May 6, 1947. W. B. HAGGERTY 2,420,240

MEANS FOR THE PREVENTION OF FROST ON REFRIGERATOR DOORS

Filed March 13, 1945

Fig. 1.

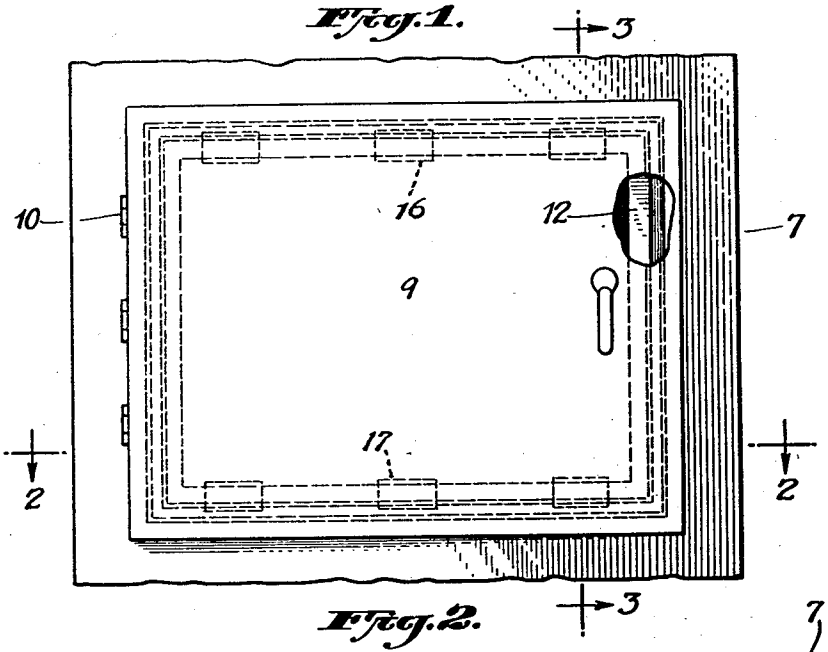


Fig. 2.

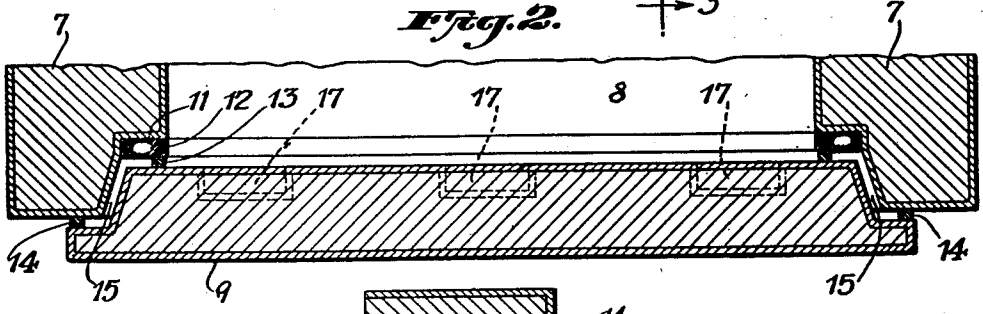
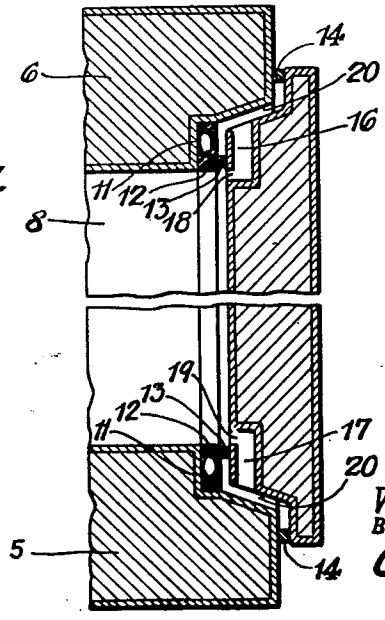


Fig. 3.



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MEANS FOR THE PREVENTION OF FROST ON REFRIGERATOR DOORS

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4 Claims. (Cl. 62—89)

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The invention relates to low-temperature compartments or enclosures in general, of the type used for the refrigeration or storage of any material to be held for a period at temperatures below the freezing point of water, as exemplified, for instance, by conventional refrigerators and more particularly to those that include a low-temperature compartment.

