

June 14, 1949.

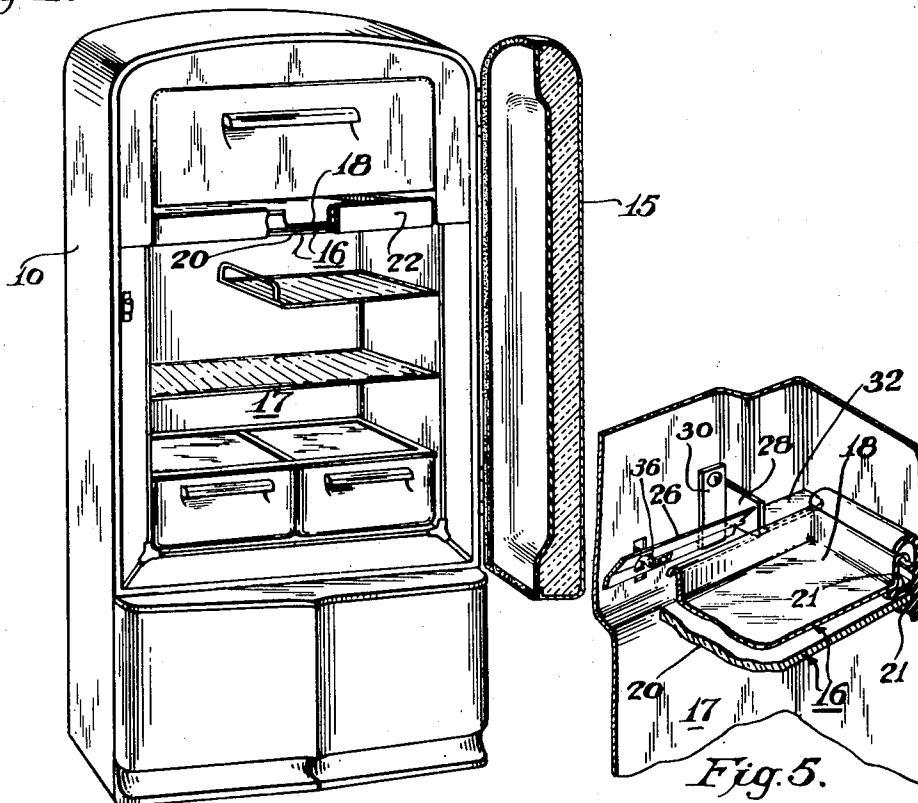
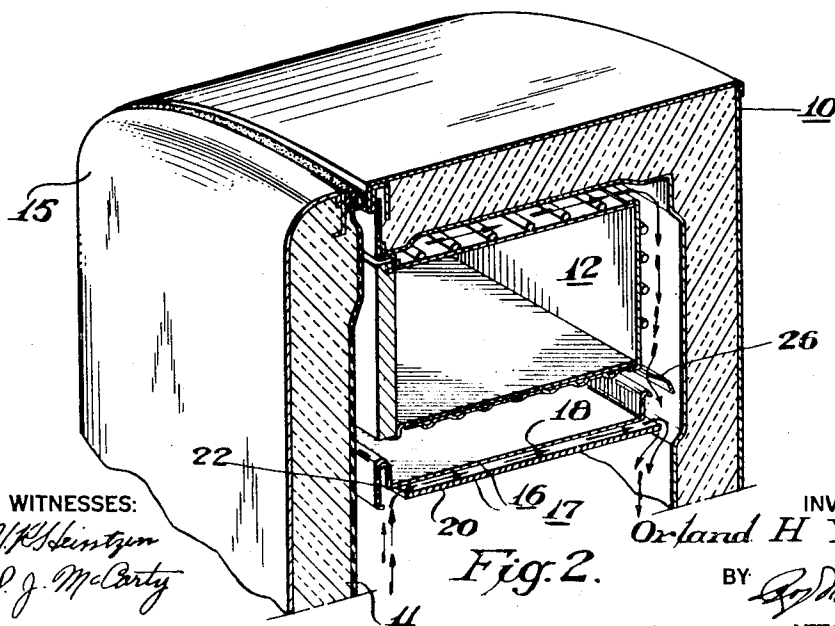
O. H. YOXSIMER
REFRIGERATOR HAVING MEANS FOR
MINIMIZING CONDENSATION

2,473,322

Filed Nov. 12, 1947

2 Sheets-Sheet 1

Fig. 1.



WITNESSES:
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Fig. 2.

