July 31, 1956 M. E. ROBERTSON 2,756,564

VENTILATING ATTACHMENT

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FIG. 1

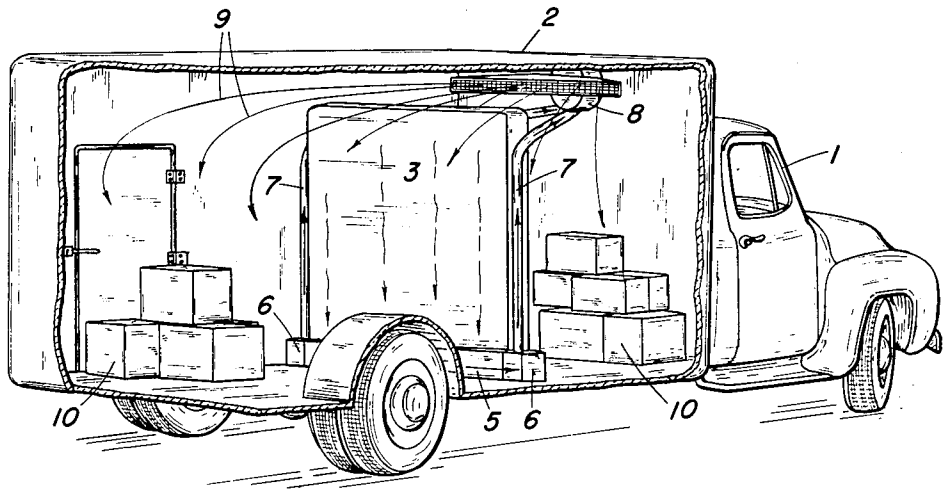

FIG. 2

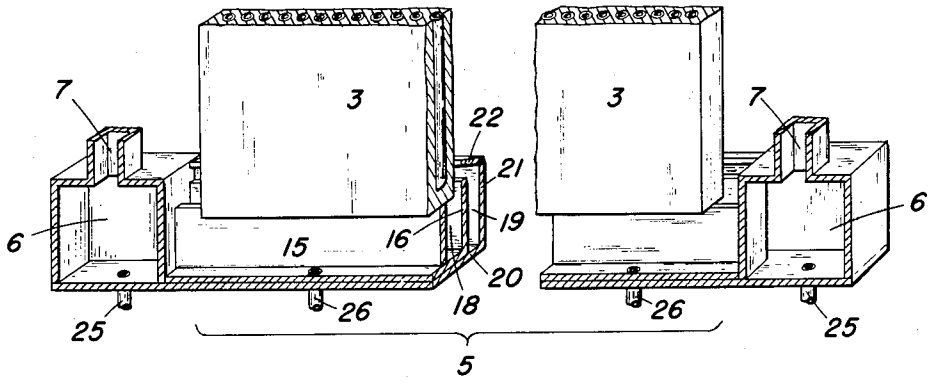

FIG. 3

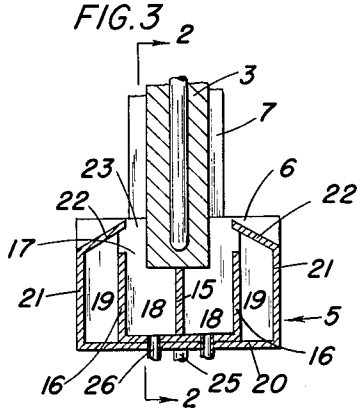

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FIG. 4

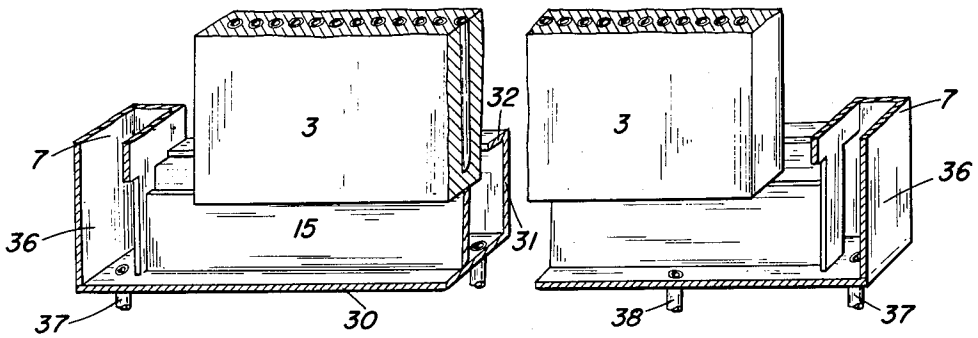


FIG. 5

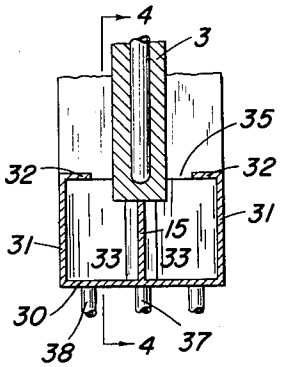
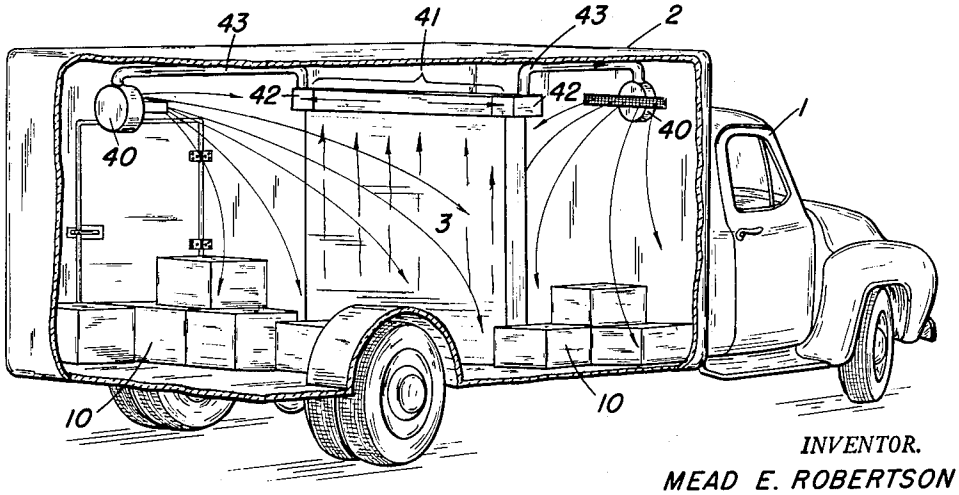


FIG. 6



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VENTILATING ATTACHMENT

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Application January 12, 1955, Serial No. 481,401

13 Claims. (Cl. 62—102)

This invention relates to a ventilating attachment for a cooling device and more particularly to means for enhancing the efficiency obtained with flat plate vehicle cooling units which comprises an attachment which does not cover either of the faces thereof and which is disposed along a horizontal edge thereof.

Flat plate cooling units are conveniently used in obtaining and maintaining low temperatures in the bodies of vehicles such as trucks and railroad cars which are adapted to contain perishables such as dairy products, produce and meats, frozen food, ice cream, frozen confections, and the like. Normally such units are disposed on the walls of a box-like body or may be disposed on walls or partitions of the bodies or partitions themselves. In some installations they may be disposed horizontally on either the ceiling or floor of the compartment. In any such arrangement the cooling of the goods contained in the compartment has been characterized by being carried out in any one of several manners. In the first, cooling is by conduction for those goods piled against the refrigerant plates and by radiant heat absorption or unassisted conduction cooling for goods