June 2, 1942. C. M. ASHLEY ET AL 2,285,075

AIR CONDITIONING APPARATUS

Original Filed June 17, 1936 2 Sheets-Sheet 1

Fig. 1.

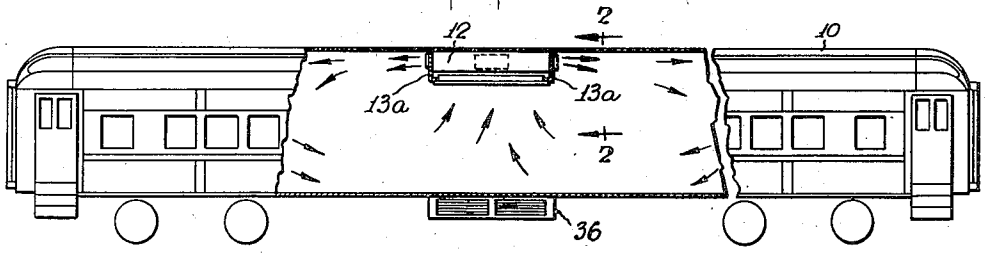

Fig. 2.

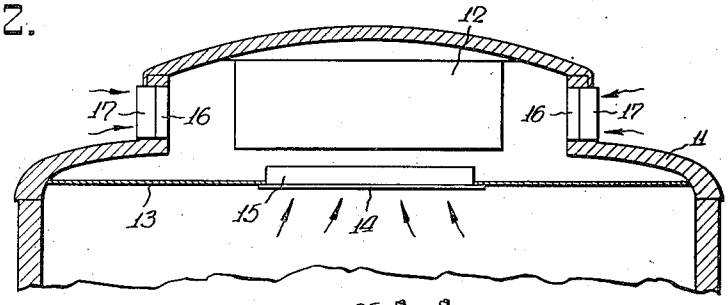

Fig. 3.

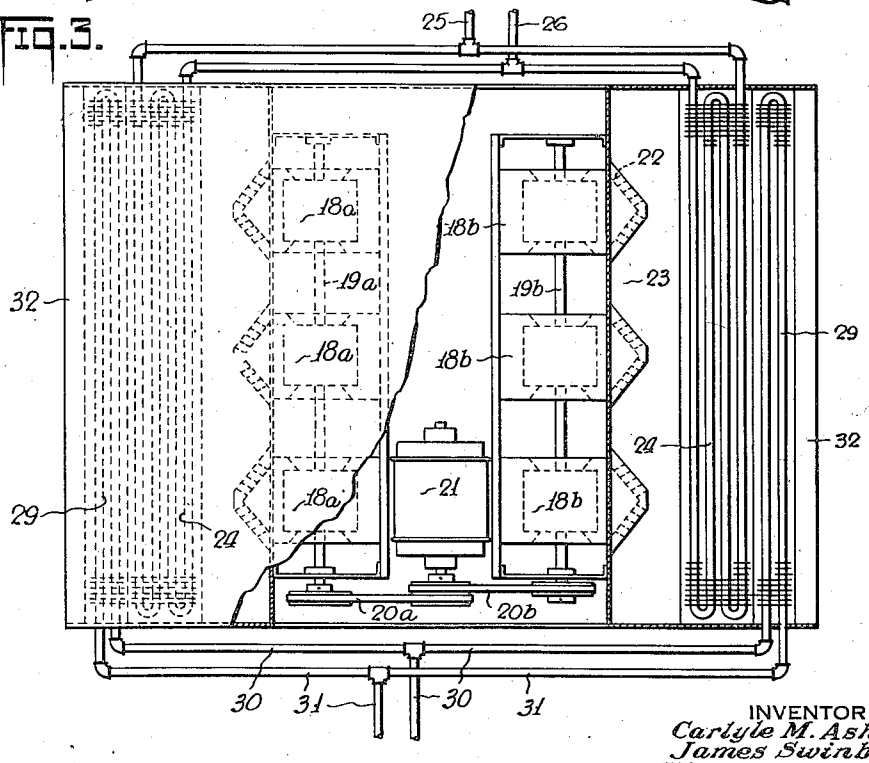

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Fig. 4.

