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Melting of the Ice Deposited over the Car Using Heating Module

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Abstract

Automobiles are used to travel from one place to another either short or long distance, in every environment like in summer, winter, rainy seasons. There is no restriction on the use of the vehicle in a particular season and there are no particular vehicles for a particular season and in some countries weather always remains cold or warm. In cold weather countries snow gets deposited over the vehicles in dense form which poses a serious problem to drive the vehicle or even entering the vehicle. For the side glasses and the rear and front glass shields defogger can be used which are primary or secondary. Thus to overcome this problem heating module can be used over the body of the vehicle to melt the snow deposited. These heating modules can be heated from the outside power source or can be vehicle battery powered and sensor are fitted to detect the temperature of the body. When the temperature of the body of the vehicle becomes 2-3ºC, then the modules supply can be cutoff. This present research is useful for the vehicles being used in hill areas or in cold weather countries where snow falling is a routine matter and the vehicles get snow covered to that extent that it becomes to make entry into the vehicle or drive the vehicle. This research will solve that problem very much.

Keywords: *Automobile, Heating module, Rear-shield, Snow, Windshield.*

I. INTRODUCTION

During the treacherous driving days of the winter it is important to keep the car windows, glass, body to be kept clear off from the snow. So, it takes extra time to remove the snow from the body and glass of the vehicle before driving onto the wintry roads or while driving onto the winter roads. Not only on the body and the glass of the vehicle, the tail pipe of the car should also be checked for the snow otherwise vehicle would not crank or there will be wastage of time and fuel [1]. It may also lead to the buildup of carbon monoxide in the car. After that crank the car and the defroster. It may take at least five minutes or more to warm up the car and start the melting process.

Snow should be cleared from the roof, trunk, hood and the trunk lid. Then clear off the side and the rear windows. Also do clear the exterior mirror, headlights, taillights and the turn signals.

Then clear off the ORVM, headlights, signal lights and the taillights. After every six months change the wipers. Clear off the frost from the windows too. For removing use, the ice scraper. Always use the strokes in the vertical direction [2]. And keep pushing the frost accumulation down and off the vehicle. To clear off the windshield make use of a plastic ice-scraper. Make vertical strokes always and then scrape across the window surface to break up the ice into smaller pieces. Don't use the hot water on a car covered with the snow as it would change the temperature of the glass immediately which may shatter the glass. Don't use sharp tools to chip away the ice like screwdriver as these can scratch or shatter the glass. For fluffy snows, use a snow brush with plastic bristles or broom to clear off the windows and after that a scraper can be used. Heavy snow may require a push broom, but never make use of a shovel that may damage the vehicle.

Always clear the roof of the vehicle before clearing the windows and brush the snow from the roof, hood and the trunk as during the driving these big clumps of snow may blow off while driving and may obstruct the view of the driver [3]. Vehicles can be prevented from the deposition of snow if are parked inside a garage or under an overhang. If not available the roof, windshield and the hood of the car can be covered with a snow blanket for the easy removal by pulling the blanket away from the vehicle. To keep the good visibility always keep the air vent set to "fresh" rather than "recirculate" as the recirculation can contribute to the foggy windows. Vehicle's defroster can also help to reduce the problem as opening the windows slightly. Air conditioners are designed to remove the moisture from the air and also perform even when the heater is on. A cloth can also be used to clear off the stubborn foggy spots.

The Arduino UNO is the best board to start with the electronics and coding/programming. The UNO is the very much in demand and documented board of the whole Arduino family. Arduino Uno is a microcontroller board based on the ATmega328P [4]. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 are analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), one USB connection, one power jack, one ICSP header and one reset button. It also contains everything required to support the microcontroller; by simply connecting it with a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in the Italian and was chosen to mark the release of Arduino Software –IDE b 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino. The Uno board is the first one in the series of USB Arduino boards and the reference model for the Arduino platform, for an extensive list of the current, past and the outdated boards.

