FABRICATION OF SOLAR POWER THERMOELECTRIC AIR CONDITIONER

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Abstract:
Now a days the main problem we are facing are global warming and energy crisis. But to usage of conventional Air-Conditioner the both problems are increasing. So in the order to that we have Peltier based systems. The main aim of the project is to design and fabricate thermoelectric air conditioner which can be operate with a solar power.

Keywords: Lipo Battery, PIC Micro controller, Solar Panel, Charging circuit, DHT11 (Temperature and humidity sensor), POT, Exhaust Fan, Room (Chamber). LCD display, Air purifier filter.

1. Introduction.

In our project main use of solar power which is nature's free gift is used to drive this air conditioning system. The solar energy is converted into electrical energy through solar panel which is can be used to charge the battery. The blowers extract the heat from the cold side and the cold air is circulated in the conditioned space. So basically, this is a year-round air-conditioning which can be used for many purposes.

Solar energy-based temperature-controlled chamber is presented in this project. The temperature-controlled chamber (room) is utilized for cooling. Air purifier operating principle – is one. Air set in motion by the fan passes through a system of filters and purified air is released to the outside.

This project consists of fan to spread the cool air into the chamber. DHT11 is uses to measure the temperature and humidity of room and will be display on LCD display. Microcontroller will control the air purifier with filters. By using POT user can set the temperature limit of the room.

2. LITERATURE SURVEY

On by reviewing the literatures on solar operated thermoelectric refrigeration of the various researchers, the literatures here described as:

[1] Sujith G. et al.(2016) In this paper author design and fabricated the Thermoelectrical Refrigeration to cool a volume of 40L using principle of Peltier effect to cool and maintain temperature range of 5°C to 25°C and the project is used only for light heat load to lower its temperature to particular temperature. One of the advantage of this project is it takes low power to drive the refrigerator.

[2] Bharat M. Jibhakate et al.(2016) The study show that a Thermoelectric Refrigeration model is design and fabricated in place of compressor and it is based on principle of Peltier effect to maintain effectiveness of both heating and cooling side also the simulation is done to on thermoelectric refrigeration to maintain it at 40°C. The designed is environmental friendly also it has various applications in medical and pharmaceutical equipment's.

[3] Sivakumar.N.et al. (2018) In the literature the author designed the Thermoelectric Refrigeration in place of prime movers, compressor or any type of refrigerant as this designed is applicable in such areas where the electricity not available and also environmental friendly as CFC, CO2 etc. produce in other refrigeration system. As per the experimental result on thermoelectric refrigeration the minimum temperature 15°C for cooling and maximum temperature 65°C for heating was obtained. Also comparisons of results done on effect of cooling on AC and DC supply and COP of systems.

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[4] Mr. Swapnil B. Patond et al.(2015) In this research a thermoelectric module is designed to analysis the heating and cooling system by using solar energy and which is based on peltier effect. This system is different from other refrigeration system where heating and cooling is done with the help of mechanical devices and by using refrigerants. Experimental study is done for small scale solar operated thermoelectric heating and cooling, the graph is plotted from obtained results from experiment for different metals, fruits & water to analyse the heating and cooling rates in various modes. This system is free from maintenance.

3. Implementation:

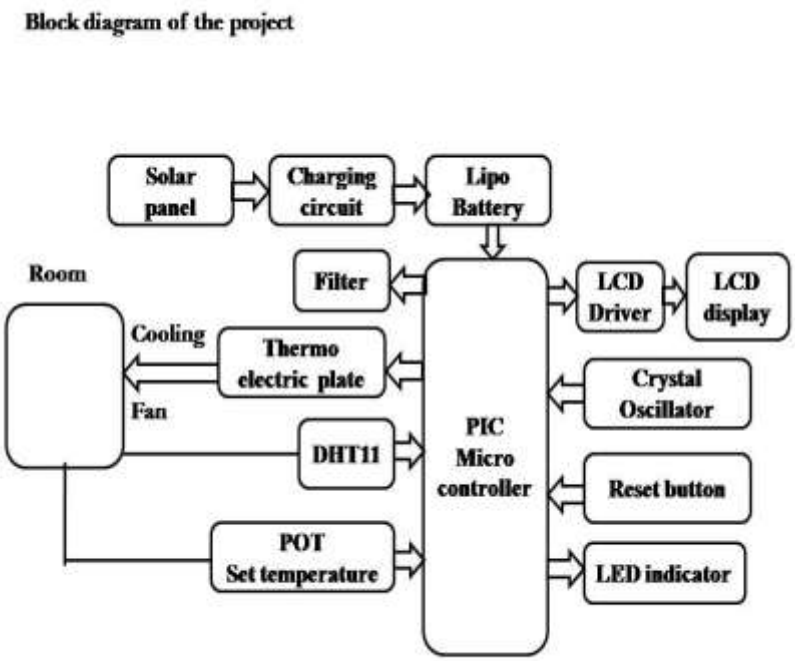

Fig 1: Fabrication of solar power thermoelectric air conditioner

Thermoelectric coolers operate by the Peltier effect. The device has two sides, and when a DC electric current flows through the device, it brings heat from one side to the other, so that one side gets cooler while the other gets hotter. The "hot" side is attached to a heat sink so that it remains at ambient temperature, while the cool side goes below room temperature. In some applications, multiple coolers can be cascaded together for lower temperature.

