March 31, 1953 W. D. JORDAN 2,633,003

MULTITEMPERATURE REFRIGERATOR

Filed Sept. 29, 1950 5 Sheets-Sheet 1

Fig. 2

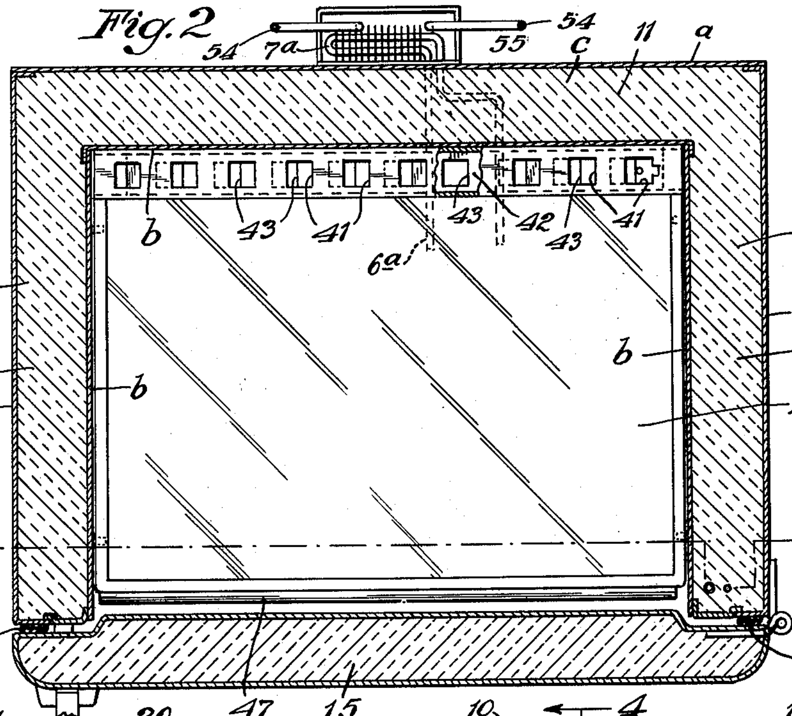
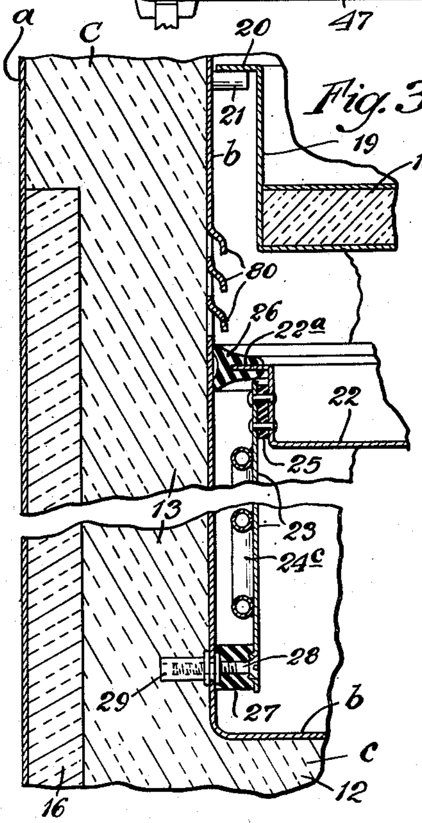


