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Conversion of dessert cooler in to air conditioner using peltier module

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Abstract:
The present air conditioning system produces cooling effect by refrigerant like, CFC, Freon, Ammonia etc. The main purpose of this project is to develop portable air conditioning systems without using any gas. The system used peltier module as main device for producing cool air is known as thermoelectric pump. Thermoelectric refrigeration is new (advance) alternative it can convert waste electricity into useful cooking, is expected to play an important role in meeting today fossil energy challenges. Thermoelectric devices are solid state devices. They have small size & light weight as compare to air conditioner. Due to these advantages, the peltier module have found a large range of applications. In this paper, basic knowledge of the Peltier module and an overview of these applications are given.

Key Words*: Dessert cooler, Peltier module, Thermoelectric system.*

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I. INTRODUCTION:

A dessert cooler is a device that cools air through the evaporation of water. The air supplied by the conventional air cooler is generally 80 - 90%relative humidity, very humid air reduces the evaporation rate of moisture. The only two mechanical parts in most basic evaporative coolers are the fan motor and the water pump which requires very low maintenance. It is low cost and low power consumption system. A peltier module driven dehumidification system. Objective of this project is to design thermoelectric refrigerator utilitie peltier effect to refrigerate and maintain a specified temperature, perform control in the range (5-30) degree Celsius. Interior cooled volume of 5 litre and retention for next half hour.

Fig. no.1 dessert cooler

1.1 Thermoelectric Effects :

In the thermoelectric refrigeration system,the thermoelectric effects is the phenomenon of the create a heat flux between the junctions of two difference types of materials as the p-type and n-type semiconductor materials. A thermoelectric device creates voltage when there is a difference (gradient) temperature on each side. Conversely, when a voltage is applied to it, it creates a temperature gradient (difference). At the atomic scale, an applied temperature difference causes change carriers in the material to diffuse from the hot side to the cold side. The term "Peltier module effects" encompasses three separately identified effects :The Seebeck effect, Thomson effect, Peltier effect.

1.1.2 Peltier Effect

A peltier cooler can also be used as a thermoelectric generator. Peltier effect found there was an opposite phenomenon to the Seebeck effect, where by thermal energy could be observed at one dissimilar (different) metal junction and discharged at the other junction when an electric current flowed within the closed circuit. When operated as a generator, one side of the device is heated to a temperature is greater than the other side, and as a result, a difference in voltage will build up between the two sides.

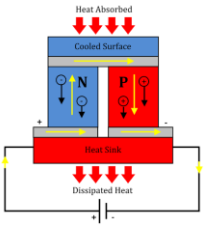

Fig. no.2 peltier effects

1.1.3 The Seebeck Effect :

The Seebeck effect is the conversion of heat directly into electricity at the junction of difference (dissimilar) electrical conductor.

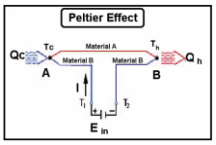

Fig. no. 3 peltier effect

The conductor are two different metals denoted as material A and material B. The junction temperature at A is used as a reference and is maintained at a relatively cool temperature Tc. The junction temperature at B is used as temperature (greater) higher than temperature Th with heat applied to junction B, a voltage (Eout) will appear across terminals T1 and T2 and therefore an electric current would flow continuously in this closed circuit. This voltage is known as Seebeck emf (electromotive force), can be expressed as
Eout =α(Th-Tc).

II. WORKING :

A typical thermoelectric module is composed of two ceramic substance that as a foundation and electrical insulation for p-type and n-type Bismuth Telluride dice that are connected electrically in series and thermally in parallel between the ceramics. While both p-type and n-type materials are alloys of Bismuth and Telluride, both have different freedom electron densities at the time equal (same) temperature. Excess of electrons is in n-type dice, while p-type has an deficiency of electrons. As current flow up and down through the module, it attempts to establish a new (advance) equilibrium with the material the current treads the p-type material as a hot junction needing to be cooled and the n-type as a cold junction needing to be heated. Therefore the material is really (actually) at the same temperature. The result is that the hot side becomes hotter while the cold side becomes colder.

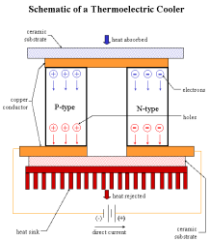

Fig. no.5 Thermoelectric with heat sink

III. PERFORM SPECIFICATIONS :

Delta Tmax: 152.6°F, Current (Imax :6.0amp) , Voltage (V :15.4w) , Dimensions (D :1.6*1.6*.015m), Wire lead length (L :8m), Aluminium heat sink :205w/mk.

IV. GOVERNING EQUATION :

4.1 Cooling power :

$Q=(\alpha_p-\alpha_n)IT_1-(T_2-T_1)*(K_p-K_n)-I^2(R_p+R_n)/2$

4.2 Power Consumed :

$W=(\alpha_p-\alpha_n)I(T_2-T_1)+I^2(R_p+R_n)$

4.3 Coefficient Of Performance :

$$COP = \frac{(\alpha p-\alpha n)IT1-(T2-T1)*(Kp-Kn)-I2(Rp+Rn)/2}{(\alpha p-\alpha n)I(T2-T1)+I2(Rp+Rn)}$$

4.4 Maximum Cooling Power :

$Q=(\alpha_p-\alpha_n)IT_1-(T_2-T_1)*(K_p-K_n)-I^2(R_p+R_n)/2$

V. FEATURES OF PELTIER MODULE :

•Peltier module can convert thermal energy into electricity, than observations of heat (cool side) on one side and rejection of heat (hot side) on other side.
•Conventional systems can use or generate harmful gases like CFCs (chloro fluoro carbon) and HCFCs (hydro chloro fluoro carbon). The Peltier module can not use or generate these harmful gases.
•Peltier module can operate on dc power source.
•By using proper closed loop circuit, the module can control precise temperature.

Applications :

- Peltier module is a thermoelectric cooling system.
- Highly efficient during dry as well as humid weather.
- It requires low cost.
- Low cost maintenance.

Advantages :

- The thermoelectric cooling system is much smaller and lighter.
- A peltier module attached to the heat sink has the ability to reduce the temperature below the ambient value peltier module can heat or cool depending upon the polarity of the applied power.
- Peltier module are usually small and are not general used for large refrigeration dessert cooler also require supply of electricity to wear efficiently.
- Highly efficient during dry as well as humid weather.

Disadvantages :

- Peltier module is not generally used for large scale refrigeration.
- Peltier cooler also require supply of electricity to work efficiently.

VI. CONCLUSION:

In literature regarding the investigation (search) of dessert cooler air conditioner using different modules has been thoroughly reviewed. From the review of the pertinent literature presented above, it can be inferred that peltier module technology using different used for cooling as well as heating application has considerable attention. Many researchers try to improve the COP of the dessert cooler air conditioner using different materials. Dessert cooler to be practical and competitive with more traditional (advance) form of technology, the thermoelectric device must reach a comparable level of efficiency at converting between thermal and electrical energy.

REFERENCES:

[1]. Murray J Lawn and TakakazuIshimatsu (2003), "Modeling of a Stair- Climbing Wheelchair Mechanism with High Single Step Capability", Vol. 11, No. 3,pp.

[2]. Bynum, W.-F.; Porter, R.: (eds) Oxford Dictionary of Scientific Quotations. Oxford University Press. Oxford, England, 2006.