FORM 2

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COMPLETE SPECIFICATION

Title

"Rotating Solar Panel Using Arduino**"**

Applicants

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The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed.

Field of the Invention:

[001] The field of the invention lies within renewable energy technology, specifically focusing on optimizing solar energy capture. This project enhances the efficiency of photovoltaic systems by integrating a rotating solar panel mechanism controlled by an Arduino microcontroller. By dynamically adjusting the orientation of the solar panel to follow the Sun's trajectory, the system maximizes the energy captured throughout the day. This innovation contributes to more efficient solar energy utilization, addressing the growing energy demands and supporting the shift from depleting non-renewable resources to sustainable, renewable energy sources.

Background of the Invention and Related Prior Art:

[002] The background of the invention is rooted in the need to address the increasing global energy demand and the depletion of non-renewable resources. Solar energy, as a sustainable and abundant resource, offers a promising solution to these challenges. Traditional fixed solar panels often suffer from suboptimal energy capture due to their static positioning, which limits their efficiency as they cannot adjust to the Sun's movement throughout the day. The invention of a rotating solar panel system, controlled by an Arduino microcontroller, seeks to overcome this limitation. By allowing the solar panel to continuously align with the Sun, this innovation enhances the efficiency of solar energy collection, making solar power a more viable and effective alternative for meeting energy needs.

[003] In a patent document CN101539343B relates to a non-intermittent real-time tracking solar energy light collecting drive mechanism and a working method thereof. The non-intermittent real-time tracking solar energy light collecting drive mechanism is characterized by consisting of a light collecting device, a drive mechanism, a speed reducer, an electric motor, an energy output mechanism, an energy output pipeline and a base; the working method comprises: (1) equipment installation; (2) adjusting the light collecting device in the solar energy light collecting drive mechanism to be precisely aligned to the sun; (3) starting the electric motor for driving; (4) energy output; (5) error treatment. The invention has the advantages that the light collecting drive mechanism can continuously track the sun without intermission; the method for adjusting the light collecting angle is simple and easy as well as low in cost, so as to be suitable for promotion and use in families and other small-scale electricity utilization occasions; the

mechanism can continuously run so as to have electric power consumption being much lower than that of intermittent driving, has no impact load, is hard to damage, and is much longer in service life than that of intermittent transmission. The invention is an environment-friendly and energy-saving energy collecting device, thus being worth popularizing and applying.

[004] Another patent document CN102929294A discloses a power supply of a wind-solar hybrid street light based on intelligent light tracking of a solar panel. According to the power supply, positions of the sun can be tracked automatically, the utilization efficiency of the solar is improved, compared with a fixed photovoltaic system, the electric energy production is improved by about 40%, the total electric energy production is greatly increased, and solar power generation and wind power generation are combined for roadway lighting systems. The power supply is characterized by comprising a support frame, a steering mechanism, a tilting mechanism, a solar panel assembly, a position acquisition module, a data processing module, a mounting platform, a wind generating set and a wine vane.

[005] A document CN203057028U discloses a wind-light complementary road lamp power-supplying power source based on solar panel intelligent light tracking. The object of the utility model is to provide a system which can automatically track the position of the sun, improve the utilization efficiency of a solar panel and combines solar power generation with wind power generation and is used for road lighting. Compared with a fixed photovoltaic system, generated electric energy can be increased about 40%, and therefore, total generated electric energy can be greatly increased. The wind-light complementary road lamp power-supplying power source is characterized in that the wind-light complementary road lamp power-supplying power source comprises a support frame, a steering mechanism, a tilting mechanism, a solar panel assembly, a position acquisition module and a data processing module, an installation platform, a wind turbine generator system and a wind vane.

[006] Another document CN107643768B discloses a portable solar power generation device and a control method. The system comprises a control module, a mechanical module and an energy storage module, wherein the control module comprises an Arduino UNO control panel, a motor control panel and four photosensitive sensors; the mechanical part comprises a shell, five motors, two sets of rotating supports and a solar panel; the energy storage module is a movable energy storage device and is provided with a USB circuit output port. When the solar tracking system works, light obliquely irradiates two pairs of photosensitive sensors, the photosensitive sensors

receive different illumination intensities to generate potential differences, and the different potential differences correspond to the direction and the height of the sun through an algorithm. When the potential difference is higher than a certain value, the control panel enables the motor to rotate so that the solar cell panel is perpendicular to the light. The invention has the advantages of high efficiency, small volume, automatic stain cleaning, high intellectualization, safe and reliable work and the like. The generator can be used for household industrial power generation, emergency power generation, outdoor travel power generation and the like, and has wide market prospect.