Fig. 3



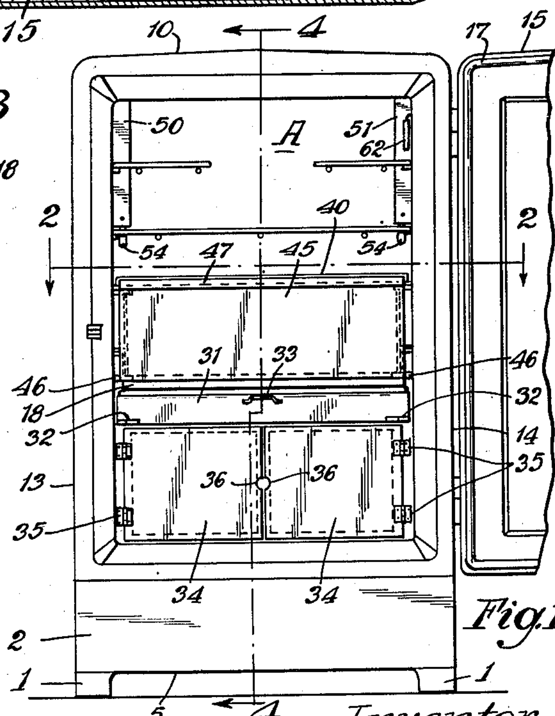


Fig. 1

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Fig. 4

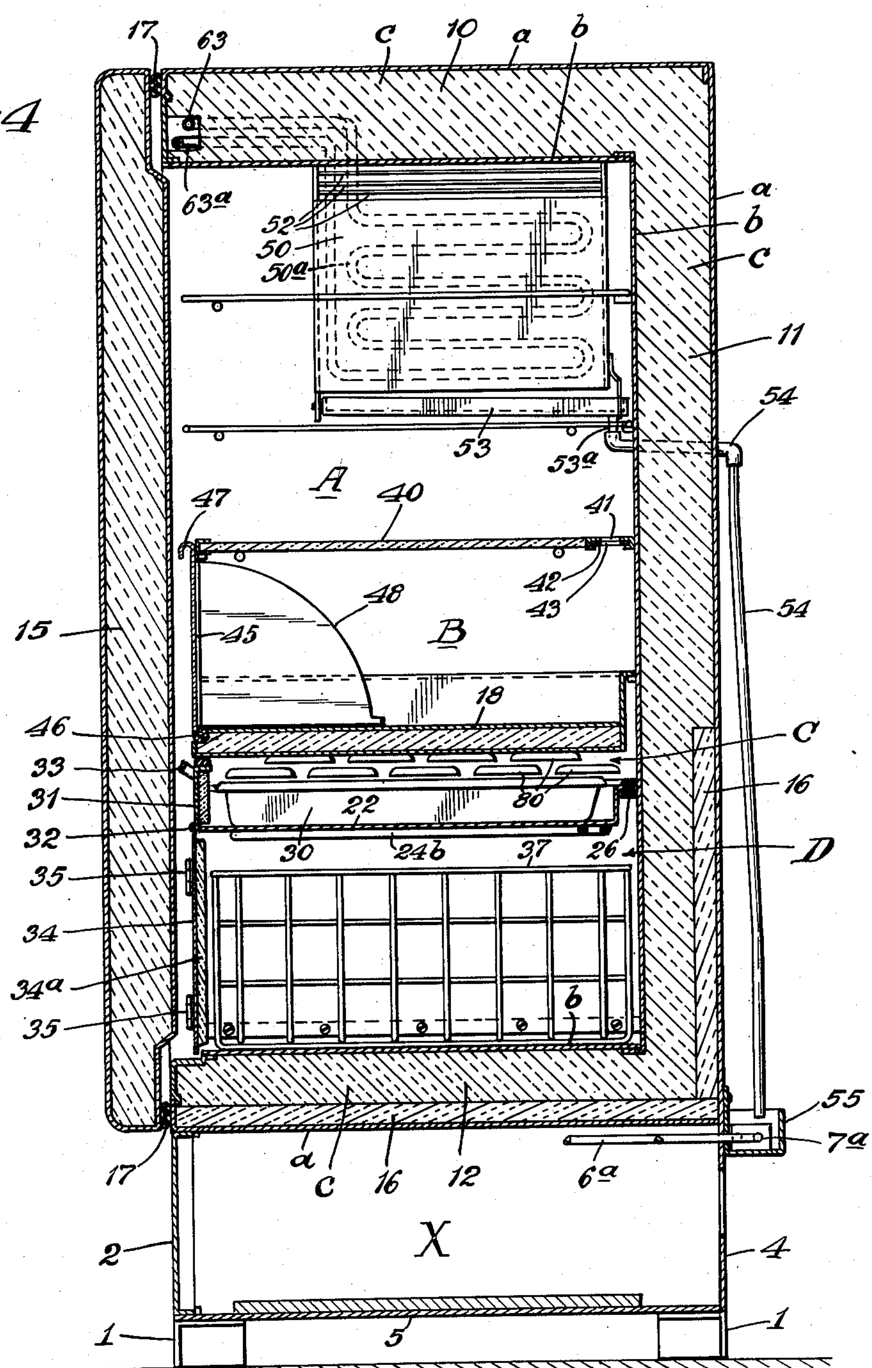

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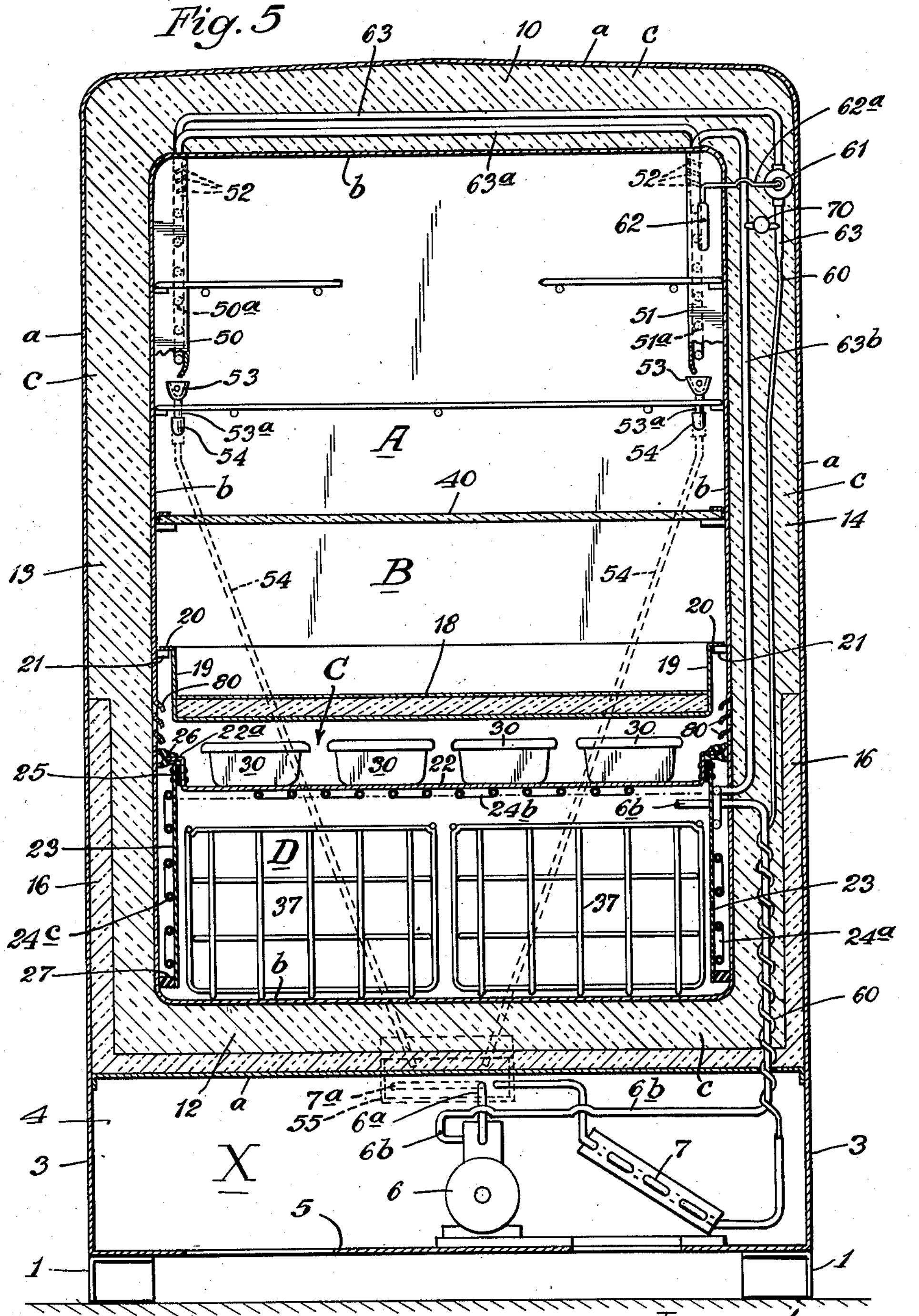
Fig. 5