located nearer the center of the compartment. In the second, conduction cooling is assisted by cooling with fans or blowers suitably located in the compartment to force warmer air against the plates and to bring air cooled by the plates into more intimate contact with the goods contained in the compartment. Such systems of course have the advantage that turbulence of the air is increased with resultant increase in heat transfer. In the third arrangement cooling is primarily accomplished with a forced draft arrangement; the cooling unit is shrouded; the blower or fan pulls air through the shroud or housing surrounding the cooling element, thus forcing cool air into the compartment containing goods being maintained under refrigeration and pulling warm air from the compartment into and through the housing and into relatively intimate contact with the cooling unit. Each of these methods has certain disadvantages. The efficiency of installations utilizing unassisted conduction cooling is extremely low when goods nearly fill the compartment because free circulation of air is nearly entirely impeded and conductive cooling of goods near the center of the compartment is extremely slow. The same is generally true of the assisted conduction cooling arrangements. When the compartment is full of goods the fan usually circulates air in only a small portion, often the upper part, of the compartment and its efficiency is enormously reduced. Thus in order to obtain adequate refrigeration with such a system when the compartment is fully loaded it is generally necessary to keep the fan going all the time. This results in a considerable load on the electrical system of the vehicle on which the compartment is mounted. In a forced draft installation it is necessary to keep the fan going all of the time in order to obtain any effective cooling.

