

Oct. 30, 1934.

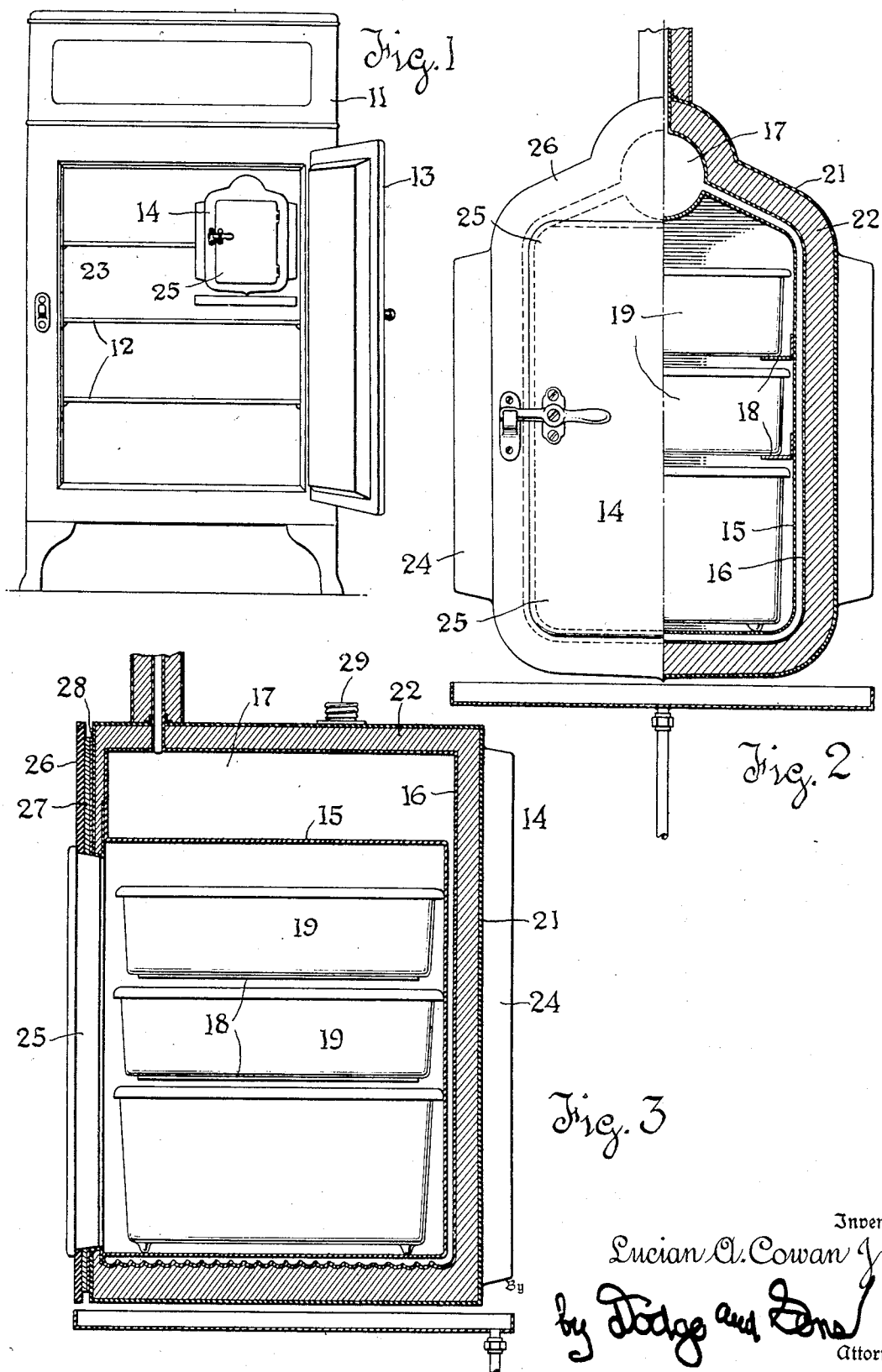
L. A. COWAN, JR

1,979,142

REFRIGERATOR

Filed Aug. 13, 1932

2 Sheets-Sheet 1



Oct. 30, 1934.

