

TITLE

Ventilation System For Vehicles

FIELD OF THE INVENTION

5 This invention relates to a ventilation system for vehicles.

BACKGROUND ART

10 The design of motor vehicles with the passenger carrying compartment sealed off by steel and glass means that there is always a need for good ventilation to enhance the comfort of persons transported in the vehicle. Many vehicles incorporate ventilation systems that are powered by the engine of the vehicle. These systems include fans
15 to draw air into the vehicle through vents in the front of the vehicle or air-conditioning systems that incorporate a compressor and heat exchanger. However, these systems rely on the power from the vehicles' engine to operate. In most vehicles the ventilation fan will only operate when the
20 ignition is switched on which means that the fan cannot be used when the vehicle is left standing in the open without leaving the key in the ignition. Although a small fan can be driven for a limited period by the power of the vehicles' battery care has to be taken so that the use of
25 such a fan does not drain all of the power out of the battery. In our earlier Malaysian patent application, we disclose the use of solar power to provide additional power to run the extraction fan to thus reduce the drain on the vehicle's battery.

30 It is thus considered that there is a need for a more flexible ventilation system for vehicles and it is this need that has brought about the present invention.

SUMMARY OF THE INVENTION

35 According to the present invention there is provided a ventilation system for a vehicle 10 having an air duct 11 facilitating passage of air into the vehicle,

the system comprising at least one fan 26 arranged to be mounted in the vehicle 10 to draw air through the duct 11 into the vehicle, the fan 26 being arranged to be coupled to the electrical circuit of the vehicle 10 so that the fan
5 26 can operate when the vehicle is parked, characterised in that the system includes means to monitor the charge of the battery and means to control the flow of current to the fan 26 in dependence on the charge of the battery.

In accordance with a further aspect of the
10 invention there is provided a vehicle having a ventilation system comprising an air duct 11 facilitating passage of air into the passenger compartment 12 of the vehicle 10, at least one fan 26 mounted in the vehicle 10 to draw air through the duct 11 into the passenger compartment of the
15 vehicle, the fan 26 being coupled to the electrical circuit of the vehicle so that the fan 26 can operate when the vehicle is parked, characterised in that the electrical circuit includes means to monitor the charge of the battery and means to control the flow of current to the fan 26 in
20 dependence on the charge of the battery.

DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention will now be described by way of example only with reference to the
25 accompanying drawings in which:

Figure 1 is a schematic side-on view of a vehicle illustrating the path of a ventilation system,

Figure 2 is a circuit diagram of the ventilation system, and

30 Figure 3 illustrates details of a fan for use in the ventilation system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A solar powered ventilation system for a vehicle
35 is disclosed in our earlier Malaysian Patent Application No . The disclosure of Application is incorporated herein by reference.

The ventilation system of this invention essentially comprises one or more fans coupled through relays to the vehicle's electrical system so that by use of selective switching the fan or fans may be driven either
5 from the vehicle's battery or the power generated through the automobile's alternator driven by the engine.

A temperature control sensor 52 is also positioned in the circuit to cause the ventilation system to be switched on when the interior temperature of the
10 vehicle exceeds a preset maximum.

The vehicle 10 shown in Figure 1 is of conventional design with an air duct 11 positioned at the front of the vehicle beneath the windscreen 12. The air duct 11 allows the passage of fresh air into the interior
15 of the vehicle that defines the passenger compartment 15. Two electric fans 25,26 are positioned spaced apart on the rear parcel shelf 21 to draw air through the air duct 11, through the passenger compartment 15 of the vehicle 10 and out of the rear of the vehicle into the boot 30. The boot
20 30 includes a hollow casing 31 in the form of a pipe in the base 32 of the boot opening to the underside of the vehicle so, as shown in Figure 1, the air passes through the vehicle through the boot 30 and out of the rear underside of the vehicle. Although in the preferred embodiment the
25 air duct 11 is positioned at the front of the vehicle beneath the windscreen 12 it is understood that there are other forms and positions of air ducts that would work satisfactory with this invention. It is also understood that the passage of the air through the vehicle and into
30 the boot is merely a preferred option. Other paths of air flow are also envisaged.

A manually operable "on/off" switch 40 is positioned on the dashboard for ready access by the driver of the vehicle.

35 As shown in the circuit diagram of Figure 2 the fan 26 is wired to the vehicles power source that comes from both the vehicle's battery 50 and the alternator that

is driven by the engine. The availability of this power is controlled by the ignition switch which can either be in the fully "on" position whilst the engine is running or in an auxiliary position where the engine is off but power is supplied from the battery. Thus if the vehicle is left parked standing in the sun, the switch 40 can be activated to ensure that the fan 26 is driven by the power from the battery 50. Operation of the fan 26 should keep down the interior temperature of the vehicle and means that the vehicle does not have to be left with its windows open. When the vehicle is in use the switch 40 is turned off and the fan is driven by the power generated by the alternator of the vehicle. The user of the vehicle can also switch the fan off at any time if the ventilation system is not required. However, if the vehicle's battery 50 is to be used to power the fan 26 when the vehicle is unoccupied, there is a danger that prolonged use of the fan will drain the power from the vehicle's battery which will mean that the vehicle cannot be restarted. To protect the battery, the system of the subject invention incorporates a device that cuts off the supply of power to the fan when the charge of the battery descends to a predetermined threshold. In this manner, use of the fan when the vehicle is unoccupied will not cause the battery to become completely flat. Once the battery has been recharged past the predetermined threshold, the circuit switches back to allow power to flow from the battery to the fan. The circuit diagram in Figure 2 illustrates the means for incorporating the battery protection device.

