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Study and Design of Alternating Current (AC) Solar Generator

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Abstract - *AC Solar Generator works on a very simple principle. It consists of standard solar cells arranged in 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 disc powered by a DC electric motor. The DC motor gets its power from four small DC solar cells mounted in the corners of the base. The disc has portals cut into it allowing light to pass through to every other solar cell below it. As the disc spins each of the banks of solar cells is alternately exposed to light and alternately produce power. When the portal is halfway between the two cells the voltage cancels and drops to zero. The resulting voltage is sinusoidal or AC. Thus there is no need of conversion equipment's such as inverters, phase synchronizers, etc. This makes the overall concept quite simple yet effective and economical as well as compared to the current trend of extracting the solar energy in the market.*

KeyWords: Solar energy, Solar cells, AC solar generator, DC motor, Economical, Series opposition connection

1.INTRODUCTION

There is a current global need for clean and renewable energy sources. Fossil fuels are nonrenewable and require finite resources, which are dwindling because of high cost and environmentally damaging retrieval techniques. So, the need for cheap and obtainable resources is greatly needed. An efficient and more feasible alternative option is solar energy. Solar energy is a more practical type of energy due to its plentiful availability; it is derived directly from the sun.

One of the problems which hinder the use of solar energy extensively is the cost of extracting the energy and then converting it into suitable form according to its 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. AC Solar Generator eliminates the problem of converting DC to AC. It uses solar as its input and with the help of a motor-disc arrangement it converts the DC power of solar cells directly to AC without use of any conversion equipment's. The resulting output voltage is thus sinusoidal or AC. Thus there is no need of conversion equipment's such as inverters, phase synchronizers, etc. This makes the overall concept quite simple yet effective and economical as well.

2. PROPOSED SYSTEM

Solar input which the never ending source of energy is and which is readily available is used as an input. This reduces the ever increasing demand for fossil fuels such as coal, petroleum, diesel etc. The DC motor is used for driving the disc mounted above the solar panels. This motor will drive the disc at a constant speed. This motor will be supplied from the power generated from the solar panels.

Fig -1: Flowchart of I/O Power Utilisation

The disc has portals cut into it allowing light to pass through to every other solar cell below it. As the disc spins each of the banks of solar cells is alternately exposed to light and alternately produce power. The solar cells are arranged in such a way that it gives us the output in sinusoidal form.

3. CIRCUIT DESCRIPTION

3.1. Panel Arrangement

The solar cell a/c electricity generator has a base that supports the various components thereof. The base may be formed of wood, plastic or other suitable material which is preferably, but not necessarily, a non-conducting material. The base includes an alternating current electricity production portion formed by a disc and a plurality of photovoltaic or solar cells.

Fig -2: Construction of Base for components mounting

As seen in Figure-2 above, the plurality of solar cells are arranged in a generally circular array on an upper surface of the base. 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 are shown as rectangles, the size and shape of the solar cells may be otherwise, such as truncated conical, triangular, polygonal or square.

3.2. Disc Arrangement

As shown in figure 3, the disc has a generally flat body made of a sunlight blocking material that is generally the circumference of the solar cell array in order to extend over the solar cell array when in use.

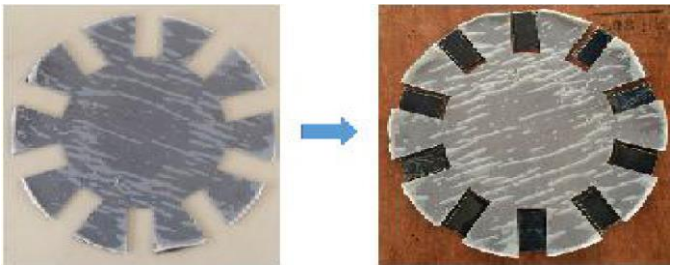


Fig-3: Disc Arrangement

The disc is also preferably made of a lightweight material that resists warping or is not susceptible to warping. It should be appreciated that the disc may be partially reflective or nonreflective if desired. The disc has a plurality of cutouts, openings, or windows formed thereabout. The size and shape of the cutouts generally correspond to the size and shape of the solar cells and particularly is sized and shaped to allow total exposure of a solar cell to sunlight when the cutout is positioned over the solar cell. The cutouts are situated and spaced on the disc so as to define a plurality of covers, coverings or blocks. The coverings are sized and shaped to completely cover or block a solar cell when the covering is over the solar cell.

