April 18, 1939. L. A. PHILIPP 2,155,059

REFRIGERATING APPARATUS

Original Filed July 30, 1934

Fig. 1.

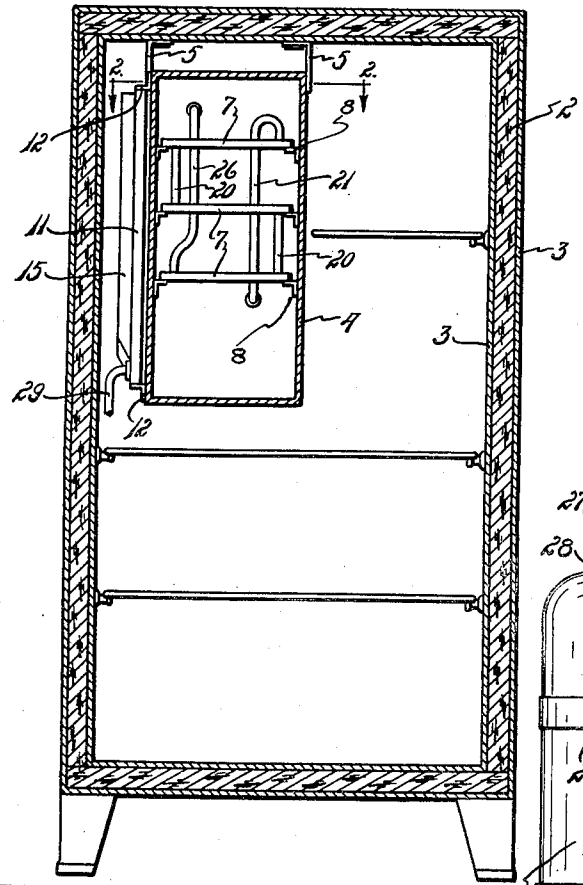


Fig. 2.

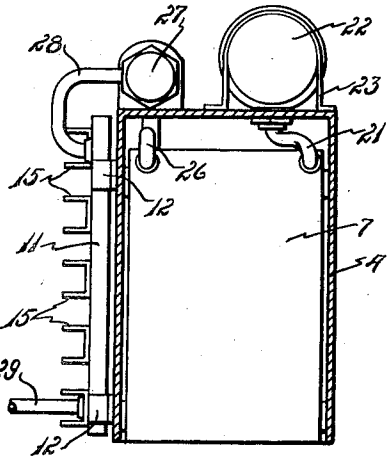


Fig. 3.

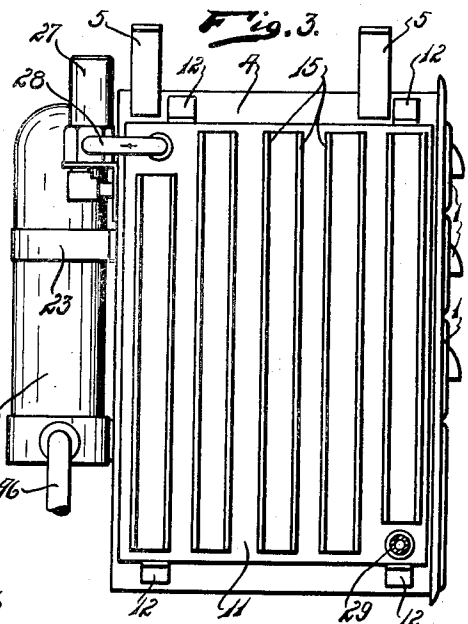


Fig. 4.

