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Design and fabrication of portable solar operated chemical sprayer

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ABSTRACT

In India energy demand is the major thread for the people. Finding of solution for reducing energy demand is great challenge for scientists. Now a days pesticide sprayer is based on fuel engine and hand operated sprayer. In agriculture, pesticides spraying is the important for protect the crops from the insects. Mostly farmers can use hand operated and fuel operated spray pump system for spraying pesticides. Now-a-days non- conventional energy plays a major role for all the developing activities. The proposed sprayer is design considering parameters like desired spraying efficiency, low weight, low cost, user friendly nature, high operating time and for faster coverage of area. In our project, we are going to use the cheapest method by trapping the solar energy. the trapped solar energy is used to charge the battery for pumping the particular items to the agriculture field.

Keywords: Solar panel, Battery, Tank, Pump, Nozzle

INTRODUCTION

A sprayer is a mechanical device used to spray the liquid like herbicides, pesticides, fungicides and fertilizers to the crop for avoiding any pests and insects. sprayer provides optimum utilization of pesticides or any liquid with minimum efforts. Farmers used two types of sprayer, there are hand operated and fuel operated sprayer for spraying pesticides. These types of sprayer can sprinkled the pesticides and fertilizers manually, but it will result in harmful effects on farmers. In order to overcome this problem, different spraying techniques have been developed. A solar operated sprayer is easy to handle and maintenance free, hence is affordable to the farmers. Therefore a solar operated sprayer is designed and fabricated. The first unit of proposed system is energy conversion unit. Solar energy is absorbed from the sun is converted into electrical energy using solar panel by photovoltaic effect.

LITERATURE SURVEY

[1] R. Joshua, V. Vasu et al, Finding solutions for the “Energy-demand” is the great challenge forsocial scientist,Engineers, Entrepreneurs and Industrialist of our country. According to them, applications of non conventional energy is the only alternate solution for conventional energy demand. Now-a-days the concept and technology employing this non-conventional energy becomes very popular for all kinds of development activities. One of the major area, which finds number applications are in agriculture sectors. Solar enery plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote villages without electricity.

[2] R.Rajesh et al, Energy demand is one of the main threads for our country. Finding solution to meet the energy demand is great challenge for scientist, engineers. Now a day pesticide sprayer is operated based on fuel engine.This operation is

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more economical. In order to overcome this problem we found the new concept known as "solar pesticide sprayer". In this pesticide sprayer is operated mainly based on solar energy and hence ther is no need of any kind of alternative source. It has many advantages such as cost of spraying and also saving on Fuel/Petrol.

[3] AkshayM.Narete, Gopal Waghmare et al, Today's energy demand is the great challenge for our society. Conventional energy (fossil fuel, coal, nuclear energy) can be widely used in India such as Textialindustry, power plant etc. Conventional energy there are many exhaudt that can be come out after pollutant which is harmful to our environments. In such situation we should move towards some non-conventional energy(solar energy, wind energy,tidal energy).Non conventional becomes very popular for all kinds of developments activities such as irrigation purpose and for spraying purpose. In this paper we are trying to make unique equipment for cultivation users.My contribution on my project is that from enauri on 20 farmer I can collect data regarding spraying and how exactly farmer can facing problem while spraying, farmers mainly use hand operated or fuel operated spray pump for this task.

[4] Krishna Murthy B et al A solar operated pesticide sprayer is a pump running on electricity generated by photovoltaic panels. The operation of solar powered pumps is more economical due to the low operation and maintenance costs and less environmental impact than pumps powered by an internal combustion engine(ICE).Solar pumps are useful where grid electricity is unavailable and alternative sources (in particular wind) do not provide sufficient energy. The solar panels make up most (up to 80%) of the systems cost.The size of the solar irradiance available. The solar sprayer has many advantages.

[5] S.Charvani et al In agriculture sector, spraying of pesticides is an important task to protect the crops from insects. However, farmers have been mainly using traditional conventional techniques like hand operated and fuel operated sprayer system for spraying pesticides. Fuel is expensive and in many places fuel may not be available. If hand operated spray systems are used, the labour productivity decreases and the efficiency will be low. The use of solar energy system is an alternate solution for farmers. Hence, a solar powered agricultural pesticide sprayer is designed and fabricated. The system was designed and fabricated by considering parameters like desired spraying capacity, low weight, low cost, user-friendly nature and high operating time.

MACHINE COMPONENTS

The proposed solar sprayer consists of the following components to full fill the requirements of complete operation of the machine.

1. Pump
2. Solar panel
3. Battery
4. Nozzle
5. Storage tank
6. DC Motor

Pump

A pump is a device used to move gases, liquids or slurries. A pump moves liquids or gases from lower pressure to higher pressure, and overcomes this difference in pressure by adding energy to the system such as a water system. A gas pump is generally called a compressor, except in very low pressure-rise applications, such as in heating, ventilating, and air-conditioning, where the operative equipment consists of fans or blowers.

Pumps work by using mechanical forces to push the material, either by physically lifting, or by the force of compression. Hand - operated, reciprocating, positive displacement, water pump. A positive displacement pump causes a liquid or gas to move by trapping a fixed amount of fluid or gas and then forcing displacing that trapped volume into the discharge pipe. They are relatively inexpensive, and are used extensively for pumping water out of bunds, or pumping low volumes of reactants out of storage drums.