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MULTITEMPERATURE REFRIGERATOR

Filed Sept. 29, 1950 — 5 Sheets-Sheet 4

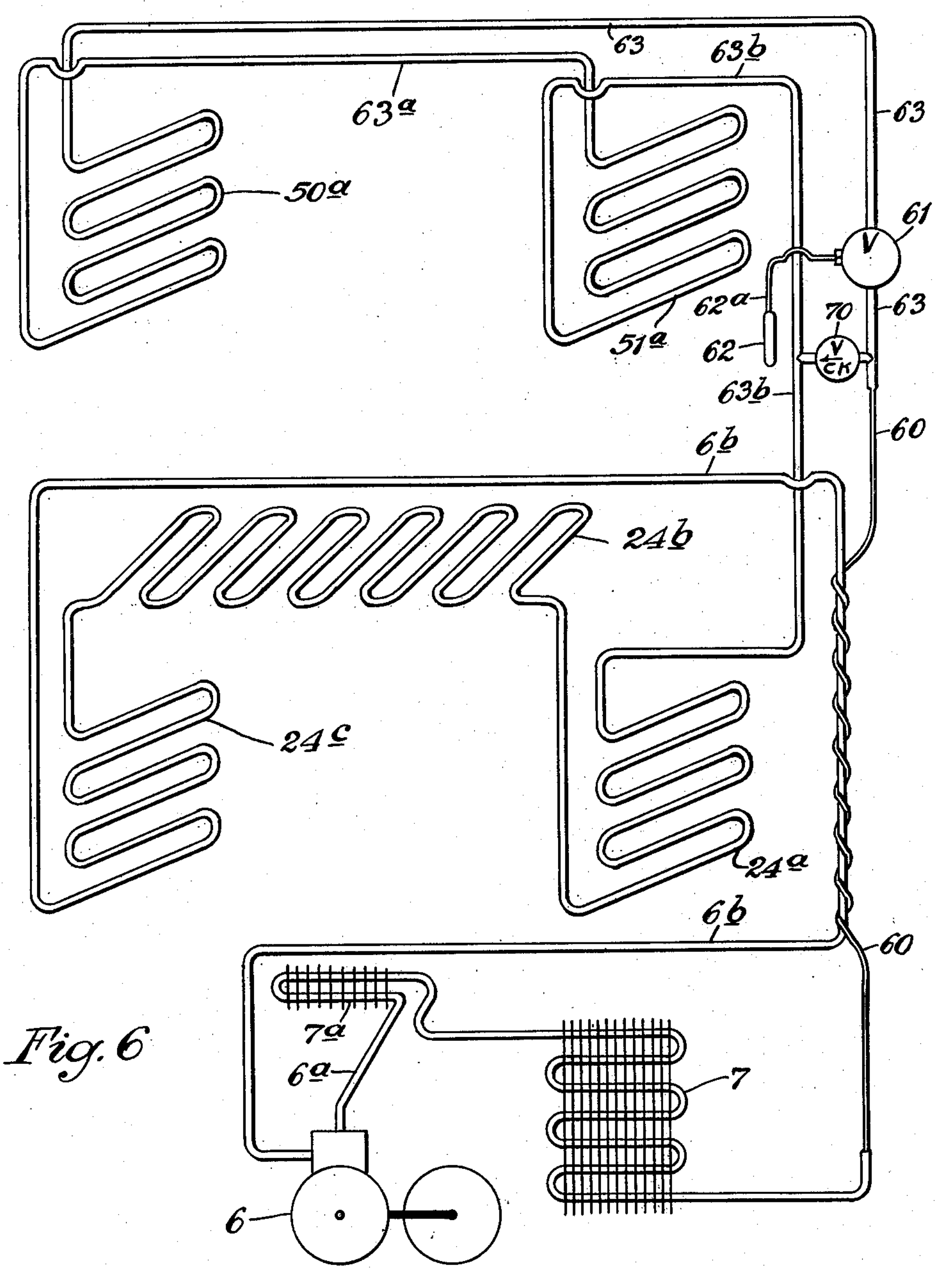

Fig. 6

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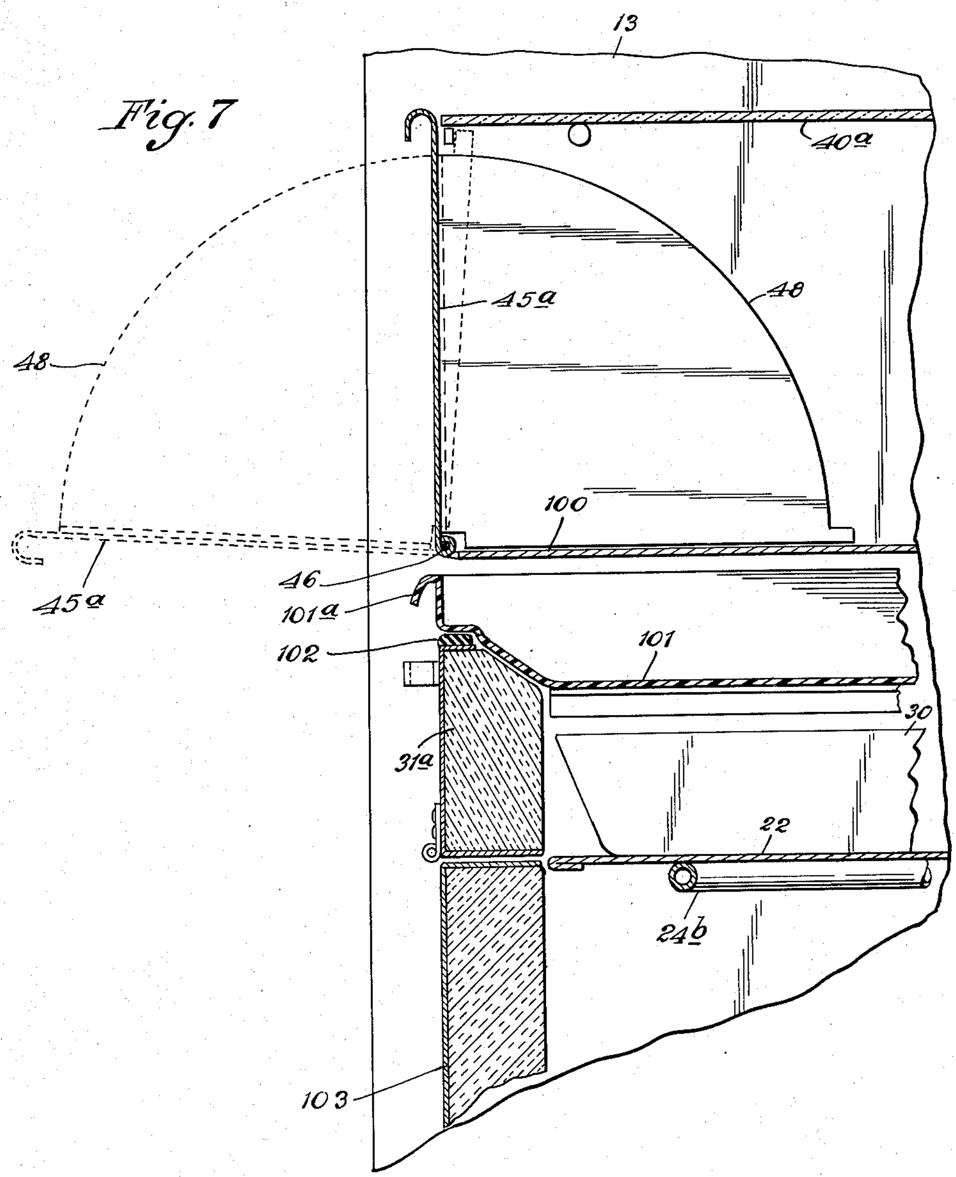
Fig. 7



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Patented Mar. 31, 1953

2,633,003

UNITED STATES PATENT OFFICE

2,633,003

MULTITEMPERATURE REFRIGERATOR

Wayne D. Jordan, Chicago, Ill.

Application September 29, 1950, Serial No. 187,415

10 Claims. (Cl. 62—4)

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My invention is an improvement in refrigerators and refers particularly to two-temperature refrigerators which include a compartment for storing frozen food.

One purpose is to provide a novel arrangement whereby the refrigerated space within one liner is divided into four separate compartments, with means to maintain the proper temperature and relative humidity in each of said four compartments, which are:

(A) A moist cold compartment for unfrozen foods, across the upper portion of said refrigerated space, which places all shelves for the frequently used foods at eye and reach level and avoids stooping to see and reach foods on low shelves as in most other refrigerators.

(B) A humid crisper compartment, across the center of said refrigerated space, which is also at easy reach level, and in which a high humidity may be maintained to avoid dehydration of vegetables, fruits and left-overs, thereby avoiding the need for wrapping or covering such food items.

(C) An ice cube freezing compartment across the central area of said refrigerated space, below elbow level, making it convenient to insert refilled trays without spilling water, whereas most other refrigerators place the ice trays at or near the top of the box, making it extremely difficult to insert filled trays without spillage.

