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Heat Reduction in Parked Automotive Cabin

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Abstract
The refrigeration unit currently used in automobiles is the vapor compression refrigeration unit (VCRS). This system uses the power from the engine shaft as an input signal to drive the refrigeration compressor, so the engine has to do extra work to run the refrigeration compressor with additional fuel. In this project, the first goal of this project is to calculate the cooling load required for 5 passenger cars. Consider all stressors such as windows, roofs, engines, people, and increased heat through your audio system. The second goal of the project is to close all windows and park in the parking lot in direct sunlight, and the temperature will rise to 60-70 degrees. But our comfortable temperature is 23 degrees, so lowering this temperature takes time and requires strong cooling. To avoid this problem in our project, we developed a solar fan. Absorbs warm indoor air and maintains the outdoor temperature. When the car is parked in the sun, the fan is controlled by a thermostat, which is set at the same temperature as the outside air. This fan system can reduce the cooling load on vehicles in a parking lot. With this system we can increase the fuel economy of our car. The software used in this project includes modeling, assembly, and construction

Keywords: *Domestic animals, thermostat, solar panel, charge controller , battery*

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I. INTRODUCTION

It gets very hot when parking in the sun for several hours. It will be too hot to get inside. This is due to the fact that the closed structure and the material from which the car is made trap hot air. Since solar radiation can enter the car through the windows, it creates an inaccurate radiation imbalance, but the long waves emitted from the car are blocked and cannot escape. There are also many problems, including reduced vehicle interior life, danger to pets or vehicle occupants, and loss of the air conditioner when the user turns it on all the way to allow hot air to pass through. This project was undertaken to find a solution to these problems. The main idea is to introduce a new HVAC system that uses thermocouples to overcome the shortcomings of the existing HVAC system. If this system were to appear in today's HVAC systems, there would be a revolution in the automotive sector.

The starting point for the development of a modern heat reduction system in a car should be the thermal characteristics of the human body and the thermal preferences of passengers (meaning the human body and the climate system with an emphasis on summer conditions). The main topic of this article is the human body, pets and preferred microclimate conditions; automatic heat dissipation or increased heat ventilation can provide more comfort for people and pets, as well as a normal room temperature.

II. MATERIAL SELECTION

We are basically trying to fit this heat reduction system in to model of a car which is the exact half dimension of a Maruti Suzuki OMNI vehicle. The basic chassis structure will be made up of galvanized iron ,body will be covered by galvanized iron sheet and wind shield glass .

2.1 GALVANIZED IRON PIPE

Galvanized iron is basically iron coated on the outside with a protective zinc layer. Iron itself is susceptible to deterioration due to weather conditions. When exposed to moisture and oxygen, the main chassis

structure is made of this galvanized iron (such as rust and corroded iron). Over time, rust and corrosion can penetrate the iron and severely compromise its structural integrity.

Figure1: Galvanized iron pipe

1.2 GALVANIZED IRON SHEET

Galvanized Iron Sheet (GI) is basically a zinc coated steel sheet. The body is lined with galvanized iron. These sheets include various galvanized and galvanized steel sheets. The zinc coating provides a strong barrier that prevents moisture and oxygen from entering the steel. Protects the substrate by reacting with the atmosphere.

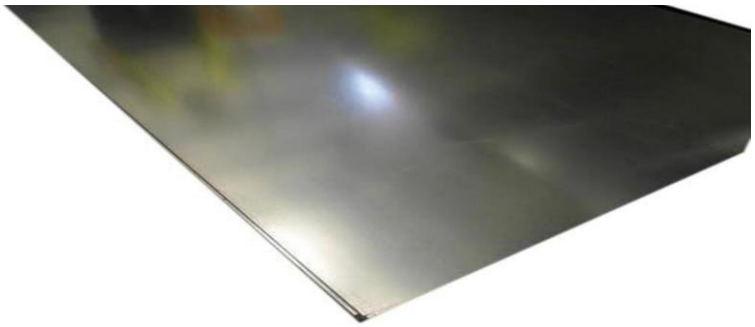

Figure 2: Galvanized iron sheet

2.3WIND SHIELD

Windshields are classified as flat glass, providing visibility and protecting passengers from the elements. A modern windshield consists of laminated safety glass, a type of processed glass, which usually consists of two curved glass panels, between which a layer of plastic is laminated for safety and connected to the window sill.

