Oct. 7, 1941. C. O. BERGSTROM 2,258,565

AIR CONDITIONING SYSTEM UTILIZING REFRIGERATION

Filed July 13, 1939 2 Sheets-Sheet 1

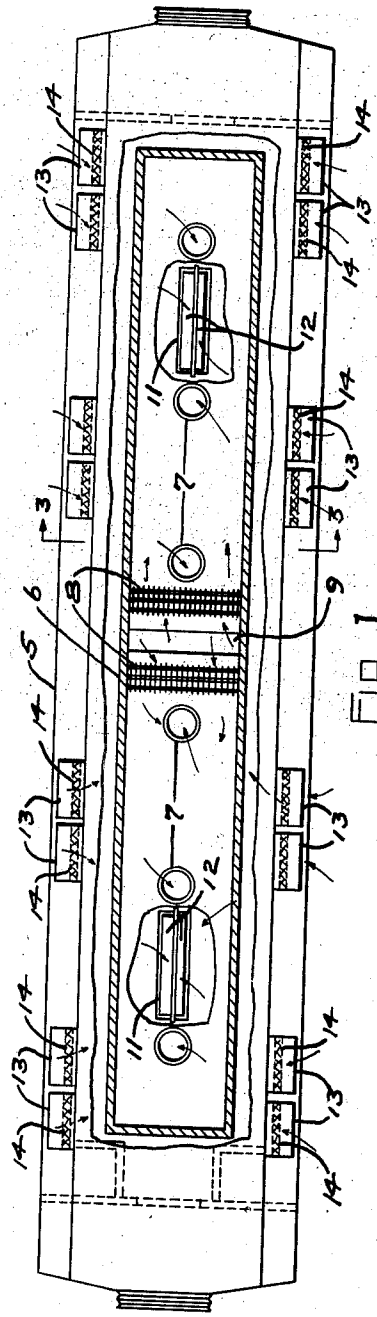

Fig-1

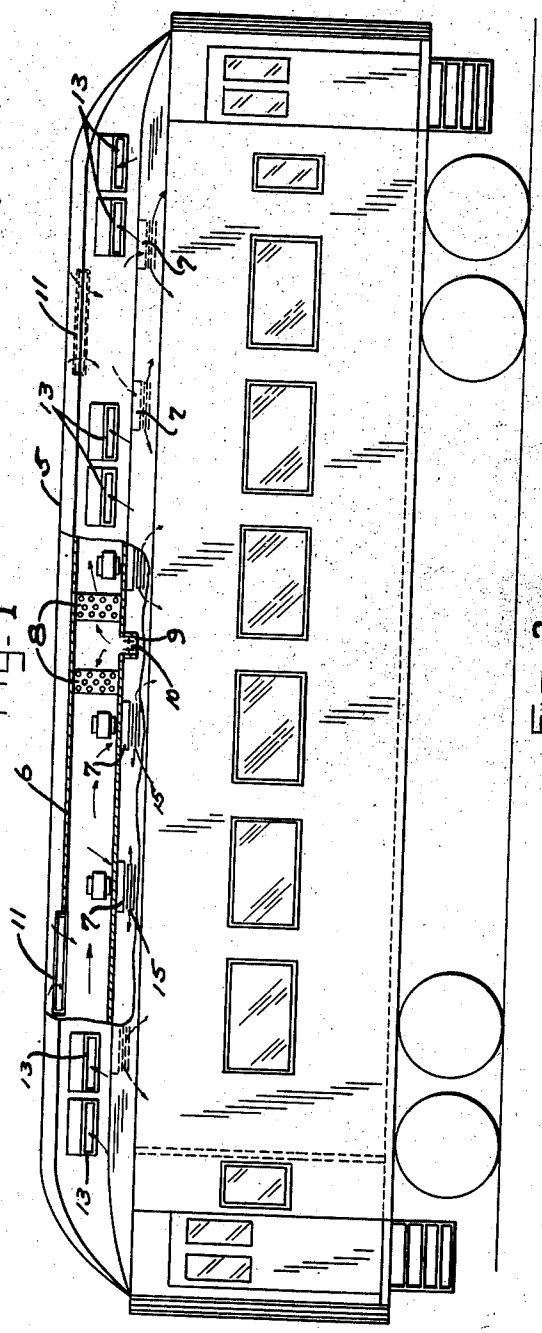

Fig-2

INVENTOR.
CARL O. BERGSTROM
BY
Robert J. Palmer
ATTORNEY.

