Solar Air Cooler

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Abstract— Solar Air Cooler uses Solar Energy to play a role of an air cooler. Solar Energy is stored during the operation in a battery. Water in the tank is cooled and the air is blown using a blower fan.

Keywords: Air, Battery, Blower, Cooler, Solar

I. INTRODUCTION

Solar Air Cooling is one of the best ways to go with *pollution-free* environment in regards to air conditioning. Various methods have been researched, and some demonstrated, but only a few systems have been installed for other than research purposes. Solar cooling systems are practically better than the current solutions because cooling is most needed in places where the solar energy is most available, like *India*. Utilizing Solar Energy in a cooling system maximizes the environmental as well as economical benefits, as there are fuels are not in use by this system.

II. LITERATURE REVIEW

A. Concealed control valve by Henz W.Braukmann

Change in ambient temperature expands the wax to squeeze the adjoining rubber casing which moves the plunger contained therein to push the valve stem towards valve seat to regulate flow. The invention has the setback in terms of limited movement of plunger and associated valve stem due to relatively smaller change in thermal expansion of wax, smaller temperature range of operation due to relatively low temperature of melting of wax, and the mode of operation of the valve which closes fluid flow on temperature rise. In case of solar heating applications we need a valve that opens on temperature rise and closes at lower temperature levels.

B. Application of a thermostatic control valve by Ernst Gobien

Application of a thermostatic control valve to maintain at constant temperature of coolant flow in the cooling jacket of an internal combustion engine. It comprises of warm up valve to suppress coolant flow in partial area of cooling jacket, a radiator valve to supply coolant from cooling jacket to radiator, a bypass valve to return coolant from cooling jacket's outlet to its inlet thus bypassing radiator. A single thermostatic element therein responds to temperature changes and actuates warm up valve, radiator valve and bypass valve. A solar heating system hardly requires warm up valve or bypass valve since the system aims to deliver solar heated fluid at constant temperature or at minimum high temperature.

III. PROJECT BACKGROUND

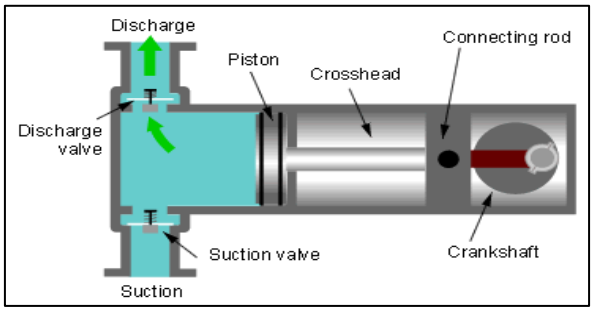
The main objective of making this project was to get the mechanical output without using electricity, and to cool a large area in a relatively shorter time compared to other conventional systems and this results in cooling which lasts longer. Along with that, efficiency and having minimum moving parts were of the most importance, which also helped reducing the cost of the final assembly, making it easily affordable to everyone.

The main purpose of making this project was to provide as much functionality and comfort as possible, to the villages and small businesses who can't afford a dedicated air-conditioning system, despite being the most needful of it. A battery backup helps those in the villages where power blackouts is a common issue. The Solar Energy stored in the battery pack has an electrical plug inlet that be used by other electronic devices as well, in case of an emergency.

IV. CONSTRUCTION

1) Galvanized Tray: A tray is constructed using galvanized material of 3 mm thickness and square-shaped joints together to support the assembly. We used mcil (flux) and white cement in appropriate places to make the tray leak proof.
2) PV Panel: A Photovoltaic panel is used to utilize solar energy and convert it to electrical energy. The panel is rated for 12 Volts and 5 Amperes.
3) Battery: Battery is rated for the same as the PV Panel to reduce losses while conversion. Battery is connected to solar panel. There can be one auto cutoff circuit which will avoid overcharging of battery and will ensure long life. An IC attached with a screen to the battery could be used to indicate the battery levels.
4) Nut-Bolt and L-Clamp: Stainless steel and alloy-steel bolts and nuts are often used in solar industry, as they are used in plain condition but also in various kind of finishing work like, hot-dip galvanised, PTFE. *L-clamp* is used for bottom fitment of body.

5) Piston Motor: An electric motor is an electrical machine that converts electrical energy into mechanical energy. A motor controllers a device that serves to govern in some predetermined manner the performance. The motor is connected to battery, and powers the blowers which generate the flow of air. Pump and Motor come as a single component which reduces cost and space.



6) Blowers: Blowers used instead of regular fans so that radial space is saved while the efficiency increases. It gives good amount of cooling effect upto a long enough distance. They require rectangular socket for proper fitment in casing. Two Blowers are connected to the battery.
7) Cooling Pad: Cooling pad helps to give cooling effect after water circulates inside the pad. Water is pushed with the help of the Piston Motor. Use of multiple cooling pads is adviced.
8) Circuit Connections: Positive Terminal of the Battery is connected to Positive Terminal of Piston Motor and Blowers while the negative terminal is connected to negative terminals of Piston Motor and Blowers in parallel. An LED dock is connected directly to battery which glows up as per the command given to it by the user.
9) Overall Construction: The PV panel is connected to the Battery and one of its connection is given to the reciprocating Piston Motor from where the water is circulated to the Cooling Pad while the another connection is given to the Blowers in series. We have added one slot for providing light effect.

V. WORKING

1) The Project works on a simple principle of converting solar energy to mechanical energy and from mechanical energy to mechanical output.
2) First, the PV panel is used which utilizes the Solar Energy or Sunlight to charge up the Battery.
3) The Battery in turn runs the pump, while still storing the surge electrical energy.
4) Here the pump is reciprocating type Piston Motor, which does not catch air and will not require any priming process beforehand. It circulates the water through the Cooling Pads, to maintain a stable temp within the cooler.
5) Blowers are used instead of regular fans so that space requirement will be minimum. Rectangular slots are needed for fitting them.
6) To avoid shorts in circuit, resistors and thermistors are added in the PCB design, to ensure that only the required amount of energy is being given to the blowers.
7) Power plug socket is provided which will provide electricity to our LED panel after appropriate connections.

VI. ADVANTAGES

1) Compensates for electricity usage, and hence reducing electricity bills.
2) More efficient with greater functionality than other offerings.
3) Affordable while maintaining good quality. Reduces Environmental Pollution. Cools more area and maintains the temperature.
4) It can be carried and used anywhere with versatility.
5) Power generated can be used by other devices too.
6) Low maintenance.

VII. APPLICATIONS

1) For cooling effect during electricity shortage.
2) Minimizing season wise servicing.
3) Using Solar energy at its fullest potential for air conditioning.

VIII. FUTURE SCOPE

1) We can use this project for 3 purposes; cooling, light effect, and power supply.
2) We can add auto cut off circuit for battery safety so that access charging will avoid.
3) We can also use an IC which will indicate us charging of battery.
4) We can make it more light by using fiber body in case of mass production with the help of moulds.

IX. CONCLUSION

Solar Air Cooler is a low cost cooler as well as a battery backup without bulky assembly that requires low periodic maintenance, while also being easily portable.

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