Feb. 13, 1951 C. F. HENNEY 2,541,921

REFRIGERATING APPARATUS FOR RAILWAY CARS

Filed Dec. 16, 1947 2 Sheets-Sheet 1

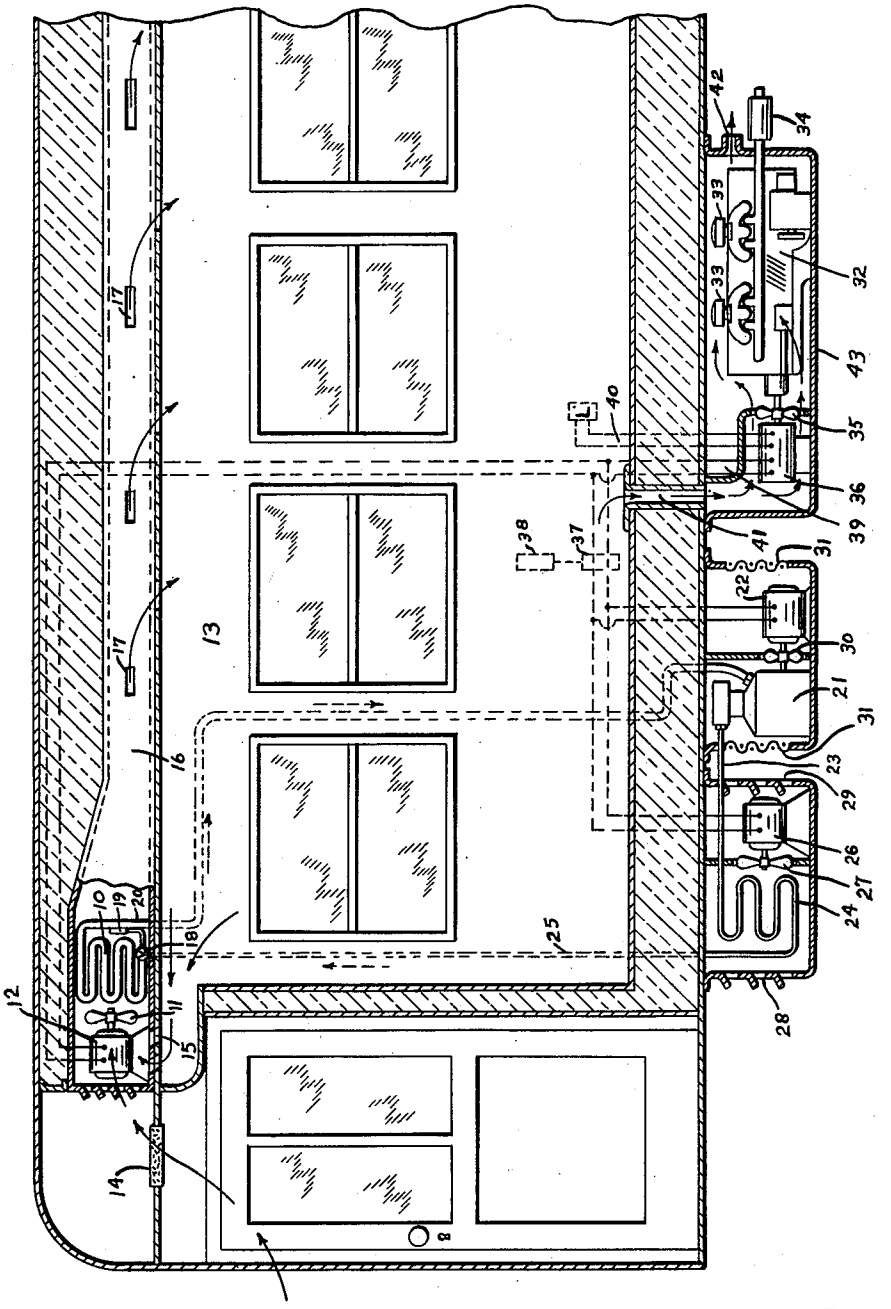


FIG. 1

INVENTOR.
Charles F. Henney
BY
Spencer Hardman & Fehr
Attorneys

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REFRIGERATING APPARATUS FOR RAILWAY CARS

Filed Dec. 16, 1947 2 Sheets-Sheet 2

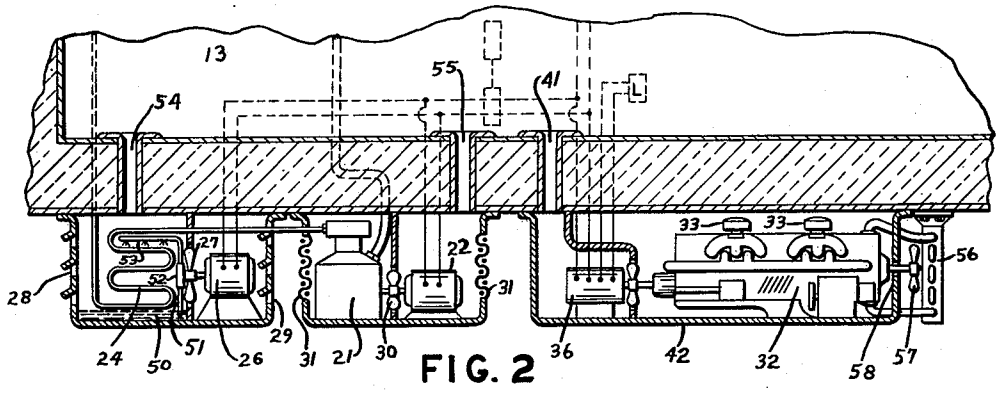


FIG. 2

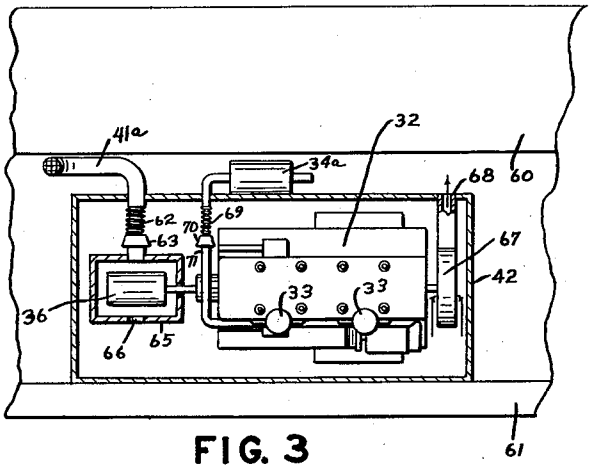


FIG. 3

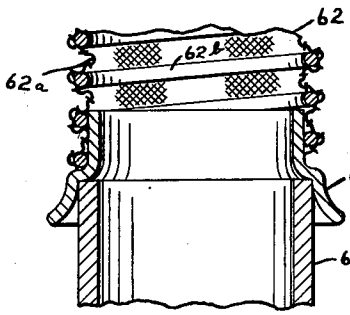


FIG. 4

INVENTOR.
Charles F. Henney
BY
Spencer, Kirkman & Fish
Attorneys

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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS FOR RAILWAY CARS

Charles F. Henney, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

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8 Claims. (Cl. 62—117)

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This invention relates to refrigerating apparatus and more particularly air conditioning systems.

In railway car air conditioning systems, it is customary to place the heat dissipating units (condenser, compressor and motor drives therefor) and the power unit (generator and its driving means, such as an internal combustion engine) under the floor space of the car. There they are subjected to a very dusty atmosphere, created as the train travels at high speed over the roadbed. These units require air flow over them to cool them, and the internal combustion engine requires air for combustion purposes. The use of the air from the dusty atmosphere under the car tends to clog these units and is hignly injurious to the internal combustion engine. According to this invention, clean, vitiated air from the conditioned space of the car, which previously has been expelled and wasted to make way for fresh conditioned air, is used in one or more of the said units in lieu of the air from the dusty atmosphere. In this way injury to the internal combustion engine is avoided and clogging is reduced or avoided, depending on the quantity of clean, vitiated air available for this purpose.

An object of this invention is to provide an air conditioning system, particularly for railway cars, or the like, in which one or more heat dissipating units, and/or power unit, derives some or all of its air supply from the air conditioned space.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a diagrammatic vertical cross-sectional view of a car embodying this invention;

Fig. 2 is a view somewhat similar to the lower portion of Fig. 1, showing another modification;

Fig. 3 is a horizontal cross-sectional view of a modified power unit; and

Fig. 4 is an enlarged cross-section of the conduit shown in Fig. 3.