II. LITERATURE REVIEW

A. Aroussi, A. Hassan, B. Clayton, B. S. Abdul Nour and E. Rice in their research paper studied the prevailing fluid flow and the heat transfer on the windshield of a vehicle and also examined the ways it can be improved further. They examined the promoting of the efficient ways for the

de-icing and the demisting [5]. They examined that the present ways of de-frosting and the de-misting the windshields are inefficient because always the area below the drive's eye clears first and it also takes a considerable time after the blower has been switched on. The complexity of the windshield topography and the defroster nozzle geometry yield inadequate flow mixing, poor momentum interchange and in critical areas of visibility there are dead flow zones. So they explored some passive ways for the defrosting and the demisting process by using the already existing air handling system of the vehicles. They calculated this flow simulation in a numerical method. But the present research is based on the use of sensors and the heating modules to clear off the snow which gets deposited during the snow fall on a parked car or while travelling. The heating modules are directly fitted on/under the vehicle body. Tai Ming Huang, Wei Ke An, Jing Yin Tan, Yong Zhou in their research proposed the use of computational fluid dynamic (CFD) to study the lack of the performance of the vehicle windshield defrosting. In CFD numerical simulation analysis was done and experimented to validate the improved prosposal [6]. The improved proposal included the change in the angle of the grill of outlet for the wind flow and adding the grill on the left and the right sides. The discrepancy found was the 5%. By doing this the windshield defrosting area got increased and also the requirements. But the present research is focused on the clearing off the snow deposited over the vehicle body during the snow fall. Phanatorn Amnuayphan, Rattapon Thanapatpanich, Prabhath De Silva* , and Pinunta Rojratsirikul in their research studied the effect of water evaporation on the delaying in the melting process of the snow[7]. As during the defrosting of the snow, the ice layer on the windshield begins to melt as the temperature of the defrost air increases. Ice turned water evaporation takes place which depends upon the ambient air humidity level and the speed of flow of the wind. As the evaporation of the water takes away the heat which in turn delays the ice melting process. At low wind speeds the air humidity has minimal effect on the delay in the ice-melting process. However, at high wind speeds (>10m/s) water evaporation takes away high amount of heat from the melting which makes a large difference in the ice removal rate.

III. METHODOLOGY

Heating modules will be fitted all round the body of the vehicle like in front, right side doors, left side doors, back side door or back side of the vehicle body. The power to these all the modules will be given from the battery of vehicle or external source can be used with inbuilt AC to DC converter or the batter using a separate plugin system which can be provided on the front side of the car on the bumper[8]. Temperature sensors can be provided on the body of vehicle on all the sides to sense the temperature of the body and cutoff the supply of the modules when the temperature goes up-to 2-3ºC. For the side glasses, windshield and the rear shield the defogger can be used to melt the snow which can either be the primary or the secondary defogger. Secondary defoggers use the conducting material and are directly placed on the glass in the form of lines which heat up the glass area and thus melting the snow. The heating modules used are controlled by a microcontroller Arduino Uno. Microcontroller can switch on/off between various modules.

When the switch is on the sensors detect the temperature of the vehicular body's snow which is below zero then the modules are switched on till the temperature of the vehicle body reaches the 2-3ºC. at this temperature all of the snow gets melt and body becomes free of the snow.

