March 7, 1944. C. D. BONSALL 2,343,395

AIR CIRCULATING MEANS FOR REFRIGERATOR CARS

Filed Aug. 3, 1942 2 Sheets-Sheet 1

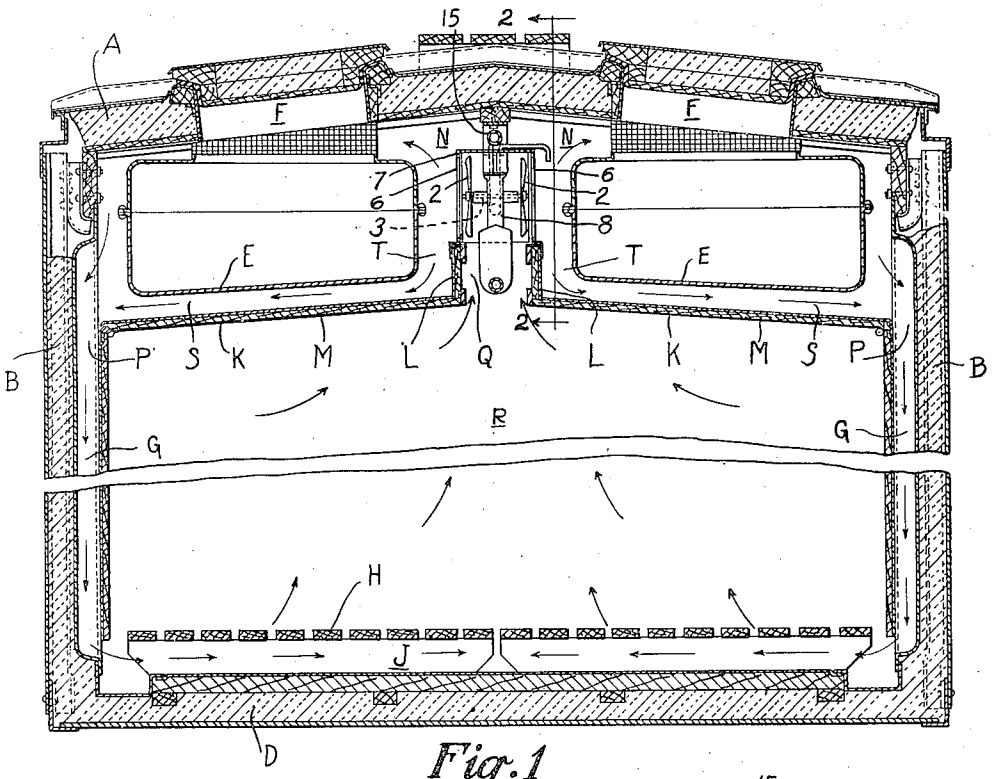

Fig. 1

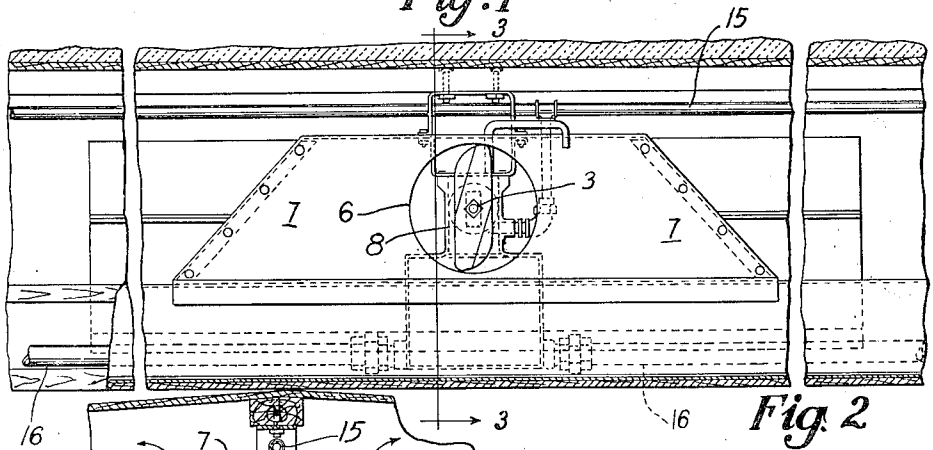

Fig. 2

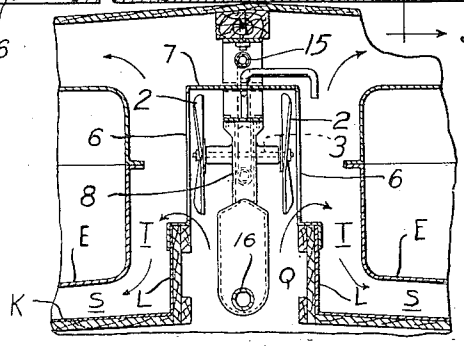

Fig. 3

Inventor:
Charles D. Bonsall
Gustav E. Olsson
Attorney

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AIR CIRCULATING MEANS FOR REFRIGERATOR CARS

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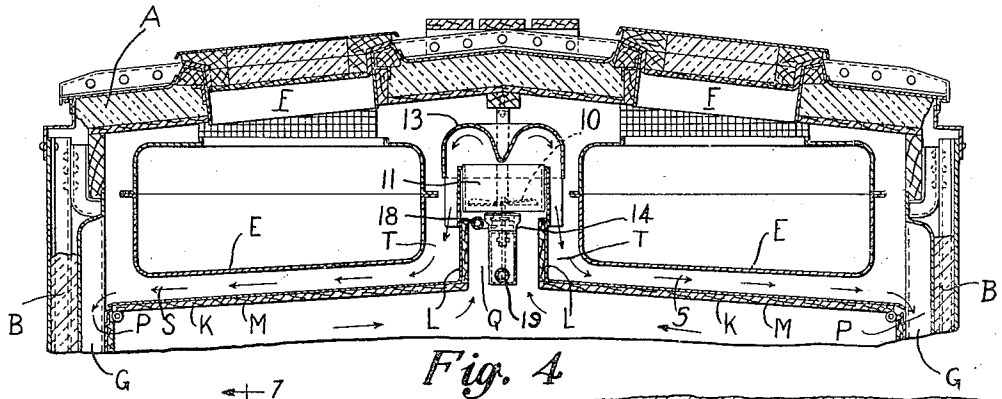

Fig. 4

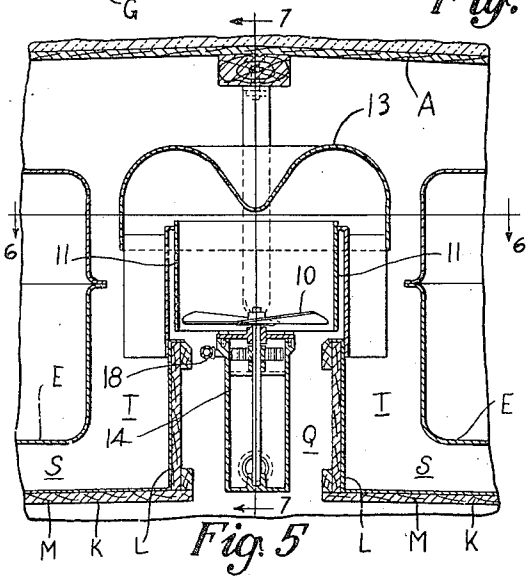

Fig. 5

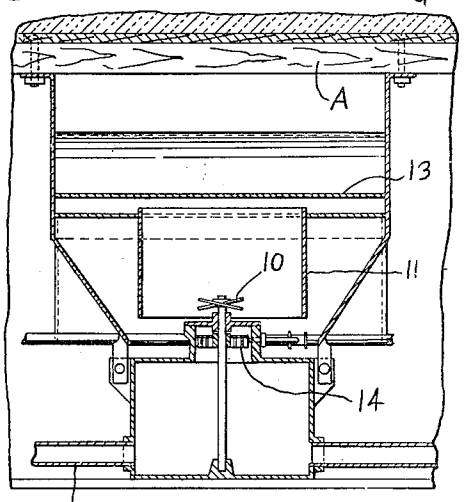

Fig. 7

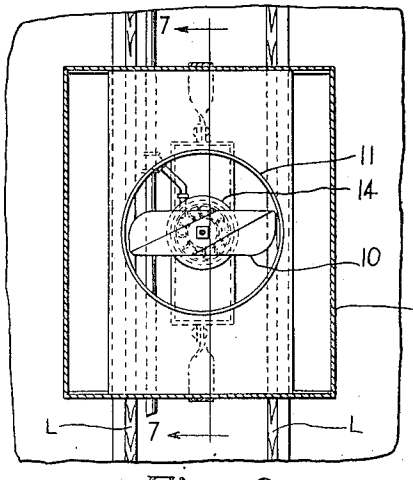

Fig. 6

Inventor:
Charles D. Bonsall
Attorney

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UNITED STATES PATENT OFFICE

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AIR CIRCULATING MEANS FOR REFRIGERATOR CARS

Charles D. Bonsall, Chicago, Ill., assignor, by mesne assignments, to Standard Railway Equipment Manufacturing Company, a corporation of Delaware

Application August 3, 1942, Serial No. 453,452

5 Claims. (Cl. 62—24)

This invention relates to refrigerator cars used to transport perishable commodities at a predetermined temperature. The essential features of a refrigerator car are an insulated body to prevent or retard ingress of heat during warm weather and egress of heat during cold weather and a cooling means and preferably a heating means to be used during warm and cold weather respectively.

