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STUDY ON SOLAR AC GENERATOR

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ABSTRACT

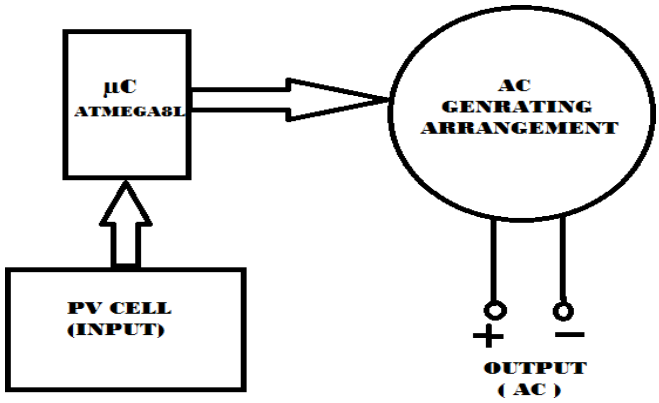
This project has opted a way to generate AC power directly from a solar panel. Why is this so important? It makes it possible to simply hook the solar panels directly into the power grid without the need for expensive DC to AC power conversion equipment. This invention, when commercialized, will make the cost of solar power more practical and affordable. in the world's sunniest areas all the cities would be supplementing their power with clean renewable solar power. Solar panels today produce DC power which has to be converted to AC to be used by most homes and businesses. 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.

Today AC power is produced for the power grid by AC generators. The generators are powered by mechanical energy provided by water turbines (hydro- electric) or steam turbines powered from coal, natural gas or nuclear fuel. The mechanical energy rotates the coils of the generator in a magnetic field to produce voltage. Because the conductor coil of the generator flips direction during rotation in the magnetic field the resulting voltage produced is sinusoidal or AC. The process Inventive Research used to do this is simple but pure genius in its application. In model arranged modified standard solar cells into a circular pattern mounted on a base.

INTRODUCTION

"It is a generator which generates an alternating current (AC) directly from the solar panel without using any converting equipment's."

Fig.2.1: Block Diagram of Proposed model



As shown in above diagram, the working of system basically consist of input as PV cell, Microcontroller (Atmega8l), rotating assembly etc. The working of each is explain below

1) PV Cell: A photovoltaic cell known as a solar cell captures and converts sunlight into electricity. A solar cell is made from a semiconducting material (a semiconductor) such as silicon that absorbs the sunlight which generates a flow of electricity through the solar cell.

2) Microcontroller: It is used for maintaining a desired alternating current frequency. It also controls the motor to control rotation of the segmented disc.

3) Rotating Assembly:

WORKING:

The system, device and method mechanically gradually exposes and shades photovoltaic cell pairs connected in anti-parallel to sunlight to generate alternating current electricity at an a/c junction of the solar cell 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 mechanically covering and exposing the solar cell pairs.

In particular, while one solar cell of an anti-parallel connected solar cell pair undergoes gradual exposure to sunlight from 0% exposure (100% shaded) of the solar cell electricity generating area to 100% exposure (0% shaded) of the solar cell electricity generating area, the other solar cell of the solar cell pair undergoes gradual shading from sunlight

from 0% shaded (100% exposure) to 100% shaded (0% exposure). Such gradual, 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.

In one form, a rotating disc situated over the solar cell pairs has spaced apart openings forming coverings between each opening to alternately expose and shade the solar cell pairs during rotation. A direct current motor is utilized to rotate the segmented disc. The motor is preferably powered by separate solar cells.

.Referring to Figs. 1-5, there is depicted various views of an exemplary embodiment of a photovoltaic alternating current (a/c) electricity generator, generally designated 10, fashioned in accordance with the present principles. The photovoltaic a/c generator 10 is embodied as a solar cell a/c electricity generator 10, but it should be appreciated that a photovoltaic a/c electricity generator fashioned in accordance with the present principles may use photovoltaic cells other than solar cells.

The solar cell a/c electricity generator 10 has a base, frame or other mounting structure 12 ("base 12") that supports the various components thereof. The base 12 may be formed of wood, plastic or other suitable material which is preferably, but not necessarily, a non-conducting material. It should be understood that while the base 12 is shown as a box or a box-like structure, the base may be a substrate, board or other suitable mounting or supporting structure. The base 12 includes an alternating current (a/c) electricity production portion 14 formed by a disk 15 and a plurality of photovoltaic or solar cells 20 (hereinafter, "solar cells 20"). As best seen in Fig. 3, the plurality of solar cells 20 is arranged in a generally circular array 21 on an upper surface 13 of the base 12. It should be appreciated that arrays other than circular may be used within the present principles. It should also be appreciated that while the solar cells 20 are shown as rectangles, the size and shape of the solar cells 20 may be otherwise, such as truncated conical, triangular, polygonal or square.

