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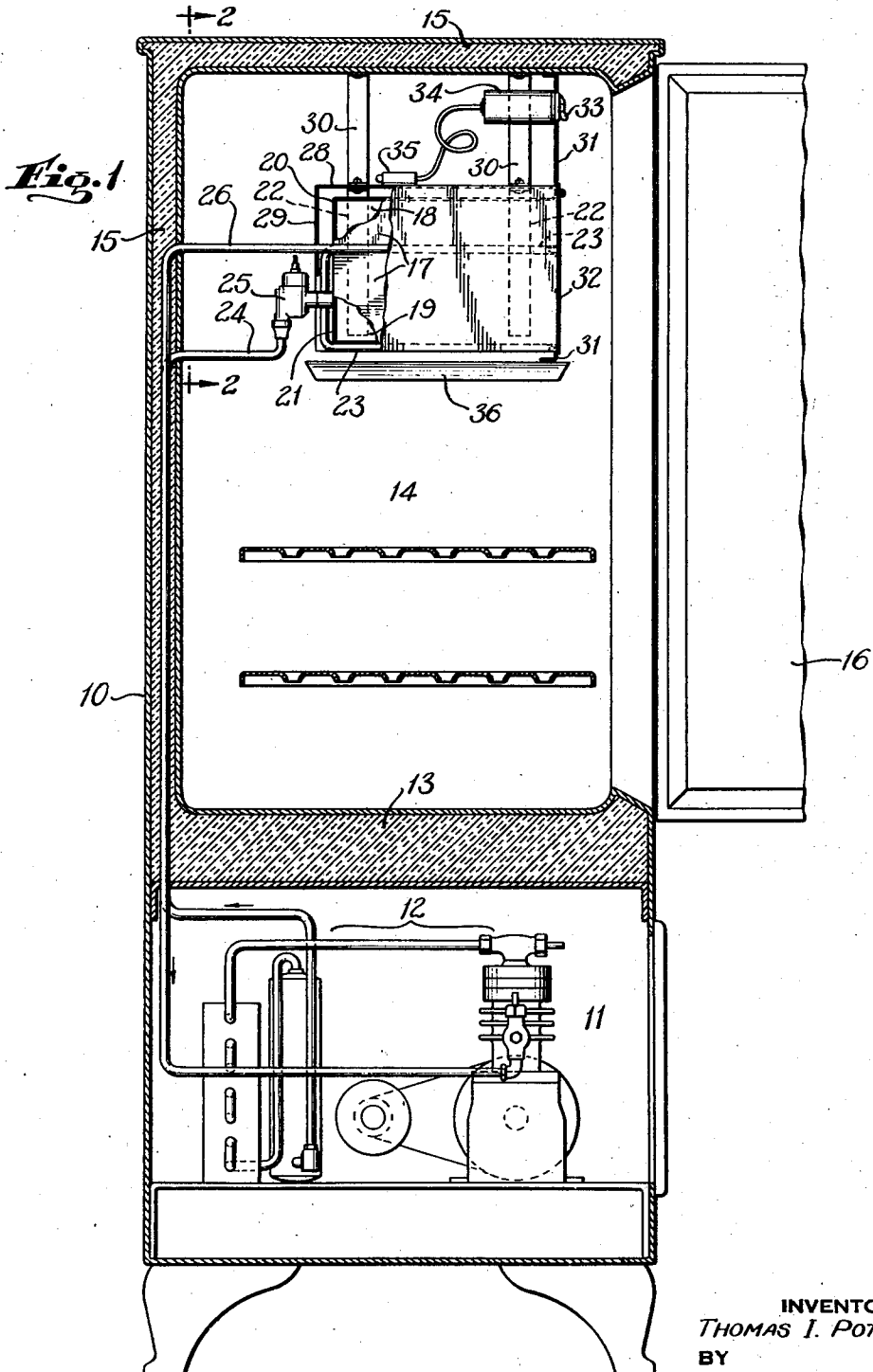
T. I. POTTER