[007] A patent document CN102520731A relates to the technical field of automatically tracking the sun, and discloses a method for automatically tracking the sun and an automatic tracking system. The automatic tracking system comprises a photoelectric tracking system and a tracking actuating mechanism, wherein the tracking actuating mechanism comprises an east-west sun-around rotating mechanism and a north-south sun-around angle regulating rotating mechanism, the sun-around angle rotating mechanism comprises a ring gear and a pinion which are meshed and connected, the pinion is connected with a stepping motor and arranged on a supporting base, two ends of the ring gear are hinged with a main shaft arranged in the center of a solar panel support, and the main shaft rotates relative to the supporting base, a gear arranged on the main shaft is meshed and connected with a gear arranged on a stepping motor shaft fixed on the solar panel support, and the solar panel support rotates relative to the main shaft. According to the invention, the movement of solar rays can be automatically tracked, the plane where an energy transformation component of solar energy equipment is ensured to be vertical to the solar rays all the time, and the energy utilization ratio of receiving equipment is increased.

[008] None of these above patents, however alone or in combination, disclose the present invention. The invention consists of certain novel features and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the details may be made without departing from the spirit, or sacrificing any of the advantages of the present invention.

Summary of the Invention:

[009] The invention is a rotating solar panel system designed to optimize solar energy capture by dynamically adjusting the panel's orientation to follow the Sun's path. Controlled by an Arduino microcontroller, the system mounts the solar panel on a rotating platform driven by a motor. This

setup allows the solar panel to consistently face the Sun, maximizing energy absorption and improving overall efficiency. By continually scanning for the optimal angle of incidence, the system ensures that the solar panel can generate and store the maximum amount of energy in a 12VDC battery. This innovative approach enhances the effectiveness of solar power systems, addressing the need for more efficient renewable energy solutions.

Detailed Description of the Invention with Accompanying Drawings:

[010] For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawing a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, the invention, its preparation, and many of its advantages should be readily understood and appreciated.

[011] The principal object of the invention is to develop rotating solar panel using Arduino. The invention is a solar panel system that incorporates a rotating mechanism to enhance solar energy capture efficiency. This system includes a photovoltaic solar panel mounted on a platform that can rotate along one or more axes. The rotation is driven by a motor controlled by an Arduino microcontroller, which is programmed to track the Sun's position in the sky.

Here's a detailed description of the invention:

1. Solar Panel and Platform: The core component is a photovoltaic solar panel installed on a rotating platform. The platform allows the solar panel to tilt and swivel to face the Sun directly, optimizing the angle of incidence and maximizing energy capture.

2. Motor and Rotation Mechanism: The platform is mounted on a motorized rotation system, which includes stepper motors or servos capable of precise angular adjustments. These motors enable the platform to rotate horizontally (azimuth) and vertically (elevation) to track the Sun's movement across the sky.

3. Arduino Microcontroller: An Arduino Uno board with an Atmega328 microcontroller is used to control the motor system. The microcontroller is programmed with software to interpret sensor data and adjust the motor's position to align the solar panel optimally with the Sun.

4. Sun Tracking Sensors: Light sensors, such as photoresistors or photodiodes, are positioned around the solar panel to detect the intensity of sunlight from different angles. These sensors provide real-time data to the Arduino, which processes the information to determine the optimal panel orientation.

5. Power Supply and Battery: The solar panel charges a 12VDC battery through a charge controller that regulates the charging process. This battery stores the energy captured by the solar panel for later use.

6. Control System: The Arduino code continuously scans the sensor data to detect the Sun's position and adjusts the motor's operation accordingly. This process ensures that the solar panel remains oriented towards the Sun throughout the day, optimizing energy capture.

7. System Integration: All components are integrated onto a printed circuit board (PCB) for compact and efficient assembly. The PCB supports the Arduino and motor connections, ensuring reliable operation of the rotating solar panel system.