As best seen in Fig. 4, the disc 15 has a generally flat body made of a sunlight blocking material that is generally the circumference of the solar cell array 21 in order to extend over the solar cell array 21 when in use (see, e.g., Figs. 1 and 2). The disc 15 is also preferably made of a lightweight material that resists warping or is not

susceptible to warping. The disc 15 is preferably reflective either inherently or via a coating, film, overlay or the like. It should be appreciated that the disc 15 may be partially reflective or non-reflective if desired. The disc 15 has a plurality of cut-outs, openings, windows or the like 16 ("cut-outs 16") formed thereabout. The size and shape of the cut-outs 16 generally correspond to the size and shape of the solar cells 20 and particularly is sized and shaped to allow total exposure of a solar cell 20 to sunlight when the cut-out 16 is positioned over the solar cell 20. The cut-outs 16 are situated and spaced on the disc 15 so as to define a plurality of covers, coverings, blocks or the like 18 ("coverings 18").The coverings 18 are sized and shaped to completely cover or block a solar cell 20 when the covering is over the solar cell 20.The cut-outs 16 and coverings 18 are alternately radially situated about the disc 15. The number of cut-outs 16 corresponds by 1 /2 to the number of solar cells 20 so that the number of coverings 18 corresponds by 1/2 to the number of solar cells 20. Therefore, when the disc 15 is situated on frame 12 and over the solar cell array 21 , the cut-outs 16 and coverings 18 expose 1/2 of the total solar cell array area and cover 1/2 of the total solar cell array area. As the disc 15 rotates over the array 21 of solar cells 20, the cut- outs 16 and coverings 18 continuously gradually expose and cover the array of solar cells. As can be discerned from Figs. 1 and 2, rotation of the disc 15 causes the cut-outs 16 and coverings 18 to alternately expose and cover adjacent solar cells 20. The faster that the solar cells 20 are exposed and covered (rotation speed of the disc 15), the higher the frequency of a/c electricity produced. The slower that the solar cells 20 are exposed and covered (rotation speed of the disc 15), the lower the frequency of the a/c electricity produced. Since the solar cells are wired in anti-parallel, an alternating current is generated between the a/c junction of the solar cell pairs as the solar cell pairs are alternately, gradually exposed and covered. Alternately stated, the total solar cell area of a solar cell pair comprises 100% where one solar cell of the solar cell pair defines 50% of the total area and the other solar cell of the solar cell pair defines the other 50% of the total area. The one solar cell of an anti-parallel connected solar cell pair undergoes gradual exposure to sunlight from 0% exposure (100% shaded) of the solar cell electricity generating area to 100% exposure (0% shaded) of the solar cell electricity generating area, the other solar cell of the solar cell pair undergoes gradual shading from sunlight from 0% shaded (100% exposure) to 100% shaded (0% exposure). Such gradual, alternating exposure and covering of each solar cell of each anti-parallel connected solar cell pair is periodic.

This periodic sequence is illustrated in Figs. 8A through 8E. Figs. 8A through 8E are a representation of the manner in which two solar cells of a solar cell pair are alternately, gradually exposed and covered to produce an a/c waveform. The principles of the present invention are applicable to any connection configuration of solar cell pairs, whether opposite one another as in Figs. 8A through 8E, or adjacent one another as in Fig. 3.

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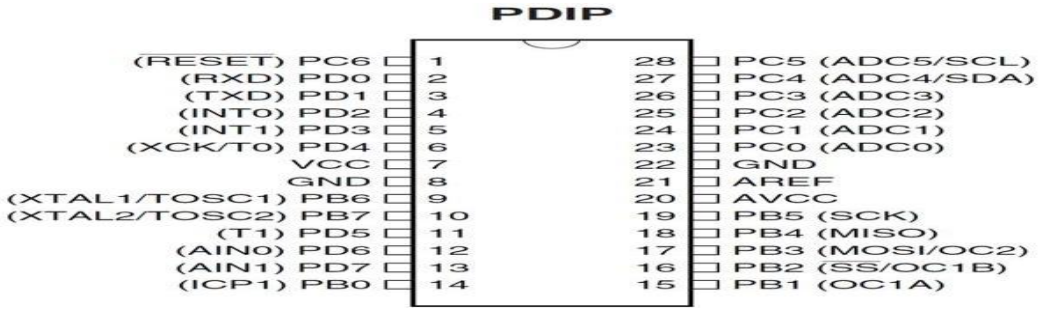
Fig. 8A is an arbitrary beginning to the sequence wherein there is represented a negative current at the output terminals A out and Bout of the solar cell pair, at its peak negative amplitude. In Fig. 8A, solar cell 2OB of a solar cell pair is 100% exposed (0% covered) while solar cell 2OA is 0% exposed (100% covered). Particularly, a cut-out 16 is fully over the solar cell 2OB thus fully exposing solar cell 2OB, while at the same time, a covering 18 is fully over the solar cell 2OA thus fully shading (covering or blocking) the solar cell 2OA. A peak negative current is thus provided at output terminals A out and Bout which is shown on the graph of Fig. 8A as current point is A- In Fig. 8B of the sequence, the rotating disc 15 has moved slightly counter clockwise such that the opening 16 that was totally exposing the solar cell 2OB is now exposing only 1/2 (and/or covering 1/2) of the area of the solar cell 2OB, while the covering 18 that was totally shading the solar cell 2OA is now covering only 1/2 (and/or exposing 1/2) of the area of the solar cell 2OA. This results in a zero (0) current at the output terminals A out and Bout as shown on the graph of Fig. 8B as current point is B- It should be appreciated that the rotational movement of the disc 15 from point shown in Fig. 8A to that shown in Fig. 8B gradually exposes and covers the solar cells, as described above, to create the gradual and not stepped a/c waveform as depicted in the graph of Fig. 8B.

