July 11, 1944. H. E. ROSEBROOK 2,353,361

REFRIGERATOR

Filed Aug. 3, 1940 3 Sheets-Sheet 1

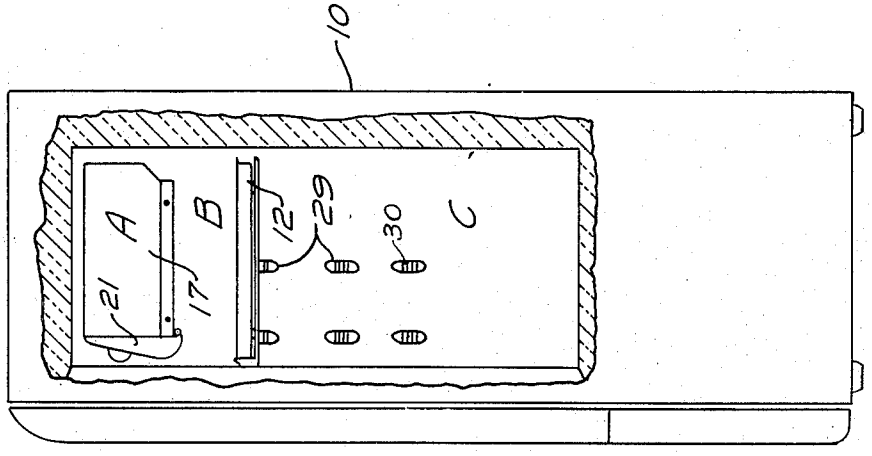


FIG. 2

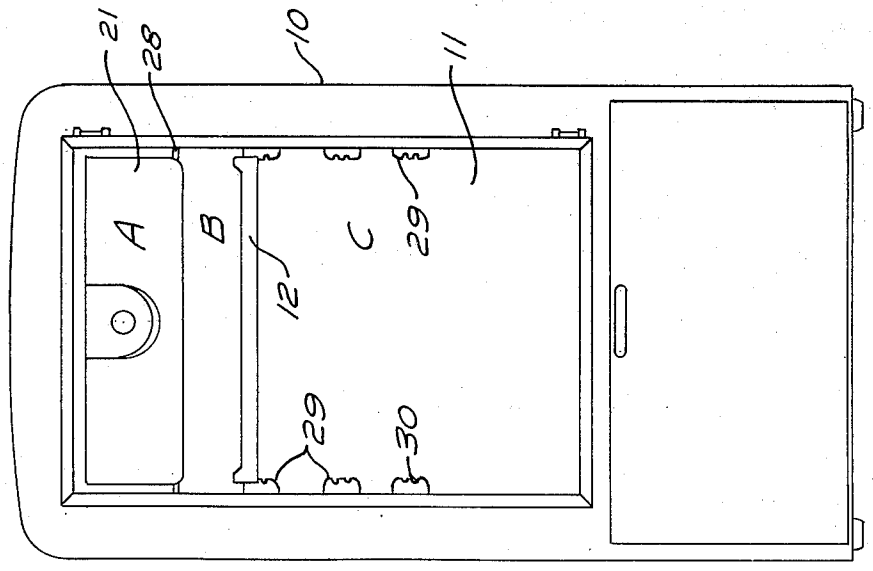


FIG. 1

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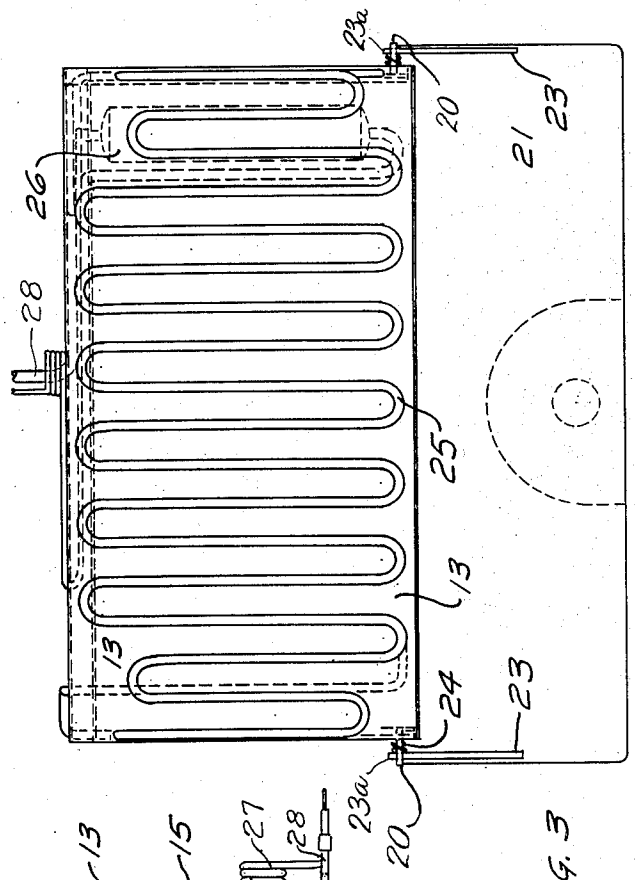