(D) A frozen food storage compartment across the lower portion of said refrigerated space, with the frozen food packages stored in bins or baskets which pull out and tilt for convenient access to any packages wanted.

Another purpose is to provide automatic defrosting of the refrigerating evaporator surface in compartment (A) whenever refrigerant is not being supplied to said evaporator.

Another purpose is to maintain the relative humidity in compartment (A) substantially higher than in most other refrigerators, which is accomplished by using an evaporator of light weight and low total heat content and adapted to warm up quickly to the temperature of the surrounding air when the refrigerant supply is shut off, which avoids accumulating moisture, as frost, out of the surrounding air and food except during the relatively brief periods when the condensing unit is running. When the condensing unit is not running, the slight accumulation of frost melts quickly and part of the moisture is re-evaporated by the surrounding air.

Another purpose is to provide improved and automatic means of draining and disposing of any defrost condensate which may drip off said evaporator in compartment (A), thereby requiring no attention whatsoever.

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Another purpose is the simplification of design to obtain low manufacturing cost; I use only one liner inside the insulation, only one door, one set of hardware, and one refrigerating system, whereas some other two-temperature refrigerators use two liners, two doors, two sets of hardware and two refrigerating systems, which results in a higher selling price to the refrigerator user.

Another purpose is to provide an improved and simplified refrigerating system, which will maintain the proper temperature in each of said four compartments with only one condensing unit and one electric control or switch.