In Fig. 8C of the sequence, the rotating disc 15 has moved further slightly counter clockwise. In Fig. 8C, solar cell 2OA of a solar cell pair is now 100% exposed (0% covered) while solar cell 2OB is now 0% exposed (100% covered). A cut-out 16 is fully over the solar cell 2OA thus fully exposing solar cell 2OA, while at the same time, a covering 18 is fully over the solar cell 2OB thus fully shading (covering or blocking) the solar cell 2OB. A peak positive current is thus provided at output terminals A out and B outt which is shown on the graph of Fig. 8A as current point i8C. Again, it should be appreciated that the rotational movement of the disc 15 from

point shown in Fig. 8B to that shown in Fig. 8C gradually exposes and covers the solar cells, as described above, to create the gradual and not stepped a/c waveform as depicted in graph of fig.8c.

Fig. 4.1.1 : PIN Diagram Of Atmega8l

Pin Diagram



1) Specifications:-

- Maximum power (pm):3.6W
- Operating voltage (V mp):5V
- Operating Current (Imp):600mA
- Power Tolerance: -5% to+5%

MERITS AND DEMERITS

MERITS

- Generates free energy from the sun.
- Non-polluting energy reduces emissions.
- Has no direct impact on the environment.
- It's easily scalable.
- Grid-Tie systems allow you to sell excess electricity back to the utility.
- Can be installed and operated anywhere including areas of difficult access and remote locations.
- Helps get us off dependence on foreign oil.
- PV cells make no noise and give off no exhaust.
- "Practical, applicable and revolutionary,
- product can bring about enormous power savings during peak daylight hours.
- It is more affordable as its maintenance cost is low.
- This novel integration is likely to reduce the installation complexity, resulting in a significant cost saving.
- With a successful completion of this research, a PV power system will be a "one unit plug and play" system with direct interconnection to the grid.
- This modular solution is highly repetitive and is likely to reduce the energy cost involved in the manufacturing process of conventional power converters made from discrete components.

FUTURESCOPE

- The prototype device used to demonstrate the process consists of solar cells arranged into a

circular pattern mounted on a base. Above the solar cells is a spinning disc with slots which controls each cell's exposure to light and darkness. The resulting voltage is AC that can be configured to three-phase power usable with the national power grid.

- Existing technology requires solar energy to be converted from direct current (DC) to alternating current (AC) before it is compatible with the nations power grid. The AC Solar Generator seeks to achieve the same result at a lower cost and with less energy loss by producing alternating current directly instead of relying on additional equipment.

- Researcher is credited with developing the patent-pending process to obtain and generate alternating current (AC) power directly from solar cells through the company's AC Solar Generator, which works on the same principle as existing generators. It is the AC Solar Generator that has caught the interest of a number of companies who would like to develop the product for large-scale use.

- Researcher is responsible for promoting renewable "Green" energy in Indiana, stopped by to view the invention.

- Travis and the Indiana Office of Energy Development have been instrumental in helping us find key industry contacts and resources available to help us develop our idea into a market able product.

- The Indiana Office of Energy Development, under the leadership of Lieutenant Governor Becky Skillman, is responsible for generating energy in this way of policy. That policy is outlined in the state's strategic energy plan, Hoosier Home- grown Energy.

- The AC Solar Generator is also a candidate for General Electric's 2010 Eco imagination Challenge, a competition that awards funding to projects designed to improve energy use.

CONCLUSION

This is truly a transforming technology. The AC solar generator has the potential to reduce the use of fossil fuels tremendously if you just imagine them installed photovoltaic solar power centers around the country generating supplemental power for the grid. Existing technology requires solar energy to be converted from direct current (DC) to alternating current (AC) before it is compatible with the nation's power grid. The AC Solar Generator seeks to achieve the same result at a lower cost and with less energy loss by producing alternating current directly instead of relying on additional equipment.

However, a modification can be done using new technologies that are present and can be implemented to obtain better results.