International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 06 | June 2021 www.irjet.net p-ISSN: 2395-0072

THERMOELECTRIC AIR CONDITIONER

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Abstract - *In thermoelectric material, electrical energy can be converted directly into Thermal energy, and thermal energy is converted into electrical energy. A direct transition between electrical and thermal energy is possible due to two important thermoelectric effects one the Seebeck effect and the other Peltier effect. Seebeck effect refers to the presence of electrical energy in the whole thermoelectric object depending on the temperature gradient. The Peltier effect refers to the heat absorption at the end of one thermoelectric current and the heat dissipation from the other side due to the current flow in the material.*

Key Words: Thermoelectric material, air conditioner, Peltier effect, Seebeck effect, heat.

1.INTRODUCTION

In thermoelectric material, electrical energy can be converted directly into Thermal energy and thermal energy is converted into electrical energy. A direct transition between electrical and thermal energy is possible due to two important thermoelectric effects one the Seebeck effect and the other Peltier effect. Seebeck effect refers to the presence of electrical energy in the whole thermoelectric object depending on the temperature gradient. The Peltier effect refers to the heat absorption at the end of one thermoelectric current and the heat dissipation from the other side due to the current flow in the material.

Thermoelectric cooling is often referred to as cooling technology using thermoelectric cooling. TECs have the advantages of high reliability, no mechanical components, compact size, low weight and no active fluid. In addition, it has the advantage that it can be powered by direct current (DC) power sources. A fan is the process of removing heat from a room or other applications. There are many ways to produce a cooling effect such as vapor pressure and air vapor pressure. These air conditioners produce a cooling effect using refrigerators such as Freon and ammonia etc. It produces high emissions but the worst is that it emits harmful gases into the air. Harmful gases such as cluro Fluro carbon and other gases are present.

These types of air conditioners have a variety of applications. An air conditioner is a great home appliance or method designed to change the humidity and air temperature inside an area. Cooling is usually done using a simple refrigeration cycle but sometimes evaporation is usually done to cool comfort in car and truck buildings. We mainly use a vapor compression air-condition system that has many moving parts and also produces harmful gases in the environment. By using thermoelectric Peltier modules air-conditioners we can overcome the existing air-conditioning system by modifying it to protect the environment from harmful gases.

1.1 CONSTRUCTION

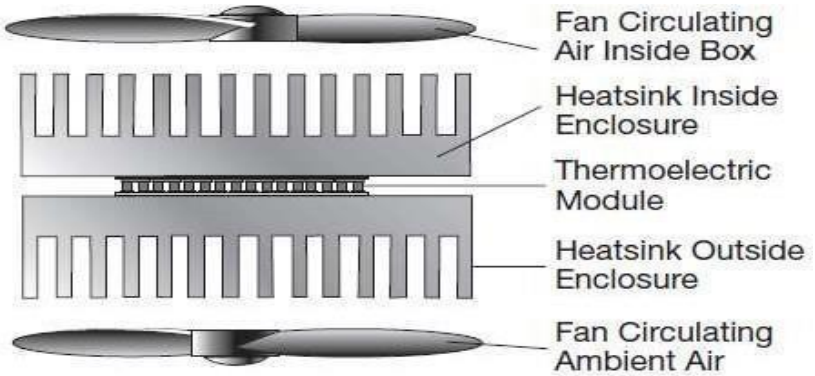

fig-1 : Schematic construction of Thermoelectric AC

The above fig shows a schematic constructional figure of thermoelectric cooling/AC which shows the components Peltier, heat sink, fans etc. Thermoelectric cooling uses the Peltier effect to create a heat flux between the junction of two different types of materials. A Peltier cooler, heater, or thermoelectric heat pump is a solid-state active heat pump that transfers heat from one side of the device to the other, with consumption of electrical energy, depending on the direction of the current. Such an instrument is also called a Peltier device, Peltier heat pump, solid-state refrigerator, or thermoelectric cooler (TEC). It can be used either for heating or for cooling, although in practice the main application is cooling. It can also be used as a temperature controller that either heats or cools. The main components used in a Thermoelectric AC are explained below.