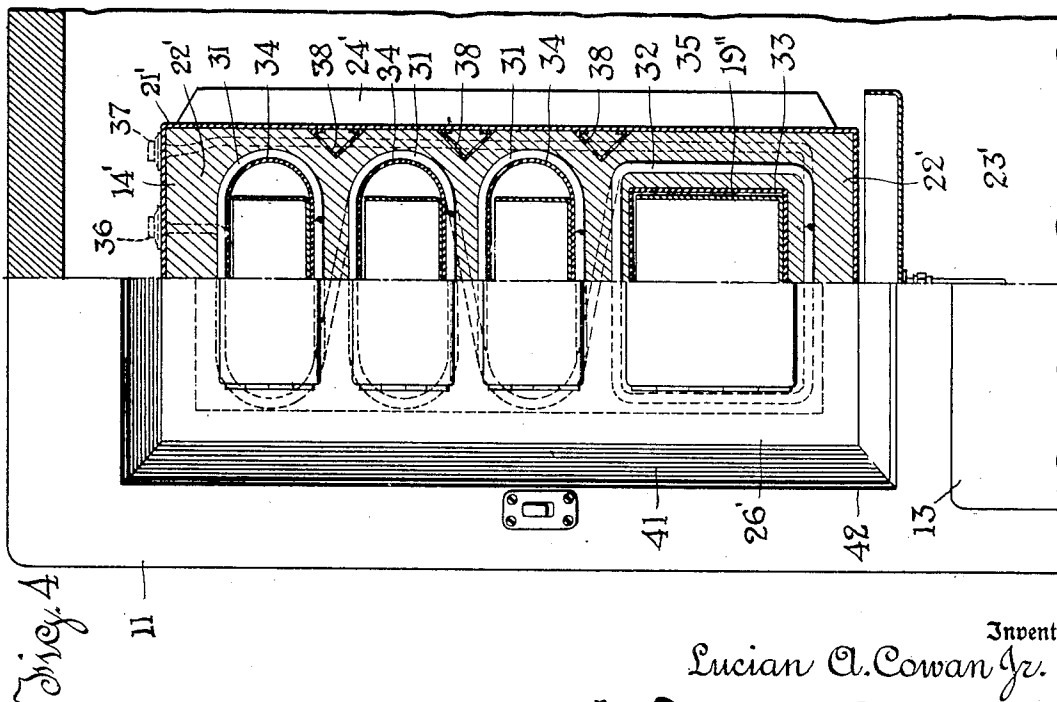
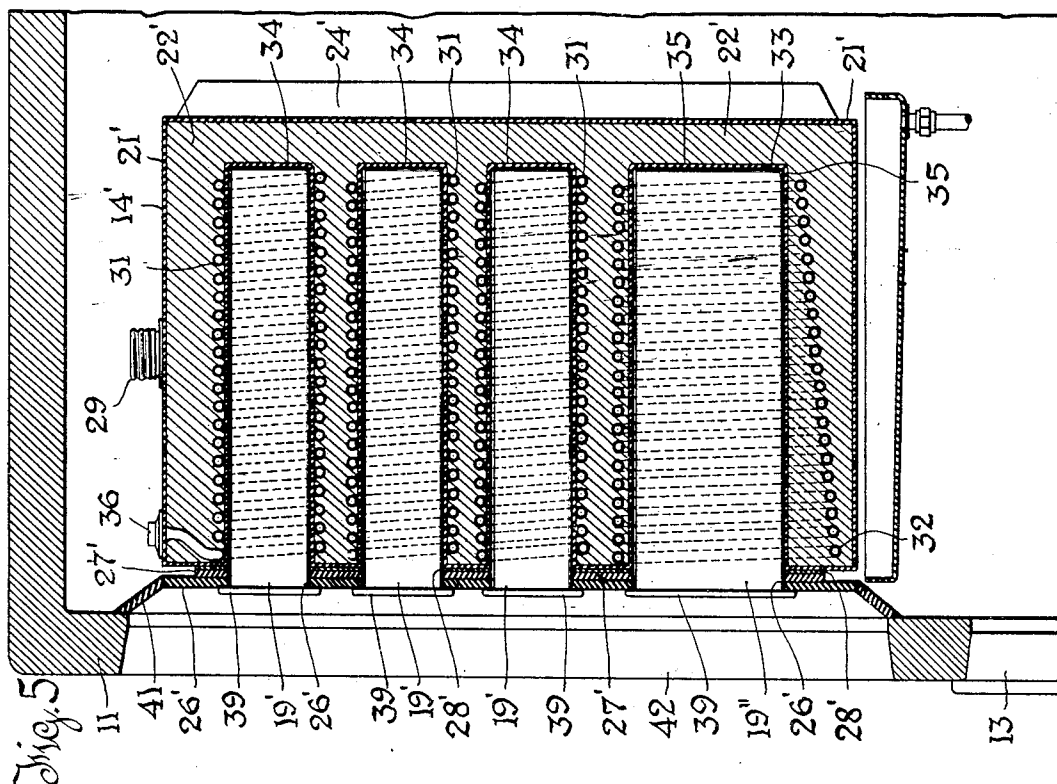
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,979,142