Each of these installations is particularly ineffective when a refrigerated truck must be loaded with goods

such as dairy products in the evening in order to be ready to start out early in the morning and must be dependent on the truck refrigerating system to maintain the necessary low temperature throughout the night. The requirements of such a cooling system are that it be capable of high capacity at certain times such as immediately after the goods are loaded until they are refrigerated to the necessary low temperature required for storage and at times when the truck is in use making deliveries and the doors are being opened at frequent intervals. On the other hand it must be capable of cooling at a very low rate of capacity with extremely high efficiency over long periods of time during which the truck is standing and not in use in order to prevent destruction of the truck's battery during such periods. In short, it is impracticable to drive a fan or blower off a truck's electrical system for long periods of time when the truck is unattended and its engine is not running but upon other occasions it is necessary that the refrigerating system of the truck have a high capacity with a high efficiency, utilizing a relatively powerful blower, in order to maintain the degree of refrigeration necessary for proper storage. During such periods generally the truck is attended and its motor is running but an unassisted conduction system which is quite satisfactory for long periods of unattended storage is entirely inadequate for use at such times.

My invention provides an assisted conduction arrangement which is far more efficient than those of the prior art and which permits a low rate of refrigeration to be maintained over long periods of time with a minimum load on the truck's electrical system and yet permits a high rate of refrigeration to be obtained at certain times, or with a minimum of expense.

It is therefore an object of this invention to provide means mountable within a low temperature storage cabinet carried by a vehicle and adapted to be attached to a flat refrigerating plate, for obtaining improved refrigerating efficiency during periods of both low demand and high demand.

Another object is a device for attachment to one of the horizontal edges of a refrigerating plate, which is adapted to provide forced draft refrigeration during periods of high demand and to provide unassisted conduction and radiation cooling during periods of low demand.

Further objects will become apparent from the drawings and the following detailed description in which it is my intention to clearly set forth and describe my invention and to show its applicability without limiting its scope. In the drawings and description like reference numerals refer to like parts and:

Figure 1 is a partially cutaway perspective view of one embodiment of my invention installed in a refrigerated compartment mounted on a truck;

Figure 2 is a partially cutaway perspective view of a preferred embodiment of the device of my invention applied to the bottom edge of a rectangular refrigerating plate, the device being cross-sectioned on lines 2 as shown in Figure 3;

Figure 3 is a cross-sectional view of the device taken at right angles to the bottom edge of the rectangular refrigerating plate;

Figure 4 is a partially cutaway perspective view of another embodiment of the device, the device being cross-sectioned on lines 4—4 as shown in Figure 5;

Figure 5 is a cross-sectional view of the device taken on a plane normal to the surfaces of the rectangular refrigerating plate; and

Figure 6 is a partially cutaway perspective view of a truck with a refrigerated compartment mounted thereon and provided with an alternative installation of the device of the invention.

Referring now to Figures 1, 2 and 3 there is shown a truck 1 having a compartment 2 mounted thereon which is adapted to be refrigerated by refrigerating plate 3.

The device of the invention is disposed along the lower edge of refrigerating plate 3 and comprises a central trough-like portion 5 provided with plenum chambers 6 at each end thereof communicating therewith. Air which flows downwardly along the faces of plate 3 is collected in trough-like portion 5, sucked into plenum chambers 6 and thence upward through ducts 7 by fan or blower 8 which thereupon blows the cool air thus collected out over the contents of the body and downward as shown by arrows 9 into intimate contact with the contents 10 contained in said compartment. Trough-like portion 5 comprises a partition member 15, two upwardly extending partitions 16 on opposite sides thereof substantially parallel thereto and at their top edges spaced away from plate 3 as shown at 17, thus defining channels 18. On each side of channels 18 are channels 19 defined by bottom 20 upwardly extending walls 21 and inwardly extending roof portions 22 spaced away from plate 3 as shown at 23. Channels 19 are connected with plenum chambers 6. Channels 18 are not connected with plenum chambers 6 but may suitably be so connected if desired. Drains 25 and 26 are provided to permit removal of water and melted ice which may collect in the channels and plenum chambers.

As shown in Figures 4 and 5 the portion of the device disposed alongside the horizontal edge of plate 3 may be made more simply. Bottom 30 and upwardly extending walls 31 and inwardly extending roof portions 32 may be disposed around central partition 15 to provide channels 33, the inner edges of roof portions 32 being disposed away from the surfaces of plate 3 as shown at 35. Plenum chambers 36 may be generally coextensive with the bottom of duct 7. Channels 33 open into plenum chambers 36. Drains 37 and 38 are provided respectively to drain the plenum chambers and trough portions of collected water and melted ice.