2,095,036

REFRIGERATOR

Filed Feb. 14, 1934

2 Sheets-Sheet 1



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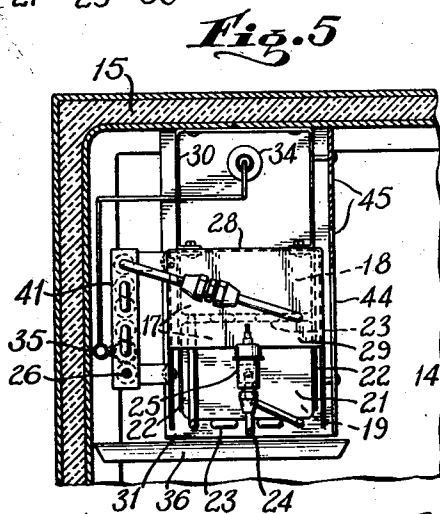
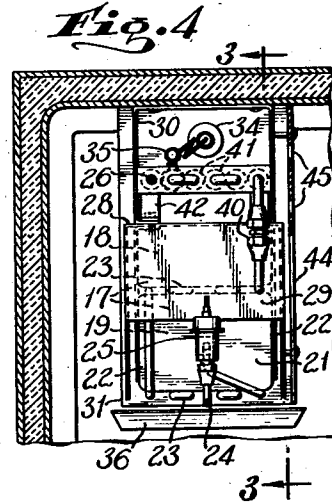
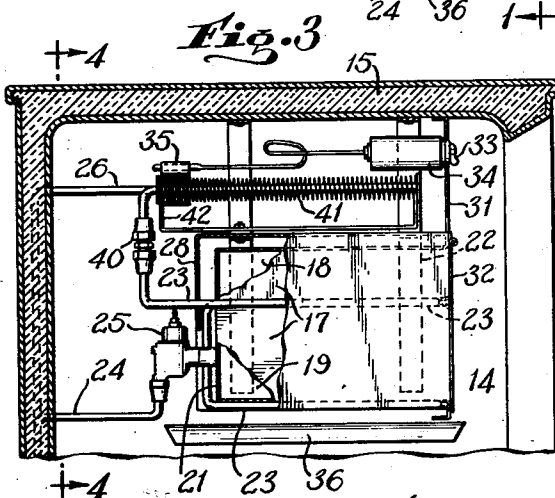
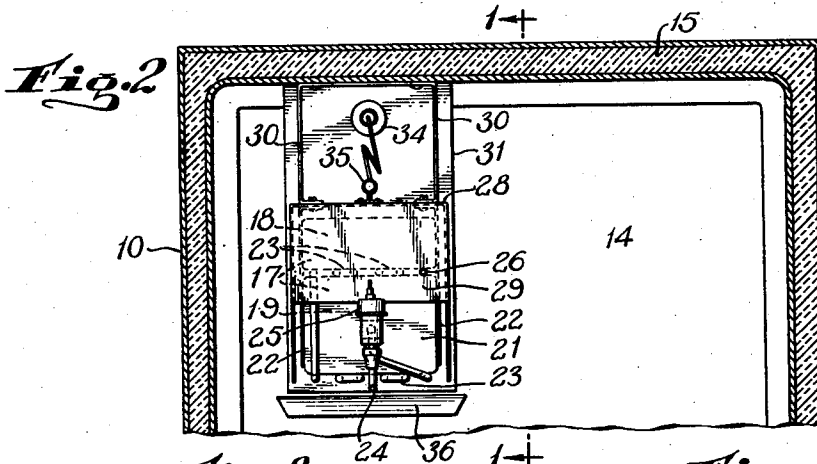
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2,095,036

REFRIGERATOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,095,036

REFRIGERATOR

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Application February 14, 1934, Serial No. 711,157

1 Claim. (Cl. 62-116)

The present invention relates to improvements in refrigerators of the type having a plurality of chambers or compartments, adapted to be maintained at different temperatures, one from the other.

More specifically the present invention relates to household refrigerators of the type disclosed in my copending application Serial No. 711,156, filed February 14, 1934, comprising a main cooling chamber having a relatively moist non-freezing atmosphere and an inner chamber within the cooling chamber in which a temperature well below the freezing point is maintained, with thermal impedance separating the two chambers. I use the term "thermal impedance" to distinguish from "thermal insulation" which is commonly used to designate a material offering a high resistance to the passage of heat. The thermal impedance separating the chambers permits heat to flow therethrough comparatively readily, but at the same time it retards the heat flow to such an extent that although the inner chamber may be cooled far below the freezing point substantially no frost will form in the outer chamber to rob the same of moisture.

In the refrigerator described in said copending application the thermal impedance is embodied in the walls of a casing enclosing one or more inner chambers, said walls being preferably of metal with impedance material applied thereon as a coating. An object of the present invention is to provide a structure in which a dead air space is employed to impede the flow of heat from the outer chamber into the inner chambers.

