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Solar Panel Cleaning System Using Dc Drive

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Abstract: *This paper contains waterless cleaning system method for solar panels. The solar panel system available for studying this work is inclined from top to bottom which provide a degree of slope to solar panels. The cleaning mechanism is placed on the main support frame to clean the surface of the solar panels which move upwards and downwards according to width of the solar panel and main frame. This operation is controlled by a control unit for the cleaning system of solar panels. The cleaning system removes the dust, dirt, sand and mass from the solar panel surface which results in improving efficiency.*
Keywords: *Solar cleaning mechanism, DC Geared motor, ESP 8266, Limit switch, Proximity sensor.*

I. Introduction

There is a demand of improving the efficiency of solar power generation in industries today. The maximum efficiency of a large solar panel is up to 32%.This efficiency drops down drastically due to dust accumulation, unwanted materials, atmospheric conditions etc. Current solar panels setups suffer a major power loss when unwanted obstruction covers the surface of the plane. The obstruction turns the shaded cell into a resistor, causing it to heat up and consume extra power. To address this issue, we will engineer an automatic cleaning of the solar panel. Our mechanism to combat the power loss indirectly resulting into efficiency loss is unique, self-reliant and easy to use. The microcontroller kit is involved which once programmed makes the cleaning process easy, duration wise and need not require any manual assistance towards it. However, as more and more PV power plants are built in the upper MW and GW power range in the future; there is a need for more attention to be paid to this problematic area, which directly affects the efficiency of the power generation. To address this issue, we are engineering an automatic cleaning system for solar panel. Our mechanism to combat the power loss indirectly resulting into efficiency loss is unique, self-reliant and easy to use. The microcontroller kit is involved through which cleaning is achieved via programming in processed way and need not require any manual assistance towards it. The whole assembly based on IOT. The Internet of things (IoT) refers to the concept of extending Internet connectivity beyond conventional computing platforms such as personal computers and mobile devices. The definition of the Internet of things has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.

II. Proposed Methodology

Solar panels absorb the sunlight as a source of energy to generate electricity or heat. A photovoltaic (PV) module is a photovoltaic solar cell. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output. It is a decision making component of this paper. DMU makes decision from the microcontroller unit that either cleans the panel with cleaning mechanism or to continue the conversion. DMU consists of adjustable timer so that we can make a timer for cleaning of PV panel after set time interval. As time elapsed and timer reaches its count value then DMU activates the cleaning mechanism and start the cleaning of PV panel.As its name suggests that it will generate the power which requires for operation of whole system. A 12 V DC supply will require to operate the motors for rotating the PV panel and to move the robot on the PV panel. Another power supply of 5 V DC supply will require to operate the ICs in the circuit e.g. Microcontroller.This block is use to control the motor assembly and cleaning mechanism .. Motor assembly will rotate the cleaning mechanism across the PV panel.Here we used LCD to display the current state of the paper. Size of LCD is available from

8x2 to 40x4. For this paper we have used 16x2 LCD. 16x2 represents the rows and columns i.e. 16 columns and 2 rows. PV Panel