Such refrigerators are designed to meet general refrigeration problems and usually include a door for the low-temperature compartment to permit ready access thereto at will.

In order to provide maximum efficiency, the aforesaid door of the low-temperature compartment must be insulated and tight fitting. A conventional door of this type will freeze fast to the door frame of the refrigerator because of the gradual accumulation of frost or ice on the frame caused by the moisture which will condense on the frame and door surfaces whenever the door is opened, or which may result from possible leakage of air and moisture through worn gaskets.

The object of the invention is to provide a novel arrangement whereby undesired accumulation of frost and ice between contiguous parts of the refrigerator is automatically prevented.

Another object of the invention is to provide a novel arrangement in which heat from a suitable source is used in associated relation with the door and contiguous door frame to prevent freezing together of the parts.

The invention contemplates further the provision of a novel arrangement wherein heat developed in the normal operation of a refrigerator may be utilized to automatically prevent accumulation of ice and frost to freeze the door of said refrigerator fast to the door frame thereof.

Other objects will appear from the description hereinafter, and the features of novelty will be pointed out in the claims.

In the accompanying drawings, which illustrate an example of the invention without defining its limits,

Fig. 1 is a front elevation, partly broken away, of a refrigerator embodying the novel features;

Fig. 2 is a fragmentary horizontal section on the line 2—2 of Fig. 1, and

Fig. 3 is a corresponding vertical section on the line 3—3 of Fig. 1.

As shown in the illustrated example, the refrigerator comprises a cabinet of conventional rectangular shape and dimensions and consisting of the customary insulated bottom 5, top 6, side walls 7, and a suitable back wall.

The interior of the cabinet constitutes a low-temperature compartment or chamber 8 which is open at the front and normally is closed by means of an insulated door 9 which is movably mounted in place, for instance, by means of suitable hinges 10. Suitable means is also provided for locking the door 9 in its closed position.

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The bottom 5, top 6, and side walls 7, are formed with recesses 11 which together comprise a continuous recess extending about the internal low-temperature chamber 8.

The continuous recess 11 further accommodates a member 12 fixed in said recess in any convenient manner and designed and arranged so as to completely enclose and surround the front opening of the chamber 8. The member 12, which may be designated as a heated jamb, or facing, is designed to provide a source of heat as will appear more fully hereinafter.

The insulated door 9 is provided with spaced gaskets 13 and 14—the former fitting tightly against the member 12 along the inner edge thereof, and the gasket 14 being located in proximity to the outside edge of said door. When the latter is in its closed position, the gaskets 13 and 14 form a continuous air space or channel 15 approximately ¼ of an inch deep around the door facing, that is, the bottom, sides, and top thereof.

The door 9 is provided with vents 16 and 17 located respectively at the top and bottom of said door as shown in Fig. 3. The vent 16 opens into the compartment 8 at the top thereof as indicated at 18 while the vent 17 opens into said compartment at the bottom thereof as shown at 19 in Fig. 3. The inlets of the vents 16 and 17 are located just inside of the inner gaskets 13 while the outlets of said vents are located between the gaskets 13 and 14 as shown at 20 in Fig. 3.

In refrigerators of the class under discussion, the conventional door, as previously stated herein, has a tendency to freeze fast to the door frame because of the gradual accumulation of frost or ice on the frame. The latter is caused by the moisture which condenses on the frame and door surfaces when the door is opened and by possible leakage of air and moisture through worn gaskets.

With the novel features embodied in the instant arrangement, this condensed moisture is automatically removed as it accumulates and is carried into the low-temperature compartment 8 where it will deposit on the coldest surface; namely, the evaporator or refrigeration cold plates or coils.

If low-temperature air that because of its temperature contains very little moisture, is heated, its moisture-carrying capacity increases rapidly. Air saturated at 20° F. will hold 2½ times as much moisture in the form of low-pressure vapor as air saturated at zero degrees F. Air saturated at 40° F. will hold six and one half times as much moisture as air saturated at zero degrees F.

If a controlled amount of cold air from the bottom of the low-temperature compartment 8 is heated and allowed to come into contact with the moisture that has accumulated on the cold surface of the door where it comes into associated relation with the cold door frame on which mois-

ture has also accumulated, the heated air will pick up the moisture in the form of low-pressure water vapor.