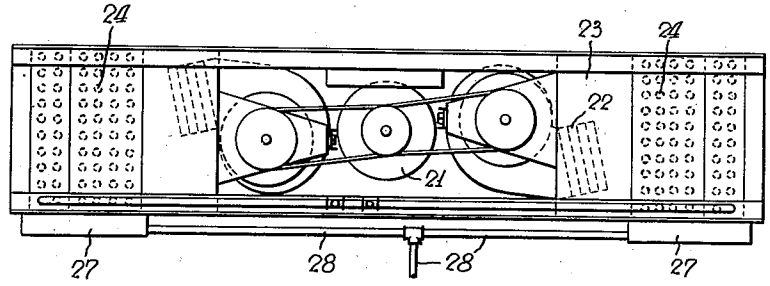
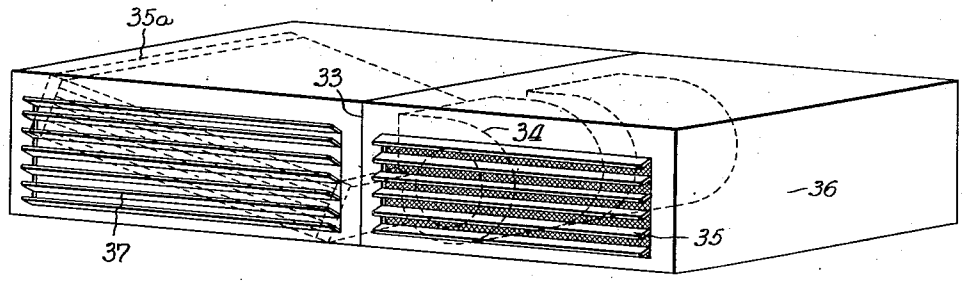


Fig. 5.



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Patented June 2, 1942

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UNITED STATES PATENT OFFICE

2,285,075

AIR CONDITIONING APPARATUS

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Original application June 17, 1936, Serial No. 85,642. Divided and this application April 5, 1939, Serial No. 266,052

1 Claim. (Cl. 62—117)

This invention relates to air conditioning and is a division of co-pending application, Serial No. 85,642, filed June 17, 1936.

The general object of the invention is to provide an improved apparatus for air conditioning enclosures, and more particularly vehicles such as railroad cars or the like.

It is another object of the invention to provide an improved apparatus for air conditioning vehicles such as railroad cars in which the refrigerating equipment is located beneath the car.

It is another object of the invention to provide an improved undercar arrangement of refrigerating apparatus used to effect desired air conditioning of the car, which arrangement assures an adequate supply of air utilized for condensing refrigerant employed in such refrigerating system, and which gives assurance against "short circuiting" of the air delivered from the undercar refrigerating apparatus to the air inlet thereof.

It is another object of the invention to provide an undercar arrangement of refrigerating apparatus which is relatively simple and inexpensive and which is readily accessible for purposes of inspection, repair or replacement.

Other objects, features and advantages of the invention will be more apparent from the following description to be read in connection with the accompanying drawings in which:

Fig. 1 is a side elevational view of a railroad car, partly broken away to illustrate diagrammatically applicant's air conditioning system;

Fig. 2 is a schematic and diagrammatic view lengthwise of the car and partly in section of applicants' air conditioning unit;

Fig. 3 is a plan view of applicants' air conditioning unit;

Fig. 4 is a side elevational view of applicants' air conditioning unit; and

Fig. 5 is a side elevational view of the undercar refrigerating unit.

Referring now to the drawings, numeral 10 designates generally a railroad car having a monitor top 11 of conventional design. Within the monitor space, proximate the center of the car 10 is positioned an air conditioning unit, generally designated 12. In a preferred form of the invention, there is provided a false ceiling 13 below the conditioning unit 12 and extending between end walls 13a. An opening 14, formed in the false ceiling, is adapted to return air from the car to the unit for reconditioning. Preferably a filter 15 is associated with the opening 14 for removing particles of dust and other foreign matter from the air returned to the unit. Fresh air from the outside atmosphere is adapted to be supplied to the unit 12 through fresh air openings 16 in the monitor top 11. Filters 17, associated with the fresh air openings, cleanse the fresh air passing therethrough. Dampers, louvres or the like, of any suitable construction, may be provided in connection with return air opening 14 and the fresh air openings 16, for controlling the proportions of fresh air and return air circulated through the unit and discharged into the car. If desired, the false ceiling 13 may be eliminated. In such case, applicants' construction would be modified by the provision of ducts for conveying fresh air from the openings 16 to the unit 12; or the width of the unit might be increased so that it extends from one side of the monitor top to the other. A wide variety of such modifications in arrangement and design may be made without departing from the scope of the invention.

In the central portion of the unit are two sets of fans designated 18a and 18b respectively. Since the unit forms a closed casing except for the air inlet openings and discharge openings at the ends thereof, the air delivered within the unit through the air inlets 14 and 16 is supplied to the inlets of the fans. Preferably, all the fans 18a are mounted on a single shaft 19a which is driven through belt connection 20a by motor 21 and fans 18b are mounted on a single shaft 19b which is driven through belt connection 20b by motor 21. Although the rotors of fans 18a and fans 18b are rotated in the same direction, air is discharged by these different sets of fans in opposite directions by directing the discharge openings of the fan housings toward opposite ends of the car, as shown in Fig. 4. To provide substantially uniform air flow across the width of the unit, the outlet of each fan is provided with a series of deflector vanes 22, disposed in a V-shaped formation within an equalization or pressure chamber 23. A set of cooling coils 24 is positioned in each end of the unit 12, thus to condition the separate air streams travelling in opposite directions set up by the fans 18a and 18b, respectively. Cooling medium is supplied to coils 24 through a common supply line 25, and withdrawn therefrom through common return line 26. Cooling medium of any desired character may be employed in the coils to effect the desired reduction in air temperature. Thus the coils 24 may be usd as expansion coils in which a chemical refrigerant is evaporated, or, if desired, a cooling medium such as water or brine,

cooled by suitable refrigerating mechanism, may be supplied thereto. Moisture condensed from the air contacting coils 24 is collected in pans 27 whence it is drained through pipes 28 for disposal in any desired manner.