There is shown in Figure 6 an alternative installation of the device according to the invention which may be utilized if desired although most of the advantages of the invention are sacrificed in such an arrangement. Blowers 40 pull cool air upward alongside the plate 3 thence into trough portion 41, thence into plenum chambers 42 connecting therewith, and thence through ducts 43. The cool air thus pulled into blower 40 is blown out over the top of contents 10.

It may be seen that due to the tendency of hot air to rise, the air as it is heated by goods 10 will pass in a relatively direct path to trough 41 rather than passing alongside the walls of plate 3, thus in effect short-circuiting the refrigerating unit 3 and resulting in lessened efficiency of the installation.

Thus it may be seen that the invention is broad in scope and is to be limited only by the claims.

Having thus disclosed my invention, I claim:

1. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge near and parallel to a horizontal edge of said cooling plate, a floor portion extending outwardly from the bottom edge thereof and a wall portion extending upwardly from the outer edge of said floor portion adapted to conjointly define a channel adapted to receive air flowing vertically along a wall of said flat plate, a plenum chamber connected to one end of said channel and a duct connected to said plenum chamber.

2. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge near and parallel to a horizontal edge of said cooling plate, floor portions extending outwardly from said partition and wall portions

extending upwardly from said floor portions to define at least one channel on each side of said partition, plenum chambers at each end of said partition connected with said channels and ducts connecting to said plenum chambers.

3. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge near and parallel to a horizontal edge of said cooling plate, floor portions extending outwardly from the bottom marginal edge of said partition on each side thereof, wall portions extending upwardly from the outer marginal edges of said floor portions and roof portions extending inwardly from the upper marginal edges of said wall portions, adapted to define two channels, one on each side of said central partition, said channels adapted to receive air flowing vertically along the walls of said flat plate, plenum chambers at the ends of said partition and ducts connected to said plenum chambers.

4. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge near and parallel to a horizontal edge of said cooling plate, a floor portion extending outwardly from the bottom marginal edge of said partition on each side thereof and wall portions extending upwardly from the outer marginal edges of said floor portion plenum chambers at the ends of said partition and the ducts connected to said plenum chambers, a second floor portion extending under said first floor portion and outwardly beyond the edges thereof, wall portions extending upwardly from the outer edges of said second floor portion and roof portions extending inwardly from the upper marginal edges of said outer wall portions, said partition, wall and roof portions adapted to together provide two channels on each side of said central partition, said channels adapted to receive air flowing vertically along the walls of said flat plate, at least said outer channels opening into said plenum chambers, and ducts opening into the tops of said plenum chambers.

5. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge near and parallel to a horizontal edge of said cooling plate, at least one channel on each side thereof defined by said partition, floor portions, wall portions extending upwardly from the outer marginal edges of said floor portions and roof portions extending inwardly from the upper marginal edges of said wall portions, said channels opening into plenum chambers at each end of said partition, and ducts opening upward from said plenum chambers.

6. In a refrigerated compartment, the combination of a vertical flat plate cooling unit and an air collecting and blowing device comprising an upwardly extending partition disposed with its upper edge adjacent a horizontal edge of said cooling plate, two channels on each side of said partition, each substantially defined by a floor portion substantially connected to the bottom marginal edge of said central partition and by wall portions extending upwardly from said bottom portions, plenum chambers at each end of said central partition and ducts connected to said plenum chambers.

7. Apparatus comprising in combination the device of claim 1, means for withdrawing air from at least one end of said channel unit, means for conveying said air to an upper portion of side compartment and means for there re-introducing said air into said compartment.

8. In a refrigerated compartment, the combination of a vertically disposed flat plate cooling unit, channel means disposed along a horizontal edge of said unit adapted to receive air flowing vertically along at least one side thereof, means for withdrawing such air from at least one end of said channel unit, means for conveying said air to an upper portion of said compartment containing said unit

and means for there re-introducing said air into said compartment.

9. The device of claim 8 wherein two such channel means are provided.

10. The device of claim 8 wherein four such channel means are provided.

11. The device of claim 1 wherein said partition is adjacent to said horizontal edge.

12. The device of claim 2 wherein said partition is adjacent to said horizontal edge.

13. The device of claim 3 wherein said partition is adjacent to said horizontal edge.

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