REFRIGERATOR

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Application August 13, 1932, Serial No. 628,730

2 Claims. (Cl. 62—95)

The present invention relates to mechanical refrigerators, and more particularly to means for insulating the cooling unit and its freezing compartment to lessen precipitation of moisture and prevent subsequent formation of frost due to continued freezing of moisture on the exposed surface of the unit.

One of the disadvantages of freezing units disposed in refrigerators to act as a cooling medium is that food in the refrigerator is subject to desiccation or loss of moisture. The moisture is extracted from the air in the refrigerator as it comes in contact with the sub-freezing surfaces forming frost or ice on the unit, thus causing the air to become relatively dry and to absorb moisture from the contents of the refrigerator. This is usually referred to as "dry cold", as distinguished from "wet cold", such as results from the use of melting ice for cooling refrigerated food compartments.

Another disadvantage in refrigerators of the type wherein sub-freezing surfaces are exposed to the air within the refrigerator is that formation of ice or frost on the unit lowers the efficiency of the cooling unit and requires frequent defrosting.

This invention aims to obviate these disadvantages, first, by insulating the coils or tank containing the refrigerant from the food compartment to a limited degree so that the surfaces exposed to the air within the refrigerator are maintained above freezing temperatures during a substantial portion of one entire cycle of operation of the refrigerating apparatus and second, by insulating the freezing compartments from the air within the refrigerator by means of a front of insulating material provided with suitable openings and insulating doors or plates to form a substantially air-tight closure for the freezing compartment openings.

In the drawings there are illustrated two embodiments of the invention from which a clear understanding thereof will be had.

Fig. 1 is a front perspective of a refrigerator showing a cooling unit disposed therein;

Fig. 2 is a front elevation, partly in section, of one type of cooling unit employed in the present refrigerator;

Fig. 3 is a sectional view taken on the center line of Fig. 2;

Fig. 4 is a front elevation of another form of cooling unit, shown partly in section, and indicating its position in the refrigerator;

Fig. 5 is a sectional view taken on the center line of Fig. 4.