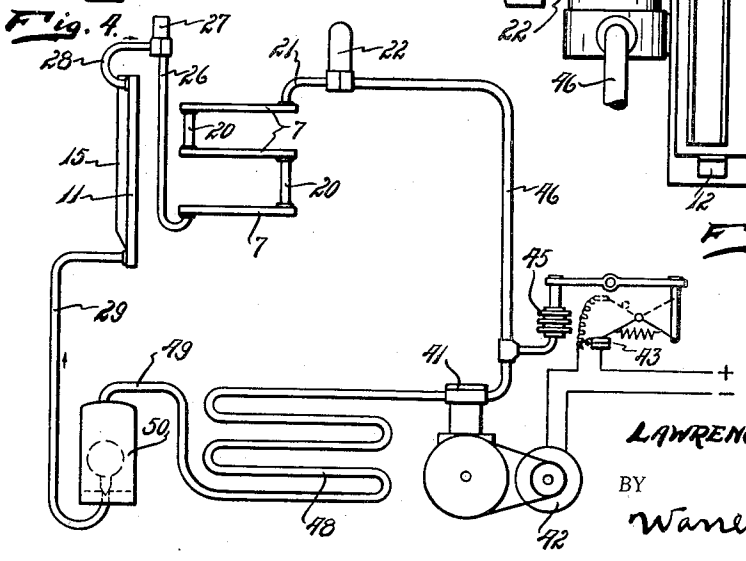
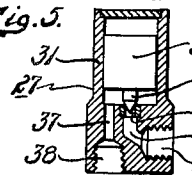


Fig. 5.



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REFRIGERATING APPARATUS

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Application July 30, 1934, Serial No. 737,538
Renewed April 27, 1937

2 Claims. (Cl. 62—116)

My invention pertains to a two-temperature refrigerator and more particularly to a non-frosting structure for use with a two-temperature refrigerating system.

It is an object of my invention to provide an improved two-temperature non-frosting refrigerator.

It is also an object of my invention to provide a simplified non-frosting refrigerator which is especially adapted for use with a two-temperature refrigerating system.

It is a further object of my invention to provide a two-temperature non-frosting refrigerator comprising a food storage compartment, and a freezing chamber and cooling plate so disposed therein that the air may circulate freely around the freezing chamber and the cooling plate for efficiently and uniformly cooling the compartment, and defrosting the cooling plate between operations.

The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a sectional view showing a refrigerator constructed in accordance with my invention;

Fig. 2 is a plan view showing the freezing chamber and the cooling plate assembly;

Fig. 3 is a side elevational view thereof;

Fig. 4 is a diagrammatic view schematically representing the cooperative interconnection of the various elements of a two-temperature refrigerating system suitable for use in conjunction with my refrigerator; and

Fig. 5 is a sectional detail view showing the construction of a weight valve, which comprises a suitable pressure reducing device for maintaining a temperature differential between the freezing chamber and the food storage compartment.

Referring more specifically to the drawing my refrigerator comprises a cabinet 2 enclosed by walls of suitable heat insulating construction. The inner and outer surfaces of the cabinet walls are provided with a sheet metal covering 3 having a coat of vitreous enamel such as porcelain to present a pleasing and sanitary appearance.

A freezing chamber is provided within the food storage compartment of the cabinet by an enclosure 4 which is suspended by suitable brackets 5 from the top wall of the cabinet. The interior of the freezing chamber is cooled by means of horizontally disposed freezing plates 7 mounted upon brackets 8 secured to the side walls of the enclosure 4 and which also provide shelves upon which trays 1 may be disposed within the chamber. The freezing plates 7 are spaced from the sidewalls of the enclosure 4, as shown in Figs. 1 and 2. Each freezing plate may comprise a double walled refrigerant evaporator construction into which refrigerant may be introduced through suitable inlet and outlet conduit connections or, if preferred, the refrigerant conduit may extend in a series of loops through the interior of the freezing plate which may contain a heat transmitting and storing medium such as brine surrounding the conduit, as will be readily understood by those skilled in the art.

A cooling plate 11 for cooling the food storage compartment is secured adjacent one side of the freezing chamber by suitable brackets 12. The cooling plate 11 may comprise a heavy plate of heat conductive material to one surface of which a refrigerant conduit is secured in intimate thermal contact in alternate serpentine coils to provide maximum thermal contact with the plate or, if preferred, a double walled evaporator may be used. In order to provide increased thermal coupling with the air in the food storage compartment, the opposite surface of the cooling plate 11 is provided with parallel fins 15 of heat conductive material. As shown in Figs. 2 and 3, the fins 15 may be readily provided by securing strips of sheet metal of U-shaped cross section to the plate 11 in any suitable manner as by soldering or welding.

