IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 17, Issue 3, Ser. I (May – June 2022), PP 45-51
www.iosrjournals.org

Smart Solar Operated Pesticide Sprayer for Agriculture Purpose and Human Safety

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Abstract — *This research describes a solar- powered liquid sprayer that can be used in agricultural, environmental, and health-care applications. Pesticides can be sprayed with the suggested liquid sprayer in agricultural applications. It can be used to spray hypo fluids in environmental applications such as eradicating bacteria and insects in drainage systems. It can also be used to spray sanitizer in health-care applications, such as eradicating the COVID-19 corona virus. For spraying purposes, the proposed sprayer uses solar power and solar energy as a source of power. The proposed sprayer may be operated by just one person. Spraying insecticide in various agricultural fields was used to evaluate the sprayer's performance.*

Keywords: *Solar Power, Liquid Sprayer, Agricultural Applications, Environmental Applications, Health CareApplications.*

I. Introduction

Spraying liquids such as pesticides, hypo treatments, and sanitizers is a crucial role in everyday applications such as agriculture, health care, and the environment. A liquid sprayer is necessary for all of these applications.

The liquid sprayer is used in agricultural applications to spray chemicals to protect crops from insects. In environmental applications, the liquid sprayer sprays hypoliquid or bleaching liquid into street drainages and trash cans to kill bacteria and insects. The liquid sprayer is used in health care applications to spray chemicals to kill bacteria and sanitizer to kill the COVID-19 corona virus. [1]

Spraying can be accomplished with a variety of traditional liquid sprayers. There are three types of sprayers: I hand-operated, (ii) engine-operated or fuel- operated, and (iii) electric motor-operated sprayers. Because of their weight and structure, traditional sprayers are now obsolete. [1, 2, 3]

So many applications nowadays rely on non- conventional energy sources. Solar energy is one ofthese sources of energy. The energy provided by the sun is completely free. Solar energy is available in India for eight months of the year. As a result, it can beutilised for spraying. [4-8]

Power A solar panel made up of photovoltaic cells absorbs sun energy. These cells are responsible for converting solar energy into electrical energy. This converted energy is used to store the voltage in the DC battery, which is then used to power the battery sprayer. When spraying is required, a solar-powered sprayer is the most cost-effective option. Solar energy is used as a source in this solar-powered sprayer. Solar power is used to charge a storage battery first. The solar energy stored in the battery is used to power the pumping motor. The continual discharge of liquid, solar energy, battery charging, monitoring and timer, and novel power control techniques are all part of the solar energy based sprayer concept.

A solar-powered liquid sprayer is demonstrated in this study for spraying liquids such as pesticides for agricultural purposes, hypo liquid for environmental applications, and sanitizer for health-care applications. The proposed liquid sprayer can help users feel less tired. There is no need for fuel, making the suggested method environmentally benign.

II. Standard Liquid Sprayer

Spraying can be accomplished with a variety of traditional liquid sprayers. There are three types of sprayers: I hand-operated, (ii) engine-operated or fuel- operated, and (iii) electric motor-operated sprayers.

The A hand-operated sprayer is shown in Figure 1. The user's hand controls the hand-operated sprayer. As aresult, while spraying, the operator is uncomfortable. As a result, the hand-operated sprayer cannot be utilised forlong periods of time. As a result, this style of sprayer is unsuitable.

Fig.1. Hand operated sprayer

Figure 2 depicts an engine-operated or fuel- operated sprayer. The engine-driven sprayer uses fuels such as gasoline, diesel, and kerosene. In terms ofeconomics, the cost of fuel is extremely high. As a result, this style of sprayer is unsuitable.

Fig.2. Engine operated sprayer

Figure 3 depicts an electric motor-driven sprayer. It makes use of an electric motor that runs on electricity. A DC Battery can be used to generate electricity. Government Electricity Supply will charge the battery. The government's electricity supply will beinsufficient in rural areas. As a result, this style of sprayer is unsuitable.

Fig.3. Electric Motor operated sprayer

III. Solar Power

Solar Solar energy is a form of renewable energy obtained from the sun's light or heat. Solar energy is a renewable or unconventional energy source that is stable and fully inexhaustible, unlike finite fossil fuels. It is a non-polluting energy source that generates electricity without emitting any greenhouse gases.

