

Compressor less Portable Refrigerator

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Abstract: *The impact of on-going progress in Science and Technology has created a variety of systems that can be used in the generation of power from Renewable Sources of energy and one of these is Solar Energy. The project which we have prepared utilizes either solar energy with the use of Thermoelectric Module and Photovoltaic Module for generation of energy or simply direct electricity which we further use for cooling and heating effect. It is basically a portable cooler which is mainly designed for the convenience of the travelling people and the militaries. The most important utilization of this portable cooler is for the preservation of insulin in extreme conditions. A Thermoelectric module (TEM) is used instead of compressor so that it become portable, as it is based on the principles of peltier effect. The use of peltier effect is to create a heating side and a cooling side and also to maintain effectiveness.*

Keywords: *Peltier effect, Thermo-electric module, photovoltaic module.*

1. INTRODUCTION

Evaporative cooling in refrigeration is an old idea but due to its dependency on outside environment (relative humidity, dry bulb temperature) it is limited to certain parts of world. Some of the examples for evaporative cooling are clay pots used in India for cooling the drinking water. In Mexico, fishermen use freezer to produce ice for storing fish. The Peltier effect is the heat liberation at one junction of thermocouple and heat absorption at the other, when an electric current flows into it. This effect is used in thermal analysis and also for heat flow compensation. With time many researches were conducted, many new theories and

with them many new devices were put forth. Air Conditioner, Refrigerator etc. are few of them, where by the use of electricity, cooling is obtained. But in these devices cooling does not just takes place totally due to electricity (here for efficiency and fast rate of cooling Refrigerants), compressors are used. in which the refrigerant undergoes phase changes, is one of the many refrigeration cycles and is Oil refineries, petrochemical and chemical processing plants, and natural gas processing plants are among the many types of industrial plants that often utilize large vapor compression refrigeration systems. Refrigeration may be defined as lowering the temperature of an enclosed space by removing heat from that space and transferring it elsewhere.

2. OBJECTIVE

1. To fabricate an aluminum assembly container inside the Plastic Jar/Can suitable to store food stuff inside.
2. To make a space (at any one side of the above encloses) to fit PELTIER JUNCTION APPRATUS in this with no air gap remains open.
3. To fix a small exhaust air fan at the outer surface above the PELTIER junctionappratus.
4. To fabricate & assemble a 12 V DC Power supply to provide power Source for this whole set up and battery charging.
5. To provide solar powered electrical energy (DC) Using Suitable Solar Modules (optional assembly)
6. To Connect a change over switch for polarity reversing for cooling & heating effect inside the enclose.

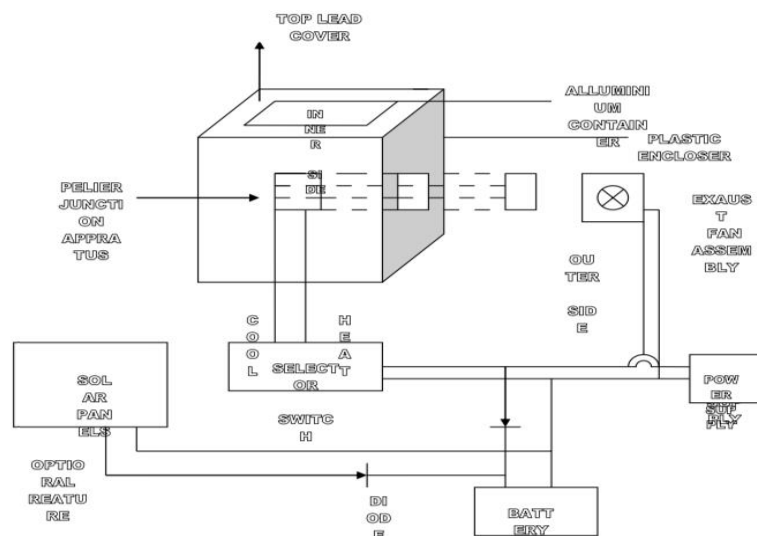


Fig.1: Block Diagram

3. CONSTRUCTION

Firstly a box of thermocol is made of given dimensions and then the inner walls of the box are covered with the aluminum sheet and the outer walls by the chart paper. The taping of the box from outer side is done so as to provide mechanical support and blocking of air. The two Peltier units are well placed in the two holes made in the box and kept on the heat sink with hot side attached to the heat sink surface and cold side inside the box. The heat sink is linked with a fan which is used to dissipate the heat of heat sink into the outer atmosphere i.e. out of the thermocol box. So, the hot side of peltier unit is unable to affect the temperature inside the box. All the electrical connections are made putting a switch for on/off and a LED as an indicator whether the fridge is working or not. Two batteries each of 12 Volts DC, 7.5 Ah are connected in parallel with the peltier units connected in series and the two cooling fans. All the electrical connections are made strong by soldering them and all the wires are arranged properly so as to avoid any inconvenience for the user.

4. WORKING

The fridge is provided power supply form a 12 volt DC 7.5 ampere battery. To start the fridge, the switch on the fridge is turned on. When the switch is turned on, a led starts glowing indicating that the fridge is now online. Now two Peltier thermoelectric devices which are insulated from the cooling side and arranges in the fridge generates cooling effect on inner side and heat is dissipated on outer side. On the heat side of the peltier unit, a heat sink along with the fan works to dissipate the heat from the peltier unit in the outer environment. The Peltier thermoelectric Device will be so arranged in a box with proper insulation system and heat sink so that efficient cooling takes place at all the time. To turn off the fried, switch can be turned off. Then the glowing led will also stop glowing indicating no power for the fridge.

Battery charging

The batteries used in the fridge are charged from the solar panels using a charge controller rated 12volts, 10 amps. The battery is connected to the charge controllers which get supply from the solar panels and feeds it to the battery.



Fig.2: Final Project

5. CONCLUSIONS

A thermoelectric refrigerator with an inner volume of 10litres has been designed and built. A more ecological system because it does not use refrigerants. More silent and robust since it minimizes the moving parts (it does not need a compressor). The advantage of the solar refrigerator is that the production of power is not uniform since solar energy is not available throughout the day and it also maintain in intensity by usage of battery during various times of the year. Hence, it can be used only in places where strong sun rays are available throughout the year and most parts of the day. A highly nonlinear model for the behavior of the compressor less refrigerator is considered. A parametric study to investigate the influence of the control parameters on the response is conducted. The final result positive manner .There is no problem while in Final assembly design; without failure. For proving that above design is carried out for applying fabrications for future works. Finally, I report that original manufactured assembly is fine and design model results are shown without any failure.

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