An air conditioning system, embodying this invention, may include a cooling unit or evaporator 10 for cooling air by the evaporation of a refrigerant within the evaporator. This unit may be provided with air circulating means, in the form of a fan 11 and motor 12, which are adapted to draw fresh air from the exterior of the space 13, which air may be cleaned as it passes through a filter 14 and, if desired, may be mixed with return air 15. Thence the air may be forced by

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the fan 11 past the cooling unit or evaporator 10, through the conduit 16 and distributing openings 17, into the space 13. If desired, the evaporator 10 may be provided with a thermostatic expansion valve 18, having a thermostatic bulb 19 in thermal contact with the evaporated refrigerant leaving the evaporator. The valve 18 may be of well known type which admits liquid refrigerant into the evaporator when the pressure therein is reduced below a predetermined value; but which throttles the refrigerant by the thermostatic bulb 19 when liquid refrigerant tends to spill over the evaporator into the suction line 20.

A heat dissipating unit for drawing heat from the cooling unit 10 and for dissipating it to the exterior of the space 13 may be provided. This may include a compressor 21 driven by a motor 22, which withdraws gaseous refrigerant from the evaporator 10, through the suction line 20, compresses it, and forwards it through line 23 to the condenser 24, where the refrigerant is liquefield and is forwarded through line 25 to the evaporator 10. A motor 26 is provided for driving a fan 27 which circulates air past the condenser 24. This air may enter through louvers 28 and may be discharged through the louvers 29 or vice versa. The motor 22 may drive a fan 30, which circulates air over the compressor 21 and motor 22, the air entering and leaving through the screened or louvered openings 31.

A power unit for the system may be provided. This may comprise an internal combustion engine 32, preferably of the Diesel type, having air intake openings 33 and a discharge muffler 34. This engine may drive a fan 35 and a generator 36. The generator 36 supplies electric energy or current for the motors 12, 22 and 26. Preferably the motors 22 and 26 are under the control of an automatic switch 37 which is opened and closed by the control member 38 which is responsive to a condition of the air within the space 13, or a combined condition of the air within the space 13 and the outside air, or of the outside air alone. The condition to which this control may be responsive may be thermostatic or humidistatic, or a combination of the two.

The generator 36 supplies electric energy for the motors through the lines 39 and energy for the lighting system or the like through the lines 40.

Air conveying means conveying air from the space 13 past the generator 36 and into the internal combustion engine 32 may be provided. This may take the form of a conduit 41 and casing 43, which permits the fan 35 to withdraw

air from the space 13 and circulate it past the generator 36 and thence partly into the intakes 33 of the internal combustion engine and partly through the discharge opening 42.

In the modification shown in Fig. 2, the construction is the same as in Fig. 1, with the exceptions hereinafter noted. The condenser 24 may have an evaporating liquid, such as water, introduced over it. Conveniently, this may take the form of a sump 50 which may maintain a level of water by float controlled water supply, or otherwise, not shown. The water may be circulated from the sump 50 through the pipe 51, pump 52 and spray-head 53. The pump 52 may be driven by the motor 26. If desired, air conveying means 54 may be provided for conveying air from the space 13 past the condenser 24, where it may be mixed with air entering louvers 28 and may then circulate past the condenser 24 through the fan 27 past the motor 26 and out the louvers 29.

Air conveying means 55 are also provided for conveying air from the space 13 past the compressor 21 and/or the motor 22. This air may be circulated by the fan 30 after it is mixed with air entering the louvers 31.

The internal combustion engine 32, in Fig. 2, may be provided with a cooling system including the usual water jacket in the engine, from which water is circulated through the water cooling radiator 56 and thence back to the engine. Air is forced through the radiator 56 by means of the fan 57, driven by the engine 32. The air driven through the radiator 56 may be partly from the exterior of the car, and partly from the conditioned space 13 which flows through the conduit 41, past the generator 36, fan 35, engine 32 and through the opening 58 in the casing 42, where it is mixed with outside air, and is circulated past the radiator 56. Other portions of the system of Fig. 2, whether designated by reference characters or not, may be substantially identical with corresponding elements of Fig. 1, and cooperate with elements in Fig. 1 which are not repeated in Fig. 2.

Fig. 3 shows a construction in which the power unit, including engine 32 and generator 36 may be laterally withdrawable from under the car for repairs. The unit, with its casing 42 may be placed under the car adjacent the center sill 60 and may be withdrawn out of the side 61 of the car. In this case the air conveying means 41*a*, corresponding to conduit 41 of Figs. 1 and 2, leads from the interior 13 of the car to a resilient flexible connector 62 having flared coupling member 63 with cooperates with the cylindrical coupling member 64 carried by a small casing 65 around the generator 36. When the power unit is inserted under the car, the coupling members 63 and 64 form an air conveying coupling for carrying air from the interior 13 into the casing 65, from whence it flows through the opening 66, partly into the intakes 33 of the engine and partly into the blower 67 and out the outlet 68. A muffler 34*a* may be provided. If it is carried by the center sill, a flexible portion 69 may be provided similar to portion 62, which is also provided with a flared coupling member 70. This cooperates with the cylindrical exhaust pipe 71 in a manner heretofore described with regard to members 63 and 64. The engine may be water cooled. If desired, it may be provided with a radiator 56 and fan 57 as shown in Fig. 2 in lieu of the blower 67 shown in Fig. 3.

