

Solar powered grass cutter and safety pesticide sprayer

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Abstract- Rapid growth of various high-tech tools and equipment makes our jobs done comfortable and sophisticated. Due to the continuous increase in the cost of fuel and the effect of the emission of gases from the burnt fuel atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a grass cutter and pesticide sprayer. The project aims at solar powered grass cutter and safety pesticide sprayer machine system which makes the grass cutter based motor and pesticide sprayer based on solar pump running through solar energy. A solar powered grass cutter and pesticide sprayer was designed and developed, based on the general principle of mowing this project deal with designed and fabrication of solar powered grass cutter and sprayer comprises of direct current (D.C) motor, rechargeable battery, solar panel, stainless steel blade and control switch. The solar powered grass cutter and pesticide sprayer is operated on the control panel which close the circuit and allow the flow of current to the motor which in turn drive the blade used for mowing and for the purpose of spraying of pesticide solar pump is used. So in this project we design and fabricate solar powered grass cutter and sprayer which can be use as per our need.

Index Terms- Solar, DC motor, Blades, Sprayer, Control panel

1. INTRODUCTION

Now a days pollution is a major issue for whole world. In case gas powered grass cutter and pesticide sprayer due to the emission of gases it is responsible for pollution. Also the cost of fuel is increasing hence it is not efficient. So solar grass cutter and pesticide sprayer are introduced. solar powered grass cutter and safety pesticide sprayer can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the mowing of a lawn. Solar energy is the renewable energy.

Grass cutter or lawn mowing with a standard motor powered lawn mower is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled

people. Motor powered push lawn mowers and riding lawn mowers create noise pollution due to the loud 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 inconvenience. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all. Also, if the electric lawn mower is corded, mowing could prove to be problematic and dangerous. The self-propelling electric control panel lawn mower is a lawn mower that has control panel capability. This prototype is cost efficient, safe to use, efficient to use, and environmentally friendly. It can save significantly on labor costs.

Previous all pesticide sprayers don't have safety to protect human from pesticide sprays on human body but in this sprayer have safety sheets to protect human body from pesticide spray.

2. PROBLEM IDENTIFICATION

There are lots of labour charges needed for a simple grass cutting and spraying work. The electric and labour charge both cost gives a heavy expense. Along with this conventional grass cutter operated on gas or diesel are responsible for large amount of air pollution. Major problem associate with conventional sprayer is it's noise production during operation. The human body depends on atmosphere and weather conditions. Earlier most of activities are done by naturally. Gradually so many big and small equipments are developed to ease human activities, thus to reduce the human efforts to do the things.

Now a days most of the activities which included human efforts are either replaced or automated by the use of machines or other kinds of equipments. Now we have a need to depend on the technology. Due to the risk involved in a conventional grass cutter and now very few people are coming forward to grass cutting by conventional methods. Moreover, educational background of Indian youth is improving. So, most of the people hesitate to use old and conventional grass cutter and sprayer.

3. SOLAR POWERED GRASS CUTTER

The lawn mower or grass cutter is made up of an induction motor, a battery, an alternator, three collapsible blades, and a link mechanism. The power and charging system comprises of an alternator which charges the

battery while in operation. The D.C. motor forms the heart of the machine and provides the driving force for the collapsible blades.



Fig 3.1 Solar powered Grass Cutter

This is achieved by the combined effect of mechanical action of the cutting blades and the forward thrust of the mower.

4. SOLAR ENERGY

Solar energy is radiant light and heat from the sun harnessed using a range of ever-evolving technologies such as solar heating, solar photo voltaics, solar thermal energy, solar architecture and artificial photosynthesis.



Fig. 4.1 Solar Energy

It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active

solar depending on the way they capture and distribute solar energy or convert it into solar power times greater than the total annual energy of the world. A large amount of solar radiation fall on India and for most of the country very few days are without sunshine.

India lies within the latitude of 7 N to and 37 N with annual average intensity of solar radiation as 500 to 600 cal/cm/day with more such insulations available in arid and semi arid regions.

5. COMPONENTS

5.1 BLADE

A blade is that portion of a tool, weapon, or machine with an edge that is designed to cut and/or puncture, stab, slash, chop, slice, thrust, or scrape surfaces or materials. The blade is seldom sharp enough to give a neat cutting.

5.1.1 DECK BLADES

Also known as the standard or straight mower blade, this is the most commonly used blade on rotary mowers. the blade of a rotary mower is usually mounted directly to the crankshaft of its engine, but it can be propelled by a hydraulic motor or a belt pulley system.



Fig 5.1.1 Deck blades

5.1.2 FIXED BLADE

The blade which has no motion is called Fixed blade. This fixed blade is welded to the frame.