Another purpose is to provide control of the relative humidity in compartment (B) whereby the housewife may maintain the humidity high enough to avoid dehydration of any foods stored in said compartment, but low enough to avoid mold formation on the food which occurs when the humidity is excessively high.

Another purpose is to provide a break in the conduction of heat in the walls of the liner surrounding said refrigerated space, said break being located at the level of the separation between the low temperature compartments and the higher temperature compartments, thereby enabling me to maintain sub-zero temperature in compartments (C) and (D) adjacent to said liner walls, but to maintain the liner walls above said break at a temperature higher than 32° F., thereby avoiding any ice formation on said liner walls in compartment (B).

Another purpose is to avoid any accumulation of moisture in the insulation of the refrigerator by causing any water vapor which leaks into the insulation chamber, through faulty sealing of the outer shell or enclosure, to pass through apertures in said liner walls and accumulate as frost on the colder refrigerating surfaces within the liner, thereby avoiding the need for meticulous care and inspection in the sealing of the outer shell or enclosure.

Another purpose is to provide a single, unitary refrigerating system which may be assembled, charged and tested before being installed in the refrigerator, and which is installed in or removed from the refrigerator as a complete assembly comprising the condensing unit, evaporators and all connecting tubing.

Another purpose is to provide a single refrigerating system which will supply refrigerant to all the evaporators in series when refrigeration is needed in all of said four compartments, which will shut off the supply of refrigerant to the evaporator in compartment (A) when that compartment comes down to the desired temperature, but will continue to supply refrigerant to the lower evaporator until compartments (C) and (D) come down to the desired temperature.

Another purpose is to provide a hinged cover or door over one of said compartments, which will open down 90° to form a shelf on which to set articles when placing foods in or removing foods from the refrigerator.

Another purpose is to provide a novel means of insulating the refrigerator, using two insulating materials of different conductivity characteristics, which enables me to use an insulation chamber of uniform thickness from top to bottom of the box, but to obtain greater insulating effect around the lower portion of the box where the temperature differential is greater.

Other purposes will appear in the specifications and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings, wherein:

Fig. 1 is a front elevation with the door open;

Fig. 2 is a section on an enlarged scale on the line 2—2 of Fig. 1;

Fig. 3 is a detailed vertical section of one side of the structure illustrated in Fig. 5;

Fig. 4 is a section on an enlarged scale on the line 4—4 of Fig. 1, with the front door closed;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a flow or cycling diagram; and

Fig. 7 is a partial vertical section through a variant form.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring, for example, to Figs. 4 and 5, 1 generally indicates any suitable supporting members or feet upon which is mounted a base structure including any suitable front removable panel 2 and any suitable fixed side walls 3 and rear wall 4. The bottom 5 may be suitably apertured to permit the upward passage of air and the rear wall 4 may also be suitably opened whereby air may be circulated through the condensing unit space X defined within the above described structure. Within the condensing unit space X I may position any suitable refrigerating unit, the details of which do not of themselves form any part of the present invention. 6 diagrammatically indicates a combined compressor-motor unit of any suitable type, and 7 diagrammatically indicates any suitable condenser. The connections between the refrigerating unit and the evaporating units will later be described in detail.

I provide any suitable insulated housing shown as including a top wall 10, a rear wall 11, a bottom wall 12, side walls 13, 14, and a hinged door 15. Each such wall may have an outer element *a* and an inner element *b* with any suitable intervening insulating materials *c*. The outer members may, if desired, form upward continuations of the previously described walls 3 and 4. The insulating effect of the bottom wall 12 and of the lower parts of the side and rear walls may be increased by inserts 16 of more efficient insulation. I do not wish to be limited to any specific means, but, as an example, the basic insulation *c* may be of fiberglas, or other suitable material, with the inserts 16 being of a material such as Santocel, of low heat conductive characteristics. Or I can employ a grade of fiberglas having a heat transfer coefficient well below the grade used in the upper zone. Thus, as will be clear from Figs. 4 and 5, I provide an insulated housing of differential heat transfer or heat insulating characteristics, the lower part being more efficiently insulated than the upper.

The cooling compartment will thus be understood to be bounded or defined by the inner elements *b* of the top, bottom, rear and side walls, the otherwise open front of the storage compartment being closed or closable by the hinged door 15 with any suitable sealing strips 17.

In the device, when finally assembled, I provide an insulating separating shelf between the more highly insulated lower portion and the less highly insulated upper portion. For example, I illustrate a horizontal insulated shelf structure 18 having side hangers or side walls 19 terminating in an outwardly extending flange 20 removably supported on any suitable abutments or supports 21. Thus the insulating partition 18 upwardly bounds a low temperature storage zone and downwardly bounds a high temperature storage zone. As an alternate insulating means between the two compartments, I illustrate a removable shelf positioned to form the floor of the higher temperature compartment, with a pan or tray directly below the shelf, said pan or tray providing static air insulation to separate the two compartments. It may also be used for storing fresh meats and other foods at a temperature somewhere between the temperatures maintained above and below said pan or tray.

Considering first the low temperature storage zone, I provide an evaporator structure in the form of a horizontally extending shelf or partition 22 and depending side walls 23. Secured to the lower surface of the top wall 22 and secured to the outer surfaces of the side walls 23 are evaporator coils or units 24*a*, 24*b*, and 24*c*, which may, for example, be connected in series. The shelf 22 is separated from the walls 23 by intervening rubber elements 25. A sealing strip 26 extends around the sides and rear edges of the upper outwardly extending flange 22*a* of the shelf 22. It will be understood that rubber or a suitable rubber substitute may be employed to the end that the space below the flanges 22*a* is sealed from the space above. The lower edges of the walls 23*a* are supported by bushings 27 through which screws 28 extend into threaded members 29. It will be understood that the above described structure can readily be removed outwardly through the open door when the screws 28 are removed.

