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HEATING AND VENTILATING SYSTEM FOR CAR BODIES

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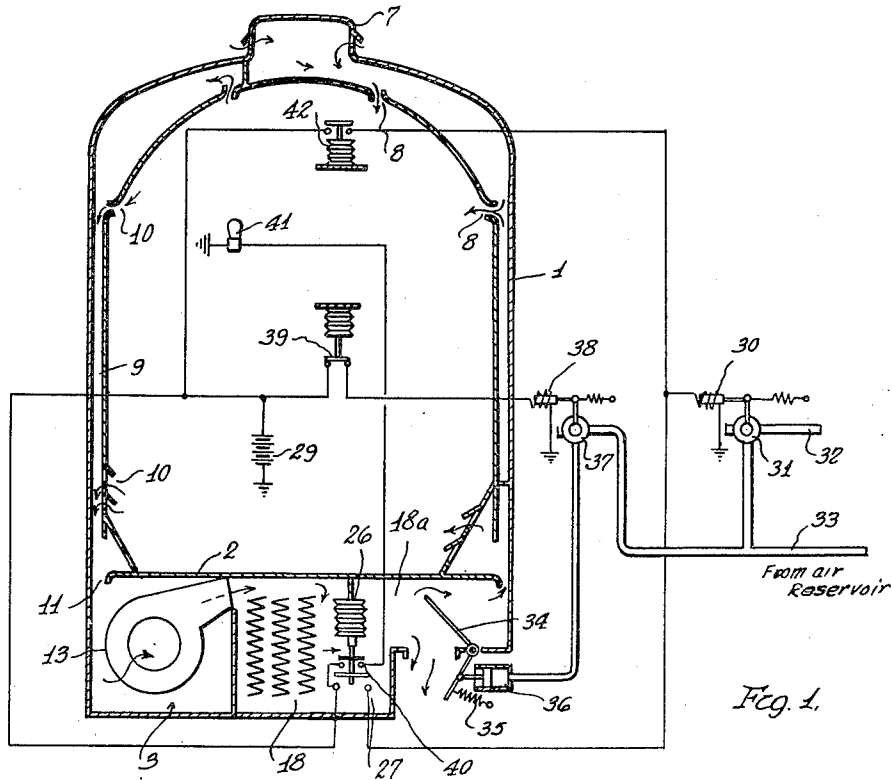


Fig. 1.

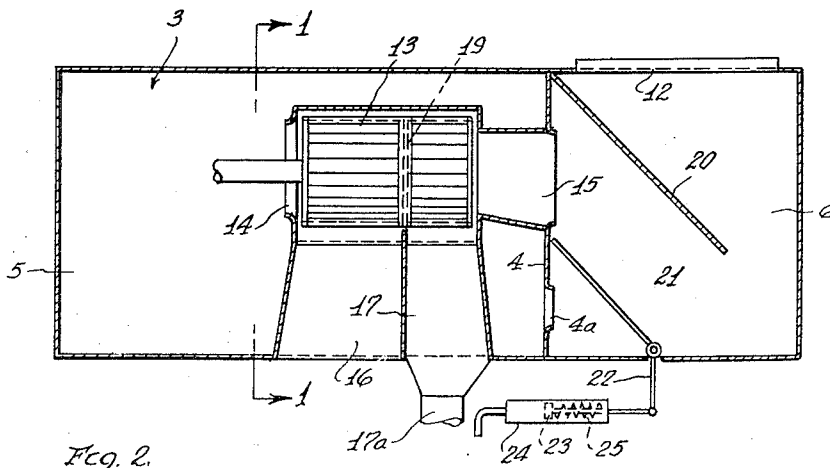


Fig. 2.

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HEATING AND VENTILATING SYSTEM FOR CAR BODIES

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9 Claims. (Cl. 98—10)

This invention relates to heating and ventilating systems for street cars and like vehicles and has for its primary object to utilize the heat generated by the electric energy dissipated in the control resistance of the traction motor circuit during acceleration and deceleration, while at the same time maintaining the resistance at a safe operating temperature.

