Oct. 4, 1932. H. J. DICK 1,880,877

REFRIGERATING APPARATUS

Filed March 31, 1928

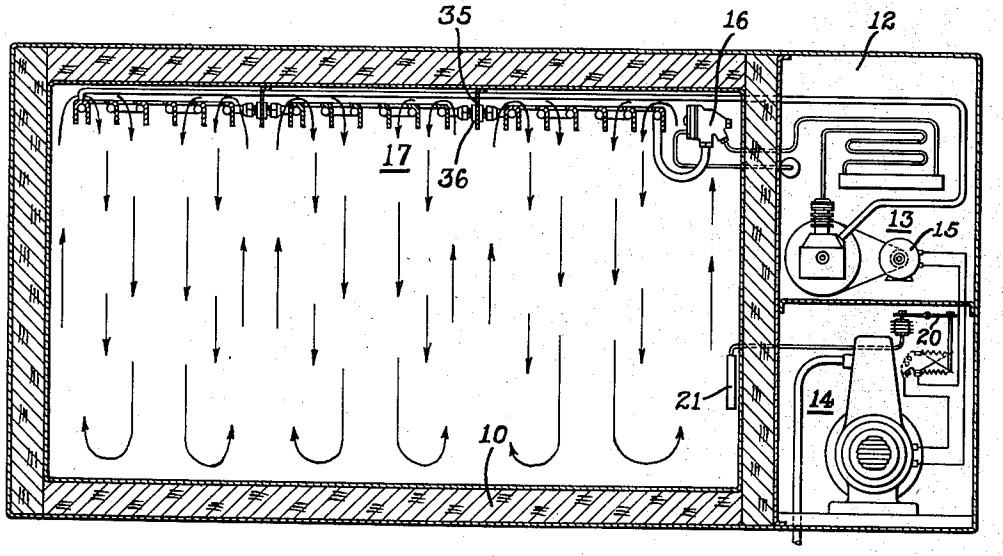


Fig. 1

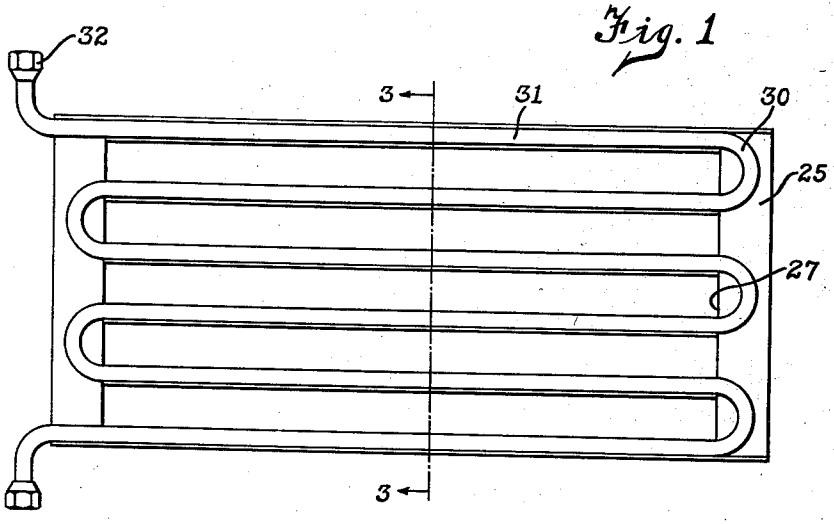


Fig. 2

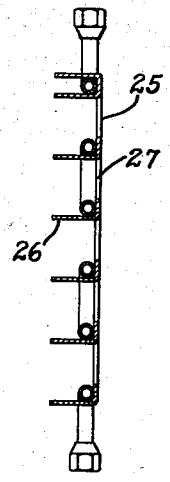


Fig. 3

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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

Application filed March 31, 1928. Serial No. 266,295.

This invention relates to refrigerating apparatus particularly to a novel refrigerating element and method of making it. The invention is also particularly concerned with refrigerating elements adapted to be used in refrigerating motor vehicles.

One of the objects of the invention is to provide an improved convenient and economical method of making a refrigerating element.

Another object is to provide an improved refrigerating element having a large amount of refrigerating surface which can be disposed within a small height and permit the circulation of air through the element.

Another object is to provide a refrigerated compartment particularly suitable for use on motor vehicles with means for improving the circulation of air.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a longitudinal vertical section of a portion of a motor vehicle provided with a refrigerating system constructed in accordance with the present invention;

Fig. 2 is a bottom plan view of a refrigerating element; and

Fig. 3 is a section on the line 3—3 of Fig. 2.

In refrigerated motor vehicles such as ice cream trucks the matter of head room or available height for the storage of goods in the refrigerated compartment is very important. Since the bodies of vehicles of this character are very heavy they must be kept low in order not to raise the center of gravity of the vehicle. For this reason it becomes important to provide a refrigerating element having a relatively large amount of surface, sufficient to cool a large sized compartment, but which can be disposed within a very small height. This invention is concerned, among other things, with providing an improved evaporator particularly adapted for this class of service.

Referring to the drawing 10 designates an insulated compartment which may be carried by a motor vehicle having a machine compartment 12 which contains a refrigerating apparatus generally denoted by 13 and a power plant generally denoted by 14. The refrigerating apparatus includes a compressor driven by a motor 15 for supplying refrigerant through a control valve 16 to an evaporator generally denoted by 17. The motor 15 is actuated in response to refrigerating demand through the agency of an automatic switch 20 actuated by a thermostat 21 disposed in the refrigerated compartment 10, to connect the motor to the electric generator of the power plant 14, which latter is usually arranged to operate automatically whenever there is a demand for current.