The cycling connection for the evaporators 24*a*, 24*b*, 24*c*, will later be described. It will be understood, however, that the space below the insulating partitioning means 18 is kept at a temperature substantially below freezing. Thus ice trays 30 may be positioned on the shelf 22 in the space between that shelf and the partitioning means 18. The front opening of this ice cube freezing space may be closed, for example, by a door 31 horizontally transversely pivoted at its lower edge as at 32 and provided with a suitable operating handle 33. The gap between upper edge of door and the partition 18 is closed with gasket 31*a*, as will be clear from Fig. 1. The space below the shelf 22 is shown as closed by front doors 34 vertically hinged as at 35. Any suitable finger openings or slots 36 may be employed, or any suitable handles may be used. Any suitable insulation, for example, cork may be employed, as shown by 34*a* in Fig. 4. Any suitable removable storage baskets 37 may be positioned in the cold storage space thus provided, for storage of the frozen food packages.

Located in the higher temperature storage zone and spaced upwardly above insulating partitioning means 18 is a shelf 40. Toward its rear edge are a plurality of openings 41 which may be closed by any suitable slide 42 with its apertures 43. The shelf 40 may be advantageously made of glass, whereas the shutter structure at the rear may be formed of abutting metal plates. The location of apertured shuttered member is a matter of choice, but it is convenient to put it at the rear of the shelf. The front opening of the intermediate storage space thus formed is closed by a door 45 hinged at its lower edge as at 46. Its upper edge 47 abuts the front of the shelf 40 or the support for the shelf. 48 is any suitable segmental limit means which is effective to support the door 45 in substantially horizontal position when it is fully opened. When in such position, it serves as a convenient shelf for holding articles being inserted into or removed from the storage space. The storage space thus provided may be described as a moist zone or section within the high temperature storage compartment. The above described shutter structure, when adjustment is varied, increases or diminishes the movement of water vapor to the evaporator in the upper portion of the high temperature zone. Thus I provide an effective control of the relative humidity in the moist zone in the space between the partitions or shelves 18 and 40. This provides a convenient moist storage zone for vegetables or the like.

In the upper part of the storage zone, I provide two thin, light weight side plates 50, 51, each plate having secured to its outer face appropriate evaporator coil 50*a* or 51*a*. At the upper edges of the plates 50, 51, I illustrate any suitable system of vents which may, for example, be formed by louvres 52, to provide free circulation of air between said plates and the liner walls. Below each of the evaporator coils is a drip pan or gutter 53, each such pan having a bottom spill outlet 53*a* which removably enters the upper inner end of the condensate ducts 54. The ducts extend downwardly to the pan 55 in which is the condenser section 7*a* which may be in series with the previously described condenser 7. Thus, the moisture from the pan or gutter 53 is delivered to the outside pan 55 and the heat of the condenser 7*a* effectively assists in evaporating and thus disposing of the moisture. It will be understood that any suitable shelves may be employed in the storage zone.

The refrigerant connections are as follows: The compressor 6 delivers compressed gas along the duct 6*a* to the condenser units 7*a* and 7. The condensed refrigerant is carried by any suitable capillary 60, part of which may be in contact with or coiled about the return duct 6*b* which extends to the intake side of the compressor. 61 diagrammatically indicates a thermal modulating valve controlled by any suitable temperature responsive bulb 62 with its connecting duct 62*a*. Assuming that temperature conditions permit, the refrigerant flows from the capillary 60 through the relatively enlarged duct 63 through the thermal modulating valve 61 and thence to the evaporator coil 50*a*. In the particular embodiment of the invention herein shown, the two coils for the high temperature storage are in series. Thus the refrigerant flows along the duct 63*a* to the second evaporator coil 51*a*. It flows thence by the duct 63*b* to and through the evaporator coils 24*a*, 24*b*, 24*c*, in the low temperature storage compartment. It then returns by the passage 6*b* to the intake of the compressor.

It should be noted that a spring loaded by-pass check valve 70 serves to connect the duct 63 on the intake side of the thermal modulating valve 61, with the duct 63*b*. Thus, when the thermal modulating valve 61 is operating to prevent the passage of refrigerant through the coils 50*a* and 51*a*, refrigerant can still flow through the low-temperature coils 24*a*, 24*b*, 24*c*. The heat exchange relationship between the capillary duct 60 and the return duct 6*b*, as shown in Fig. 5, will be noted.

To reduce the rate of conduction through the liner walls, from the high temperature zone above to the sub-freezing zone below, thereby avoiding sub-freezing temperature in the liner walls above said insulated partition, and to prevent the accumulation of condensed moisture in the insulation of the housing because of faulty sealing of the shell, I provide louvres 80 in the inner wall or liner portions *b* of the side walls. These communicate with the ice cube freezing chamber between the shelf 22 and the insulating partitioning means 18. These louvered openings are shown as in three horizontal rows and may be advantageously staggered to give a circuitous path for reducing the rate of downward heat transfer.

With reference to the form of Figure 7, I illustrate a substitute partitioning means. Instead of the insulated shelf structure 18 of the earlier figures, I employ any suitable non-insulating shelf member 100 which may be of glass, aluminum, or any other suitable substance. It is shown as terminating adjacent the bottom of the hinged door 45*a*, and, with the upper shelf 40*a*, defines what I may call the super-crisper compartment.

To provide insulation between the zones of higher and lower temperature I may employ a static body of air surrounded, for example, by the pull-out plastic tray 101, with its hand-piece 101*a*. This tray not merely maintains a static body of air which provides adequate insulation; it may be used for storing fresh meats, canned fruit juices, and the like, and, in general, substances which are not damaged by subjection to freezing or somewhat below freezing temperature.

31*a* indicates any suitable door for the front of the ice tray compartment. It is out of direct contact with the tray 101, and is gasketed as at 102. 103 indicates any suitable freezer door or doors for the lower freezer compartment.

