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DESIGN AND DEVELOPMENT OF SOLAR BASED REFRIGERATOR FOR REMOTE PLACES

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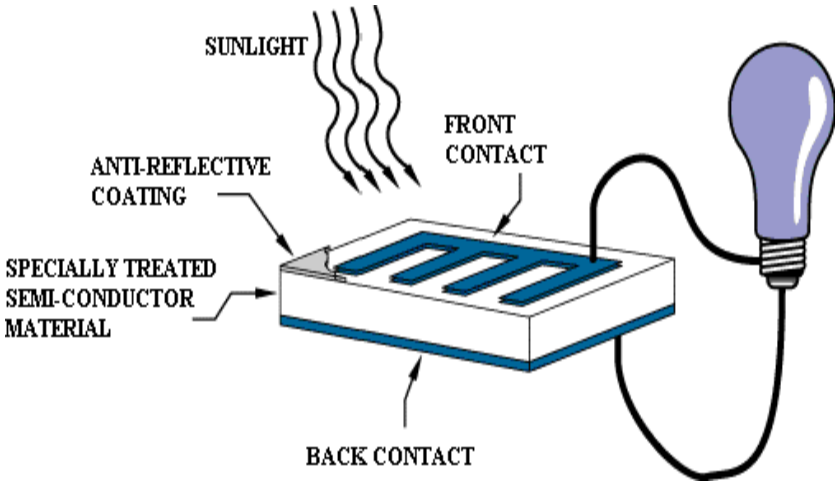
Abstract
The need for basic health development in developing countries can be greatly enhanced by the use of a cool storage environment and decaying goods. there is a growing need for refrigerators in rural areas, as there is not enough electricity from the electricity grid.
This work is about developing technologies that improve and reduce energy needs. And we can use this as we travel from one place to another.
Keywords - Solar Panel, Battery, Peltier model, Insulation material, Fan, closed button, Temperature sensor

I. INTRODUCTION

Electricity production is main cause of industrial air pollution in the country. Most of the electricity come through coal and other non-renewable energy sectors. The energy prodution from these sources takes huge toll on environment and pollutes air and soil. Renewable energy sources can be used to produce electricity with minimal impact on the environment. It is possible to produce electricity from renewable energy sources without producing CO2.
In many rural areas, electricity available or non-existent. The project is therefore focused on the construction of a small portable solar-based refrigerator. This refrigerator will be suitable for small-scale cooling purposes and will have a shorter cooling time compared to a standard refrigerator.

II. COMPONENTS

1.Solar panel



Above diagram shows performance of basic solar cell. Solar cells are made from the same semiconductor materials,that are used in microelectronic industry. In solar cells, a small semiconductor wafer is specially modified to create an electric field, positive on one side and negative on the other. When light energy hits a solar cell, electrons are released into atoms in the semiconductor space. When electrical wires are connected on both the positive and negative sides to

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form an electrical circuit, electrons can be trapped in the current electrical current, i.e. this gas can be used to power a load such as a lamp or instrument.

The number of interconnected solar cells integrated into the supporting structure is called a photovoltaic module. The modules are designed to provide electricity at a specific voltage, such as a standard 12 voltsystem. The output current depends directly on how much light falls on the module.

2.Battery

Battery used in the refrigerator has the following specifications:

- 12V DC
- 7.5 amps per hr

Refrigerator has, one battery is used as the operating time of refrigerator. If additional cooling is needed, additional connectors for the second battery in the refrigerator are available.

3.Peltier Unit

Peltier module used in the refrigerator is a TIC 12073. This module operates at 5 volts

DC,draws a current limit of 4 amps in full load. The average power of the module is 20 watts.

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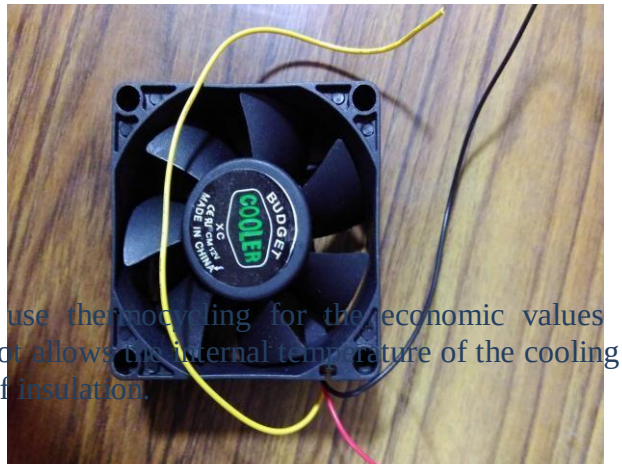
4.CoolingFan

Fig.12CoolingFan

In our refrigerator we use two cooling fans installed in one sink for each temperature. The purpose of the cooling fan is that to eliminate the radiator heat by drawing in fresh air.Fans used in the refrigerator operate on 12 V DC and draw 0.18 A.Consumption per fan is 2.16 watts.

5.Thermocol



As we know, ice sellers use thermocoling for the economic values and verygood protective properties because it will not allows the internal temperature of the cooling system to drop, therefore also has economic source of insulation.