In the drawings the refrigerator 11 is of the conventional type provided with shelves 12 and a door or doors 13. Disposed within the refrigerator, preferably in an upper corner thereof, is a cooling unit 14, which, in Figs. 1, 2 and 3, comprises three spaced parallel walls. The evaporator, which is preferably of the flooded type, but may be of any of the well known systems, and communicates in the usual manner with a compressor or other means (not shown) supplying refrigerant to the cooling unit, is formed by the inner walls 15, 16 and drum 17 at the top thereof. Within the freezing compartment formed by the evaporator are shelves 18 suitably secured to the wall to support removable ice-trays 19. Surrounding the evaporator and spaced therefrom is an outer wall 21. The space between walls 16 and 21 is filled with an insulator or other substance 22 having limited heat conducting properties so as to act, to a greater or less degree, as an insulating wall between the evaporator and the food storage space 23 of the refrigerator. In the present instance, it has been found that paraffin is suitable for the desired purpose, but other liquids, solids, or semi-solids may be utilized. Walls 15, 16 and 21 are formed from a metal of high thermal conductivity, to facilitate heat exchange. As shown in the drawings, metal fins 24 are secured to wall 21 to provide for conduction of heat from the food storage space to the cooling unit.

The evaporator is closed on all sides except the front, an insulator door 25 being provided to permit access to the ice-trays. To obviate sticking of door 25, insulating plates 26, 27 are attached to the cooling units, these plates preferably being formed from a suitable insulating material such as hard rubber, phenol condensate, or other similar compositions. Interposed between plate 27 and wall 21 is a gasket 28 of cork or other suitable flexible material. Door 25 bears against the openings in the plates to provide an air-tight closure for the freezing compartment and, since plate 26 is sufficiently removed from the evaporator to remain above freezing temperatures, moisture and subsequent freezing around the door edges is inhibited.

As will be seen from the drawings, wall 15 of the evaporator, forming the freezing compartment, is maintained at sub-freezing temperatures, whereas wall 21 is separated from the evaporator by a predetermined thickness of insulating filler 22. Obviously, the temperature of the food storage compartment is higher than

that of the freezing chamber, and in practice the insulation interposed between the walls is such that wall 21 is maintained substantially at all times above 32° F. The spacing of the walls 12 and 21 is governed by the particular insulation employed, this being determined by known characteristics and experiments. The insulation may be introduced by any expedient method, but, in the present instance, a filling opening 29 is provided through which the substance is poured while in a fluid state.

In the form of the invention illustrated in Figs. 4 and 5, the refrigerator, only a portion of which is shown, is indicated at 11, the cooling unit 14' being suitably supported in an upper corner thereof. The cooling unit comprises a plurality of freezing coils 31 and an auxiliary coil 32, the former being arranged to accommodate removable ice-trays 19', while coil 32 surrounds a chamber 33 having therein a large removable tray 19'' in which articles may be placed to be chilled, or which may be employed as a cold storage space.

Coils 31 and 32 are connected and are disposed in a box-like container having outer walls 21' and inner walls 34 and 35, all of the walls being formed from a metal of high thermal conductivity, and the inner walls conforming substantially to the curvature of coils 31 and 32, respectively, to form recessed chambers for the ice trays and chilling tray. The coils communicate in the usual manner with a compressor (not shown), through inlet 36 and outlet 37. Coils 31 bear directly against walls 34, but coil 32 is spaced from wall 35. The space between the inner and outer walls of the cooling unit housing or container is filled with a substance 22' having limited heat conducting properties.

As will be seen from the drawings, the walls of the ice tray compartments, being in direct contact with coils 31, are maintained at a relatively low temperature, whereas walls 32 and 35 are separated from the coils by a predetermined thickness of the insulating filler. The temperature of chamber 33 is higher than that of the ice tray compartments and the temperature of the food compartment is still higher. In practice, the insulation interposed between the walls and coils is such that compartment 33 is maintained at or about freezing temperature while the walls 21' have a temperature of approximately 32° F. The ice-cube compartments are, of course, maintained at sub-freezing temperatures, due to their surfaces being in contact with coils 31 carrying the refrigerant.