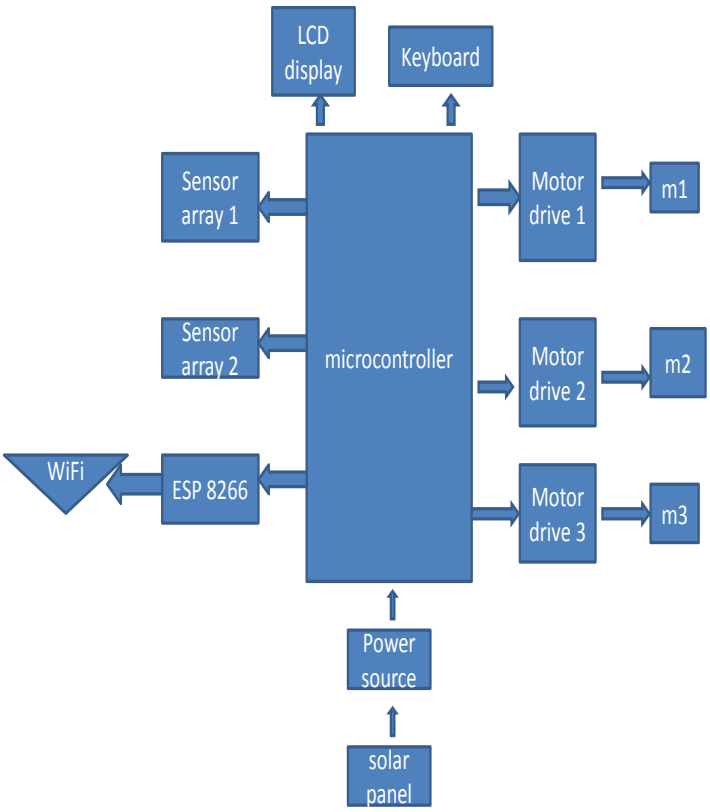

Fig 2.1. *Block Diagram*

III. Hardware Implementation

The Solar panel cleaning system is shown in combination with a row of solar panel assemblies. The solar row comprises a plurality of Solar panels of most any type and construction known to those skilled in the art. For example, a single solar panel typically would have a face area less than about one square meter. A length of the solar row can vary between about a few meters to about a few kilometers. A width of the solar row ranges from about one meter to about several meters. The cleaning system includes a Support frame that enables bi-directional movement of a cleaning assembly. This bi-directional movement enables the cleaning assembly to move along the solar row in two directions— along the length of the solar row and in the width direction of the solar row. The support frame includes a main frame that is configured to be movable along the length of the solar row. Main frame is preferably made from aluminum constructive profiles but other materials such as steel or fiberglass can be used. Supporting elements are connected to the main frame for support. Several wheels having different functions are connected to the main frame there being a total of eight such wheels in the illustrated embodiment although the number, function and position of the wheels may vary. These wheels enable the main frame to move along the solar row in the length direction of the solar row.Following are the main components used.

a. Proximity Sensor

"Proximity sensor "includes all sensors that performs non contact detection in comparison to sensors, such as limit switches, that detects objects by physically contacting them. Proximity sensors convert information on the movement or presence of an object into an electrical signal. There are three types of detection system that do this conversion : System that used the eddy currents that are generated in in metallic sensing objects by electromagnetic induction , system that detects changes in electrical capacity when approaching the sensing objects, and system that used magnets and reed switches.

Fig 3.1 Proximity Sensor

b. DC Motor

A DC motor is any of class of rotary electrical machines that converts direct currents electrical energy into mechanical energy. The most common type relies on the forces produced by magnetic fields. Nearly all types of dc motors have some internal mechanism, either electromechanically or electronic, to periodically change the direction of current flow in part of the motors. Dc motors were the first type widely used , since they could be powered from existing direct current lighting power distribution system. A dc motor speed can be controlled over a wide range using either variable supply voltage or by changing the strength of current in its field winding.

Fig 3.2 DC Motor

IV. Working

Several sensing devices or sensors are provided in the cleaning system. For example, sensor is positioned on the rail to detect a maximum leftward movement of the main frame on the rails. Similarly, sensor is positioned on the rail to detect a maximum rightward movement of the main frame on the rails. Sensor and/or sensor may alternatively be placed on the rail. Sensor is positioned on the main frame to detect a maximum upward movement of the secondary frame on the main frame. Similarly, sensor is positioned on the main frame to detect a maximum down ward movement of the secondary frame on the main frame. Also shows a connection between the cable that winds and unwinds about the shaft coupled to the winch, and an upper edge of the secondary frame, close to a center region of an upper profile that is part of the secondary frame. Each cable may be similarly connected to the shaft and secondary frame. When the winch cylinder rotates in one direction, the length of the cables between the shaft of the winch cylinder and the secondary frame becomes shorter, and the secondary frame is moved upward. When the winch cylinder rotates in the opposite direction, the length of the cables between the shaft of the winch cylinder and the secondary frame becomes longer and the frame moves down ward. An angular condition should be set between a long axis of the winch cylinder and the cables, which angle will ensure an orderly winding arrangement of the cables on the winch cylinder.

Fig.4.1 *Solar Panel cleaning system*

V. Result & Conclusion

After successful installation of the "**SOLAR PANELS CLEANING SYSTEM USING DC DRIVE**", The results have been recorded into five sections, such as before cleaning and after cleaning. They are described as follows.Before cleaning the solar panel the effency was very less as compared after cleaning.

With rising implementation of photovoltaic arrays, a new method of cleaning and inspection is necessary. Complete cleaning is especially important since the obstruction of a single panel with debris affects the energy generation for the entire array. It is extremely important that all cells operate at peak efficiency since they are connected in series. On comparing the cost of cleaning by manual hand with automatic cleaning system is more easy and efficient as well as it is more significantly less difficult. Also it is a smart system as it will operate by mobile phone.

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