In the refrigerator disclosed in said copending application there is an evaporator located in the interior of the casing, this evaporator constituting either the sole or the principal cooling element of the outer and inner chambers so that heat from the outer chamber must wholly or to a large extent pass through the inner chambers to reach the evaporator. An object of the present invention is to provide a structure in which the evaporator is formed in or on the walls of the inner chambers instead of being enclosed therewithin, while a shroud serves to shield the casing from convection currents in the outer chamber.

Other objects of the present invention will appear in the following description of certain embodiments thereof and thereafter the novelty and scope of the invention will be pointed out in the claims.

In the accompanying drawings;

Figure 1 is a view in vertical section through a refrigerator embodying the present invention, the section being taken on line 1-1 of Fig. 2, and the casing and shroud being shown in side elevation and partly broken away;

Fig. 2 is a fragmental view in section taken on the line 2-2 of Fig. 1 and showing the casing with associated parts in rear elevation;

Fig. 3 is a fragmental view in section taken on line 3-3 of Fig. 4 and is similar to Fig. 1 but shows another embodiment of the invention in which an auxiliary non-frosting coil is provided above the shroud in the cooling chamber;

Fig. 4 is a fragmental view in section taken on the line 4-4 of Fig. 3; and

Fig. 5 is a view similar to Fig. 4 of still another embodiment in which the auxiliary coil is located at one side of the shroud.

The refrigerator shown in Figs. 1 and 2 is of the self-contained type adapted for domestic use. It comprises a cabinet 10 having a lower chamber 11 in which is located the usual heat pumping mechanism, generally indicated by the reference numeral 12. Above the chamber 11 and separated therefrom by a thick wall 13 of insulation is a main cooling chamber 14. This chamber is protected from ambient heat by the usual insulation walls 15 and a door 16 of insulation material.

Suspended within the chamber 14 is a casing indicated generally by the reference numeral 17 within which are two inner chambers 18 and 19 disposed one above the other. The casing 17 is preferably made of two metallic shells 20 and 21 respectively, which are connected by straps 22. An evaporator 23 is fixed to the casing, being preferably formed of two layers of coils. One layer is located under the lower shell 21, while the other is fitted between the shells 20 and 21. In order to secure the greatest possible heat conductivity the evaporator coils are preferably soldered, welded or otherwise integrally connected to the shells 20 and 21. Refrigerant is pumped from the heat pumping unit 12 through a high pressure line 24 and thence through an expansion valve 25 into the lower layer of coils of the evaporator and the expanded refrigerant is drawn from the upper layer through a return line 26 passing down to the unit 12.

Covering the casing 17, but spaced therefrom, is a shroud 28 which is of inverted U-shape in vertical section so that it covers the top and the sides of the casing 17. The shroud has a rear wall 29 which extends downwardly to blanket the upper shell 20 and part of the lower

shell 21. If desired, this shroud could be carried all the way down to cover the entire rear of the casing. The shroud is secured to the straps 22, and hangers 30, depending from the top wall of the chamber 14 are attached to the shroud, thereby suspending both shroud and casing within the cooling chamber.

The casing is provided with a front wall 31 which extends up to the ceiling of the chamber 14 and which is formed with a doorway opening into the inner chambers 18 and 19. This doorway is normally closed by a door 32. Mounted on the plate 31, with an operating handle 33 projecting therethrough is a thermostatic switch 34 having a heat sensitive bulb 35 preferably attached to the shroud, although, if desired, it can be attached to the suction line 28.

It will be observed that in this construction the evaporator 23 constitutes the sole cooling element of the refrigerator. However, the evaporator is separated from the cooling chamber 14 by the air space between the shroud 28 and the casing 17. Since there is practically no circulation of air in this space the air layer constitutes an impedance to the passage of heat. Suspended below the casing 17 is a drip pan 36 which lies fairly close to the lower layer of coils of the evaporator 23, and the intervening air space also serves as thermal impedance at the under side of the casing 17. This drip pan is wide enough and long enough to catch any condensed moisture dripping from the shroud 28.

In operation the inner chambers 18 and 19 will be much cooler than the chamber 14 because of their direct metallic contact with the evaporator coils. The chamber 14 will be cooled by the escape of heat through the shroud 28 and the intervening layer of dead air to the evaporator 23 and the walls of shells 20 and 21. The insulation of the cooling chamber 14 and the impedance surrounding the casing 17 are so related to each other and to the cooling capacity of the evaporator that under normal conditions the temperature in the cooling chamber will be above the freezing point while the temperature in the chambers 18 and 19 will be far below the freezing point.

