Aug. 10, 1937. G. E. HULSE 2,089,799

CAR VENTILATING SYSTEM

Filed Aug. 12, 1933

Fig. 1.

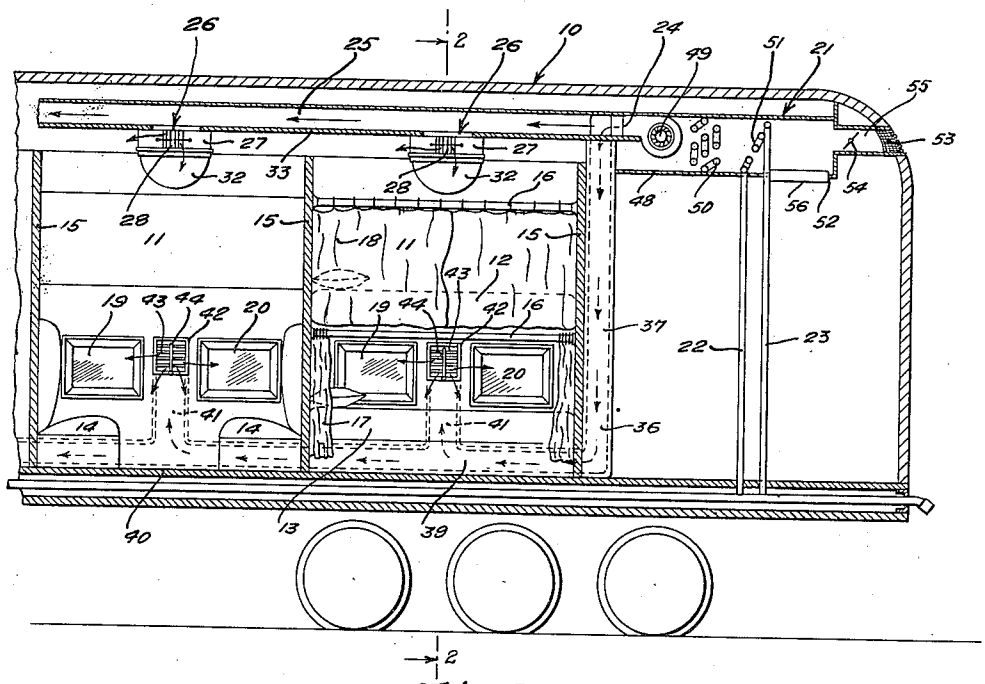



Fig. 2

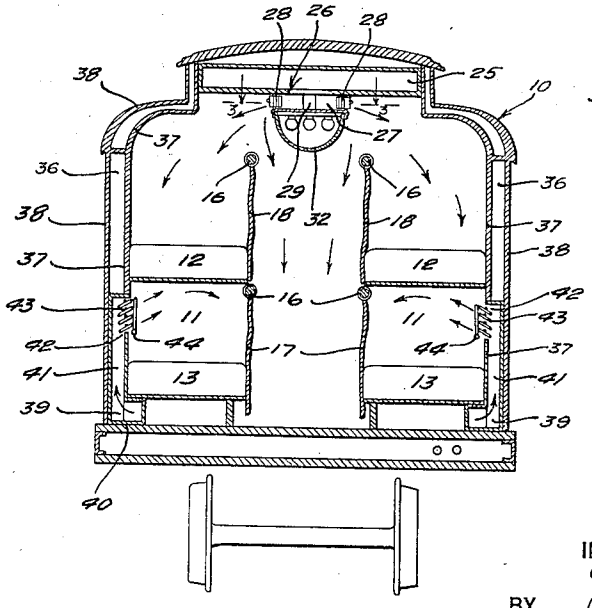
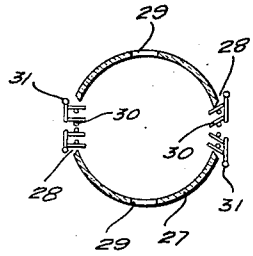



Fig. 3.




