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Fabrication for Agricultural Fertilizer Sprayer Runs on Smart Solar Energy

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Abstract- Energy demand is a major thread for our country. Nowadays, with the depletion of the conventional sources of energy the usage of non-conventional sources is in a rise. To meet this huge energy demand one of the important sources that can be used is the solar energy. As this solar energy is being used in many other places like pumping water from the well, it will also prove helpful to the farmer by implementing it in agriculture sector. By introducing solar energy, the pollution due to the usage of diesel and petrol is controlled. Hence in agricultural sector solar energy can be used for spraying fertilizers, pesticides, etc., with the help of solar sprayers. In this paper we have discussed that instead of using fossil fuels like diesel, petrol, etc., for spraying fertilizers solar power is used, where the later proves to be efficient than the former. The system was fabricated by considering parameters like desired spraying capacity, low weight, low cost, user-friendly nature, high operating time and for faster coverage of area. Thus, the solar sprayer was fabricated to be a value for money product in the agricultural sector. For designing the prototype, the conventional sprayer system was studied to understand the mechanism for spraying process.

Keywords- Nozzle, Tyre, DC Pump, Tank, Solar Sprayer, Solar Panel and Battery.

I. INTRODUCTION

Agricultural sprayers come in various design types, sizes, and equipment and performance specifications. They range from small spot-spraying machines to very large sprayers with extensive land and plant coverage.

Agricultural sprayers have been engineered to optimize their applicability and performance for the many purposes that the machines are put to, whether being used on crops, vegetation, or soil. Agriculture sprayers are often used for applying water and water/chemical solutions containing acids or caustic materials for crop-performance or pest-control; i.e., fertilizers and pesticides.

There are a number of agriculture sprayers designed for spraying applications and designed to be versatile and suitable for various uses from spot applications, gardens, crops, row crops, crop trees, fruit, groves, vineyards, perimeter maintenance, livestock needs, weed control, pastures and rangeland. Self-propelled sprayers help farmers improve spraying efficiency and productivity while taking full advantage of every minute they have in the field.

II. LITERATURE REVIEW

In this 21st century Pesticides spraying with flourishing technology is introduced. There is numerous types of robot used in agricultural activity for production process. Thus, the usage of autonomous robot is assumed to rise from 2018 to 2038. Neverthless, the common problem with an autonomous robot use in agricultural activity is the navigation method used to make the robot fully operated with DMC (decision making capability) Some researcher on RFIN based navigation are conducted to implement navigation tools as artificial intelligence.

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Lastly, the designed robot used in agriculture having the difference performance index depends on the variable they want to achieve.

III. PROBLEM IDENTIFICATION

In India, 73% of population is directly or indirectly dependent upon the farming. Hence India is now an agricultural based company. But till now farmers face numerous problems.

1. Pests:
Farmer's productivity is threatened by pests. Pests are a major threat to food production. Better knowledge and understanding of pest behavior under different projected scenarios is required to adopt and develop new technologies to respond to threats resulting from climate change.

2. Lack of mechanism:
In spite of the large-scale mechanization, most of the agricultural operations are carried on by human hand using simple and conventional tools and implements like wooden plough, sickle, etc. strenuous efforts are being made to encourage the farmers to adopt technically advanced agricultural equipment.

3. Short supply of electricity:
Rural areas face serious problems with the reliability of power supply. In a country like India most of the people in rural areas depend on agriculture. Because of this, farmers have to make multiple visits to the farms at odd timings just to turn on the motor pump.

IV. MATERIAL AND EXPERIMENTAL SETUP

1. Solar panel:
A solar panel, or photo-voltaic (PV) module, is an assembly of photovoltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy and generate direct current electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

2. Bridge Rectifier:
Bridge Rectifiers use four diodes that are arranged cleverly to convert the AC supply voltage to a DC supply voltage.

The output signal of such a circuit is always of the same polarity regardless of the polarities of the input AC signal.

This depicts the circuit of a bridge rectifier with diodes interlocked in a bridge configuration. The AC signal is applied at the input terminals.

Fig 1. Solar Panel.

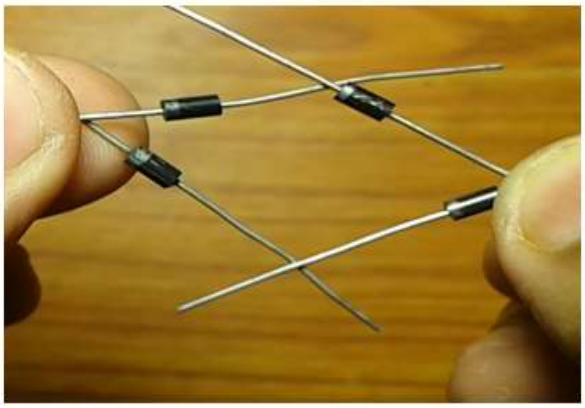
Fig 2. Diode.

3. Battery:
A battery works on the oxidation and reduction reaction of an electrolyte with metals. When two dissimilar metallic substances, called electrode, are placed in a diluted electrolyte, oxidation and reduction reaction take place in the electrodes respectively depending upon the electron affinity of the metal of the electrodes.

- 12-volt batteries are commonly used as car batteries. One of the most common uses of a 12 volt battery is for transportation applications, such as in cars and boats.

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Fig 3. Battery.

4. Flow Nozzle:

A flow nozzle meter consists of a short nozzle, with a smooth guided entry and a sharp exit is placed in the pipe to change the flow field and create a pressure drop that is used to calculate the flow velocity. Frictional loss in a flow nozzle meter is much less than in an orifice meter, but higher than in a venturi meter.

Fig 4. Nozzle.

V. RESULT

The proposed system was tested with AC charging as well as solar charging. From the results it was found that the current and time required for charging the full battery capacity of 12V, 7.5Ah by analytically.

The fully charged battery can be used to spray 300 liters of fertilizer, which approximately spray 1-2 acres of land. It was also found that, if we charge the battery in a day it can be used to spray liters of fertilizer.

The initial cost of the proposed system is little more as compared to conventional sprayer but the running cost of the system is very less. The developed system used for spraying the fertilizer, pesticides, fungicides.

VI. CONCLUSION

The prototype gave a fairly good rate of area coverage with a reasonably low operating cost. The proposed spraying & mower robot is suitable for small and medium scale farmers. Large scale production of the spraying unit will reduce the cost significantly giving partial thrust to Indian agriculture practices.

The unit can be scaled up based on the requirement. The developed system can not only be used for spraying fertilizer, pesticides, fungicides, lawn watering and lawn mowing but also for maintenance of sports fields like cricket ground. Workload on the farmers is decreased and health problems also.

Successful in constructing robot which can be travelled on rough, uneven surfaces also and weighing enough loads of pump and other equipment.

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