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AC Solar Generator without Inverter

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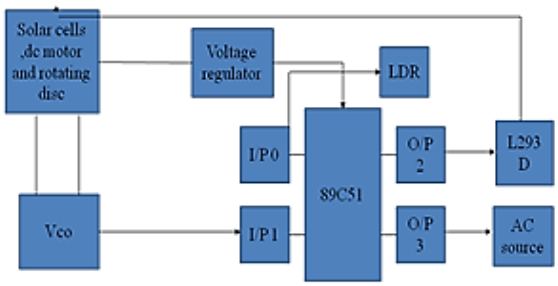
***Abstract*: -- Due to increase usage of electrical energy day by day energy demand of world is increased. So energy reduction is another problem to overcome this problem we need to find another source like non-conventional source which is easily available. Solar panels today produce a dc power which has to be first converted into ac to mostly used in business and home appliances. Solar panel becomes very expensive when we add this solar panel with the joint of inverter and phase synchronizers in addition to that power loss of different component that is used in dc to ac conversion. This paper reports a new technique for the generation of ac power from solar directly without the inverter. By this technique, we can remove power loss due to the inverter. We can generate a sinusoidal waveform of any freq by controlling the speed of dc motor this is achieved by PIC microcontroller. The control of dc motor play vital role in the project. PWM technique can be used for the speed control of dc motor by using the 89c51 microcontroller and motor drive L293D the L293D is driven by PWM signal generated by 89Cs51 this work is practical and feasible.**

***Keywords*— Solar Cells, Battery, DC Motor, Microcontroller, L293D**

I. INTRODUCTION

Due to major problems related to environment such as global warming it is very difficult to fulfill energy demand of world with the help of conventional energy sources. So energy depletion is another problem so to overcome this issues we need to find another sources like non conventional sources such as solar, wind, boi-gas, etc which are easily available as well as non pollutant & clean. Out of that Solar energy is effective renewable energy. We can generate alternating current directly from photovoltaic cells. We can use an array of photovoltaic cell pairs that are connected in anti-parallel form to create an AC wave form. Solar panels today produce DC power which has to be firstly converted into AC to be mostly used in business and home appliances. Solar panels become very expensive when we add solar panel's price joint with the price of inverters and phase synchronizers. In addition to that the power losses of different components that are used in the DC to AC converters so it becomes even more expensive. We show a new technique for the generation of AC power from Solar panel without inverter. By adopting this technique we can decreases power losses due to an inverter. Another very good aspect of this technique is that we can generate the sine wave of any frequency by just controlling the speed of motor used in this technique. So it is a very simple technique with great effects. In this project we have control the actual speed of dc motor to get proper 50Hz frequency. This can be achieved through PIC microcontroller. The speed control strategies of DC motor plays a vital role in the performance of drive. The main Purpose of speed controller is to take an appropriate signal sample of speed and to bring the motor to that desired speed. The objective of dc drive is to maintain a system with the stable speed irrespective of load condition. In this project, PWM that can be used for speed control of a DC motor is generated using microcontroller 89C51. DC motor is fed by a driver IC L293D. The L293D is driven by the PWM signal generated by the microcontroller. This work is a practical one and high feasible according to economic point of view and accuracy.

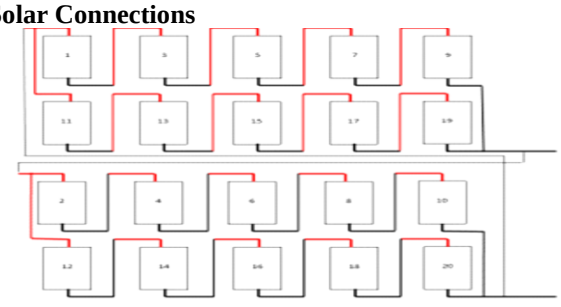
II. PROPOSED SYSTEM



A. Base

We used wood sheet as base which is a non-conducting material. The solar cells are arranged in a circle on the surface of the base and the motor is at the center of base which is rotating the spinning disk. To support the upper disk some rollers are also fixed on the base.