INVENTOR
GEORGE E. HULSE

BY Glair Curtis & Dunne

ATTORNEYS

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## CAR VENTILATING SYSTEM

George E. Hulse, New Haven, Conn., assignor, by mesne assignments, to The Pullman Company, Chicago, Ill., a corporation of Illinois

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12 Claims. (Cl. 98—5)

This invention relates to a ventilating system for railroad cars or the like, and a method of ventilating such cars particularly where an air conditioner or similar apparatus is employed.

One of the objects of this invention is to provide a simple and practical ventilating device which is efficient in operation and of inexpensive manufacture and installation. Another object is to provide a device of the above character which may be readily installed with a minimum amount of labor. Another object is to provide a device of the above character which can be incorporated in railroad cars of standard construction and not especially designed for such equipment. Another object is to provide ventilating equipment for railroad sleeping cars which will afford positive ventilation for each upper and lower berth especially when in a screened-in condition. Another object is to provide a ventilating device which will efficiently and rapidly ventilate a railroad car or the like without causing undue drafts in any particular locality and at the same time maintain an even predetermined temperature and humidity. Another object is to provide a ventilating system which may be used in cars having hollow walls where the various parts of the equipment may be effectively concealed. Another object is to provide a method for ventilating cars in which the full capacity of an air conditioner is utilized to condition the air to be circulated. Another object is to provide a method of the above nature in which an even predetermined temperature and humidity may be maintained throughout all portions of the car. Another object is to provide a method of the above nature by which the direction of flow of conditioned air may be readily controlled in any particular locality. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of the various possible embodiments of my invention,

Figure 1 is a longitudinal sectional view of a railroad sleeping car having my equipment installed therein;

Figure 2 is a cross-section of the car shown in Figure 1, taken along the line 2—2 of Figure 1; and

Figure 3 is a section of a ventilator taken along the line 3—3 of Figure 2.

Similar reference characters refer to similar parts throughout the several views of the drawing.

As conducive to a clearer understanding of certain features of this invention, it might here be pointed out that the ventilating of railroad cars, and, more particularly, railroad sleeping cars in which air conditioning equipment is used, is subject to many important difficulties and undesirable conditions. While the air conditioners are quite capable of heating or cooling and purifying or humidifying the air, the distribution of such treated air is a problem which has not been effectively solved. This is particularly true in air conditioned sleeping cars where the ventilation of the curtained upper and lower berths is negligible, or where the ventilating equipment in use directs unhealthful annoying drafts upon the occupants. The lower berths in particular are badly ventilated for, when the curtains are drawn to afford the requisite privacy, the conditioned air has no way of access thereto. As for the upper berths, in many cases the direction of the flow of air cannot be controlled practically to avoid unhealthful drafts upon the occupants. The result is a sleeping car replete with annoying drafts and uneven temperatures regardless of the efficiency of the air conditioner per se. One of the several objects of this invention is to provide a method of ventilating and ventilating equipment in which the several difficulties hereinabove mentioned as well as many others are successfully overcome.

Referring now to Figure 1, there is shown a railroad sleeping car generally indicated at 10, having sections or compartments 11, each of which comprises an upper berth 12 and a lower berth 13, or the usual seats 14 when not in a made-up condition. Separating compartments 11 are partitions 15 between which are rods 16 carrying curtains 17, which are withdrawn, and curtains 18 which are in a closed position to insure privacy. The usual windows 19 and 20 are provided in each compartment in the vicinity of the lower berth 13.

As the space within a sleeping car is greatly restricted, I have found it preferable to locate the conditioning apparatus in a small compartment 21 adjacent the ceiling of the car and closed off from the remainder of the car by a partition 48. Partition 48 is provided with an

opening 52 having suitable shutters 56 disposed therein for regulating the flow of air therethrough. Preferably situated immediately adjacent opening 52 is a heating coil 51 preferably connected to steam pipes 22 and 23, the usual steam line of the train. Also disposed within compartment 21, preferably adjacent coils 51, is a coil 50 connected to any suitable refrigerating equipment.