It will be realized that whereas I have described and claimed a practical and operative device, nevertheless, many changes may be made in size, shape, number and disposition of parts without departing from the spirit of my invention. I, therefore, wish my drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my specific disclosure herein.

The use and operation of my invention are as follows:

I provide in the herein described structure a two-temperature refrigerator in which frozen food may be stored in the space below the shelf 22 and in which unfrozen food may be stored at temperatures above freezing in the space above shelf 18. Whereas optimum temperatures may vary, it may be practical to think of my structure as involving zero or sub-zero storage in the space below the partition 18, and storage of a temperature approximating 40° F. in the space above the partition 18.

The ice trays 30 are shown as positioned just below the insulating partitioning means 18 at a level from which they can be conveniently inserted and removed with a minimum of lifting and thus a minimum of spillage. They are located below elbow height, resulting in easier access.

I employ a single door, exposing a full area of a single liner front of the refrigerator. This involves a single set of hardware on the door and a single seal around the periphery of the door. However, I employ separate closures 34, 31 and 45 for the cold storage compartment, the ice tray compartment and the moist storage compartment, respectively.

I avoid any accumulation of condensed moisture in the high humidity storage zone by removing excess moisture, if any, for evaporation in the outside trough 55. The excess water vapor, if any, in the high humidity section will travel by vapor pressure differential to the upper evaporators where it deposits as frost when the evaporator coils 50*a* and 51*a* are receiving refrigerant. When refrigerant is not passing, the frost melts quickly and flows down through the drain ducts or tubes to the trough 55.

I prevent moisture accumulation in the insulation by causing any vapor that may enter it to pass through the louvres 80 to the lower temperature evaporator surfaces, where it condenses out as frost on the ice shelf. Thus the insulation is always kept dry and will be kept dry even with poor sealing of the outer enclosure.

My entire above described refrigerating system may be readily removed by loosening the breaker strips 90 at the front of the refrigerator. The liner, comprising the inner wall elements *b*, remains in the shell or housing. The back wall of the enclosure, as will be clear, for example, from Fig. 2, is without openings. But the entire evaporator structure may be forwardly and outwardly removed as a unit. This includes the ducts 63 and 63*a*, as it is a simple matter to slot the insulation and to slot the upper wall portion *b* to permit unitary removal of the entire evaporator system.

In considering the cycling operation, the capillary 60 conducts liquid refrigerant from the above described condensing unit to the upper coils 50*a* and 51*a*, when the temperature of the chamber to which the bulb 62 is subjected holds the thermal modulating valve 61 in the open position. However, even though the modulating valve 61 may be closed, the by-pass valve 70 is still effective to permit the passage of the volatile refrigerant to and through the coils 24*a*, 24*b* and 24*c*.

When the upper or high temperature storage compartment is cooled to the desired temperature of from 36° to 40° F., the thermal valve 61 closes, causing the refrigerant to flow through the check valve 70 to the duct 63, and thus to the low temperature evaporator coils. When refrigerant is not supplied to the upper coils 50*a* and 51*a*, they warm up quickly to surrounding air temperature, and the frost accumulation, if any, melts and flows off to the pan 55. When water is placed in the ice trays 30, a rapid transfer of heat to the ice shelf tubing 24*b* occurs and the cubes are frozen at a somewhat higher suction pressure, resulting in higher capacity of the condensing unit. During this ice-freezing operation, the lower temperature compartments are held at around 0° F., which is cold enough to

store food at the desired temperature, but is not so cold as to cause the control to stop the compressor. Thus ice is frozen without cycling.

In highly humid weather, frequent door openings will introduce moisture into the high temperature compartment, but when the door is closed, any excess vapor will deposit as frost on the coils 50*a* and 51*a*, which melts and runs down the drain ducts 54 whenever refrigerant is not supplied to the upper evaporators. Thus, continually automatic defrosting is provided. A much higher relative humidity is maintained in this compartment than in most other refrigerators, since the evaporators accumulate frost only while refrigerant is being circulated through said evaporators; when the refrigerant supply is shut off or the compressor is not running, the frost melts quickly and a portion of the moisture is re-evaporated by the surrounding air. The relative humidity in compartment *b* between the shelves 40 and 18 is controlled by opening or closing the shutter unit 41. In dry weather, the ports may be restricted, and in highly humid weather they may be widely opened. As a general practice, they need be changed only as between summer and winter conditions.

As above mentioned, any moisture that enters the insulation due to poor sealing of the enclosure or shell, will automatically pass through the louvered openings 80 and be deposited on the ice shelf, because of the vapor pressure differential between the ice shelf surface and that of the warmer liner surface exposed to the insulation. It will be noted that the zero zone evaporators are spaced within and out of contact with the walls or floor of the liner proper. The side evaporator plates 23 and their coils 24*a* and 24*c* may be at −10° F., during the operation of the condensing unit, but due to spacing them inwardly from the liner wall *b*, the heat gain from the outside to the liner wall and the heat loss from the liner wall to the plates balances out with the liner temperature from 10° to 15° F., above that of the evaporator. The necessary vapor pressure differential is thus maintained during the "on" cycle.

I also prevent ice formation on the liner walls at and above the longitudinal partition by retarding heat flow from the liner wall above, to the colder liner wall at and below the ice shelf 22, by making the louvres 80 elongated and staggered in two or three rows to make a tortuous heat path. With this construction, no ice forms on the walls of the liner above the louvres.