There are so many advantages of solar power compared with other powers. They are

(i) It is a renewable source of energy
(ii) It is a non-conventional source of energy
(iii) It is sustainable for long duration
(iv) It is inexhaustible
(v) It is clean and green energy source
(vi) No Production Cost
(vii) Low Maintenance Cost
(viii) Less Transmission Losses
(ix) High Efficiency
(x) It has versatile installation.

As a result, solar power is the finest choice for electric power supply in today's world. As a result, a solar-powered liquid sprayer is anexcellent choice for a variety of purposes.

IV. Proposed Liquid Sprayer Powered by Solar Energy

Figure 4 depicts the configuration of a Liquid Sprayer powered by solar energy. Solar Panel, Charging Unit, Battery and Electric Motor, Pump, Tank, and Nozzle are all part of the design.

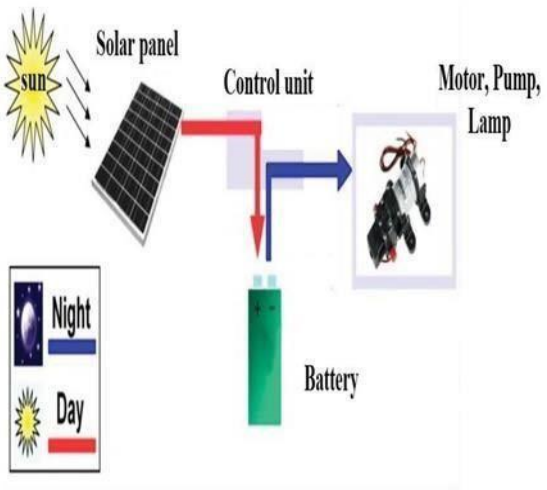

Figure 4: Proposed Liquid Sprayer Layout

In 1941, an American inventor, Russel Ohl, a physicist at Bell Laboratories, invented the first silicon- based solar panel, for which he holds the patent. Solar panels were initially employed on satellites in space. The solar panel is also known as a solar photovoltaic panel since it is made up of many solar cells. Figure 5 depicts the solar panel.

Fig.5. Solar Panel

The photovoltaic effect is a chemical and physical process that turns solar power, sunrays, sun energy, or light energy into electrical energy. The battery receives power from the solar panel.

The battery collects energy from the solar panel, stores it, and then distributes it to the electrical and electronic loads and circuits. A battery is a device made up of a large number of electrochemical cells connected to the outside world. Power is stored in the battery in the form of an electrostatic field. The battery is responsible for providing electrical power to electrical and electronic equipment.

. The battery is used in Uninterruptible Power Supply (UPS), Mobile Phones, Electric cars and insome other electrical and electronic circuits. The battery is shown in fig.6.

Fig.6. Battery

The Battery will come in a variety of sizes and shapes. Hearing aids and wristwatches will be powered by the little battery. The compact battery will be utilised in remote controls for televisions and wall clocks. Mobile phones will use the medium-sized battery. The big battery will be employed in UPS systems as well as electric automobiles. The largest battery will be utilised in data centres, banks, and hospitals, among other places.

An electric motor is a machine that transformselectrical energy to mechanical energy. The battery provides electric power to the electric motor. The electric motor's shaft will be mechanically attached to the pump set..

A pump is a mechanical device that is used to move fluid around. Pumps come in a variety of shapes and sizes, as shown in fig.7. Centrifugal pumps, diaphragm pumps, roller pumps, transfer pumps, pistonpumps, and irrigation injection pumps are the types of pumps available.

Fig.7. Different types of Pumps

One of the best pumps available is the diaphragm pump. This pump isolates all moving elements and suspends them in oil, resulting in pumps that are extremely sturdy and long-lasting. A positive pressure gradient is created by the synthetic diaphragm of this pump, which directs fluid flow to the system nozzle. This pump can handle pressures ranging from low to high, up to 725 PSI. The flow capacity of this pump ranges from low (0.6 GPM) to high (1.2 GPM) (68.7 GPM). This pump has a wide range of uses. Figure 8 depicts a diaphragm pump.