In some respects the present invention constitutes an improvement on the heating and ventilating system disclosed in Patent No. 2,178,644, which discloses a heating and ventilating system wherein heat generated in the motor control resistance is recovered in part to heat the interior of the vehicle.

An important object of the invention is to provide a heating and ventilating system wherein air withdrawn from the interior of the car body is divided with a part passing through a compartment containing the motor control resistance and another part passing through a duct which is adapted to be connected to the vehicle motors for ventilating the same.

Another object is to provide a system such as above described embodying automatic means for directing the air which passes through the resistance compartment either to the atmosphere or the car body. When the air is passed back to the interior of the body the system functions as a heating system whereas when the air is discharged exteriorly of the body it functions to maintain a flow of air through the body and as a resistance cooling system.

Another object is to provide a system having automatic means which functions under low temperature conditions for decreasing the rate of withdrawal of air from the car body while at the same time increasing the flow of air through the resistance compartment and into the car body. In this respect the invention provides a compartment which is divided into two sections, one of which is adapted to receive air from the interior of the car body and the other of which is adapted to receive air either from the first section or from the outside atmosphere. Air blowing means is provided which has two inlets connected to respective sections and two outlets connected respectively to the resistance compartment and to a duct adapted to lead to a motor ventilating system. A valve is provided in the second section for connecting the adjacent blower inlet with either the outside air or with the first compartment section. With this arrangement it is possible for both inlets to receive air from the interior of the car body, in which case only part

of the air is returned to the car body while the remainder is utilized to ventilate the motors. It is also possible for the entire quantity of air withdrawn from the car body to be returned thereto while the motors are ventilated by outside air. Under the last named circumstances the amount of air withdrawn from the car body is decreased while the amount returned is increased.

Another object is to provide a system such as described immediately above wherein all of the several functions recited are subject to automatic control.

Other objects and advantages will become more fully apparent as reference is had to the accompanying drawing wherein my invention is illustrated and in which

Fig. 1 is a schematic cross section of a street car body taken along the line 1—1 of Figure 2 illustrating the present ventilating system, and

Fig. 2 is a schematic view of the air blowing and controlling means.

More specifically, 1 designates a street car body having a floor 2 and a compartment 3 disposed therebeneath which is divided into two sections 5 and 6 by a transverse partition 4. The car body has an intake ventilator 7 in its top which communicates with the interior of the body at 8, and has one or more hollow pier posts 9 which communicate both with the interior of the car body at 10 and the compartment section 5 at 11. The compartment section 6 has air intake louvers 12 through which outside air may enter the compartment.

Disposed in the compartment section 5 is an air blower 13 having two inlets 14 and 15 communicating with the compartment sections 5 and 6 respectively, and two outlets 16 and 17. The blower rotor is ordinarily connected to the armature of the motor-generator set of the street car for actuation thereby. The outlet 16 is connected to a motor control resistor compartment 18 having an outlet 18a, and the outlet 17 has a duct 17a connected thereto which conveys therefrom to the ventilating system of the traction motors of the street car. The rotor of the blower 13 is divided by a transverse partition 19 so that air from the compartment section 5 is directed to the outlet 16 and air from the section 6 is directed to the outlet 17. The outlet 16 is preferably larger than the outlet 17 and the partition 19 is disposed accordingly so that a greater volume of air will be discharged from the outlet 16 than from the outlet 17.

Mounted in the compartment section 6 is a

baffle 20 and a pivoted flap valve 21 which is movable from a position contacting the partition 4 to a position contacting the baffle 20. When the flap valve 21 is in contact with the partition 4 air may enter the louvres 12 and pass around the baffle 20 to the blower intake 15. When the flap valve is in contact with the baffle 20 air from the compartment 5 may pass through the opening 4a and enter the blower intake 15, the baffle 20 and flap valve 21 extending throughout the height of the compartment 6. The flap valve 21 has an operating arm 22 connected to the piston 23 of an air motor 24 having a spring 25 for retracting the piston and for moving the flap valve into contact with the baffle 20.