As best shown in Figure 1, a conduit 55 is connected to compartment 21 leading to the outside and preferably provided with a screen 53 to prevent the entrance of cinders or other foreign material into compartment 21. Conduit 55 is also provided with a damper 54 for regulating the flow of air therethrough.

A fan 49 is preferably located at the end of compartment 21 opposite conduit 55 and is so constructed that upon operation it draws air from the outside through conduit 55 and from the interior of the car through opening 52 past heating coil 51 and cooling coil 50. Thus, upon the operation of fan 49, air from the interior of the car is mixed with fresh air entering through conduit 55 and the resultant mixture is either heated or cooled according to the operation of coils 51 and 50.

Connected to an outlet 24 of compartment 21 is a duct 25 extending along the deck portion of car 10, as best shown in Figures 1 and 2. Duct 25 has suitable openings 26 at intervals preferably corresponding to the center line of each section 11. Openings 26 are covered by ventilators generally indicated at 27 in the sides of which are formed ports 28 and 29. As more clearly shown in Figure 3, ports 28 are provided with shutter devices 30 which may be suitably regulated by means of lever 31; preferably these shutters are so constructed that they cannot be completely closed. Lever 31 is preferably within reach of the occupant of upper berth 12 so that the occupant thereof can control with minimum effort the direction of flow of air through port 28. Thus it may be seen that the occupant of the upper berth may control the air flow into the berth to a certain extent; that is, he can change the direction of flow by operating shutter 30, but he cannot completely close the shutter. Suspended below ventilator 27 is a suitable lighting fixture 32, and partition 33 of duct 25 is preferably high enough to locate ports 28 above the level of upper berth rods 16.

Connected to duct 25 are air conduits 36, which are positioned between partitions 37 and 38 (Figure 2) forming the walls of car 10. Conduits 39 (Figure 1) are connected to conduits 36 substantially adjacent floor 40 of the car and run horizontally therealong preferably between the partitions 37 and 38. At intervals corresponding with sections 11, auxiliary vertical air channels 41 communicate with main conduits 39 and extend vertically therefrom between partitions 37 and 38 to terminate at openings 42 in partition 37. In the openings 42 are fitted shutter devices 43 which are manually operable by means of levers 44. Preferably shutters 43 are so constructed as to prevent complete closure thereof for reasons hereinafter more fully disclosed. Thus, as in the case of shutter 30, shutter 43 may be manipulated to control to a certain extent the volume and direction of flow of air. If both shutters 30 and 43 could be closed so as to prevent all air flow therethrough, the capacity of ports 29 (Figures 2 and 3) might be overtaxed and the total volume of air flowing into the car might drop below the minimum which maintains within the car a pressure slightly above atmospheric. As best shown in Figure 1, the shutters or ventilators 43 are preferably positioned between windows 19 and 20 at a height substantially above the level of lower berth 13 in its made-up condition. By so locating shutters 43, the danger of drafts directly striking the occupant of the berth is further obviated.

It will thus become clear that by providing shutters 43 and 30 of the above nature, the occupant of each upper or lower berth may control the ventilation in his immediate locality according to his own desire. I have found that it is unsuitable under most conditions to shut off completely the flow of air into any one locality of the car, for the reason that it is best to maintain a constant flow of conditioned air into the car to maintain the desired even temperature and humidity conditions therein.

Upon the operation of fan 49, air enters through conduit 55 and opening 52 to be suitably conditioned by coils 50 and 51, all as described above. The resultant conditioned air is forced through outlet port 24, through duct 25, openings 26, and into ventilators 27. Ports 29 are always open so as to permit a free flow of air into the interior of the car, while shutters 30 in ports 28 are adjustable as described above to direct the flow of air either toward the upper berths or deflect it more toward the central portion of the car. A portion of the air is forced by blower 49 into conduits 36, thence into conduits 39, from which it flows into auxiliary channels 41. Shutters 43 are operable, as described above, to deflect air flowing through openings 42 preferably either up or down as desired by the occupant of lower berth 13. The operation of fan 49 creates a slight pressure in the interior of the car which is not completely overcome by the return air passing through opening 52. Thus, a portion of the air which enters the car, as described above, finds its way to the outside through cracks in the windows and various other points of egress common in the construction of such cars. Accordingly, the continued operation of fan 49 provides a thorough circulation of adequately conditioned air in all portions of the car.