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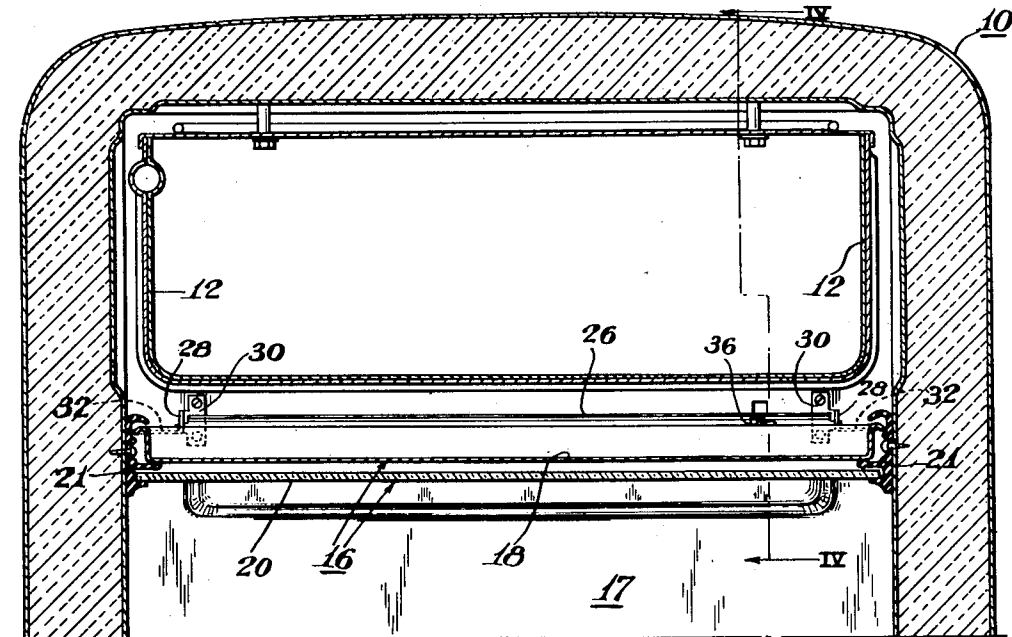


Fig. 3.

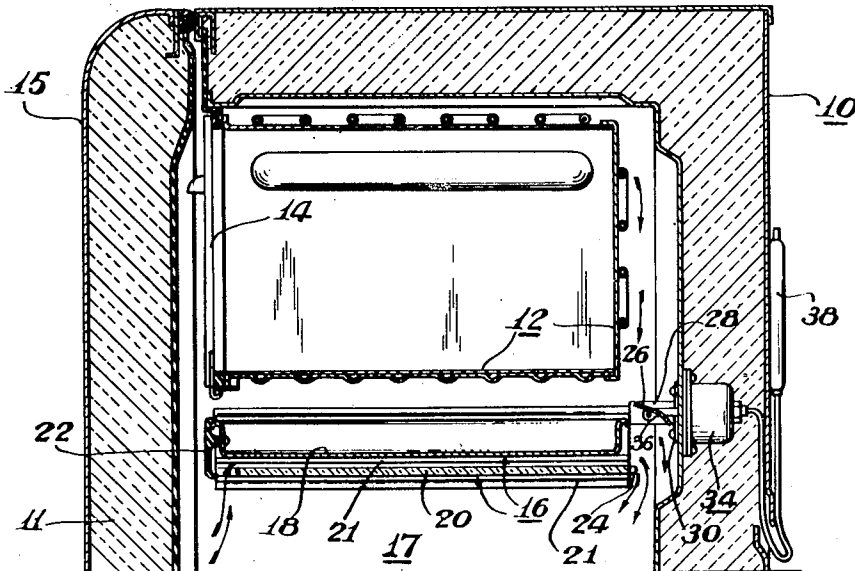


Fig. 4.

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2,473,322

REFRIGERATOR HAVING MEANS FOR
MINIMIZING CONDENSATION

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Application November 12, 1947, Serial No. 785,476

4 Claims. (Cl. 62—103)

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This invention relates to refrigeration apparatus and more especially to a partition wall between a low temperature food storage compartment and an intermediate temperature compartment.

It is an object of this invention to provide a partition wall between zones of different temperature in a refrigerator cabinet which partition wall minimizes the condensation of a moisture thereon.

It is another object of this invention to provide a partition wall between zones of different temperature in a refrigerator cabinet which partition wall conducts heat from one zone to the other but which minimizes the condensation of moisture on the partition wall.