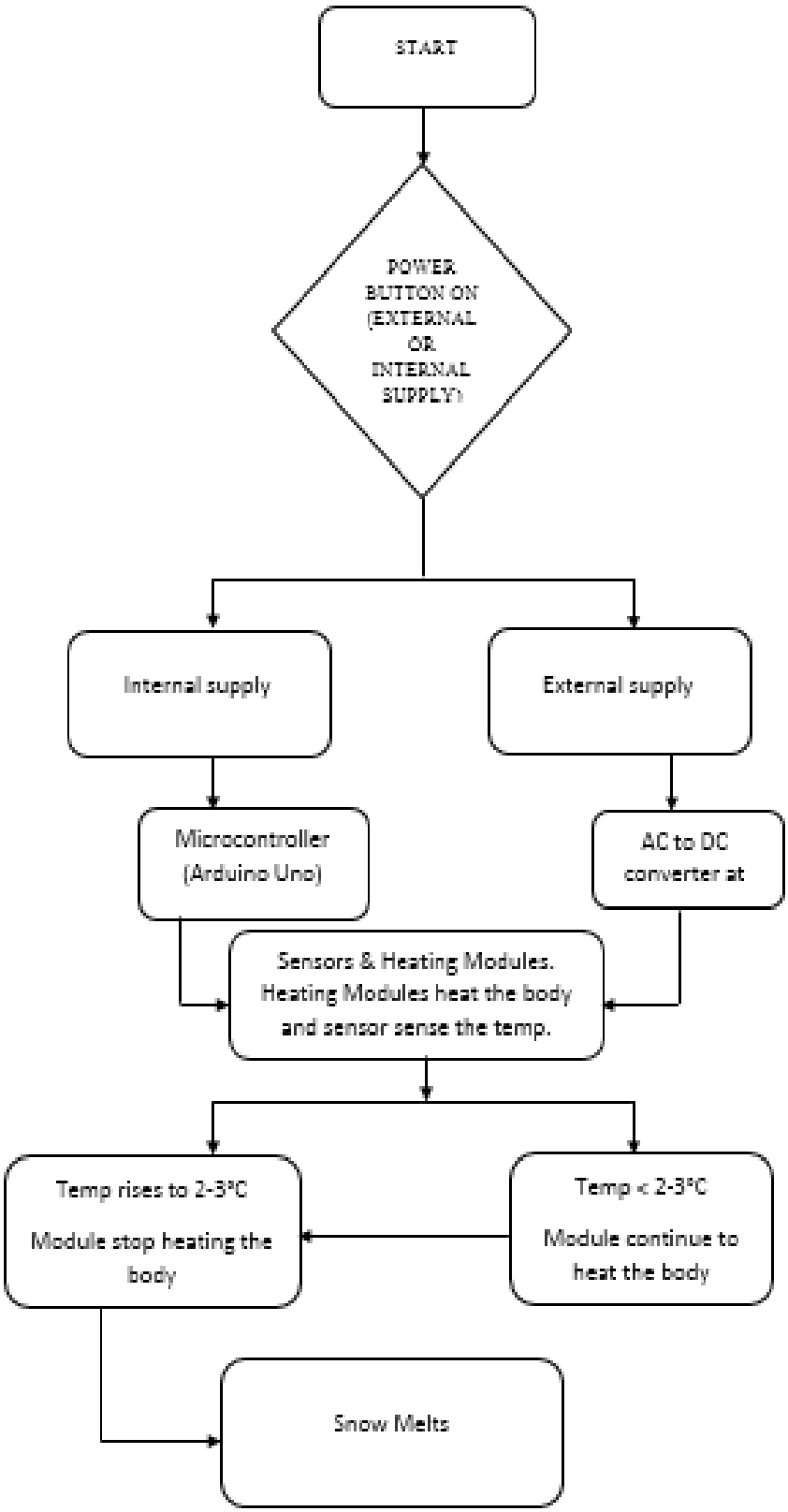
START
POWER BUTTON ON (EXTERNAL OR INTERNAL SUPPLY)
Internal supply
External supply
Microcontroller (Arduino Uno)
AC to DC converter at
Sensors & Heating Modules. Heating Modules heat the body and sensor sense the temp.
Temp rises to 2-3°C
Module stop heating the body
Temp < 2-3°C
Module continue to heat the body
Snow Melts

Fig. 1 flow chart showing the process of melting the deposited snow.

IV. RESULTS & DISCUSSION

The snow deposited over the vehicle body has temperature less than the zero degree. This temperature will be sensed by the sensors installed and the user switch on the heating module then the heating modules start heating the body which will raise the temperature of the body to the 2-3°c which again will be sensed by the sensor and the modules will be switched off in the order of their rise in temperature [9]. This rise in the temperature of the body will melt the snow deposited over the body. The power to the modules can be supplied externally or the internally depending upon whether the driver need to melt the snow while sitting inside the vehicle or when the vehicle was in parking and the snow got deposited over the vehicle. The module can have switched on earlier to prevent the earlier deposition of the snow over the vehicle body.

V. CONCLUSION

This research is going to help the automobile engineers or designers to predesign the vehicle body keeping in mind the use of heating modules to be installed on or under the vehicle body which will solve the solve the problem of running or using vehicles in cold weather area or hill areas where snow deposition is a routine matter. Otherwise earlier this was a big problem to tackle when the snow gets deposited over the body. It would take much time to clear off the snow manually or using some solutions but this research will automate the process of snow melting. It will also prevent the body from scratches which can be due to the result of the use of some tools to remove the snow from the body.

VI. REFERENCES

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