Figure3: Wind shield

III. WORKING COMPONENT

Working components like ,thermostat ,exhaust fans ,charge controller will be kept inside the cabin itself and finally remaining solar panel will be kept on the roof top of the vehicle

3.1 THERMOSTAT

The thermostat is a control component that measures the temperature of the physical system and takes steps to keep the system temperature close to the desired set point. Heat transfer fluid to maintain the correct temperature when required

Figure4: Thermostat

SPECIFICATION

- Material - Plastic
- Dimensions
  Width 10 cm
  Height 6.2 cm
  Weight 14.2 gm
- Type - DC 12V heat and cool temperature thermostat.

3.2 SOLAR PANEL

In this mechanism, the fan is powered by a battery and the battery is charged with solar energy through solar panels. A solar panel or photovoltaic (PV) module is a collection of photovoltaic cells mounted on a mounting frame. Solar panels use sunlight as an energy source to generate direct current. A set of PV modules is called a PV module, and a modular system is an array. Solar systems provide solar energy for electrical devices.

Figure5: Solar panel

SPECIFICATIONS

- Flexible mono crystaline solar panel.
- The voltage and open-circuit voltage of the 27W
- solar panel are 15 V and 21 V,
- The panel is capable of producing an electric current of 1.8A.
- It is 21.5 *18 inch
- weights about 1,100 g.

3.3EXHAUST FAN

Electric motor with fan, designed for moderate pressure blowing. A fan usually consists of a fan, a motor, and a suitable enclosure. Fan frames are usually designed as part of a heating / air conditioning system. Fans are used to move air from an external source or room air called ventilated air along the heating core or evaporator of an air conditioning system. In this way, heat is transferred from the inside of the vehicle or from the inside to the outside. Most cars have the fan motor located under the dashboard, next to the damper plate on the right side of the car. However, the heating core and the evaporator core have different positions.

Figure6: Exhaust fan

SPECIFICATIONS

Dimensions	120x120x38 mv
Voltage	12 volts
Power usage	21 watts
Voltage	12VDC
Bearing	Sleeve
Speed:	3000 RPM
Airflow	125 CFM
Noise	42dBA

3.4 EXHAUST DUCT

There is an exhaust duct pipe is provided in this mechanism to remove the hot air from the cabin to out side through the exhaust fan. And this duct connects between the AC vents and the exhaust fan. For exhaust duct, PVC (polyvinyl chloride) or CPVC (polyvinyl chloride) pipes are used. The main advantage of using PVC or CPVC pipes over steel and aluminum is that they are suitable for pipes as they are durable and will not corrode or dents. because it is resistant to moisture

Figure7: Exhaust duct

SPECIFICATION

- Material - Thermoplastic
- Physical properties

Density (ρ) - 1.56 g/cm3

Water absorption Equilibrium (ASTM) - 0.04 – 0.40

- Mechanical properties
  Young's modulus (E) - 2.9–3.4 GPa
  Tensile strength (σt) - 50–80 MPa
  Elongation (ε) at break - 20–40%
- Thermal properties
  Melting temperature (Tm) - 150 °C[citation needed]
  Glass transition temperature (Tg) - 106–115 °C
  Thermal conductivity (k) - 0.16 W/(m·K)

3.5 3-WAY CONTROL VALVE

An electrically actuated 3 way valve is provided for connecting and disconnecting the exhaust fan – duct assembly from from ac vents. The actuator has a 3-wire connection and the actuator is supplied with a cable. The drive has on / off control. This means that the two wires are securely connected to the power source. Feeding the control cable electrically opens the valve, and disconnecting the control cable electrically closes the valve. The actuator contains a limit switch and energy is only consumed when the valve is opened or closed.

Figure8: 3-Way control valve

SPECIFICATIONS

Voltage :12V

Max pressure : 10 bar

Control signal: two-point(open-close)

Operating time: 6s

3.6 CHARGE CONTROLLER

The charge controller, charge controller, or battery regulator limits the rate at which power is added to or removed from the electrical battery. This will help prevent overcharging and overvoltage that can reduce performance or battery life and pose a safety hazard. You can also extend the life of the battery by preventing full discharge ("deep discharge") or by performing controlled discharge based on battery technology. The term "charge controller" or "charge controller" can mean a self-contained device or control circuit integrated into a battery-powered device or charger.