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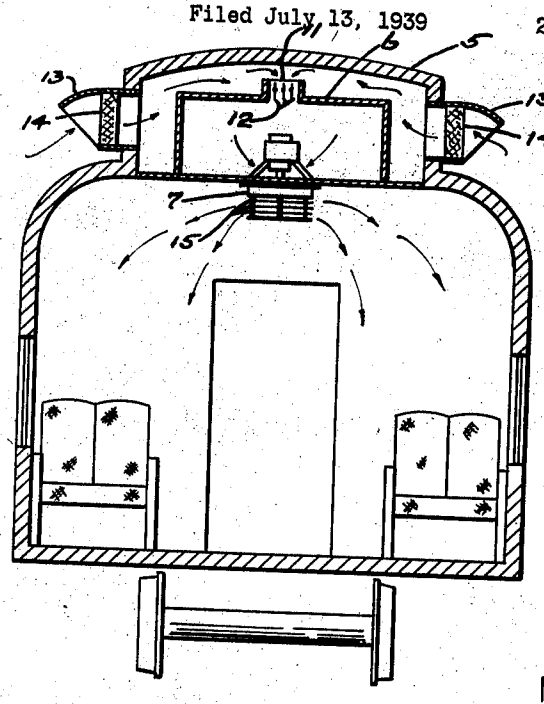

Fig. 3

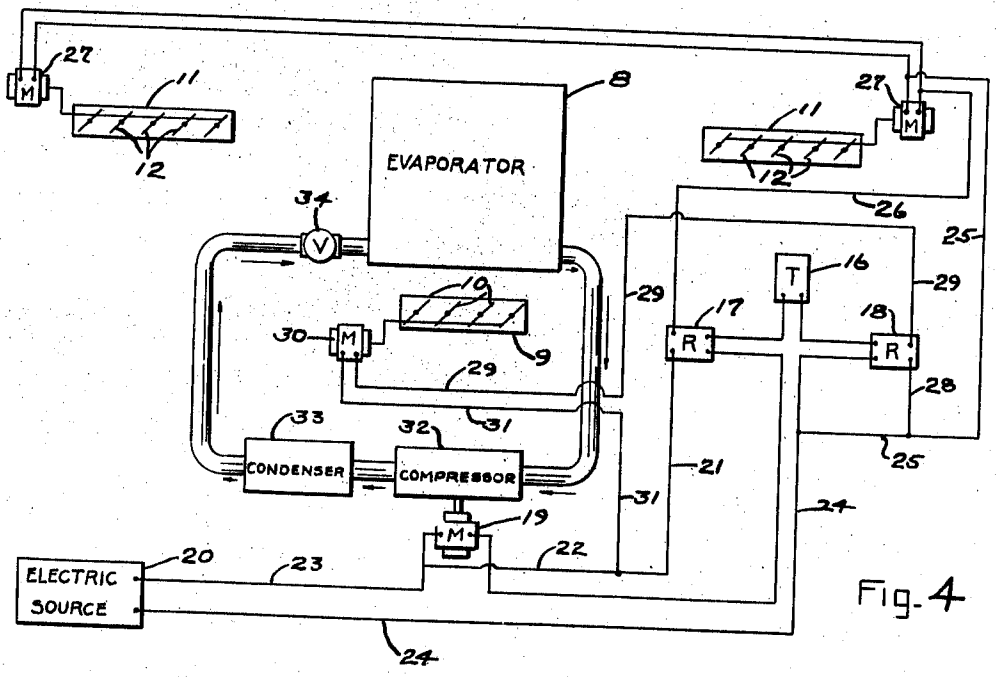

Fig. 4

INVENTOR.
CARL O. BERGSTROM
BY
Robert J. Palmer
ATTORNEY.

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UNITED STATES PATENT OFFICE

2,258,565

AIR CONDITIONING SYSTEM UTILIZING REFRIGERATON

Carl O. Bergstrom, Boston, Mass., assignor to B. F. Sturtevant Company, Boston, Mass.

Application July 13, 1939, Serial No. 284,262

2 Claims. (Cl. 62—6)

This invention relates to air conditioning systems for passenger vehicles, utilizing refrigeration and has as its object to save in refrigeration when outdoor conditions are right for effective cooling to be accomplished through supplying an increased volume of outdoor air.

On some railroad lines, it is possible to effect sufficient cooling, in summer, by forcing large volumes of outdoor air through the cars. There are brief periods, however, on such lines when a relatively small amount of refrigeration for cooling is desired. This invention provides efficient apparatus at low cost for combining refrigerative cooling with pressure ventilation under effective thermostatic control.

The invention will now be described with reference to the drawings, of which:

Fig. 1 is a plan view looking downwardly upon a railway passenger car embodying this invention, with a portion of the roof removed, and a portion in section;

Fig. 2 is an elevation view with a portion of the side removed, and a portion in section of the passenger car of Fig. 1;

Fig. 3 is a sectional view along the lines 3—3 of Fig. 2, and

Fig. 4 is a diagrammatic view of the automatic controls employed.