In order better to conduct heat from food compartment 23' to the cooling unit, metal fins 24' are secured to walls 21'. Also welded or otherwise fastened to walls 21', interiorly thereof, are angular plates 38 disposed to provide for more uniform transfer of heat from the walls to coils 31 and 32. These plates are perforated so that the insulating material will fill the spaces between the plates and the walls, thus preventing formation of dead air spaces in the unit.

Attached to the exterior surface of cooling unit housing 21' is a plate 26' similar to that described with respect to Figs. 1, 2 and 3. This plate is provided with openings corresponding with those of the freezing compartments and the storage compartment, and the plate is extended to the periphery of the cooling unit. Interposed between the front plate 26' and the cooling unit is a smaller plate 27' of similar material extending

to the periphery of the compartment openings. Also interposed between the front plate and the cooling unit is a gasket 28' of cork or suitable material. Plates 26', 27' and gasket 28' are each provided with openings corresponding with those in the cooling unit to permit passage of trays 19' and 34.

The ice-trays shown in Figs. 4 and 5 are provided with front flanges 39 which bear against plate 26', providing a substantially air-tight closure for the openings leading to the interior compartments in the cooling unit. The flanges are of sufficient insulating value to prevent frost from forming on their surfaces; and plate 26' is sufficiently removed by insulation from the coils 31 that they never reach a temperature below freezing. It will be seen, therefore, that the contacting surface between the flanges and the front plate is not subject to the formation of ice or frost, and hence no sticking results.

In lieu of flanges 39 formed on or secured to the ice-trays, each freezing compartment may be provided with an individual insulating door hinged to the cooling unit, and permitting insertion or withdrawal of the trays.

In refrigerators provided with a separate exterior door for access to the freezing compartments, a flange or dished plate 41 is connected to the front plate, this flange or plate being in contact with the refrigerator around the periphery of the opening in the refrigerator leading to the freezing compartments and extending to, and making contact with, the periphery of plate 26' attached to the cooling unit.

It will be seen that not only are air and odors from storage compartment 23' prevented from reaching the ice-tray compartments, but, when opening 42 is in communication with the exterior of the refrigerator, as when the door thereof is opened, outside air cannot reach the food compartment.

From the foregoing description it will be obvious that the cooling unit with its insulation interposed between the interior freezing compartments and its exterior cooling surface entirely eliminates formation of frost or ice on the exterior cooling surface. Due to the insulated front attached to the exterior of the cooling unit, and the insulating flanges or doors which form a substantially air-tight closure for these compartments, formation of frost in the interior freezing compartments is greatly reduced, due to the fact that air cannot circulate in these compartments, thus reducing the necessity of frequent defrosting; nor can odors from within the refrigerator permeate the freezing compartments.

While the invention has been described in detail, it is not to be construed as being limited to the illustrated forms, or to the insulating materials specified.

What is claimed is:—

1. In a refrigerator, the combination of a thermally insulated cabinet enclosing a food chamber and having a thermally insulated access door leading to said chamber; an evaporator mounted within said food chamber and arranged to be operated at sub-freezing temperatures; a housing of low thermal conductivity completely surrounding said evaporator and enclosing a freezing chamber within said food chamber, said housing having an access opening surrounded by a door jamb thermally insulated from said evaporator, and an access door independent of the access door to the food chamber sealing against said insulated jamb and itself thermally insulated, the

thermal conductivity of said housing being such that its exterior will be maintained by the evaporator at a temperature slightly above the freezing point of water; and thermal conducting means attached to the exterior of said housing within said cabinet for increasing its heat transfer surface.

2. The combination defined in claim 1, in which the access door to said housing is mounted in an aperture in said cabinet, the walls of the housing being connected with the margins of said aperture.

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15	90
20	95
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40	115
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60	135
65	140
70	145
75	150