4. Related Work:

The brief introduction of different modules used in this project is discussed below:

SOLAR PANEL:

Fig 2: Solar panel

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A solar cell or photovoltaic cell is a device that converts solar energy into electricity by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight, while the term photovoltaic cell is used when the source is unspecified.

Assemblies of cells are used to make solar panel, solar modules, or photovoltaic arrays. Photovoltaic is the field of technology and research related to the application of solar cells for solar energy.

Photons in sunlight hit the solar panel and are absorbed by semi conducting materials, such as silicon. Electrons (negatively charged) are knocked loose from their atoms, allowing them to flow through the material to produce electricity. Due to the special composition of solar cells, only allow the electrons to move in a single direction. The complementary positive charges that are also created (like bubbles) are called holes and flow in the direction opposite of the electrons in a silicon solar panel. An array of solar panels converts solar energy into a usable amount of direct current (DC) electricity.

Charging circuit:

Charging circuit which we can use to charge the battery which is coming from solar energy. The solar output will connected to the rectifier. These spikes are removed with the help of capacitor is used. We can get Steady DC at the output terminal which can be indicated if the LED glows. This 12V DC power is used to charge the battery.

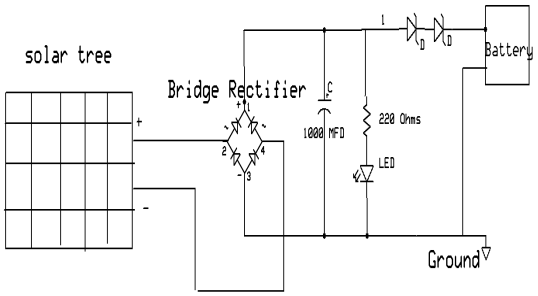

Fig 3: Charging circuit

Exhaust fan:

Fig 4: Exhaust fan

Exhaust fans work by sucking hot or humid air out of a small, localised area, allowing fresh air to enter from elsewhere (perhaps a doorway or vent) in order to replace it. The warm air that's drawn out using an **exhaust fan** is then pulled through a ducting system and expelled outside.

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PIC Microcontroller:

Fig 5 : PIC Microcontroller

A microcontroller can be considered a self-contained system with a processor, memory and peripherals and can be used as an embedded system. The 16f72 micro controller is powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller. The PIC 16F72 is a 28 pin IC in the physical structure with 3 ports like port A (6 pins), port B (8 pins), port C (8 pins) excluding the supply pins(4 pins).

DHT11:

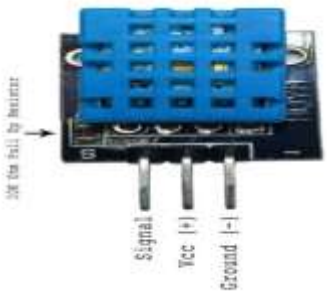

Fig 6 : Humidity and temperature

A humidity sensor senses, measures and regularly reports the relative humidity in the air. It measures both moisture and air temperature. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.

LCD display:

Fig 7 : LCD display

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals.Liquid crystal display is very important device in embedded system. It offers high flexibility to user as he can display the required data on it.

Thermoelectric plate:

Fig 8 : Thermoelectric plate

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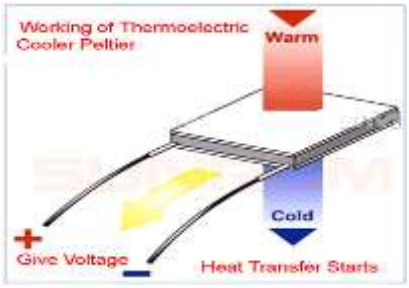
A thermoelectric cooling (TEC) module is a semiconductor-based electronic component that functions as a small heat pump. By applying DC power source to a TEC, heat will be transferred from one side of the module to the other. It creates a cold and hot side.



Air purifier:

Air purifier operating principle – is one. Air set in motion by the fan passes through a system of filters and purified air is released to the outside.
High-speed electrons are discharged that enable decomposition and removal with the Streamer.
Dust is captured. Bacteria and allergens are removed.
Dust and pollen are electrically charged and then sent to the filter.
Then the electrically charged filter absorbs the collected dust and pollen.
Odours and viruses are kept under control by photocatalysts.
Formaldehyde and odours are decomposed Discharge unit.

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Conclusion:

A portable Cooling system can be fabricated by using thermoelectric module & electric control unit for the cooling purpose. The system is self-powers & can be used in isolated & a remote part of the country where load-shading is a major problem. Thus project can be concluded that solar energy systems must be implemented to overcome increasing electricity Crisis. In order to utilize renewable energy, solar energy is integrated to the battery is used to power up the thermo electric plate for running the air conditioner. It's an ecofriendly initiative, thus it promotes green technology for the future. This technology has not been widely accepted due to its initial cost, but by using the waste heat, the system becomes very efficient compared to its traditional counterpart.

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