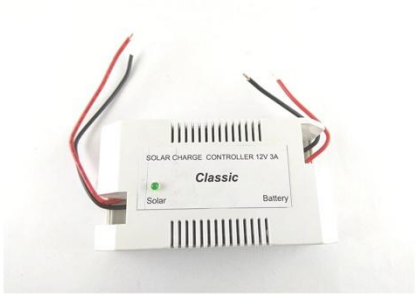

Figure9: Charge controller

SPECIFICATIONS

Type : 2 stage charge controller

Voltage : 12V

Open circuit voltage: 22V

Maximum current: 2A

3.7 BATTERY

In electricity, a battery is a device made up of one or more electrochemical cells that convert stored chemical energy into electrical energy. There are two types of batteries: primary (disposable) batteries, intended for single use and single use, and secondary (rechargeable) batteries, intended for recharge and reusable use. Here, the system uses a lead-acid battery to store electrical charge at the outlet

Figure10: Battery

SPECIFICATION

Battery cell composition.: Lead acid

Voltage : 12 volts

Weight : 4.08 kg

Dimensions : 15×6.5×9.4 cm

IV. DESIGNING

4.1 DESIGNING OF MODEL OF CABIN

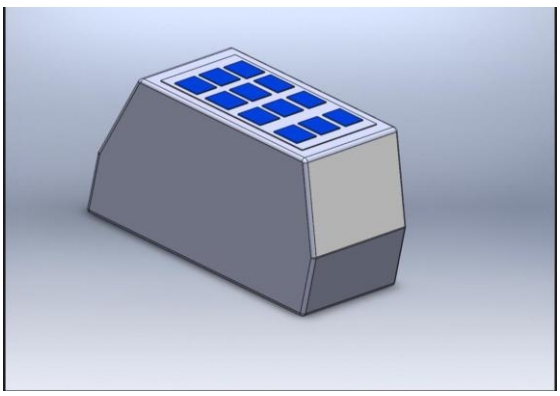

Figure11: Design model of cabin

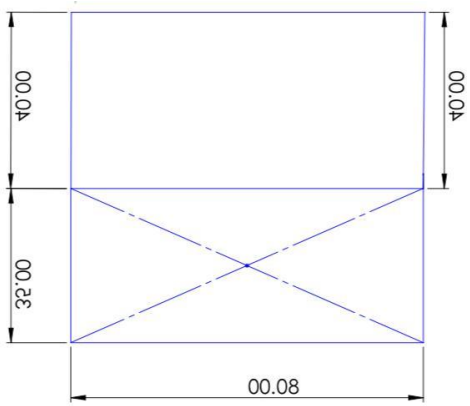

Figure12: Front view

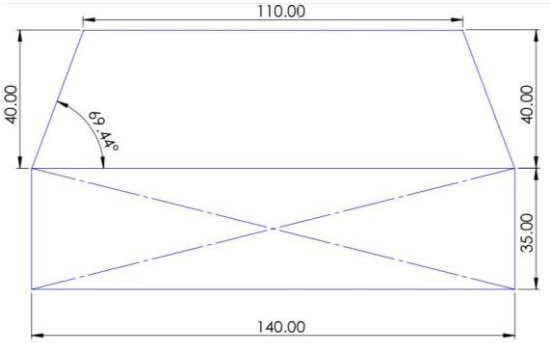

Figure13: Side view

4.2 DESIGNING OF EXHUAST DUCT AND BLOWER

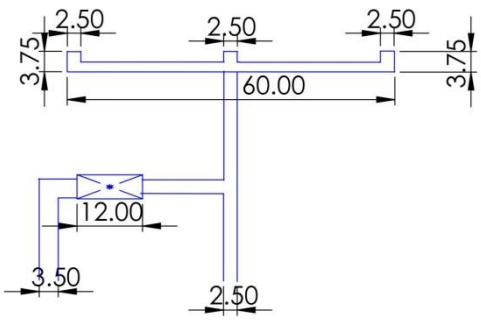

Figure 14: CADD drawing of exhaust duct and blower and its dimensions

4.3DESIGN OF ELECTRICAL LAYOUT

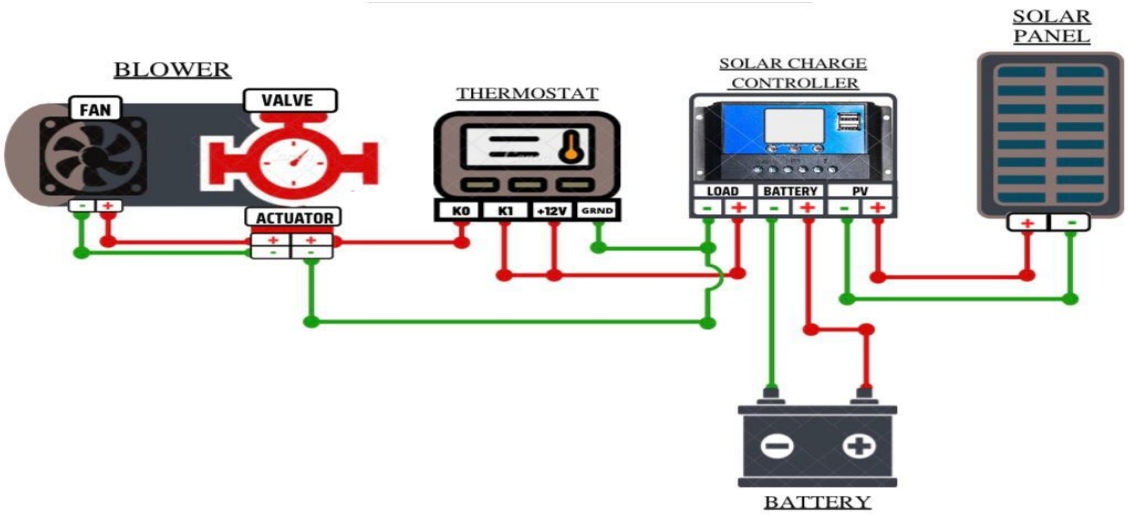

Figure15: Design of electrical layout

V. WORKING OF HEAT REDUCTION SYSTEM IN AUTOMOTIVE CABIN

When a car with this system is parked in direct sunlight the temperature inside the cabin starts to rise drastically.The thermostst is presetted at a value of 32c .When the value of temperature inside the cabin is reached above 32c the thermostat switches ON the blower and 3 way control valve.The controller closes the path or passage from AC system and opens the passage to blower exhaust fan. Thus the exhaust fan blows out the ot air from the cabin to the outside atmosphere through the duct to regulate temperature.