The evaporator preferably comprises a number of refrigerating elements of the type shown in Figs. 2 and 3. Each of these elements consists of a generally flat plate 25 of thermally conducting material such as copper, having fins 26 projecting from it and having openings 27 between the fins to permit the circulation of air through the plate and in contact with the fins. The plate is cooled by a tortuous refrigerant conduit 30, which includes a number of straight portions or passes 31 attached to as by soldering and are therefore in intimate thermal contact with the plate, for example by soldering. Preferably each of the straight portions 31 is soldered both to a fin 26 and to the underside of the plate 25 adjacent the fin and between the openings 27. The ends of the conduit are provided with suitable coupling members 32 which facilitate connecting the elements in the refrigerating system.

The plate and fins are preferably formed as a single integral structure by making a series of U-shaped cuts in the plate and bending the portions of the plate defined by the cuts to form the fins 26. Thereafter the refrigerant conduit is soldered to the plate and fins as above described. However, if desired the fins may be separately formed and secured to the plate. This latter is of advantage when it is desired to provide fins having a greater area than can be obtained from the cut out portions of the plate, for example when it is desired to dispose the fins at an

angle to the plate as is disclosed in the application of James W. Carl, Serial No. 266,296, filed March 31, 1928.

Any suitable number of refrigerating elements may be used in conjunction with one another to cool the compartment 10, three being illustrated in Fig. 1. In this embodiment of the invention baffles 35 are provided between adjacent refrigerating elements in order to assist the circulation of air in the compartment 10 as well as to assist in supporting the refrigerating elements. Coupling members 36 may be secured to the baffles and the refrigerating elements connected to each other by being connected to these coupling members. The baffles 35 extend from the top wall of the compartment down to the level of the bottom of the fins and provide warm spots which induce the upward circulation of air at the baffles thus providing a number of independent parallel circulating paths for air as indicated by the arrows. In this manner the whole refrigerating compartment is sub-divided into smaller spaces throughout which a complete circulation of air occurs, which arrangement provides a substantially uniform circulation and cooling of the compartment.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating element including in combination a plate of conducting material, conducting fins projecting from the plate, and a serpentine planar conduit for refrigerant having portions secured in intimate thermal contact with the fins.

2. Refrigerating element for cooling circulating air comprising a plate formed of heat conducting material and adapted to be exposed to air currents, said plate having openings to permit the circulation of the air currents through the plate, and integral fins formed from the body of the plate adjacent the openings, said fins projecting from the plate so as to be exposed to air currents circulating through the openings, and a conduit for refrigerant in intimate thermal contact with some of the fins.

3. A refrigerating element for cooling circulating air comprising a plate formed of heat conducting material and adapted to be exposed to air currents and integral fins formed from the body of the plate projecting therefrom so as to be exposed to air currents circulating thereover, and a conduit for circulating refrigerant interspersed between the fins and secured in intimate thermal contact with the plate.

4. A refrigerating element for cooling circulating air comprising a plate formed of heat conducting material and adapted to be exposed to air currents and integral fins formed from the body of the plate projecting therefrom so as to be exposed to air currents circulating thereover, and a conduit for circulating refrigerant secured in intimate thermal contact with the fins.

5. A refrigerating element for cooling circulating air comprising a plate formed of heat conducting material and adapted to be exposed to air currents and integral fins formed from the body of the plate projecting therefrom so as to be exposed to air currents circulating thereover, and a conduit for circulating refrigerant secured in intimate thermal contact with both the plate and fins.

6. Refrigerating apparatus comprising in combination a compartment to be cooled and a refrigerating element disposed adjacent the top of the compartment, said element including a substantially horizontal plate formed of heat conducting material and having openings therein to permit the circulation of air downwardly therethrough, and conduit means interspersed between the openings for cooling the plate.

7. Refrigerating apparatus comprising in combination a compartment to be cooled and a refrigerating element disposed adjacent the top of the compartment, said element including a substantially horizontal plate formed of heat conducting material and having openings therein to permit the circulation of air downwardly therethrough, fins projecting downwardly from the plate adjacent the openings, and conduit means interspersed between the openings for cooling the plate.

8. Refrigerating apparatus comprising in combination a compartment to be cooled and a refrigerating element disposed adjacent the top of the compartment, said element including a substantially horizontal plate substantially coextensive with the top of the compartment formed of heat conducting material and having openings therein for the circulation of air, said openings being relatively wide and separated by relatively narrow intervals, and integral fins formed from the material cut from said openings and projecting downwardly from the plate so as to be exposed on both sides to air circulating through said openings whereby the area of the plate exposed to circulating air is substantially doubled.

9. A refrigerating element comprising a plate adapted to be used in a horizontal position, the plate having openings to permit the circulation of air therethrough, said openings being relatively wide and separated by relatively narrow intervals and integral fins formed from the material cut from said openings and projecting downwardly from the plate so as to be exposed on both sides to air currents circulating through the openings whereby the area of the plate which is exposed to circulating air is substantially

doubled, and refrigerating means in intimate thermal contact with the plate between the opening therein.

10. A refrigerating element comprising a plate adapted to be used in a horizontal position, the plate having openings to permit the circulation of air therethrough, said openings being relatively wide and separated by relatively narrow intervals, integral fins formed from the material cut from said openings and projecting downwardly from the plate so as to be exposed on both sides to air currents circulating through the openings whereby the area of the plate which is exposed to circulating air is substantially doubled, and refrigerant ducts secured to the plate in the intervals between the openings.

In testimony whereof I hereto affix my signature.

HERMAN J. DICK.