The flexible connector 62 may be constructed as shown in Fig. 4. It may be made of an air-tight cloth 62*a* secured to an internal spiral spring 62*b* which fits over the coupling member 63, and may be secured thereto, by any desired method.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. An air conditioning system comprising; a cooling unit for a space to be conditioned; a fan and motor means for drawing air from the exterior of said space and forcing it over said unit; a heat dissipating unit for drawing heat from said cooling unit and for dissipating to the exterior of said space; motor means for actuating said heat dissipating unit; a power unit comprising an internal combustion engine and a generator for supplying electric energy to said motor means; and air conveying means conveying air only from said space past said generator.

2. An air conditioning system comprising: a cooling unit for a space to be conditioned; a fan and motor means for drawing air from the exterior of said space and forcing it over said unit; a heat dissipating unit for drawing heat from said cooling unit and for dissipating to the exterior of said space; motor means for actuating said heat dissipating unit; a power unit comprising an internal combustion engine and a generator for supplying electric energy to said motor means; and air conveying means conveying air only from said space past said generator into said internal combustion engine.

3. An air conditioning system comprising: a cooling unit for a space to be conditioned; a fan and motor means for drawing air from the exterior of said space and forcing it over said unit; a heat dissipating unit for drawing heat from said cooling unit and for dissipating to the exterior of said space; motor means for actuating said heat dissipating unit; a power unit comprising an internal combustion engine, a cooling radiator for said engine and a generator for supplying electric energy to said motor means; and air conveying means conveying air only from said space past said generator and partly into said engine and mixed with outside air past said cooling radiator.

4. An air conditioning system comprising: a refrigerant evaporator for a space to be conditioned; a fan and motor for drawing air from the exterior of said space and forcing it over said evaporator; a compressor and motor withdrawing gaseous refrigerant from said evaporator; a condenser receiving compressed refrigerant from said compressor, condensing it and forwarding it to said evaporator; a fan and motor forcing air over said condenser; a power unit comprising an internal combustion engine and a generator for supplying electric energy to said motors; and air conveying means conveying air only from said space past said generator.

5. An air conditioning system comprising: a refrigerant evaporator for a space to be conditioned; a fan and motor for drawing air from the exterior of said space and forcing it over said evaporator; a compressor and motor withdrawing gaseous refrigerant from said evaporator; a condenser receiving compressed refrigerant from said compressor, condensing it and forwarding it to said evaporator; a fan and motor forcing air over said condenser; a power unit

comprising an internal combustion engine and a generator for supplying electric energy to said motors; and air conveying means conveying air only from said space past said generator and into said internal combustion engine.

6. An air conditioning system comprising: a refrigerant evaporator for a space to be conditioned; a fan and motor for drawing air from the exterior of said space and forcing it over said evaporator; a compressor and motor withdrawing gaseous refrigerant from said evaporator; a condenser receiving compressed refrigerant from said compressor, condensing it and forwarding it to said evaporator; a fan and motor forcing air over said condenser; a power unit comprising an internal combustion engine; a water cooling radiator for said engine and a generator for supplying electric energy to said motors; and an air conveying means conveying air only from said space past said generator and partly into said engine and mixed with outside air past said cooling radiator.

7. An air conditioning system comprising: a cooling unit for a space to be conditioned; means for drawing air from the exterior of said space and forcing it over said unit; a heat dissipating unit for drawing heat from said cooling unit and for dissipating to the exterior of said space; motor means for actuating said heat dissipating unit; a power unit for supplying electric energy to said motor means comprising a casing adjacent said space; an internal combustion engine and a generator in said casing; and air conveying means conveying air only from said space to said casing past said generator and into said combustion engine.

8. An air conditioning system comprising: a cooling unit for a space to be conditioned; means for drawing air from the exterior of said space and forcing it over said unit; a heat dissipating unit for drawing heat from said cooling unit and for dissipating to the exterior of said space; motor means for actuating said heat dissipating unit; a power unit for supplying electric energy to said motor means comprising a casing adjacent said space; an internal combustion engine and a generator in said casing; and air conveying means conveying air only from said space to said casing past said generator.

CHARLES F. HENNEY.

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