If, by means of convection currents, the heated air containing the evaporated moisture is recirculated into the low-temperature compartment 8, such air will be cooled to a temperature below its dew point, and a part of the moisture will be condensed out of the air.

Heat is readily available in any refrigeration system of the compression type. This is the heat in the liquid refrigerant plus the heat of compression. Because of the nature of a compression system of refrigeration, the hot, discharge gases or the hot liquid under pressure are capable of being forced through any ordinary path or channel.

Since the refrigeration equipment will always go into operation immediately after the compartment door 9 is opened to thereby admit warm air to the compartment 8, the aforesaid heat will be immediately available for its intended purpose in the instant arrangement, as shown and described herein.

In such arrangement, the member 12, constituting a heated jamb or facing, provides a path for the circulation of said hot gases or hot liquid refrigerant to conduct the same entirely around the front opening of the interior compartment or chamber 8. After being thus circulated, the gas or liquid will return to the conventional passages of the refrigeration system.

In any case, air from the bottom of the compartment 8 will pass through the inlet 19 into the vents 17 and will be heated by radiation from the heated jamb or member 12. As this air thus becomes heated, it will rise by reason of the stack effect of the vertical air space between the gaskets 13 and 14 and will pass out of the latter into the vent 16 and from the latter into the upper part of the interior compartment 8. This circulation will be continuous as long as heat from the jamb or member 12 is available.

The refrigerant preferably enters the member 12 at the lowest point of the member through a pipe connecting it to the high temperature side of the refrigeration system thereby permitting the member 12 to be completely filled with the refrigerant. The refrigerant preferably leaves the member 12 at its highest point through a pipe connecting it to the refrigerant control device or devices as it passes on to the evaporators or cold surfaces of the refrigeration system.

In the foregoing description, it has been shown how the normal functions of a conventional refrigeration system may be used to supply heat to the member 12 which, to utilize this form of heat, may be designed as a hollow channel, or comprise a bar of metal provided with continuous rifle boring or the like.

Obviously, the member 12 may be designed to co-operate with other sources of heat in a manner to produce the desired results. For instance, an electric resistance heater of suitable type may be incorporated in or associated with the member 12. In such case, the novel features may be used in remote relation to the refrigeration system.

Where warm water or other warm fluids are available, they may be circulated through the passages or boring in the member 12 to perform the same function as the circulated refrigerant or the electric heater. It will be understood that any suitable means for supplying heat to the member 12 may be satisfactorily used in connection therewith.

With the novel arrangement in all forms, the accumulation of frost or ice on the contiguous surface of the door and door frame, respectively, is automatically prevented, and the door, consequently, is always capable of being opened without effort.

Although the present invention has been described in conjunction with a preferred embodiment, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such variations and modifications are considered to be within the purview and scope of the claims.

I claim:

1. A refrigerator of the character described including a low-temperature cabinet having an access opening thereto defining a frame, a door for closing said opening, means for forming a continuous closed air passage between the door and frame when the door is closed, positive means for heating said passage, and means for connecting the continuous closed air passage with the interior of the cabinet to provide a convection flow air circulation therethrough that prevents the accumulation of frost on the door frame.

2. A refrigerator of the character described including a low-temperature cabinet having an access opening thereto defining a frame, a door for closing said opening, means for forming a continuous closed air passage between the door and frame when the door is closed, positive means for heating said passage, and said passage being connected with the interior of the cabinet at spaced points to provide a convection flow air circulation therethrough that prevents the accumulation of frost on the door frame.

3. A refrigerator of the character described including a low-temperature cabinet having an access opening thereto defining a frame, a door for closing said opening, means for forming a continuous closed air passage between the door and frame when the door is closed, positive means for heating said passage, and vents at the top and bottom of said continuous closed air passage opening into the interior of the cabinet to provide a convection flow air circulation through said passage that prevents the accumulation of frost on the door frame.

4. A refrigerator of the character described including a low-temperature cabinet having an access opening thereto defining a frame, a door for closing said opening, spaced gaskets forming a continuous closed air passage between the door and frame when the door is closed, a jamb portion on said frame extending into the closed air passage and adapted to be heated by a source of heat, and vents in the door connecting the closed air passage with the interior of the cabinet.

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