This invention applies particularly to cars in which the cooling means, preferably containers for water ice, eutectic ice, brine or dry ice, are disposed immediately below the roof of the car. The lading is supported in spaced relation to the floor by a foraminous rack. Flues, preferably associated with the side walls of the car, communicate between the cooling means and the space under the floor rack to provide a path for the circulation of air. The path is from the cooling means downwardly through the aforementioned flues, through the space under the floor rack, upwardly through the lading compartment thereby cooling the lading, and finally to the cooling means from where the cycle is repeated.

The above mentioned circulation of air is a natural thermo-convective circulation and under certain conditions may not be adequate to properly circulate a sufficient amount of cold air through the interior of the car to properly refrigerate the lading.

An object of the invention is to provide a power driven fan for circulating air within the car and to provide baffles and shrouds to direct the forced air circulation in substantially the same path as is followed by natural convective circulation in a similar car.

Another object is to provide the above mentioned forced air circulation without substantially interfering with the natural convective circulation which takes place when the fan is inoperative.

Other objects and advantages of my invention will be apparent from the following detailed description by referring to the accompanying drawings.

In the drawings:

Fig. 1 is a transverse section of a refrigerator car showing one embodiment of my invention.

Fig. 2 is a section on line 2—2 of Figure 1.

Fig. 3 is an enlarged view of a portion of Figure 1 as indicated by the line 3—3 of Figure 2.

Fig. 4 is a view similar to the upper part of Figure 1 showing a modified form of my invention.

Fig. 5 is a sectional view of a portion of the structure shown in Figure 4.

Figs. 6 and 7 are sections on lines 6—6 and 7—7 respectively of Figure 5.

The general parts of the refrigerator car shown are insulated roof A; side walls B; floor D; refrigerant containers E; hatches F for loading refrigerant into the containers E; side wall flues G; foraminous floor rack H and space J between the rack H and the floor D. Spaced apart refrigerant containers E are positioned immediately below the roof A and respectively adjacent the side walls B. A drip pan K is provided below each container E and a partition L is disposed in an upstanding position at the edge of each drip pan K, the drip pans K and the partitions L cooperating with the roof A and the upper parts of the side walls B to form enclosures M around the containers E. Air inlet openings N to the enclosures M are provided above the partitions L and air discharge openings P lead from the enclosures M to the flues G at a lower elevation than the air inlet openings N. Cars of this type commonly have a row of refrigerant containers E near each side wall B, which containers are spaced apart longitudinally of the car to provide air passages between the ends of the containers. The partitions L are spaced apart to form a duct Q which communicates between the lading compartment R and openings N.

When the air circulating means is inoperative, a natural convective air circulation takes place as follows:

Air in the lading compartment R is warmed by contact with the lading and rises through the duct Q to enter the enclosing structures M through the air inlet openings N. The air then flows through the passages S between the containers E and drip pans K where it is cooled by contact with the bottoms of the cold refrigerant containers E and falls by reason of its lower temperature and therefore greater density through the discharge openings P and flues G to the space J whence it rises through the rack H to the lading compartment R. The above described cycle is thereafter continuously repeated.

In the modification shown in Figures 1 to 3, a pair of fans 2 are mounted upon a substantially horizontal, transversely extending shaft 3 disposed above the duct Q and arranged to circulate air in opposite directions from the duct Q toward both the refrigerant containers E. The air circulated by the fans 2 flows downwardy through the passages T between the containers E and the upstanding partitions and thence in a substantially horizontal direction through the passages S between the refrigerant containers E and the

drip pans K. This is the path followed by the natural convective circulation of air and the forced circulation induced by the fans 2 augments the natural circulation. An inverted channel shaped shroud 7 overlies and partially encloses both of the fans 2 and is provided with openings 6 aligned with the fans 2 and communicating with the air cooling passages T. The shroud 7 has a substantial length longitudinally of the car to prevent the air from short-circuiting back into the duct Q after leaving the fans 2. The fans may be driven by any suitable means; the driving means disclosed will be hereinafter described.