The air motor 24 is controlled automatically by a thermostat 26 disposed in the resistor compartment which under predetermined temperature conditions is adapted to close a switch 27 in circuit with the battery 29 and a solenoid 30. The solenoid 30 is connected to a spring actuated valve 31 which when moved by the solenoid connects the pipe line 32 leading to the air motor 24 with an air supply line which is connected to the usual air reservoir (not shown) which is present on street cars. When air is directed to the motor 24 the flap valve 21 is moved into contact with the partition 4.

The air discharged from the resistor compartment outlet 18a is directed either to the interior or the exterior of the car body 1 by a flap valve 34 which is adapted to be moved in one direction by a spring 35 and in the other direction by an air motor 36. Air to the motor 36 is controlled by a valve 37 which is actuated by a solenoid 38 which is in circuit with the battery 29 and controlled by a thermostatic switch 39 located in the interior of the car body. When the switch 39 is opened the valve 37 is actuated to disconnect the motor 36 from the air pressure line 33 so that the spring 35 moves the flap valve 34 to a position where the air which is heated by passing through the resistor compartment is directed to the interior of the car body.

When the flap valve 21 is in contact with the baffle 20 air withdrawn from the passenger compartment enters the compartment section 5 and part of this air is discharged from the blower outlet 16 while another part passes through the partition opening 4a and is discharged out the outlet 17. At this time the pressure in the compartment 5 will be below atmospheric because it is feeding both blowers. If the temperature in the resistor compartment rises above the predetermined limit the thermostat 26 functions and the flap valve 21 is moved into contact with the partition 4. When the flow of air through the opening 4a is thus prevented by the flap valve 21 one blower is fed from outside air through the louvres 12 and the negative pressure in the compartment section 5 is reduced with the result that the quantity of air discharged to the resistor compartment is increased. At this time air received through the louvres 12 will be pumped to the motor ventilator duct 17a.

A second switch 40 is actuated by the thermostat 26 when an excessive temperature is reached in the resistor compartment for energizing a warning signal 41 to warn the operator. The switch 27 may be of any conventional type which maintains contact during an amount of relative movement between its terminals and its contactor. As illustrated it is contemplated

that the contactor of this switch be made of flexible metal to maintain contact with the terminals as the rod of the thermostat 26 is depressed after initial contact. It is by further depression of the rod that the switch 40 is closed.

A condition may arise wherein the temperature of the air entering the intake ventilator 7 is so cold that it reduces the air temperature to a point too low for a comfortable car temperature even though the valve 34 is in a position such that all available heat from the resistor compartment is being directed to the interior of the car body. To correct this condition a thermostatic switch 42 is connected in a second circuit with the battery 29 and the solenoid 30. When the temperature falls to a point which may be predetermined the switch 42 closes, energizes the solenoid 30 and actuates the valve 31 so that air is supplied to the air motor 24 and the flap valve 21 is moved into contact with the partition 4. The quantity of air taken from the car body and through the intake ventilator 7 is thus reduced by reason of the fact that only the blower inlet 14 receives air from the compartment section 5.

It will be seen that the thermostat 42 and the contacts 27 of the thermostat 26 are in parallel with the battery circuit to the solenoid 30 and magnet valve 31. When either circuit closes the same action is produced on the damper 21. In addition to the control by the thermostat 42 the car body temperature is also controlled by the thermostat 39, as described.

Although a specific embodiment of the invention has been illustrated and described, it is understood that changes may be made within the scope of the appended claims without departing from the spirit of the invention and such changes are contemplated.

What is claimed is:

1. A ventilating system for a street car having a body with an intake ventilator and a compartment containing a motor circuit resistance, comprising dual air pumping means, one of said pumping means having its outlet connected to said resistance compartment, a passageway leading from said resistance compartment to the interior of said body a common air duct means connecting each of said dual pumping means with the interior of said car body whereby each is effective to withdraw air from said car body and whereby both set up a negative pressure in said common duct, and means responsive to temperature conditions in said resistance compartment for disconnecting the other of said dual pumping means from said common air duct whereby the negative pressure therein is decreased and a greater quantity of air is passed through said resistance compartment by the first of said dual means.