Solar panel

A solar panel is a device that collects and converts solar energy into electricity or heat. It known as Photovoltaic panels, used to generate electricity directly from sunlight Solar thermal energy collection systems, used to generate electricity through a system of mirrors and fluid-filled tubes solar thermal collector, used to

generate heat solar hot water panel, used to heat water. It is energy portal. A solar power technology uses solar cells or solar photovoltaic arrays to convert light from the sun directly into electricity. Photovoltaics, is in which light is converted into electrical power. It is best known as a method for generating solar power by using solar cells packaged in photovoltaic modules, often electrically connected in multiples as solar photovoltaic arrays to convert energy from the sun into electricity. The photovoltaic solar panel is photons from sunlight knock electrons into a higher state of energy, creating electricity.

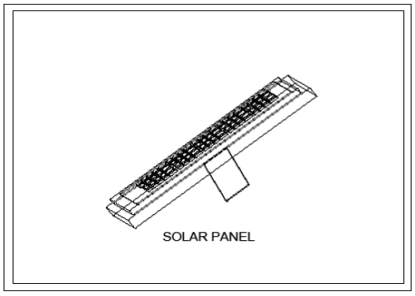

Fig.1 Solar panel

Solar cells produce direct current electricity from light, which can be used to power equipment or to recharge a battery. A less common form of the technologies is thermo photovoltaics, in which the thermal radiation from some hot body other than the sun is utilized. Photovoltaic devices are also used to produce electricity in optical wireless power transmission

Battery

A battery is one or more electrochemical cells, which store chemical energy and make it available as electric current. There are two types of batteries, primary (disposable) and secondary (rechargeable), both of which convert chemical energy to electrical energy. Primary batteries can only be used once because they use up their chemicals in an irreversible reaction. Secondary batteries can be recharged because the chemical reactions they use are reversible; they are recharged by running a charging current through the battery, but in the opposite direction of the discharge current. Secondary, also called rechargeable batteries can be charged and discharged many times before wearing out.

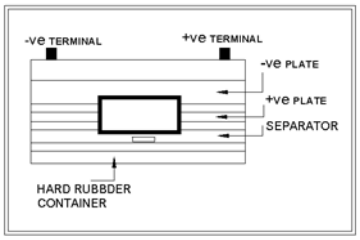

Fig.2 Battery

After wearing out some batteries can be recycled. Batteries have gained popularity as they became portable and useful for many purposes. The use of batteries has created many environmental concerns, such as toxic metal pollution. A battery is a device that converts chemical energy directly to electrical energy it consists of one or more voltaic cells. Each voltaic cell consists of two half cells connected in series by a conductive electrolyte.

One half-cell is the positive electrode, and the other is the negative electrode. The electrodes do not touch each other but are electrically connected by the electrolyte, which can be either solid or

liquid. A battery can be simply modeled as a perfect voltage source which has its own resistance, the resulting voltage across the load depends on the ratio of the battery's internal resistance to the resistance of the load.

When the battery is fresh, its internal resistance is low, so the voltage across the load is almost equal to that of the battery's internal voltage source. As the battery runs down and its internal resistance increases, the voltage drop across its internal resistance increases, so the voltage at its terminals decreases, and the battery's ability to deliver power to the load decreases.

DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills.

Tank

Storage tanks are containers that hold liquids, compressed gases or mediums used for the short or long term storage of fluids or gases. The term can be used for reservoirs. Storage tanks are available in many shapes: vertical and horizontal cylindrical open top and closed top flat bottom, cone bottom, slope bottom and dish bottom. Large tanks tend to be vertical cylindrical, or to have rounded corners transition from vertical side wall to bottom profile, to easier withstand hydraulic hydrostatically induced pressure of contained liquid. Most container tanks for handling liquids during transportation are designed to handle varying degrees of pressure.

Nozzle

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. A nozzle is often a pipe or tube of varying cross sectional area and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them. In a nozzle, the velocity of fluid increases at the expense of its pressure energy.

WORKING PRINCIPLE

The system consists of solar panel, charging unit, Battery, Pump, storage tank and sprayer. The solar panel delivers an output power absorbing the sun light. The power is saved to the battery. The power from the battery is used to run the pump. The outlet of the storage tank is connected with the pump inlet. The outlet of the pump id connected with the nozzle hence when the pump is switched on it delivers the fluid at certain pressure through the nozzle.

Drawing for Proposed Solar Sprayer

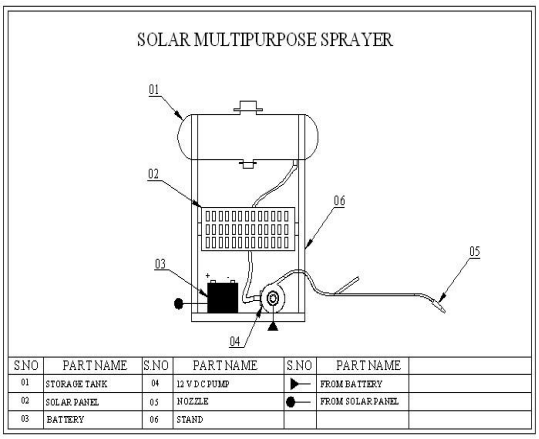

Fig.3 Proposed solar sprayer

CONCLUSION

The trapped solar energy is used to charge the battery for pumping the fertilizers, medicine etc., in the field hence the power is saved. We use the cheapest method by trapping the solar energy. It is very useful to the farmers for spraying the fertilizers, medicine etc.

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