In the modification disclosed in Figures 4 to 7, a single fan 10 is mounted to rotate upon a vertical axis and arranged to induce a circulation of air upwardly through the duct Q. The fan 10 is surrounded by a cylindrical baffle 11 and a deflector 13 is provided above the baffle 11 to divide the upwardly flowing air in two streams, each of which is directed downwardly through the passage T between a container E and the adjacent partition L and thence through the passage S between the container E and subjacent drip pan K where it is cooled in the manner hereinbefore described.

Only one fan unit is shown in the modification illustrated by Figures 1 to 3 and in the modification illustrated by Figures 4 to 7. A plurality of similar units are preferably provided at intervals along the length of the car and may be conveniently arranged with one unit between each pair of laterally spaced refrigerant containers.

The means illustrated for driving the fans 2, 10 comprise hydraulic turbines 8, 14 operated by fluid transmitted under pressure to the turbines. In the modification shown in Figures 1 to 3, the pressure line 15 is disposed immediately below the roof A while the return line 16 is disposed below the fans 2 in the lower part of the duct Q. In the modification shown in Figures 4 to 7, the pressure line 18 extends longitudinally of the car adjacent the upper edge of one of the partitions L while the return line 19 is disposed within the lower part of the duct Q. Fluid pressure may be furnished by a hydraulic pump driven by the car wheel as disclosed in Schwebs Reissue Patent 21,849 of July 1, 1941.

The accompanying drawings illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof, within the scope of the claims, will occur to persons skilled in the art.

I claim:

1. In combination with the roof and spaced apart walls of a refrigerator car, a pair of spaced apart refrigerant containers below said roof, means cooperating with each of said containers to form an air cooling passage adjacent the container, means to form a duct between said containers and air circulating means comprising a pair of fans revolubly mounted upon a horizontal axis within said duct externally of said passages, and arranged to induce a flow of air from said duct through both of said passages, means disposed between said fans for driving both of the fans, a shroud covering said fans, and openings through opposite sides of said shroud in alignment with said fans.

2. In combination with the roof and spaced apart walls of a refrigerator car, a pair of spaced apart refrigerant containers below said roof, means cooperating with each of said containers to form an air cooling passage adjacent the container, said means comprising a drip pan spaced below the container and a member spaced from a wall of the container, said members being spaced apart to form a duct, and air circulating means within said duct, externally of said passage, at a higher elevation than said members and arranged to induce a flow of air from said duct through both of said passages, a shroud covering said air circulating means, openings in said shroud aligned with said air circulating means, and means for driving said air circulating means.

3. In combination with the roof and spaced apart walls of a refrigerator car, a pair of spaced apart refrigerant containers below said roof, means cooperating with each of said containers to form an air cooling passage adjacent the container, said means comprising a drip pan spaced below the container and a member spaced from a wall of the container, said members being spaced apart to form a duct and air circulating means comprising a pair of fans revolubly mounted upon a horizontal axis at a higher elevation than said members and arranged to induce a flow of air from said duct through both of said passages, an inverted channel-shaped shroud covering said fans with its depending flanges engaging said members, substantially fan-size openings in said shroud aligned with said fans and means for driving said fans.

4. Air circulating means, for a railway refrigerator car, having a refrigerant container adjacent the roof of said car, an air cooling chamber about said container and a lading compartment therebelow, said chamber having a vertical wall providing a duct at one side of said chamber, above said lading compartment, said chamber being closed except for the hereinafter mentioned air inlet between said duct and said chamber at a higher elevation than an air outlet between said chamber and said compartment for convective flow of air therethrough; said air circulating means comprising an air circulator mounted externally of said chamber adjacent the air inlet thereinto, a shroud covering said duct and said circulator, an opening through said shroud providing an air inlet between said duct and said chamber, said air circulator being adapted to force air from the lading compartment to and through said air cooling chamber, and means to operate said air circulator.

5. Air circulating means, for a railway refrigerator car, having spaced apart walls, and a roof, a pair of spaced refrigerant containers adjacent said roof, means forming an air cooling chamber about each container, said last mentioned means providing a vertically extending duct between said chambers, said chambers being closed except for the hereinafter mentioned air inlet thereinto through said duct, and an air outlet and flue means, associated with said walls, each communicating at its upper end with one of said air outlets; said air circulating means comprising an air circulator mounted within said duct externally of said chambers, a shroud covering said duct and said circulator, openings through said shroud providing air inlets between said duct and said chambers, said air circulator being adapted to force air from the lading compartment through said duct into both air inlets through both chambers and into said flues, and means to operate said air circulator.

CHARLES D. BONSALL.