I claim:

1. In a domestic refrigerator adapted for storing both frozen and unfrozen foods and for freezing foods, ice cubes and the like, a single liner and an enclosing shell, a layer of insulation between said liner and shell, said shell and liner being open on one side, a single insulated door pivoted to the structure so formed and adapted to be moved into and out of closing position in relation to said open side, a horizontal insulating partitioning means positioned within the liner and adapted to form a separation between an upper storage compartment for unfrozen food and a lower storage compartment for ice cubes and frozen food, said partitioning means being readily removable from the liner, an ice freezing shelf mounted within the liner, extending to and sealed to the side and rear walls of the liner and having a forward edge adjacent the inner surface of the door when the door is closed, said ice freezing shelf having an evaporating coil on

its lower side, and having upright plates extending downwardly from its edges and spaced inwardly from the walls of the liner, said plates having evaporator coils on their outer sides and defining with the ice freezing shelf and with adjacent wall portions of the liner a lower storage space for frozen foods, the walls of said liner having multiple openings in alignment with the space between the horizontal partitioning means and the ice freezing shelf, whereby moisture may pass from the space outside of the liner to the space inside of the liner, a plate-type evaporator positioned in the upper food storage compartment formed within the liner and above the said horizontal partitioning means, a refrigerant condensing unit positioned outside of the liner and its surrounding insulation, said condensing unit including a compressor and condenser, a capillary tube extending from the condenser, and conduit connections between said capillary tube and said evaporators and between said evaporators and said condensing unit, a thermal-controlled switch for said condensing unit, said switch having an element responsive to the temperature of the frozen food storage space, and a thermally actuated valve assembly between the capillary tube and the plate-type evaporator in the high temperature storage compartment, said valve assembly including a heat sensitive member responsive to the temperature of the zone of unfrozen storage, whereby the flow of refrigerant from the condenser to the plate-type evaporator is stopped and the refrigerant is by-passed to the low temperature evaporator at a predetermined food storage temperature, and is started at a somewhat higher temperature.

2. In a two-temperature refrigerator, a liner, an insulated enclosure surrounding said liner, an insulating partitioning means separating the interior of said liner into two food storage compartments, refrigerating means for maintaining an above freezing temperature in a warmer compartment, refrigerating means for maintaining a below freezing temperature in a colder compartment, each of said refrigerating means including a refrigerant evaporator, a condensing unit serving both of said refrigerating means, refrigerant conduit means connecting said evaporators in series with said condensing unit, including a duct extending from said condensing unit to the evaporator in the warmer compartment, refrigerant control means adapted to prevent the delivery of volatile refrigerant from the condensing unit to the refrigerating means in the warmer compartment when a predetermined temperature is reached in said warmer compartment, and by-pass means for maintaining a continued supply of volatile refrigerant to the refrigerating means in the colder compartment when said refrigerant control means prevent the delivery of refrigerant to the first refrigerating means.

3. In a two-temperature refrigerator, an insulated enclosure, an inside liner defining the refrigerated storage space, partitioning means separating said storage space into a warmer compartment and a colder compartment, a refrigerant evaporator in each of said compartments, a refrigerant condensing unit located outside the refrigerated space, refrigerant conduit means connecting said condensing unit to said evaporators in series, and extending from the refrigerant condensing unit to the evaporator in the warmer compartment, and refrigerant control means adapted to shut off the supply of refrigerant to said evaporator in said warmer compartment when a predetermined temperature is reached in said warmer compartment, while permitting the refrigerant to continue to flow to said evaporator in said colder compartment, there being a by-pass duct extending from said refrigerant conduit to the evaporator in the colder compartment.

4. In a two-temperature refrigerator, an insulated enclosure, means within said enclosure for defining refrigerated storage space, partition means separating said storage space into a warmer compartment and a colder compartment, a refrigerant evaporator for each of said compartments, said evaporators being arranged in series, a refrigerant condensing unit located outside the refrigerated space including a compressor and a condenser, a supply duct extending from said unit to the evaporator in the warmer compartment, pressure reduction means in the line of delivery of refrigerant to said evaporator, a duct connecting the evaporator in the warmer compartment to the evaporator in the colder compartment, a return duct extending from the evaporator in the colder compartment to the suction side of the compressor of the refrigerant condensing unit, such duct constituting the sole return to the compressor, a normally open valve in the supply duct extending from the condensing unit to the evaporator in the warmer compartment, located on the delivery side of the pressure reduction means, means for closing it in response to a predetermined temperature condition in the warmer compartment, and a bypass passage between the pressure reducing means and said valve through which refrigerant may pass to the evaporator in the colder compartment without passing through the evaporator in the warmer compartment.

5. The structure of claim 4 characterized by and including a spring loaded valve in the bypass passage.

6. The structure of claim 4 characterized by and including a single shell within the insulated enclosure and surrounding all of the refrigerated storage space.

7. The structure of claim 4 characterized by and including a single shell within the insulated enclosure and surrounding all of the refrigerated storage space, means for defining an ice freezing space in the colder compartment, the shell being apertured in communication with said space, whereby the insulation in the insulated enclosure is in vapor transfer relationship with the ice freezing space.

8. The structure of claim 4 characterized by and including a single shell within the insulated enclosure and surrounding all of the refrigerated storage space, means for defining an ice freezing space in the colder compartment, the shell being apertured in communication with said space, whereby the insulation in the insulated enclosure is in vapor transfer relationship with the ice freezing space, with the apertures in the shell being closely spaced and extending substantially across the walls of the liner, whereby the vertical heat transfer by conduction in said apertured wall is substantially reduced.

9. The structure of claim 4 characterized by and including a single shell within the insulated enclosure and surrounding all of the refrigerated storage space, the partition means being constituted by an insulating partition located within the shell, and sealing means between partition and shell adapted substantially to reduce temperature conduction therebetween.

10. The structure of claim 4 characterized by and including a single shell within the insulated enclosure and surrounding all of the refrigerated storage space, the evaporator in the colder compartment being spaced inwardly from said shell, whereby the shell is maintained at a temperature substantially higher than the temperature within the colder compartment.

WAYNE D. JORDAN.

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