The freezing chamber cooling plate assembly comprises suitable conduit means 20 for interconnecting the freezing plates in series relation. The conduit 21 connecting from the freezing plate at one end of the series comprises the outlet connection which extends into a liquid accumulator 22 which is also secured to the assembly by a suitable bracket 23, as shown in Figs. 2 and 3. The conduit 26 connecting from the freezing plate 7, at the opposite end of the series comprises the inlet connection for the freezing plates, and extends into a pressure reducing weight valve 27. A suitable conduit 28 extends from the weight valve to the cooling plate 11 from which a conduit 29 extends to receive liquid refrigerant from a suitable refrigerating system.

The pressure reducing weight valve 27, which is disposed between the freezing plates and the cooling plates, comprises a valve casing 31 inclosing a valve 32 which is biased by a weight 33

upon a cooperative valve seat **34**, as shown in Fig. 5. The lower portion of the valve casing is provided with a pipe fitting **35** through which the high pressure refrigerant may pass to the valve seat **34** by means of a channel **36**. From the valve chamber an outlet channel **37** extends downwardly to a second pipe fitting **38** through which the pressure reduced refrigerant is discharged. The valve weight **33** is so selected relatively to the area of the valve and the valve seat that it automatically maintains a suitable pressure differential between the respective inlet and outlet conduits **28** and **26**.

As shown in Fig. 4, the refrigerant may be condensed by a compressor **41**, driven by an electric motor **42** which is controlled by means of a snap action switch **43** for intermittent operation. The switch may be actuated by a bellows **45** in accordance with the pressure of the suction line **46**, or a thermo bulb in the storage compartment, in the usual manner. It will be apparent that the switch **43** may be adapted either to open or to close for any desired pressure variation and the actuating bellows **45** may be operatively connected to either evaporator **7** or **11** instead of to the suction line **46**.

The compressed refrigerant passes from the compressor **41** through an associated condenser **48** by means of which its latent heat of vaporization is dissipated. Suitable conduit means **49** carries the condensed refrigerant into a high side float chamber **50** which has its outlet connected to the inlet conduit **29** on the cooling plate **11**.

In operation liquid is fed from the high side float **50** into the tubing of the cooling plate **11** which is attached to one side of the freezing chamber. After vaporizing under the temperature-pressure condition permitted by the weight valve **27** the liquid and gas refrigerant are fed through the weight valve into the horizontal freezing plates **7** within the freezing chamber where further vaporization occurs at a low pressure. From the freezing plates the refrigerant passes into the liquid accumulator **22** the gas being removed through the suction line **46**.

The weight valve **22** is so selected and/or adjusted that the freezing plates **7** are kept below 32° F. while the finned cooling plate operates at about 26° F. when the compressor is operating and then defrosting during the off period. The enclosure prevents the accumulation of frost on the freezing plates since they are enclosed.

It will be seen that I have provided a simplified improved two-temperature refrigerator comprising a cool food storage compartment with a cooling plate and a freezing chamber arranged therein to provide for the circulation of air for efficiently cooling the storage compartment and defrosting the cooling plates.

Although I have shown and described certain specific embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as necessitated by the prior art.

I claim as my invention:

1. Refrigerating apparatus comprising a cabinet, an enclosure exposed to circulating air within said cabinet and enclosing a low temperature zone including a vertical wall position in close proximity to a side wall of the cabinet to provide an air cooling zone, refrigerant evaporating means including a portion positioned in said enclosure for maintaining low temperatures in said low temperature zone and a portion positioned outside of said enclosure adjacent said vertical wall and side wall for cooling circulating air to the desired temperature as it passes through said air cooling zone, and means for maintaining a higher temperature in the refrigerant evaporating portion which cools said circulating air.

2. Refrigerating apparatus comprising a cabinet, an enclosure exposed to circulating air within said cabinet including a top, bottom and side walls spaced from the walls of the cabinet and enclosing a low temperature zone and including a wall positioned in close proximity to a wall of the cabinet to provide an air cooling zone, refrigerant evaporating means including a portion positioned in said enclosure for maintaining low temperatures in said low temperature zone and a portion positioned outside of said enclosure for cooling circulating air to the desired temperature as it passes through said air cooling zone, and means for maintaining a higher temperature in the heat absorbing portion which cools said circulating air.

LAWRENCE A. PHILIPP.