B. Solar Connections



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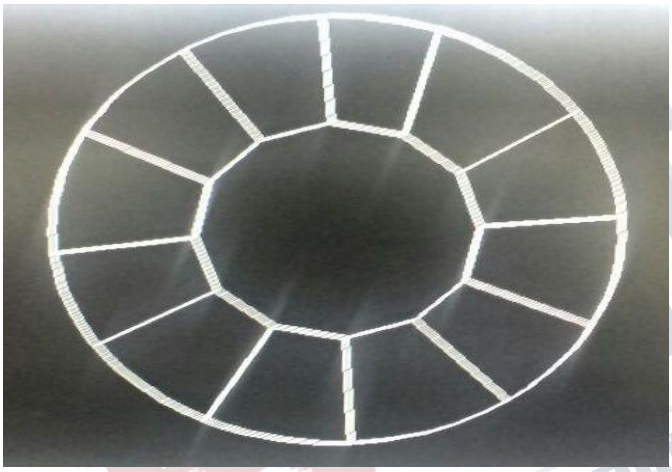
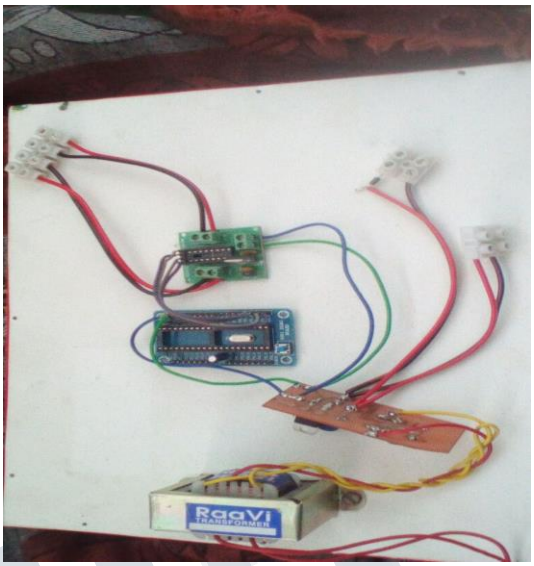
The connections are divided into two groups: positive and negative. The cells are arranged in such a way that alternate cells will form a positive group and other alternate will form negative group. For example, if cell number 1, 3, 5 etc. forms a positive group then cell number 2, 4, 6 will form a negative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

C. Disc Arrengenment



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. The disc is also preferably made of a light weight material that resists warping or is not susceptible to warping. It should be appreciated that the disc may be partially reflective or non-reflective 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.



D. Solar Input

We can use clean renewable energy in the form of solar energy. It is a regular resource of clean energy as sun shines everywhere in the planet. So we can easily convert solar energy into electricity using a solar cells cell.

E. Solar Cells

A Photovoltaic cell is made up of a semiconductor material like silicon. It absorbs the sunlight and produces electricity. Electron can only flow in a one direction through a solar cell because the terminals (positive and negative) of the solar cell are static. That's why solar cell can only produce direct current (DC). Now direct current has its own issues as it is difficult to send out in large distance, so it has limited uses.

F. Voltage Regulator

A voltage regulator is a voltage stabilizer that is designed to automatically stabilize a constant voltage level. A voltage regulator circuit is also used to change or stabilize the voltage level according to the necessity of the circuit. Thus, a voltage regulator is used for two reasons:-

1. To regulate or vary the output voltage of the circuit.
2. To keep the output voltage constant at the desired value in-spite of variations in the supply voltage or in the load current.