When the temperature is reched below 32c then the thermostat will switch off the working of blower fan and control valve will reach to its initial position

.

All the electrical and electromechanical equipments like charge controller ,exhaust fan, thermostat ,3 way valve controller are driven by consuming energy from the battery which is charged by solar panel.

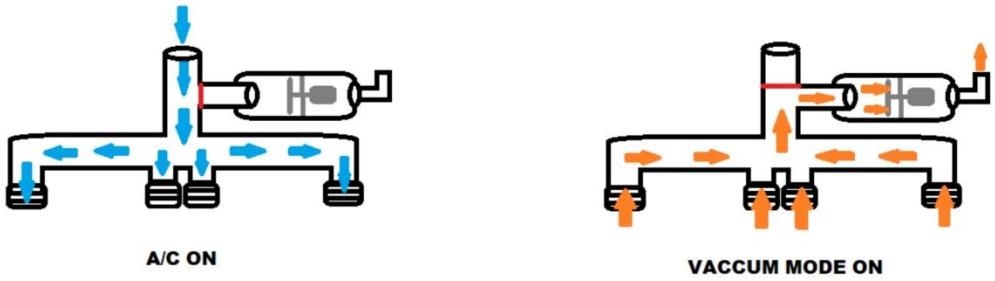

Figure16: Air flow diagram

VI. CONCLUSION

It gets hot inside the car when you park in the sun. Harmful to the living, do not live in the car. This project is an attempt to reduce heat through adequate ventilation. Build and prototype intelligent car ventilation systems

The system consists of fans that are optimally positioned and operate at optimal performance depending on the temperature. The aforementioned experimental studies have shown that the solar-powered ventilation system has been successfully used for its intended purpose in testing

In this test, it was found that the rise in the internal temperature of the vehicle with the ventilation system was lower than without the ventilation system. For this project, we reduced the temperature to 6-7 degrees during peak hours. We also regulate the night temperature using a battery. This device allows you to regulate the temperature of a small segment of a car parked in a parking lot where the engine is not running. This system saves fuel.

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