3.3. Solar Cell Connections

The connections are divided into two groups: positive and negative. The cells are arranged in such a way that alternate cells will form a positive group and other alternate will form negative group. For example, if cell number 1, 3, 5 etc. forms a positive group then cell number 2, 4, 6 will form a negative group.

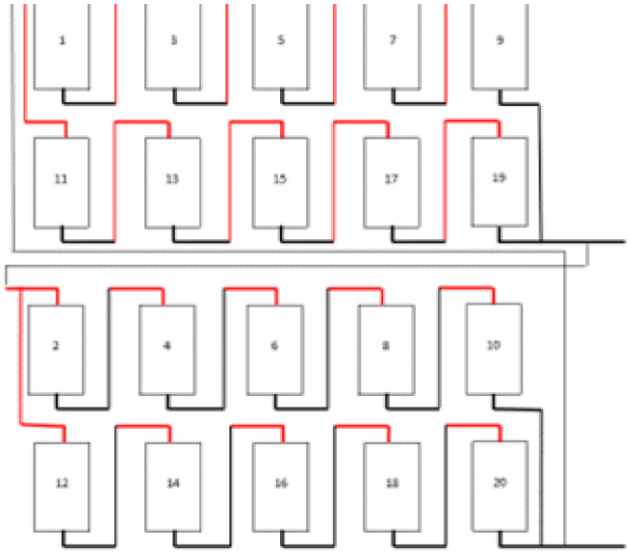


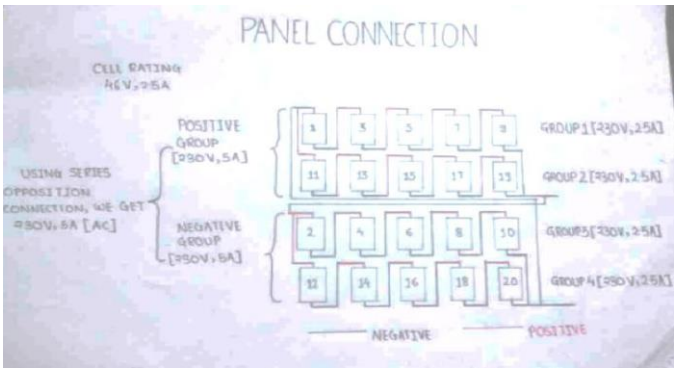
Fig-4: Solar Cell Connections

Red symbolizes positive while black symbolizes negative groups from the figure above. Horizontally, cells are connected in series. Cells in the first row are connected in parallel with the cells in the second row. This together forms a positive group. Similarly, cells of third and fourth rows are connected in parallel and this forms the negative group. The number of cells can be increased as per the requirement. Now, the two groups which are formed i.e. positive and negative are connected in series opposition which actually brings the voltage to zero and gives the required sinusoidal alternating output.

3.4. Prototype Testing

The figure 5 below shows the prototype which had been engineered as the project work.The output was tested on the C.R.O. As best seen from the figure above, the output is a pure sinusoidal or AC.

Fig-5: Testing of prototype output on C.R.O



The figure above shows the calculations of a single phase 230 V AC system as used in our household applications. These calculations are our brainchild. It was achieved after continuous trial and error basis.

4. CONCLUSION

Considering the ever increasing demand of electricity, it has become a need of an hour to encourage the use of renewable sources of energy. Considering their advantages of low cost per unit of generation, less maintenance, reliability, etc. these renewable energy sources are the best alternative for the currently in use nonrenewable source of energy for power generation which are feared of becoming extinct in near future, AC solar generator provides one such solution.