

Solar AC Power Generator

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Abstract

Solar panels today produce DC power which has to be converted to AC to be used by most homes and businesses applications. The price of solar panels combined with the price of inverters, phase synchronizers, installation and maintenance has made the price of solar prohibitive. Add to that the loss of power from the different components used in the DC to AC conversion process and it becomes even more unattractive. Here we arrange modified standard solar cells into a circular pattern mounted on a base. A spinning disk is mounted above solar cell which is powered by DC electric motor. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When the portal is half way between the two cells the voltage cancels and drops to zero. The resulting voltage is sinusoidal or AC. It can even be configured to produce three phase AC power

It is thus an object to produce alternating current electricity of specific frequencies, single or three phase, from solar cells in a cost efficient and simple manner. This is truly a transforming technology. The AC solar generator has the potential to reduce the use of fossil fuels tremendously. Losses such as switching loss in mosfet copper and core loss in inverter section can be avoided by this system. It can be installed and operated anywhere including areas of difficult access and remote locations

Keywords: Solar pannel, Spinning disk, pwm.

1. Introduction

In this we introduce a technology to convert solar energy directly into alternating current. For that we use solar cell in a circular pattern mounted on a base. A spinning disk powered by a dc electric motor is mounted above the solar cell. The DC motor gets its power from battery. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When arranged in a circle next to each other they could generate power from the entire area under the rotating disk. Combining the phase matching with the alternating current generation is what allows the AC solar generator to create AC power without the losses and cost associated with the AC to DC power conversion process This makes solar energy

available, cost effective, environmentally friendly option for residential and/or commercial use. This is capable of being used on a minute, small or large scale through appropriate scaling the solar cell a/c electricity generator. Large scale solar cell a/c electricity generator arrays can be easily set up even in the most remote places in the world. The present invention reduces the need of other forms of power.

2. Related Works

In [1] method for generating alternating current (a/c) electricity directly from solar panel. Pairs. Gradually and alternately exposing and shading the two anti-parallel connected solar cells of each solar cell pair causes the amplitude and polarity of the electricity at the a/c junction to gradually rise and fall to produce alternating current electricity

In [2], This paper presents a method to manage the Independent renewable power source DC system, such as a standalone solar/fuel cell system, to achieve the maximum using efficiency of the system. The system includes the power generation, energy storage, power bus and Power electronics parts. Scenarios, modes, loads and power sources decide the different control status and load priority.

In [3] it provides a solar converter for producing variable amplitude alternating current waveforms directly from solar energy by using a photo-voltaic cell bank array formed of a plurality of weighted photo-voltaic segments. A multi-sided high speed, rotating and light concentrating concave mirror system provides light on and past the weighted segments of the photo-voltaic bank to produce instantaneous output which are proportional to the number of cells scanned in each segment. A simulated alternating current (a/c) waveform is produced by suitable arrangement of the photo-voltaic segments In [4] a solar electric generating system is provided for space vehicles which directly generates alternating current from ambient light without power conversion. Light incident to photocell arrays is mechanically or electrically gated to produce fluctuating direct current (d/c) electricity. A number

of transforming devices are provided to convert the fluctuating d/c current to alternating current (a/c).

3. Problem Domain

This system, is a method for directly generating alternating current from solar cells. Alternately exposing and shading the two anti-parallel connected solar cells of each solar cell pair causes the amplitude and polarity of the electricity at the a/c junction to gradually rise and fall to produce alternating current. The gradual, alternating exposure and shading of the two anti-parallel solar cells is accomplished by mechanically covering and exposing the solar cell pairs. Alternating exposure and covering of each solar cell of each anti-parallel connected solar cell pair is periodic. The rate of exposure and shading determines frequency. A direct current motor is utilized to rotate the segmented disc. The motor is preferably powered by separate solar cells. The present invention also provides a phase synchronizer for maintaining a desired alternating current frequency

4. Motivation

4.1 Real Time Motivation

The main real time motivation is the demand and need for clean and renewable energy is becoming more urgent as earth undergoes global climate changes. One type of clean renewable energy is solar energy or sunlight. A photovoltaic cell known as a solar cell captures and converts sunlight into electricity to produce alternating current electricity of specific frequencies, single or three phase, from solar cells in a cost efficient and simple manner.

4.2 Technical Motivation

The technical motivation is that, to produce alternating current directly from solar energy. Losses such as switching loss in mosfet copper and core loss in inverter section can be avoided by using direct ac generation system from solar

5. Problem Definition and Statement

This is a method to produce alternating current directly from solar energy. Alternately exposing and shading the two anti-parallel connected solar cells of each solar cell pair causes the amplitude and polarity of the electricity at the a/c junction to gradually rise and fall to produce alternating current electricity

6. Problem Issues

Solar AC Power Generator provides the ability to produce alternating current directly from solar power. An external supply is not required for the operation of this system.