It is to be understood that blower 49 and dampers 56 and 54, as well as the air conditioning plant itself, may be controlled jointly or separately by any suitable thermostatic or hygrometric device in order to make the operation of my ventilating system automatic, this being desirable under certain conditions.

It will now become clear that I have provided a simple and practical ventilating system for a sleeping car or the like which assures an adequate supply of conditioned air to all portions of the car irrespective of the position of the berths. Air passing through duct 25 and thence out into the car by way of ventilators 26 is directed, as shown by the arrows most clearly in Figure 2, to all portions of the upper section of the car including the upper berths 12. Simultaneously, conditioned air is forced into each individual berth by way of channels 41 so that these berths, which are normally shut off from the interior of the car by curtain 17, are thoroughly ventilated with conditioned air. Also, the air currents passing through individual sections of the car may be varied to suit the particular tastes of a group of individuals. Thus the air coming into each lower berth may be deflected by way of shutters 44, and the air passing toward

each individual upper berth may be deflected in a similar manner by shutters 30. Not only have I provided adequate means for assuring proper ventilation of all portions of the car, but, also, an individual regulation of the air circulation to suit individual tastes.

Accordingly, it will be seen that I have provided a thoroughly practical and efficient ventilating system and method of ventilating a railroad car or the like in which the several objects hereinabove mentioned as well as many others are successfully accomplished.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In railroad car construction, in combination, a car, means for directing a supply of conditioned air longitudinally of the car from one end thereof, said means including an air duct extending along the upper portion of the car, means associated with said air duct for distributing air flowing through said duct at spaced portions therealong laterally and longitudinally of the car, and means controllable at will for varying the direction and volume of lateral air flow.

2. In railroad car construction, in combination, a car, means for directing a supply of conditioned air longitudinally of the car from one end thereof, said means including an air duct extending along the upper portion of the car, a plurality of ventilators secured to said air duct in spaced relationship with respect to one another, each of said ventilators having ports arranged laterally and longitudinally with respect to the car, said longitudinal ports being unobstructed, and means connected to each of said ventilators and associated with said lateral ports for varying at will the direction of air flow therefrom.

3. In railroad car construction, in combination, a car, an air conditioning unit having an outlet in said car, an air duct connected to said unit and extending along the upper portion of said car, said duct including a plurality of spaced openings, ventilator means secured to said duct over each of said openings for controlling at will the volume and lateral direction of air flow from said duct with respect to said car, said means including unobstructed openings permitting unimpeded air flow longitudinally of the car.

4. In railroad car construction, in combination, a car, means for recirculating air in said car, an air duct connected to said means and extending longitudinally of said car, said duct having a plurality of spaced openings, a ventilator element secured to said duct over each of said openings, said element having ports therein through which air flows in longitudinal and lateral directions with respect to said car, the ports providing longitudinal air flow being unobstructed, and means operable at will associated with said lateral ports whereby the lateral direction of flow may be changed without affecting the longitudinal direction of flow or the total volume of air flowing into the car.

5. In railroad car construction, in combination, a car, an air conditioning unit having an outlet in said car, an air duct connected to said outlet and extending longitudinally of said car along the ceiling thereof, said duct having a plurality of spaced openings, a plurality of ventilator elements secured to said duct over said openings, each of said elements having ports therein through which air flows in longitudinal and lateral directions with respect to said car, the ports providing longitudinal air flow being unobstructed, means operable at will for controlling the volume and direction of lateral air flow from each of said elements whereby the longitudinally flowing air is not affected in volume or direction of flow, a pair of air conduits connected with said duct and extending vertically therefrom on opposite sides of said car to the floor of said car, a second pair of air conduits connected with said first pair of conduits and extending longitudinally along the floor of said car adjacent the sides thereof, and means for directing conditioned air from said second pair of conduits into the lower portions of said car.