The car 5 has the longitudinal duct 6 mounted in the roof zone above the ceiling. The lower wall of this duct may form the ceiling of the car. The lower wall of the duct is perforated to receive the centrifugal fans 7 which extend into the passenger space and which are fitted with horizontal deflectors 15 for discharging air in horizontal streams into the passenger space. The fans preferably employed are those of my Patent No. 2,142,834 which issued Jan. 3, 1939.

The two air cooling evaporators 8 are mounted in the duct 6 adjacent the longitudinal center thereof, one on each side of the recirculated air inlet 9, which is in the lower wall of the duct at the longitudinal center thereof. The dampers 10 are adjustable as will be explained later, to control the volume of recirculated air.

The duct 6 contains in its upper wall, the fresh air inlets 11 with dampers 12. The ventilators 13 which contain the air filters 14 are in the sides of the car and supply outdoor air which passes along the side of and top of the duct and enters the inlets 11 under the suction of the fans 7. The inlets 11 could of course, be arranged in the ends or sides of the duct.

Referring now to Fig. 4, the thermostat 16 which may be mounted in the outdoor air stream or in the passenger space, controls the conversion from pressure to refrigerative cooling and vice versa. By way of example, when the temperature of the outdoor air is below say 80° F., the contacts of the thermostat 16 are open and the relays 17 and 18 and the compressor motor are deenergized through being disconnected from the electric source 20. The contacts of the relay 17 are closed and complete the electric circuit including the electric source 20, the wires 21, 22, 23, 24, 25 and 26 and the damper motors 27, causing the motors 27 to adjust the fresh outdoor air dampers 12 to full open position. At this time, the contacts of the relay 18 are open causing the electric circuit including the electric source 20, the wires 23, 22, 31, the recirculated air damper motor 30, the wires 29, the contacts of the relay 12, and the wires 28, 25 and 24 to be deenergized. This causes the motor 30 to adjust the recirculated air dampers to fully closed position. At the same time, the compressor motor 19 is deenergized due to the contacts of the thermostat 16 which are in series with it and the electric source 20, being separated.

Thus when the temperature of the outdoor air is below 80° F., the compressor 32 which in cooperation with the condenser 33 and the expansion valve 34, supplies the evaporators 8 with refrigerant, is shut down, and the fans 7 draw in, for example 4200 cubic feet per minute of outdoor air through the inlets 11 and 13, and supply it into the passenger space.

When the temperature of the air rises above 80° F., the thermostat 16 closes its contacts; the solenoids of the relays 17 and 18 are energized with the result that the damper motors adjust the outdoor air dampers to closed or substantially closed positions; the damper motor 30 adjusts the recirculated air dampers 10 to wide open position, and the compressor motor 19 is energized to drive the compressor 32.

The fans 7 now operate against a higher pressure which reduces the air volume to about 2,000 cubic feet of air per minute. There will be a leakage through the fresh air dampers 12 providing about 25% of outdoor air. The recirculated air through the inlet 9 passes through the evaporators 8, is mixed in the duct 5 with the outdoor air and then discharged into the passenger space.

This design provides a relatively inexpensive system, readily adaptable for installation in existing passenger cars not equipped with air conditioning.

While one embodiment of the invention has

been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus illustrated, as many departures therefrom may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. An air cooling system for a railway passenger car, comprising a longitudinal duct overhead the passenger space, a plurality of longitudinally spaced fans extending through the lower wall of said duct into said passenger space, means for admitting outdoor air into said duct, means for admitting recirculated air from the passenger space into said duct, a refrigerant evaporator in said duct in the path of the recirculated air admitted by said last mentioned means, a compressor for supplying refrigerant to said evaporator, and means including thermostatically controlled means for adjusting said first mentioned means responsive to temperature changes in the air in said space towards closed position, for adjusting said second mentioned means towards open position and for energizing said compressor or for alternatively adjusting said first mentioned means towards open position, said second mentioned means towards closed position and deenergizing said compressor.

2. An air cooling system for a railway passenger car, comprising a longitudinal duct overhead the passenger space, a plurality of longitudinally spaced fans extending through the lower wall of said duct into said passenger space, means for admitting outdoor air into said duct, means for admitting recirculated air from the passenger space into said duct, an air cooler in said duct in the path of the recirculated air admitted by said last mentioned means, refrigeration means for supplying refrigerant to said cooler, and means including thermostatically controlled means responsive to temperature changes in the air in said space for adjusting said first mentioned means towards closed position, for adjusting said second mentioned means towards open position and for energizing said refrigeration means to supply refrigerant to said cooler or for alternatively adjusting said first mentioned means towards open position, said second mentioned means towards closed position and deenergizing said refrigeration means to decrease the volume of refrigerant supplied to said cooler.

CARL O. BERGSTROM.