawnmower machine was conceived and manufactured successfully. The solar panel converts sunlight into electrical energy, which is then stored in the battery. However, a charger controller is put beside the battery to assist prevent the battery from being overcharged or discharged. As a result, the battery provides the essential energy to the electric motor.

The project's main goal is to design and build a solar grass cutter, which is an environmentally beneficial gadget. There had been several attempts in the past to create a device that cut the grasses, but they were mostly center on using human or animal muscle power. In addition, technological advancements have led to the use of electric power to propel lawn mowers. People are increasingly focused on employing renewable energy sources for all activities that consume non-renewable resources as the world faces an energy crisis. Similarly, the grass cutter's power consumption has been shifted to the solar sector, which is a renewable energy source.

9. 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 are incident normally (at 90 degrees) on the solar panel. With this, the device would be capable of capturing solar energy at all times, even when the sun's light is weak. Because we can accumulate more power with a high-wattage panel, the machine can be utilised at night for garden illumination or room lighting. At night, though, you keep it separate. As a result, the battery's power can be utilised for this purpose. We can also use one of the valves in the pipe for gardening, i.e., pouring water for plants. We can move files, books, and other items from one location to another in the office or anywhere else by connecting one box type transporter. After adapting for small rice harvesting, grass cutting can be used more efficiently.

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