7. Problem Capture

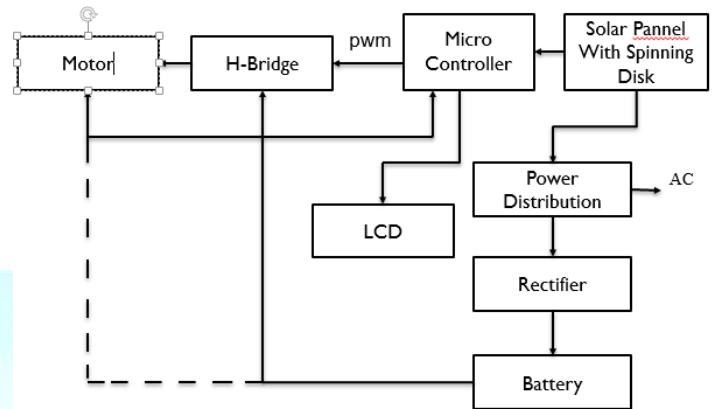


Fig. 1. Block diagram Solar AC Power Generator

Fig. 1 shows the block diagram of Solar AC Power Generator. The block diagram consists of four sections as:

- 1) Solar panel
- 2) Dc motor
- 3) Microcontroller unit
- 4) Charge storage element

The solar cell receives sunlight which is directly converted into AC. Here we arranged modified standard solar cells into a circular pattern mounted on a base. Half of the cells are wired in one circuit and half in another circuit. Mounted above the solar cells is a spinning disk powered by a DC electric motor. The DC motor gets its initial power from DC battery. The disk has portals cut into it allowing light to pass through to every other solar cell below it. As the disk spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When the portal is half way between the two cells the voltage cancels and drops to zero. The resulting voltage is sinusoidal or AC. It can even be configured to produce three phase AC power. The output from solar is given to the microcontroller where it checks the actual frequency with a preset frequency. If any mismatch is found then it correct it by adjusting the PWM. Then both the actual frequency and set frequency are displayed in LCD display. A portion of ac power is converted into dc and charges battery. when sunlight is not available system works by taking battery power.

8. Algorithm

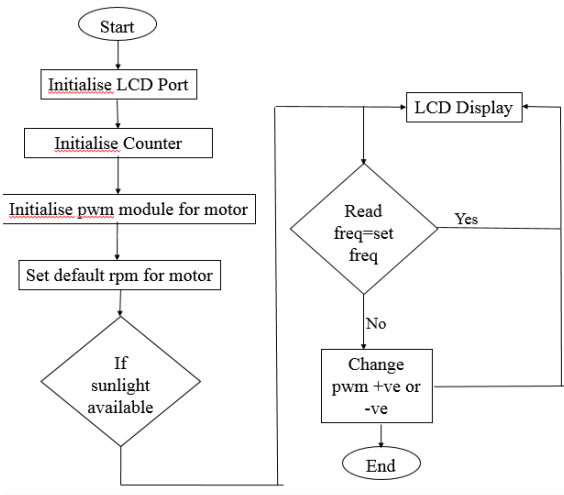


Fig. 2. Flow chart of Solar AC Power Generator

9. Circuit Diagram

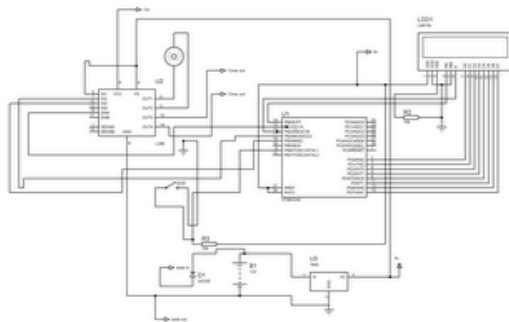


Fig. 3. Circuit diagram of Solar AC Power Generator

The output from the solar panel is given to the magnetic switch which is used to isolate the electrical signal with microcontroller ATmega8. The output from the magnetic switch is given to the ninth pin in port B of microcontroller which is an input port. The microcontroller compares the actual frequency with the set frequency and if any mismatch occurred it is corrected by adjusting the PWM. The speed of the motors can be adjusted by connecting PWM outputs from microcontroller to the ENA input pins on the motor driver board L298. The ENA pin controls Motor. The longer the PWM duty cycle is, the faster the motor will turn. Alternating current is obtained as output from L298. A portion of AC output is given into the rectifier section where it converts AC to DC and charges the battery. The initial power for motor

rotation is given through battery. The output frequency and set frequency are displayed in the LCD display. If solar power is not available then system utilize battery power for its functioning.

10. INPUT-OUTPUT MODEL

10.1. Solar Pannel

Input : Sunlight

Process : Converts solar power directly into AC using spinning disk mounted above the solar cell.

Output : AC power

10.2. ATmega8

Input : AC output from solar pannel

Process: Monitor frequency of generated AC and compares with set frequency if any mismatch occur correct it by adjusting pwm.