G. Microcontroller

Software used: Keil /\Vision 3

The program is written in C language and compiled using Keil pVision3. The .hex file created after compiling the program has been dumped into the micro-controller using In System Programmer. Here we have used P89V51RD2 which is 89C51 based microcontroller with 64 KB Flash and 1024 bytes of

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data RAM. Since this micro controller is suitable for PWM generation. we have chosen P89V51 micro controller to control the speed of the motor. The microcontroller P89V51R02 is used to control the speed. The datasheet of micro controller P89V51RD2 provided the working conditions, pin configuration of the micro controller. The micro controller takes the reference speed signal from the keys. The microcontroller takes the feedback signal from ADC and it then compares the running speed of the motor with the reference speed and generates a suitable control signal which is fed into the driver IC LM293D

H. LDR

An LDR or light dependent resistor is also known as photo resistor, photocell, photo conductor. It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface. When the light falls on the resistor, then the resistance changes. These resistors are often used in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light.

I. L293D

A L293D is an integrated circuit chip which is usually used to control motor. L293D or Motor driver act as an interface between 89C51 and the motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will referring the motor driver IC as L293D only. The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor.

Pin No. - Pin Characteristics

1 - Enable 1-2, when this is HIGH the left part of the IC will work and when it is low the left part won't work.

2 - INPUT 1, when this pin is HIGH the current will flow though output 1

3 - OUTPUT 1, this pin should be connected to one of the terminal of motor

4, 5 - GND, ground pins

6 - OUTPUT 2, this pin should be connected to one of the terminal of motor

7 - INPUT 2, when this pin is HIGH the current will flow though output 2

8 - VCC2, this is the voltage which will be supplied to the motor.

16 - VCC1, this is the power source to the IC. So, this pin should be supplied with 5 V

15 - INPUT 4, when this pin is HIGH the current will flow though output 4

14 - OUTPUT 4, this pin should be connected to one of the terminal of motor

12, 13 - GND, ground pins

11 - OUTPUT 3, this pin should be connected to one of the terminal of motor

10 - INPUT 3, when this pin is HIGH the current will flow though output 3

9 - Enable 3-4, when this is HIGH the right part of the IC will work and when it is low the right part won't work.

J. DC Motor

A DC motor that is supported by the base rotates the disc above the base consisted of solar cell array. Rotation can be in any direction clockwise or counterclockwise. Rotation of the disc causes the cutouts to alternately cover and expose the neighboring photovoltaic cells. The frequency of the signal depends on the speed of the rotating disk. Faster the photovoltaic cells are covered and exposed, the higher the frequency of AC electricity produced and vice versa. The variable power supply is used to supply the DC voltages to the DC motor which will then rotate the disk to produce AC waveform.

K. Speed Control Of DC Motor

This describes you how to control the DC motor using AT89C51 controller. The maximum output current of microcontroller pin is 15mA at 5V. But the power requirements of most of DC motors is out of reach of the microcontroller and even the back emf (electro motive force) which is produced by the motor may damage the microcontroller. Hence it is not good to interface DC motor directly to the controller. So use motor driver circuit in between of DC motor and controller. Here, we are using L293D motor driver IC to drive DC motors. Using this IC, we can drive 2 DC motors at a time. For this IC motor supply is variable 4.5 to 36V and it provides maximum current of 600mA.The major components in the above circuit diagram are at89c51 microcontroller and motor driver. Here the motor driver input pins IN1, IN2 are connected to the P3.0 and P3.1 respectively to control the motor directions. DC motor is connected to output terminals of L293D. EN1 pin is connected to the 5V DC to drive the motor. Switches are connected to the P2.0 and P2.1 in pull down configuration. First switch rotates the motor in clockwise direction and second switch rotates the motor in anti clockwise direction. 8th pin of motor driver is connected to the battery directly.

III. 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

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per unit of generation, less maintenance, reliability, etc. these renewable energy sources are the best alternative for the currently in use non-renewable source of energy for power generation which are feared of becoming extinct in near future. AC SOLAR GENERATOR provides one such solution.

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