When switch 40 is switched to the on position power is supplied from the battery 50 to the battery protection circuit 35. Trimmer 36 which is a variable resistor ensures that an appropriate voltage is supplied to the base of a first transistor 37. When V_{be} of the first transistor 37 is sufficiently large, ie when V_{be} is more than 0.6V greater than the 4.3V across first zener diode 38, the first transistor 37 turns on and current is

supplied to a second transistor 39 which also turns on. When the second transistor 39 turns on a voltage of 6.2V appears across a second zener diode 41 and a third transistor 42 turns on. When the third transistor 42 is
5 turned on current is supplied to the relay 43 causing it to close. When relay 43 is in the closed position, the battery 50 is connected to voltage regulator 51 which acts as a 5V power supply for temperature sensor 52. The temperature sensor 52 is pre-programmed to turn on mosfet
10 transistor 53 when the temperature reaches a pre-programmed level. When mosfet transistor 53 is turned on power is supplied from the battery 50 to fan 26. As the fan operates it draws power from the battery which results in a reduction in the potential appearing across the terminals
15 of the battery. Thus, the voltage which can be supplied by the battery will decrease as the fan operates. In order to prevent the voltage from dropping below an acceptable level (usually a level at which the vehicle will not start), a feed back system is provided which causes relay 43 to open
20 when the voltage drops below a pre-set level.

An appropriate drop-out voltage is set by means of a second trimmer 54. Resistors 54, 55, 56, 57 act as a voltage divider so that when the voltage across second zener diode 41 drops below 6.2V, diode 58 provides a feed
25 back to first transistor 37 and turns it off. When the first transistor 37 turns off, second and third transistors 39 and 42 also turn off and relay 43 opens thus disconnecting the temperature sensor 52 from its power supply and causing fan 26 to turn off.

30 Although not shown, an electrically driven flap can be actuated to selectively close off or open the air duct 11 at the front of the vehicle 10.

Figure 3 illustrates a typical fan 25 or 26 for use in the ventilation system. The characteristics of the
35 fan are listed hereunder.

A = 88mm ϕ

E = 30mm ϕ

B = 118mm ϕ F = 75mm ϕ
 C = 30mm ϕ G = 20mm ϕ
 D = 85mm ϕ H = 40mm ϕ

Current	Input	Speed	Air Volume		Static Pressure		Noise	Voltage
					mm/H ₂ O	inc/H ₂ O		
			m ³ /min	CFM				
below 0.2	below 2.4	± 3,000 KPM	± 4	± 120	± 10	4±	below 50	12 V

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The ventilation system described above can be retrofitted to an existing vehicle or it is understood that a vehicle could be designed to have the ventilation system installed as original equipment. The ventilation system is particularly advantageous in situations where there is a need to leave infants or pets in a vehicle that is left standing in the sun. The ventilation system can ensure adequate ventilation notwithstanding the fact that the windows of the vehicle may be closed. The fact that the ventilation system exhausts into the boot of the vehicle is also advantageous in that it allows foul odours that may collect in the vehicles boot to be expelled.

The protection device also ensures that use of the system does not cause the vehicle's battery to become flat.

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CLAIMS:

1. A ventilation system for a vehicle 10 having an air duct 11 facilitating passage of air into the vehicle,
5 the system comprising at least one fan 26 arranged to be mounted in the vehicle 10 to draw air through the duct 11 into the vehicle, the fan 26 being arranged to be coupled to the electrical circuit of the vehicle 10 so that the fan 26 can operate when the vehicle is parked, characterised in
10 that the system includes means to monitor the charge of the battery and means to control the flow of current to the fan 26 in dependence on the charge of the battery.
2. The ventilation system according to claim 1
15 characterised in that the means to control the flow of current prevents current flow to the fan 26 when the charge falls below a predetermined level and permits flow of current to the fan when the charge rises above a predetermined level.
- 20 3. The ventilation system according to either claim 1 or 2 characterised in that a temperature sensor 52 is positioned in the vehicle to control the operation of the fan 26.
- 25 4. A vehicle having a ventilation system comprising an air duct 11 facilitating passage of air into the passenger compartment 12 of the vehicle 10, at least one fan 26 mounted in the vehicle 10 to draw air through the
30 duct 11 into the passenger compartment of the vehicle, the fan 26 being coupled to the electrical circuit of the vehicle so that the fan 26 can operate when the vehicle is parked, characterised in that the electrical circuit includes means to monitor the charge of the battery and
35 means to control the flow of current to the fan 26 in dependence on the charge of the battery.



5. The ventilation system according to claim 4 characterised in that the fan 26 has an exhaust that feeds through the boot 30 of the vehicle 10 to the exterior of the vehicle.