Because of the intervening layer of dead air no frost will form on the exterior surface of the shroud. In fact, I find in practice that little, if any, frost forms even on the outer surface of the walls of the shells 20 and 21 because although the temperature of said walls may drop well below the freezing point there are no currents of air brushing over said surfaces to carry moisture thereto. As a result the atmosphere in chamber 14 is not robbed of its moisture by the formation of frost and consequently it retains sufficient moisture to prevent foods from drying out.

The construction shown in Figs. 3 and 4 differs from that shown in Figs. 1 and 2 mainly in the fact that an auxiliary coil 41 is used in the cooling chamber 14. This auxiliary coil which is of the non-frosting type, being provided with fins in the usual manner, is connected by a suitable coupling 40 to the low pressure end of the main coil 23 so that the two coils are connected in series in the refrigerant line 24-26. Preferably, the non-frosting coil 41 is located above the shroud 28 so that any moisture dripping therefrom will flow down the shroud into the drip pan. The coil 41 is supported on a U-shaped bracket 42 far enough above the shroud to prevent chilling the latter below the freezing point.

The casing 17 is preferably located near one of the side walls of the cooling chamber, as shown, and at the opposite side there is a baffle plate 44 which conceals the finned coil as well as the shroud. This baffle plate is mounted in spaced relation to the shroud 28, as clearly shown in Fig. 4, and is formed with louvres 45 therethrough for the circulation of air currents.

The bulb 35 of the thermostatic switch 34 is clamped to the coil 41 at or near the low pressure end thereof, so that the operation of the heat pumping unit is controlled by the temperature of the coil at the point of attachment at the bulb thereto. It will be understood, of course, that this will give control of temperature conditions in all of the chambers 14, 18 and 19 and that the inner chambers 18 and 19 will be cooled first, the finned coil 41 receiving only such liquefied refrigerant as has not already been boiled away in the coil 23. The chamber 14 will be cooled by the main coil as well as its non-frosting extension 41, because heat from chamber 14 will flow through the jacket of dead air surrounding the casing 17. If desired, the shroud, not only in the structure shown in Figs. 1 and 2 but also in that shown in Figs. 3 and 4, may be enameled to further impede the passage of heat therethrough. Preferably the baffle 44 is enameled for sanitary purposes as well as appearance.

While it is desirable to have the auxiliary non-frosting coil disposed above the shroud, it will be obvious that it can be placed in any suitable position in the chamber 14. For instance, in Fig. 5, the finned coil 41 is shown as located between the shroud and the adjacent side wall of chamber 14.

As in the structures disclosed in said copending application, it is possible to obtain wide variations of temperature in the several chambers. The upper chamber 18 has less exposed wall surface and consequently will be colder than the chamber 19, and both of these chambers will be far colder than chamber 14 because they are enclosed by a layer of dead air which retards the flow of heat therethrough. The relative heat absorbing capacity of the main coil 23 with respect to the auxiliary coil 41 is controlled by the setting of the expansion valve 25, but, in addition to this control of relative temperatures the thermostatic switch is also controllable by the operation of the handle 33 in the usual way to determine at what temperatures the heat pumping unit would be started and stopped.

While I have described several embodiments of my invention I wish it to be understood that these are to be taken as illustrative and not limitative and that I reserve the right to make such changes in form, construction and arrangement of parts as may fall within the spirit and scope of the following claim.

I claim:

A refrigerator comprising a cabinet formed with a thermally insulated main food chamber, a casing within the chamber providing an auxiliary food chamber, a shroud covering the casing and spaced therefrom to provide a heat impeding layer of dead air between the casing and the main food chamber, a refrigerating system thermally proportioned to cool the auxiliary chamber to a sharp freezing temperature while cooling the main chamber to a refrigerating temperature above the freezing point of water, said means comprising an evaporator in the auxiliary chamber and an extension thereof above the shroud and in spaced relation thereto, said extension

being formed with fins adapted to provide a wide temperature differential between the interior and exterior thereof, means for controlling the operation of the refrigerating system to prevent cooling the external surface of the shroud and that
5 of the extension below the frosting point, and a

baffle vertically disposed at one side of said extension and said shroud and spaced therefrom to direct convection currents from said extension down the side of the shroud.

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