1.2 working

Thermoelectric AC performance is primarily based on peltier performance or peltier effect When voltage is applied to the free ends of two peltier semiconductors than current DC flows across the semiconductors junction causing temperature differences. The side with the cooling plate absorbs heat from the attached heat sink and is transferred to the other side of the device where the other heating is placed and thus the cooling effect is made across the peltier. This cooling effect is transmitted to the occupant with the help of a cooling fan or a used blower. The direction of heat and cooling is determined by the magnitude of the applied voltage.

2. COMPONENTS OF THERMOELECTRIC AC

PELTIER

Two unique semiconductors are used, one type one and one type p, because they need to have a strong electron density. The semiconductors are heated to each other and electrically connected to the series and then connected to a plate that heats warmly on each side. Thermoelectric Coolers, also abbreviated to TECs are usually connected side by side and connected between two ceramic plates. The cooling capacity of a complete unit is equal to the number of TECs in it.

Heat sink

It is a heat exchanger that transmits heat generated by any electronic device to the air or liquid environment to maintain a constant temperature throughout. It is widely used by powerful semiconductor devices with low heat dissipation capability. Made of copper or aluminum.

Blower fan

A blower follower is also called a centrifugal fan or squirrel follower. It is a mechanical device used to move air or other gases to any place. Rotating generators for fans are used to increase the speed and volume of the air distribution. These fans transmit endless air volume to it instead of constant weight, thus leading to continuous fan speed.

Exhaust fan

It is a fan used to remove moisture from the room. It helps to remove any odor. The main purpose of the exhaust fan is to control the internal environment by removing smoke and other contaminants that may be present in the air. It can be combined with a cooling or heating system. It disperses the air harmlessly. It can be used in the summer to compress hot air to control the temperature. It can be used as an alternative to air conditioning.

Transformer

It is a magnetic field that transmits electrical energy between multiple circuits through electromagnetic input. It is the process of generating electricity across the electric conductor by converting the magnetic field. If in one coil, the current is changed, then the magnetic field is also changed, which, in turn, stimulates the electrical potential of the second coil. It is used in the use of electrical and electronic power by increasing or decreasing the reduction of the exchange.

Switched-mode power supply

A flexible controller combined with a power switch for switching from one type to another is a required feature called a modified power supply. SMPS transfers power from a DC or AC source to a DC loading those computers. Converts voltage

and current power. The transitionor switch mode provides constant switching between low, full and fully active circuits, and spends very little time on high distribution switching. In this way, it reduces the energy used. Theoretically, there is no power distribution in the modified power supply.

3. CONCLUSION

A Thermoelectric Air cooling for car prototype was designed and built which can be used for personal cooling inside the car. Six TECs were used for achieving the cooling with a DC power supply through car battery. It had been shown from testing results that the cooling system is capable of cooling the air when recirculating the air inside the car with the help of a blower. TEC cooling designed was able to cool an ambient air temperature from32 °C to 25.8 °C. Cooling stabilizes within three minutes once the blower is turned ON. The system can attain a temperature difference of set target which was 7 °C. Accomplishing the set target establishes the success of the project. All the components in the project had been tested individually and the results were found to be positive.

REFERENCES

1. Bartlett, S & Sukuse L, 2007, Design and build an air conditioned helmet using thermoelectric devices, Final Year Project, University of Adelaide.
2. Buist, RJ & Streitwieser, GD March 16-18,1988, The thermoelectricly cooled helmet, The Seventeenth International Thermoelectric Conference, Arlington, Texas.
3. Bulat, L & Nekhoroshev, Y 2003, Thermoelectric cooling-heating unit for thermostatic body of pickup refrigerated trucks, 22nd international conference on thermoelectrics.
4. Harrington, SS 2009, Thermoelectric air cooling device, Patent Application Publication, US Patent Number 5623828.
5. Harvie, MR 2005, Personal cooling and heating system, Patent Application Publication, US Patent Number 6915641.
6. Hyeung,SC, Sangkook, Y & Kwang-il, W 2007, Development of a temperature-controlled car-seat system utilizing thermoelectric device, Applied Thermal Engineering, pp 2841-2849.