6. In railroad car construction, in combination, a car, an air conditioning unit having an outlet in said car, an air duct connected to the outlet of said unit, and extending therefrom centrally along the top of said car, said duct having spaced openings therein, a plurality of air conduits connected to said outlet and extending along the bottom portion of said car, a plurality of spaced channels connected to said conduits and extending vertically therefrom, said channels opening into said car, the distance between said duct openings and the distance between said channels being substantially the same, fan means adapted to force air through said duct and said channels, and means associated with said openings and said channels whereby the respective lateral and vertical directions of flow of air with respect to said car may be varied at will.

7. In railroad car construction, in combination, a sleeping car comprising a plurality of individual sections having upper and lower berths, an air conditioning unit mounted on said car, means for conducting air from said unit to the vicinity of said upper berths, means for conducting air from said unit to the vicinity of said lower berths when said upper berths are in either open or closed position, and means for controlling said first mentioned means to vary the lateral direction of air flow from said first mentioned means to said upper berths, and means for controlling the said second-mentioned means to change at will the vertical direction of air flow from said second-mentioned means to said lower berths.

8. In railroad car construction, in combination, a railroad car, an air conditioning unit having an outlet on said car, a duct extending along the top of said car and connected to the outlet of said unit, said duct having a plurality of spaced openings formed therein, a series of ventilating parts connected to said duct over said openings, said ventilating parts including means for directing air from said duct into said car in directions longitudinally with respect to said car and laterally with respect to said car, and means for changing at will the lateral direction of air flow.

9. In railroad car construction, in combination, a railroad car, an air conditioning unit having an outlet on said car, a duct extending along the top of said car and connected to the outlet of said unit, said duct having a plurality of spaced openings formed therein, a series of ventilating parts connected to said duct over said openings, said ventilating parts including means for directing air from said duct into said car in directions longitudinally with respect to said car and laterally with respect to said car, means for changing

at will the lateral direction of air flow and means for conducting air from said unit to the bottom portion of said car.

10. In railroad car construction, in combination, a passenger car having sections comprising an upper and lower berth each, an air conditioning unit having an outlet in said car, an air duct connected to the outlet of said car and extending centrally along the top thereof, said duct having a number of openings spaced in relation to said sections, means connected to said outlet to accommodate the passage of air therefrom, said means extending longitudinally of said car along the lower portions thereof, a plurality of channels connected to said means and extending vertically with respect to the floor of said car, said channels being spaced to coincide with said sections and having openings communicating with said lower berths, fan means associated with said unit for forcing air from said unit through said duct and said channels, and means related to said duct and channel openings whereby the direction of air flow may be varied without affecting volume of air-flow into said car.

11. In railroad car construction, in combination, a car, an air conditioning plant associated with said car and having an outlet therein, an air duct positioned in the clear story of said car and connected with said outlet, said duct having a plurality of spaced openings therein, a plurality of air conduits connected with said air duct and extending vertically therefrom to the floor of said car, a second plurality of air conduits connected with said first plurality of conduits and extending longitudinally along the floor of said car adjacent the sides of said car, a plurality of spaced channels extending vertically from said second plurality of conduits and having openings therein, and shutter means pivotally mounted in said duct openings and said channel openings whereby respectively the lateral and vertical directions of flow of air introduced into said car through said duct and channels may be varied.

12. In railway sleeping car construction, in combination, a car having sections each comprising an upper berth and a lower berth, an air conditioning plant in said car, a fan in said plant adapted to force air therefrom, an air duct connected to said fan and extending longitudinally of said car in the deck portion thereof, a plurality of ventilators associated with said duct, a plurality of air conduits connected to said duct and extending therefrom to and along the floor of said car, a plurality of channels connected to said conduits each extending vertically along the central portion of said sections and in the vicinity of said lower berths and being of smaller cross section than said conduits, and shutter means covering openings in said channels and pivotable to vary the vertical direction of flow of air therefrom.

GEORGE E. HULSE.