It is a further object of the invention to provide a partition wall of the type described which partition wall tends to dissipate the moisture which may have condensed thereon.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a view in perspective of the refrigerator embodying the invention, parts of the refrigerator being broken away;

Fig. 2 is a vertical sectional view in perspective of the upper portion of the refrigerator of Fig. 1 but with the door closed;

Fig. 3 is a vertical sectional view into the upper portion of the refrigerator of Fig. 1;

Fig. 4 is a sectional view taken on the line IV—IV of Fig. 3; and,

Fig. 5 is an enlarged view in perspective of a detail of the partition wall of this invention.

Referring to the drawings, the reference numeral 10 designates a refrigerator cabinet having an evaporator 12 in the upper portion thereof. The evaporator 12 is of the type described and claimed in the patent application of Jules N. Saler, filed May 18, 1946, Serial No. 666,950, now Patent No. 2,450,732 granted Oct. 5, 1948. A door 14 closes the evaporator. The upper portion of the inner wall of the cabinet 10 is bulged outwardly adjacent the evaporator 12 to provide air passages as more particularly described and claimed in the patent application of Ralph E. Kruck, et al., filed November 20, 1946, Serial No. 710,974, now Patent No. 2,455,781 granted Dec. 7, 1948. The evaporator is maintained at a temperature of about 0° F. by apparatus, not shown, and constitutes a storage chamber for frozen foods. Access to the refrigerator 10 is obtained

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through a door 15 forming the front wall 11 of the refrigerator cabinet 10. The front wall 11 is of lower heat insulating value than the side or rear walls of the cabinet 10.

The partition wall 16 of this invention is located below the evaporator 12 and comprises a metal defrost pan 18 and a glass plate 20 spaced closely below the pan 18. The plate 20 may comprise any material which is transparent to or transmits radiant heat. Both the pan 18 and the glass plate 20 are supported by guide rails 21 secured to the side walls of the cabinet 10. The front edges of the pan 18 and plate 20 are spaced from the door 15 of the cabinet 10 to provide an air passage adjacent the door 15. The front edge of the pan 18 is somewhat in advance of that of the plate 20 and an ornamental trim 22 is secured to the front edge of the pan 18 and overlaps the front edge of the plate 20. The rear edges of the pan 18 and plate 20 are spaced from the rear wall of the refrigerator cabinet 10 to provide a second air passage adjacent to this wall. A stop 24 limits the rearward sliding movement of the plate 20.

A valve 26 is located in the air duct adjacent the rear wall of the refrigerator cabinet 10 to control the air flow therethrough. The forward edge of the valve 26 substantially contacts the upper edge of the pan 18 and the rear edge of the valve 26 substantially contacts the rear wall of the refrigerator cabinet 10 when the valve 26 is in the closed position. However, the valve 26 is arranged not to close completely so that the edges of the valve 26 cannot freeze to the edge of the pan 18 or to the rear wall of the cabinet 10. The valve 26 is pivoted at approximately its central element in hangers 28 formed of sheet metal. Each hanger 28 comprises an attachment flange 30 bent at right angles to the body portion of the hanger 28 and a second flange 32 bent at right angles to the body portion and also to the attachment flange 30. The second flanges 32 form baffles for closing the spaces between the pan 18 and the rear wall of the cabinet 10 at the ends of the valve 26 and additionally form stops which engage the upper edge of the pan 18 to limit its rearmost position.

A thermostat 34 is located mainly in the insulation of the rear wall of the cabinet 10 and actuates the valve through a lever 36. The thermostat 34 includes a temperature-sensitive bulb 38 which is located on the rear wall of the refrigerator cabinet 10 and is responsive to the ambient temperatures of the cabinet 10. This thermostat 34 is of the general type described and claimed in the patent application of Ray-

mond E. Tobey, filed October 8, 1945, Serial No. 621,058. The compartment 17 of the refrigerator cabinet below the plate 20 is devoted to the general storage of foods and is maintained at a constant temperature of about 40° F. by the thermostat 34.

The pan 18 forms a thermally conducting wall between the cold evaporator 12 and the warmer zone 17 of the cabinet 10. The characteristic of such a thermally conducting wall is that condensation usually forms on the surface thereof which is exposed to the warmer zone. This condensation is greatest if the refrigerator door is opened frequently at a time when the room air is humid and the valve 26 is closed. The reason why the condensation is greatest when the valve 26 is closed is that the circulation of air between the evaporator 12 and the warmer compartment 17 of the cabinet 10 is then substantially reduced so that the moisture in the warmer compartment 17 is not readily deposited on the evaporator 12.

The tendency to condense moisture on the lower wall of the pan 18 is also present in applicant's refrigerator but the glass plate 20 reduces this condensation. At times it prevents the condensation entirely, and at other times it collects the moisture which drips from the pan 18 so that it does not fall on the comestibles stored in the compartment 17.