This detailed setup allows the solar panel to consistently align with the Sun, enhancing the system's efficiency and making it a more effective solution for harnessing solar energy.

Figure 1. Working methodology according to the embodiment of the present invention.

Figure 2. C Code according to the embodiment of the present invention.

Figure 3. C Code according to the embodiment of the present invention.

Figure 4. Prototype model according to the embodiment of the present invention.

[012] Without further elaboration, the foregoing will so fully illustrate my invention, that others may, by applying current of future knowledge, readily adapt the same for use under various conditions of service. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention.

Advantages over the prior art

[013] Rotating solar panel using Arduino proposed by the present invention has the following advantages over the prior art:

1. Increased Efficiency: By continuously adjusting the panel's orientation to face the Sun, the system maximizes the angle of incidence, leading to higher energy capture compared to fixed panels.

2. Optimized Energy Harvesting: The system tracks the Sun throughout the day, ensuring that the solar panel captures the maximum possible amount of solar energy, which enhances overall energy production.

3. Reduced Energy Loss: Improved alignment reduces the energy lost due to suboptimal angles of incidence, which is common with stationary solar panels.

4. Enhanced Performance in Low-Light Conditions: By tracking the Sun, the system can maintain optimal performance even during low-light conditions or when the Sun is not directly overhead.
5. Adaptability: The system can be easily adapted to various sizes and types of solar panels and can be integrated into different photovoltaic installations, from residential to commercial systems.
6. Sustainability: By maximizing energy capture, the system contributes to a more efficient use of renewable solar energy, supporting sustainability and reducing reliance on non-renewable energy sources.
7. Cost-Effective Long-Term: Although the initial setup may involve additional components, the increased energy production can offset the costs over time, making it a cost-effective solution in the long run.

[014] In the preceding specification, the invention has been described with reference to specific exemplary embodiments thereof. It will be evident that various modifications and changes may be made thereunto without departing from the broader spirit and scope of the invention as set forth in the claims that follow. The specification and drawings are accordingly to be regarded in an illustrative rather than restrictive sense. Therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only and not as a limitation. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective based on the prior art.

We claim:

1. Rotating solar panel using Arduino which consists of:
   - a photovoltaic solar panel mounted on a rotating platform;
   - a motor system coupled to the rotating platform, configured to adjust the orientation of the solar panel;
   - an Arduino microcontroller connected to the motor system;
   - one or more light sensors configured to detect sunlight intensity from multiple angles;
   - wherein the Arduino microcontroller is programmed to receive data from the light sensors and control the motor system to adjust the solar panel's orientation to maximize solar energy capture.

2. Rotating solar panel using Arduino as claimed in claim 1 wherein the motor system includes stepper motors or servos that enable precise angular adjustments of the rotating platform.

3. Rotating solar panel using Arduino as claimed in claim 1 wherein the light sensors are selected from the group consisting of photoresistors, photodiodes, or phototransistors.

4. Rotating solar panel using Arduino as claimed in claim 1 further comprising a charge controller connected to the photovoltaic solar panel and a 12VDC battery, configured to regulate the charging process.

5. Rotating solar panel using Arduino as claimed in claim 1 wherein the rotating platform is capable of both horizontal (azimuth) and vertical (elevation) rotation.

6. Rotating solar panel using Arduino as claimed in claim 1 wherein the Arduino microcontroller is programmed to adjust the panel's orientation at predefined intervals or in response to real-time changes in sunlight intensity.

7. Rotating solar panel using Arduino as claimed in claim 1 wherein the system is integrated onto a printed circuit board (PCB) that supports the Arduino microcontroller and motor connections.

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Rotating Solar Panel Using Arduino

Abstract

The invention provides a solar energy capture system that enhances the efficiency of photovoltaic panels by incorporating a dynamic rotation mechanism. The system features a photovoltaic solar panel mounted on a rotating platform, which is driven by a motor system controlled by an Arduino microcontroller. The Arduino receives real-time data from light sensors positioned around the panel, allowing it to adjust the panel's orientation to face the Sun optimally. This continuous adjustment maximizes solar energy capture throughout the day. Additionally, the system includes a charge controller that regulates the energy stored in a 12VDC battery. This innovative approach ensures more efficient utilization of solar energy compared to fixed-panel systems, making it a valuable solution for optimizing renewable energy production.