The unit is also provided with a set of heating coils 29 at each end thereof, adapted to heat air supplied to the car under winter operating conditions. Heating medium is supplied to the coils 29 through feed lines 30 and is returned therefrom through return lines 31. Heating medium of any desired character may be employed; but preferably steam, from the locomotive boiler or any other available source, is employed.

Air which has passed through the coils 24 and 29 issues from the unit through discharge openings 32 in the opposite ends thereof. The end walls 13a are, of course, provided with openings substantially coinciding with openings 32. Discharge openings 32 may be provided with louvres or the like, as may be desired, to enhance the appearance of the unit and to control the direction of air discharge therefrom.

The air discharge from the unit proximate the ceiling level travels at relatively high velocity toward opposite ends of the car through the space above the zone of occupancy. Before it settles into the zone of occupancy it has thoroughly mixed with, and has been attemperated by, air in the upper portion of the car. Thus drafts and shock are effectively avoided. Moreover, comfort is assured in all portions of the car by the active rolling circulation of conditioned air set up by applicants' method of air supply and withdrawal.

Applicant's unit is illustrated and described as being positioned proximate the center of the car. Such location of the unit is preferred. However, the unit may be positioned elsewhere than in the center of the car, as, for example, proximate the end of a passage or area. In sectionalized cars, such an arrangement may, in fact, be preferred.

Although the distribution of air is preferably accomplished without the use of ducts, air distribution ducts for conveying air from the openings 32 lengthwise of the car may be provided, if desired, without departing from the scope of the invention. Applicant does not limit himself to any particular duct arrangement, and contemplates that the ducts may be formed within the monitor top of the car, or externally of the car, or in any other desired manner.

Refrigerating equipment adapted to be used in conjunction with applicants' air conditioning unit may be of any desired type or design, and may be located at any desired point within or below the car. Preferably, however, the refrigerating equipment is placed below the car and proximate the center thereof, to avoid encroachment upon the useful car area and to avoid excessively long connections to the air conditioning unit.

Fig. 5 illustrates applicants' preferred method of circulating air over the refrigerating equipment used for supplying cooling medium to the apparatus located in the top of the car. According to this invention, the condenser of the refrigerating equipment is positioned at one end of the refrigerating unit, and the other equipment is positioned at the other end of the unit. A partition 33 preferably separates the two ends of the unit. A fan 34 draws air into one end of the unit through a louvred or screened inlet opening 35, formed in one portion of a side of the refrigerating unit casing 36. This air, after passing over the compressor, motor, or other equipment in the one end of the unit is discharged by fan 34 over the condenser 35 in the other end of this unit. The air is then discharged to the atmosphere through a louvred outlet opening 37 formed in the same side of the casing 36 as opening 35. The outlet louvres are preferably adapted to discharge air upwardly from the unit, so that the heated air is intermingled with and carried away by the outdoor atmosphere. The inlet opening is provided with a screen and/or louvres which extend downwardly and away from the inlet opening. Although the upward inclination of the discharge louvres effectively prevents rebounding of air from the road bed and consequent "short-circuiting," the downward inclination of the inlet louvres gives double assurance against this occurrence. Thus, an adequate supply of fresh outdoor air for cooling and condensing purposes is assured.

While the invention has been described in connection with a railroad car, its use is not limited to such applications. It will be apparent to those skilled in the art that applicants' method and apparatus, as herein disclosed, may be advantageously used for the conditioning of enclosures of all types. The invention is particularly beneficial in the conditioning of long and narrow enclosures, which heretofore have been exceedingly difficult to condition satisfactorily.

Since many modifications in and variations of the invention may be made without departing from its scope, applicants intend that the above description and accompanying drawings be considered as illustrative only, applicants limiting themselves only as indicated in the appended claim.

We claim:

In a combination of apparatus for air-conditioning a railroad car, a condensing unit, a mounting beneath a railroad car, said condensing unit being mounted on said mounting, a casing housing said condensing unit, said casing having two openings comprising an air inlet and an air outlet side by side and parallel with a side of the car for admitting air into said casing and discharging air from the casing, louvers in said openings, said louvers being horizontal and parallel with the path of movement of the car, a blower within the casing for circulating air through the casing over said condensing unit in a course through said louvers serving said inlet and outlet, means in combination with the inlet for assuring an adequate supply of fresh outdoor air for cooling said condensing unit, said louvers being arranged in combination with said inlet and outlet and positioned at differing angles whereby air substantially in the same volumes will be admitted to the casing regardless of the direction of movement of the car in a course preventing short-circuiting to the air inlet of air discharged from the air outlet.

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