The reason why plate 20 acts in this manner is perhaps not fully understood but is believed to be as follows: Since the front wall 11 of the cabinet 10 which includes the door 15 is of lesser thermal insulating value than the remaining vertical walls of the refrigerator, the cabinet air circulates slowly in the cabinet, the circulation being upwardly along door 15 and downwardly along the rear wall of the cabinet 10. If the valve 26 is open, there will also be active circulation of air upwardly through the air duct between front edge of the partition wall 16 and the door 15 and downwardly through the air passage at the rear of the partition wall 16 in which the valve 26 is located. Regardless of the position of the valve 26, a portion of the circulating air in the lower food storage compartment 17 passes through the space between the pan 18 and the plate 20 and this flow is in a direction to the rear of the refrigerator cabinet 10. This flow is very slow, however, because of the narrowness of the space.

One effect of the plate 20 is to shield the pan 18 from the humid air which enters the cabinet 10 whenever the door 15 is opened so that less moisture condenses on the pan bottom. A second effect of the plate 20 is to limit the rate of air circulation along the bottom of the pan 18 after the door 15 is again closed. This also limits the rate at which moisture condenses on the pan 18. If the door 15 now remains closed for a period of time, the water vapor in the lower food storage compartment 17 will be deposited as a frost on evaporator 12. After this has occurred, the condensation on the lower surface of the pan 18 will evaporate and also becomes deposited as frost on the evaporator 12.

A third effect of the plate 20 is as follows: When the door 15 is opened so frequently that the condensation on the pan 18 during the open period of the door 15 does not completely evaporate during its closed period, the condensation on the bottom of the pan 18 accumulates and drips on the plate 20. The plate 20, being horizontal, has a capacity for storing a large number of these drops. If the door 15 now remains

closed for a longer period of time, the drops of water on the plate 20 evaporate relatively quickly because the plate 20 is warmer than the pan 18. Some of the moisture thus vaporized may again condense on the pan 18 and drip on the plate 20 but the water eventually will be carried out of the space between the pan 18 and the plate 20 by the circulation of air therebetween and will be deposited on the evaporator 12 as frost.

The property of the plate 20 of transmitting radiation of heat from the compartment 17 to the pan 18, also decreases the condensation on the pan 18 from what this condensation would be if the plate 20 consisted of material which did not transmit such radiation. The reason for this is as follows: When the valve 26 is closed, the compartment 17 is cooled to the desired temperature mainly by the pan 18, and this cooling is effected through gravitational convectional air currents as well as by the radiation of heat through the glass plate 20 to the pan 18. Since the pan 18 has this two-fold cooling effect, it is maintained at a higher temperature than would be required if it maintained the desired temperature by gravitational air currents only. The higher temperature of the pan 18, of course, results in less moisture condensing on it. The plate 20 is also at a higher temperature due to its close proximity to the pan 18 and for this reason causes the water which may drip on it to evaporate more quickly.

Some of the dimensions of the preferred embodiment of the invention may be of importance. The storage capacity of the cabinet is seven cubic feet. The space between the evaporator 12 and the bottom of the pan 18 is 2½ inches and the space between the pan 18 and the plate 20 is ⅛ of an inch. The plate is 23½ inches long and 13½ inches wide and ⅛ of an inch thick.

It will be apparent from the above that this invention provides a partition between the low temperature and the intermediate temperature zone of a refrigerator which partition reduces the condensation of moisture thereon.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What I claim is:

1. A refrigerator comprising a food storage chamber having thermally insulated front, side, rear, top and bottom walls, said front wall including a door and being of lesser thermal insulating value than said side and rear walls, a cooling unit in the upper portion of said chamber, means for maintaining said cooling unit at a temperature below freezing, a partition in said chamber, said partition including a first plate located below said cooling unit, a second plate below said first plate and near but spaced therefrom to define a first air passage between said plates, said second plate comprising material which is transparent to radiant heat, said first and second plates having edges spaced from said door when closed to define a second air passage adjacent said door, said first and second plates also having edges spaced from the rear wall of said food storage chamber to define a third air passage adjacent said rear wall, said first air passage communicating with said second and third air passages, the side edges of said first plate being sealed to the side walls of said chamber to prevent substantial passage of air therebetween, and a valve in said third air passage and

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adapted and arranged to substantially close the space between said first plate and the rear wall of said chamber.

2. The refrigerator defined in claim 1 wherein the second plate is substantially horizontal.

3. The refrigerator defined in claim 2 wherein said second plate is spaced from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch from said first plate.

4. The refrigerator defined in claim 3 wherein the first plate is a portion of a defrost pan.

ORLAND H. YOXSIMER.

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