

Fabrication of Solar Powered Lawnmower

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ABSTRACT

Lawn mower is a machine that uses blades to cut a lawn at an even length. Even more sophisticated devices are there in every field. Solar lawn mower is a very useful device which is very simple in construction. It is used to maintain and keep lawns in gardens, schools, colleges etc. Unskilled operator can operate easily and maintain the lawn very fine and uniform surface look. The present work proposes a model of the lawn mower powered through solar energy as well as electrical energy. This is reduced both environment and noise pollution.

Keywords : Solar Panel, Battery, Relay Switch, Comparator, Temperature Sensor, Motor, Blades.

I. INTRODUCTION

The past technology of grass cutting is manually operated by the use of hand devices like scissor, these results into more human effort and more time required accomplishing the work and in old methods lack of uniformity of the remaining grass. Due to the use of engine powered machines increase the air and noise pollution also this grass cutter require maintenance. The objective of the present work is to design the lawn mower which operates on solar energy and avoids the drawback of old lawn mowers. The purpose is to avoid energy crisis in India and reduces the human efforts, operating cost and maintenance cost. Also solar based grass cutter keeps the environment clean and healthy. It is used for cutting different types of grasses for various applications. The whole machine operates on the solar energy

Solar panel, battery, DC motor, solar charger these components are used for fabrication of grass cutter. They have used less number of moving components so there is less maintenance. This grass cutter will give much more physical exercise to operator and it will easily handle.

Manually Operated Grass Cutter with straight Blades

A straight blade increases the efficiency of cutting. For adjusting the height a reel cutter is component placed on grass cutter. This grass cutter is used to cut the grass uniformly and also it can cut the different types grasses. The battery can be charged during working conditions and it also having AC charging.

Table 1 : Capacities of different components

Component	Voltage(in volts)	Current(in amps)
Motor	12	0.2
Battery	12	7.5
Solar panel(20W)	12	4.5

Manually Handle Device

The battery can be charged by using solar panel as well as external power supply. The most modern regulator is used for preventing overcharging and discharging of battery which saves span of battery. Due to industrialization more electricity is required for various industrial applications and electrical gadgets so solar energy is best alternative for electricity.

II. METHODS AND MATERIAL

In the present work the device which is able to perform the task is based on solar energy and a temperature sensor is used to detect the motor temperature to prevent from coil burning.

The system depending on the charging circuit the motor can be controlled using relay switch. The solar energy stored in the battery and then runs the motor through the relay switch. The system also includes comparator circuit for checking the temperature of the motor and when it goes beyond the limit the motor gets switched off automatically using relay switch. The motor is continuously functioning still energy supplied from the battery.

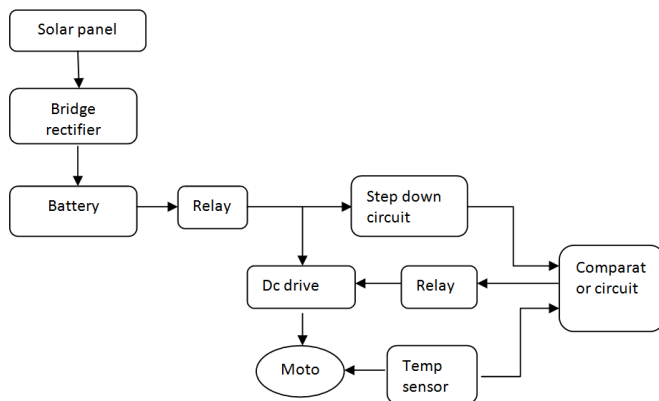


Figure 2 : Block diagram presents functioning of various components

The various components comprises of present work are explained below:

2.1 Components

Solar Panel

A solar cell or photovoltaic cell is a device that converts solar energy into electricity by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight, while the term photovoltaic cell is used when the source is unspecified. Assemblies of cells are used to make solar panel, solar modules, or photovoltaic arrays. Photovoltaic is the field of technology and research related to the application of solar cells for solar energy. Here the panel capacity is 20W



Fig 2.1.1: Solar Panel

Temperature Sensor

The LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. To detect the heat produced during the occurrence the temperature sensor is used.

Comparator

The LM358 (Low Power Dual Operational Amplifiers) series consists of two independent, high gain internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages.

Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal.

A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protection relays".

Battery

A rechargeable battery is used to run the system and it comprises of one or more electrochemical cells, and this type of batteries come in 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. but at presnt work lead–acid battery is used.

Voltage: 12v, current: 7.5amp

Motor

A DC motor uses electrical energy to produce mechanical energy through the interaction of magnetic field and current-carrying conductors.

Main frame is constructed with one inch square tube of metal mild steel with certain dimensions as per specified, with length of 460mm, width 410mm and height 140mm.

The reverse process, producing electrical energy from mechanical energy is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).
Voltage:12v, current:0.2amp

Blades

The blades have a length of 150mm and thickness 2mm. They are welded as pillars, which will give the support for the surface of the platform with lever arrangement. At the bottom of the platform a lever is attached. Hence when a pressure is applied on the surface of the platform it supports strongly because of the welding.

Working principle

Coming to the working of solar powered grass cutter, it has panel mounted in a particular arrangement at an angle of 0 to 360 degrees in such a way that it can receive solar radiation with high intensity easily from the sun.

This solar panel convert solar energy into electrical energy as studied earlier. Now this electrical energy is stored in battery by using a solar charger.

The motor is connected to the battery through connecting wires. Between these a motor driver is provided. It starts and stops the working of the motor.

From this motor, the power transmits to the mechanism and this makes the blade to rotate with high speed and this makes to cut the grass.

2.2 Fabrication

Fabrication is a process of joining of two or more components by applying temporary assembly or permanent assembly process like welding, riveted joints and some other joining operations.

In the present work arc welding, gas welding and bolts and nuts was preferred to join the various components.

After the fabrication is completed the equipment is painted to resist the corrosion, so the final fabricated lawn mower is as shown in the figure.



Fig 2.2.1: Solar powered lawn mower

The motor bed is constructed with grey cast iron sheet with specified dimensions as length 360mm and breadth 200mm. Motor is placed at centre of rectangular field clamped with two bolts with a fixture of rubber.

Motor bed is attached to main frame with welding process. Here the motor bed is adjustable with respect to height. The rail cutter is fixed 30mm below from the motor bed and it can be adjusted at different heights. Hence the rail cutter is used to guide the grass towards the blades to cut the grass in proper manner.

Four wheels with diameter of 110mm is attached at height of 120mm to the main frame from the ground. The wooden board with specifications of

540mm×250mm is placed at the top of main frame and which consists of electronic components and circuits.

One inch diameter of two hollow square shape columns with lengths of 100mm positioned at angle of 60° on the main frame. Same metal and shape of two bars with lengths of 600mm are joined with another bar of length 200mm and formed a U-shape. This U-shape configuration is fixed into the inclined columns which are already positioned on the main frame.

A long rod of diameter 250mm consists threads are fixed in U-shaped frame at the middle position connecting the two hollow bars. Two bolts are positioned on the long screw and freely moving along its length. The solar panel is positioned on the long screw with the help of two bolts and by adjusting these two bolts the panel will be freely rotated about 360° with respect to sun light movement.

One meter long wire is used to connect the solar panel and bridge rectifier so the electric energy generated at the solar cells are freely transmitted to bridge rectifier.

III. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the present work has been successfully implemented. Thus this work has been successfully designed and tested.

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