Fig.5.1.2 Fixed Blade

5.2 D C MOTOR

A DC motor is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore so is its

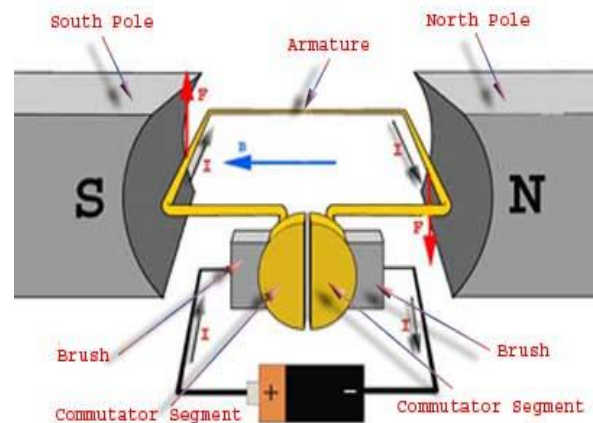


Fig 5.2 DC Motor

current. The current in the rotor is switched by the commutator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates DC motors have a rotating armature winding (winding in which a voltage is induced) but non-rotating armature magnetic field and a

static field winding (winding that produce the main magnetic flux) or permanent magnet. Different connections of the field and armature winding provide different inherent speed/torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems called DC drives.

5.3 SOLAR PANEL

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a 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 applications.



Fig.5.3 Solar panel

Each module is rated by its DC output power under standard test conditions (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 230 watt 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 installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and / or solar tracker and interconnection wiring.

5.4 SOLAR PESTICIDE PUMP

Pesticide pumping has a long history , so many methods have been developed to pump pesticide with minimum of effort. These have utilized variety of power sources, namely human energy, animal power, hydro power, wind power, solar and fossil fuels for small generator.



Fig.5.4 Solar pesticide pump

A solar electric array generate electricity from the sun's light with no moving or wearing parts. A solar pump is utilize the direct current from the array efficiently even as the energy production varies throughout the day.

5.5 NOZZLE

In a spring systems, nozzle break the liquid into droplets and form the spray pattern nozzle determine the application volume at given operating pressure, travel speed and spacing. Selecting nozzles that

produce the largest droplets size, while providing adequate coverage at the intended application rate and pressure, can minimize drift. The size of the spray particle is important because it affects both efficiency and spray drift of the application of an herbicide, insecticide or fungicide.



Fig 5.5.1 Nozzle

6. MECHANICAL ARRANGEMENTS

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

- External framework
- Solar frame
- Shaft with free-wheeling bearing
- Wheels with DC motor
- Secondary spring with breaking arrangement
- Blades
- Battery
- Solar pesticide pump
- Nozzle
- Storage tank
- Control panel

7. WORKING PRINCIPLE

7.1 WORKING PRINCIPLE OF SOLAR POWERED GRASS CUTTER

The working principle of solar grass cutter is it has panels mounted in a particular arrangement at an in such a way

that it can receive solar radiation with high intensity easily from the sun. These solar panels convert 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 panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. The motor is connected to the batteries through connecting wires. Between these two mechanical circuit breaker switch 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 slide on the fixed blade and this makes to cut the grass.

7.2 WORKING PRINCIPLE OF SOLAR POWERED SPRAYER

Solar radiation can be converted directly into electricity using semiconductor devices which are known as Photovoltaic (PV) cells. When sunlight falls upon the solar cell a part of the light is absorbed and it is converted into electrical energy by means acid battery for storing the electrical energy. A 12V DC motor is connected to these lead acid battery to convert the electrical energy into mechanical energy.

The solar agro sprayer consist of three main parts namely,

1. Solar panel unit
2. Storage battery unit and
3. Solar pump

In the solar agro sprayer the two stroke petrol engine component of the power sprayer has been replaced with a combination of storage battery and solar pump. Solar panel arrangement has been provided at the top of the unit to charge the storage battery. The units of solar panel, storage battery and solar pump were mutually attached with one another. A solar panel of size of 1 m² are

mounted on a circular metal frame which is enclosed over the plastic water storage tank of capacity of 10 liter. The solar panel arrangement was made at an angle of 45 degree to the vertical so that maximum amount of solar radiation fall on solar panel. Moreover it is able to receive maximum solar radiation continuously from the sun during the operation of the unit in the field. The output of the panel is connected in parallel with the 12 V storage battery to store the electrical energy from the panel. The 12v battery is property connected with a 12 V solar pump fixed on the chassis.

The operation of the solar pump is controlled by a switch attached on the remote control. energy received from application. This stored electrical energy can be converted into mechanical energy by rotating the motor. For this mechanical operation there is no need of conventional fuel like petrol and oil.

8. SPECIFICATION:-

Array size : 67×60cm

Maximum Power : 50W

Maximum Voltage : 12V

Maximum Current : 2.9A

9. APPLICATION

- For cricket ground.
- The football ground.
- All garden
- All Playground
- Pesticide spraying on crops

8. RESULT:-

The solar powered grass cutter and pesticide sprayer was manufactured and developed. The solar energy is generated due to solar panel and the energy is stored in battery, which converts the solar energy into the electrical energy. The blade with dc motor connected to the battery. This solar grass cutter cut all types of grass and spraying pesticide on crops.

9. CONCLUSION:-

solar powered grass cutter and pesticide sprayer is successfully completed and the results obtained are satisfactory. It will be easier for the people who are going to take the project for the further modifications.

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