Fig.8. Diaphragm Pump

The tank is composed of a material that is resistant to corrosion. Steel, polyethylene plastic, and fibreglass were utilised to construct the tank. Some materials may be corroded by the liquids in the tank. As a result, caution should be exercised to avoid the usage of inappropriate materials. Tanks made of aluminium, galvanised steel, or steel should not be used. Some chemicals react with these components, causing the liquid to perform poorly or corrosion within corrosion to occur.

A nozzle is a device that is used to control the direction or properties of a fluid flow as it exits or enters a closed chamber or tube. A nozzle is a tube or tube with changing cross-sectional area that can be used to control or guide the flow of a fluid (liquid or gas). Nozzles are commonly used to control the flow, velocity, direction, mass, form, and/or pressure of a stream that comes out of them. Its pressure, on the one hand, enhances the fluid's velocity at the expense of energy.

Figure 9 depicts the proposed solar-powered liquid sprayer that incorporates all of the above technologies. It consists of a solar panel, a charging unit, a battery, an electric motor, a pump, and other components.

Fig.9. Proposed Solar Power based Liquid Sprayer

Solar Panel, Charging Unit, Battery and Electric Motor, Pump, Tank, and Nozzle make up the suggested sprayer. The solar panel generates electricity when the sun's rays fall on it. The solar panel here generates 12 volts and 20 watts of power. Solar energy will be used to charge the charging unit. The charging unit boosts the power while also charging the battery. By connecting the panel to the battery, it can be charged continually. The battery power may be used for approximately 6 to 7 hours without the use of solar power. Electrical gadgets can be used to charge during the rainy season. The proposed method was put to the test with both AC and solar charging.

The investigation discovered that charging the 12V, 8Ah battery takes 10 hours. The motor will be powered by the battery and will begin to rotate. The pump will be connected to the motor shaft, and the liquid from the tank will be sprayed via the nozzle by the pump.

The proposed sprayer is more effective andenvironmentally friendly than traditional sprayers suchas hand-held sprayers, engine-driven sprayers, and electric motor-driven sprayers. The proposed sprayer may have a high initial investment cost, but it will havea low operating cost.

(i) Spraying Pesticides in Agricultural Applications

(ii) Spraying Hypo Liquid or Bleaching Liquid in Environmental Applications to kill bacteria and insectsin street drainages and street dustbins.

(iii) Spraying Hypo Liquid or Bleaching Liquid in Health Care Applications to kill virus in Hospitals

(iv) Spraying Sanitizer in Health Care Applicationsto kill CORONA Virus of COVID-19

OXYGEN CONCNETRATION

Oxygen deficiency gas monitors are used for employee and workforce safety. Cryogenic substances such as liquid nitrogen (LN2), liquid helium (He), and liquid argon (Ar) are inert and can displace oxygen (O_2) in a confined space if a leak is present. A rapid decrease of oxygen can provide a very dangerous environment for employees, who may not notice this problem before they suddenly lose consciousness. With this in mind, an oxygen gas monitor is important to have when cryogenics are present. Laboratories, MRI rooms, pharmaceutical, semiconductor, and cryogenic suppliers are typical users of oxygen monitors.

Oxygen fraction in a breathing gas is measured by electro-galvanic oxygen sensors. They may be used stand-alone, for example to determine the proportion of oxygen in a nitrox mixture used in scuba diving, or as part of feedback loop which maintains a constant partialpressure of oxygen in a rebreather.

Fig 11: oxygen sensor

V. Conclusion

In this A solar-powered liquid sprayer is proposed, developed, produced, and tested in this study. Pesticides can be sprayed in agricultural applications, hypo liquid or bleaching liquid can be sprayed in environmental applications, hypo liquid or bleaching liquid can be sprayed in health care applications, and sanitizer can be sprayed in health care applications to destroy CORONA Virus of COVID-19. The proposed sprayer's energy source is solar power and solar energy. The proposed sprayer requires verylittle manpower to operate. Spraying insecticide in various agricultural fields was used to evaluate the sprayer's performance.

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