Output : Control Signal

10.3. H-Bridge

Input : Control signal

Process : The input signal from microcontroller turns on the MOSFET which in turn produces an output signal which control pwm.

Output : Switching signal

A. 10.4. Magnetic Switch

Input : AC from solar pannel

Process :for giving isolation between solar panel and micro controller

Output : time delay between switching

10.5. Battery

Input : DC voltage

Process : The input DC voltage is stored as charge in the battery.

Output : 1) Charge storage

2)Used as initial power dc motor

F. LCD

Input : DC voltage

Process : The available frequency and the set frequency level are displayed.

Output :Frequency display

11. Result

5W,12V ac power obtained from solar panel is used to drive a 5W,12V CFL. In this system solar power is efficiently utilized. Main benefit of system lies in the concept of free energy utilization. It is thus an object of the present invention to produce alternating current electricity of specific frequencies, single or three phase, from solar cells in a cost efficient and simple manner.

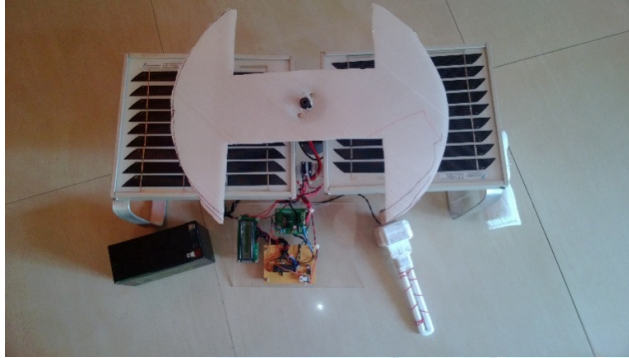


Fig 4 Solar ac power generator system

12. Analysis of Result

As compared to the existing system it produce dc which has to be converted to ac, the loss of power from the different components used in the DC to AC conversion process makes it more unattractive. This system assures reduced power loss and the present invention makes solar energy a viable, cost effective, environmentally friendly option for residential and/or commercial use..

13. Comparison of Result

In [1] method for generating alternating current (a/c) electricity directly from solar panel. Pairs. Gradually and alternately exposing and shading the two anti-parallel connected solar cells of each solar cell pair causes the amplitude and polarity of the electricity at the a/c junction to gradually rise and fall to produce alternating current electricity. The gradual, alternating exposure and shading of the two anti-parallel solar cells is accomplished by the mechanically covering and exposing the solar cell pairs. This is efficiently accomplished by a rotating segmented disc positioned over an array of solar cell pairs. The above system is facing a problem of irregularities in direction of rotation. To overcome this issue we make use of MOSFET driver in our system to make the rotation uni-directional

In [2], This paper presents a method to manage the Independent renewable power source DC system, such as a standalone solar/fuel cell system, to achieve the maximum using efficiency of the system. The system includes the power generation, energy storage, power bus and Power electronics

parts. Scenarios, modes, loads and power sources decide the different control status and load priority. The MATLAB simulation shows not only the achievement of maximum energy efficiency but also a high level performance of the power system. This system needs dc to ac conversion section for generating ac where as in our system. we generate alternating current directly by making use of a spinning disk mounted above the solar panel

In [3] it provides a solar converter for producing variable amplitude alternating current waveforms directly from solar energy by using a photo-voltaic cell bank array formed of a plurality of weighted photo-voltaic segments. A multi-sided high speed, rotating and light concentrating concave mirror system provides light on and past the weighted segments of the photo-voltaic bank to produce instantaneous output which are proportional to the number of cells scanned in each segment. A simulated alternating current (a/c) waveform is produced by suitable arrangement of the photo-voltaic segments. The simulated a/c waveform of Butler and its fragile manner (glass mirrors) of producing the simulated a/c waveform by the high speed rotating mirror is not efficient. Moreover, Butler is not easily scalable to produce larger voltages/amperes.

In [4] a solar electric generating system is provided for space vehicles which directly generates alternating current from ambient light without power conversion. Light incident to photocell arrays is mechanically or electrically gated to produce fluctuating direct current (d/c) electricity. A number of transforming devices are provided to convert the fluctuating d/c current to alternating current (a/c). Through variation of the frequency and duty cycle of the pulsing output voltage, frequency and phase relative to a reference may be controlled. However, in this electric generating system, the mechanical gating provides a square wave that is then conditioned to provide an alternating current waveform.

14 . Conclusion

Solar AC Power Generator is used to generate alternating current directly from solar power. This project helped to avoid losses due to the conversion of DC to AC in existing solar system. This system makes solar energy a viable, cost effective, environmentally friendly option for residential and/or commercial use. Thus we could achieve more efficiency than the existing system. This system reduces the need of other forms of power. Moreover, Solar AC Power Generator can be set up in a cost efficient and simple manner and used anywhere.

References

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