6.On-OffSwitch

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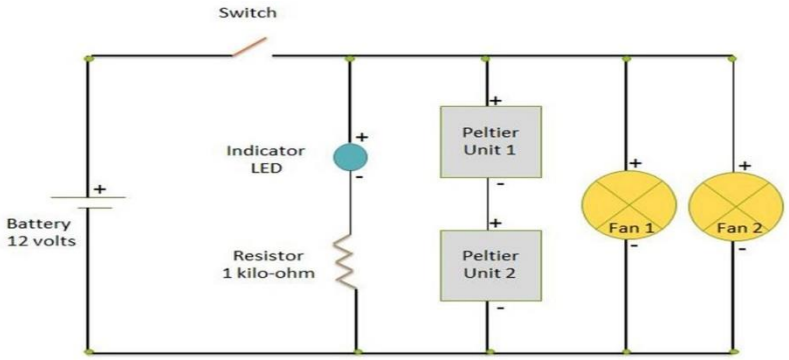
The switch on / off switch is used in the refrigerator to control power supply to the refrigerator. The switch which is rated at 6 amps.

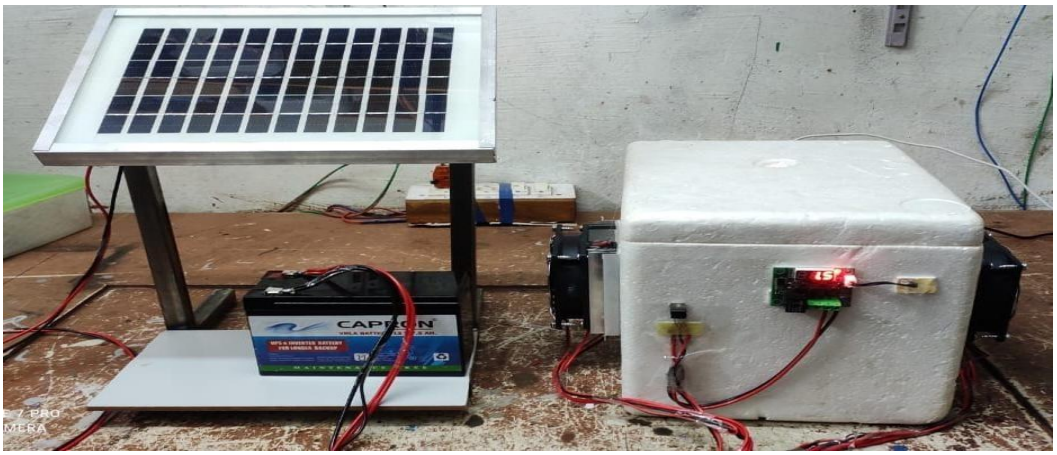
Construction of the refrigerater



- First, the thermocol box is made to the required dimensions, and the inner wall of the box is covered with aluminum sheet and outer walls with sheet paper.
- Two Peltier module are nearly placesin thetwo holes created in the box and housed in a hot side heatsink connected to the hot and cold sides inside the box.
- Heat exchanger is connected to the air conditioner, which is used to remove the heat in the external atmosphere, which is outside the thermocolbox. Therefore, hot side of the peltiermodule cannot make trouble to the temperature inside the box.
- Total electrical connection are made by using an on/off switch and an LED indicator to indicate whether the refrigerator working or not working. Batteries each at 12 V DC, 7.5 Ahr connected in series with a series peltier connection and two cooling fans are connected.

Electrical connection are caustic soda tight and all cables used are properly routed,for preventing user interference.

Working methodology of the project



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Fridge

• The refrigerator is supplied with a 12 V DC 7.5-amphrsBattery.
• To start this refrigerator, the refrigerator button is turned On.
• When the switch on, the LED will start to indicate that when refrigerator is now to start.
• Now the two Peltier thermoelectric devices are cooled on the cooling side and cooled to create a cooling effect on the inner side and dissipate the heat on the outer side
• The cooler and a fan work on the heating side of the Peltier unit, which removes the heat from the Peltier unit on the outside.
• The Peltier thermoelectric device will be neatly arranged in a box with a suitable separation system and heatsink so that efficient cooling can always take place
• The switch can be turned off state. The bright LED will then also stop indicating light indicating that there is no power in the refrigerator

Charging of Battery

The refrigerator batteries are charged on the solar panels using a 12V, 10A charge controller. The battery is connected to a charge controller that accesses the solar panels and powers the battery.

Results

In this study, a test study of the cooling performance under different load and no load was carried out. Determination of daily and long-term behavior of PV cooling systems during normal summer and winter days. For all tests, the initial internal temperature of the refrigerator was set to 24 °C, then decelerate by 10 °C for 10 seconds. Below 10°C It takes much longer compared to above 10°C. In general, the output power of the PV panel is below the normal value. However, the performance of a PV panel is affected by many parameters.

Conclusion

In this study, a multi-purpose cooling system with PV was developed to investigate its daily and seasonal performance. The PV cooling system is independent of the local grid. The effectiveness of this system in adverse weather conditions is increasingly recognized. During the daily operation of the cooling system, parameters affecting the capacity and performance of the system were determined by testing.

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