2. A ventilating system for a street car having a body with an intake ventilator and a compartment containing a motor circuit resistance, comprising dual air pumping means, one of said pumping means having its outlet connected to said resistance compartment, a passageway leading from said resistance compartment to the interior of said body a common air duct means connecting each of said dual pumping means with the interior of said car body whereby each is effective to withdraw air from said car body and whereby both set up a negative pressure in said common duct, and means responsive to temperature conditions in said car body for disconnecting the other of said dual pump-

ing means from said common air duct whereby the negative pressure therein is decreased and a greater quantity of air is passed through said resistance compartment by the first of said dual means.

3. A ventilating system for a street car having a body with an intake ventilator and a compartment containing a motor circuit resistance, comprising dual air pumping means, one of said pumping means having its outlet connected to said resistance compartment, a passageway leading from said resistance compartment to the interior of said body, a common air duct means connecting each of said dual pumping means with the interior of said car body whereby each is effective to withdraw air from said car body and whereby both set up a negative pressure in said common duct, means responsive to temperature conditions in said resistance compartment for disconnecting the other of said dual pumping means from said common air duct whereby the negative pressure therein is decreased and a greater quantity of air is passed through said resistance compartment by the first of said dual means, and means responsive to temperature conditions in said car body for disconnecting said other dual pumping means from said duct means independently of said last named temperature responsive means.

4. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, an outlet for said other dual means leading to the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body and thermostatically controlled means for operating said valvular means from each of its positions to the other.

5. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, an outlet for said other dual means leading to the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body, electrically operated means controlling movement of said valve to its different positions, and a thermostatic switch located in said resistance section for controlling said electrically operated means.

6. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, thermostatically controlled means for moving said valvular means to either of its two positions, an outlet for said other dual means leading to the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body and a second valvular means in said passageway alternately operative to either of two positions to connect said blower outlet with the interior of said body or to vent the air therefrom to the atmosphere, thermostatically controlled means for moving said second valvular means to either of its positions.

7. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, thermostatically controlled means for moving said valvular means to either of its two positions, an outlet for said other dual means leading to the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body, a second valvular means in said passageway alternately operative to either of two positions to connect said blower outlet with a duct leading to the interior of said body or to vent the air therefrom to the atmosphere, and means responsive to the temperature in said body for operating said second valvular means.

8. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, thermostatically controlled means for moving said valvular means to either of its two positions, an outlet for said other dual means leading to

the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body, a second valvular means in said passageway alternately operative to either of two positions to connect said blower outlet with a duct leading to the interior of said body or to vent the air therefrom to the atmosphere, and a thermostatic device responsive to the temperature in said resistance section for controlling the first named valvular means.

9. A heating and ventilating system for a passenger carrying vehicle having a body and an air compartment comprising a blower section and a section containing a motor resistance, the system comprising duct means for conveying air from the interior of said body to said blower section, dual air blowing means in said blower section having individual inlets and outlets, the inlet of one of said dual means being open to said duct means and its outlet leading into said motor resistance section, an inlet for the other of

5 said dual means, valvular means operative to either of two positions to connect the last named inlet either to said duct means or through a wall of said compartment directly to the atmosphere, an outlet for said other dual means leading to the ventilating system for the traction motors of the vehicle, a passageway for conveying air from said motor resistance section to the interior of the body, a second valvular means in said 10 passageway alternately operative to connect said blower outlet with the interior of said body or to vent the air therefrom to the atmosphere, a thermostatic device responsive to the temperature in said resistance section for controlling the 15 first named valvular means, and a further thermostatic device located in the car body for controlling said first named valvular means in super-20 sedence of any other control thereover adapted for operation during extraordinarily low temperatures in said body.

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