FIG. 3

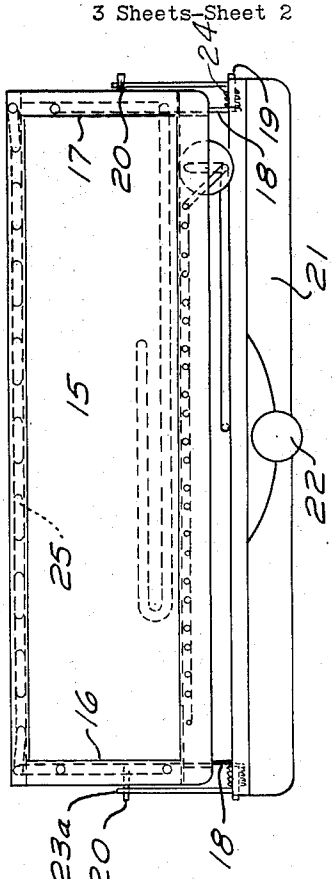


FIG. 4

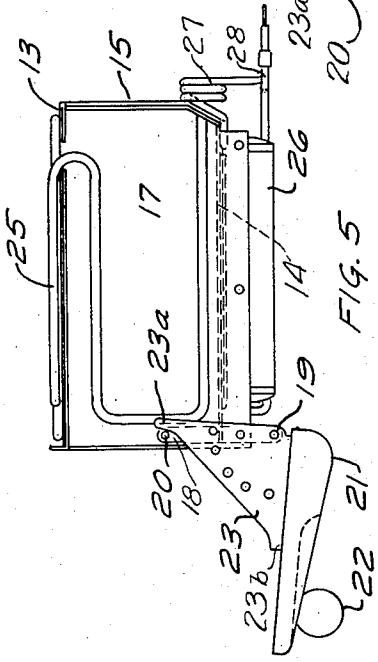


FIG. 5

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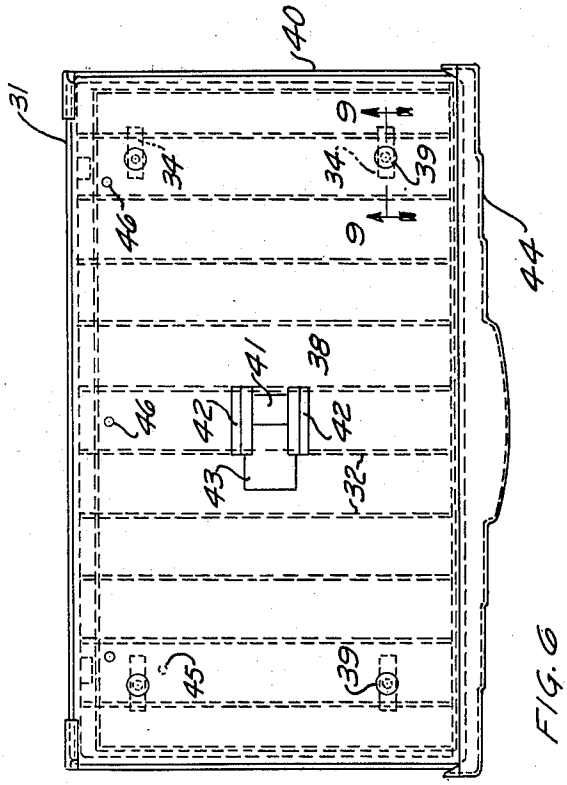


FIG. 6

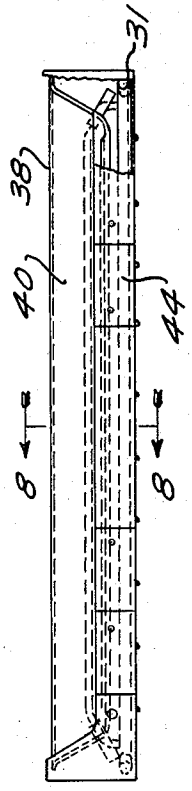


FIG. 7

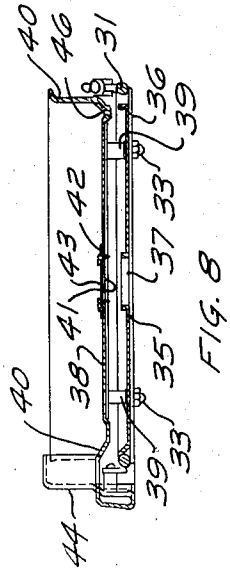


FIG. 8

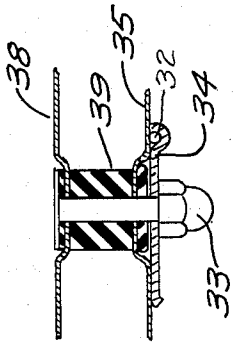


FIG. 9

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UNITED STATES PATENT OFFICE

2,353,361

REFRIGERATOR

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Application August 3, 1940, Serial No. 350,405

7 Claims. (Cl. 62—89)

This invention relates to refrigerators, and more particularly to the control of the temperature and humidity within different parts of the refrigerator cabinet.

The principal object of this invention is to provide a refrigerator cabinet having a food storage chamber divided into three compartments, each having a different temperature and humidity.

Another object of the invention is to provide a refrigerator cabinet having a food storage chamber divided into three compartments in which provision is made for regulating the circulation of air within and between at least two of the compartments whereby to control the relative temperature and humidity therein.

Another object of the invention is the provision of a storage shelf which functions both as a shelf and a partition, and in which the area of the partition may be varied.

Another object is the provision of a removable partition and storage shelf of novel construction.

Still another object is the provision of a partition composed of two vertically separated parallel pans.

Another object is to provide a freezing chest having a movable front closure adapted when open to act as a shelf.

These objects will more fully appear in the following specification, when read in connection with the accompanying drawings, wherein—

Figure 1 is a front elevational view of a refrigerator embodying the invention with the refrigerator door removed;

Figure 2 is a side elevational view of the refrigerator shown in Figure 1, a portion of the wall being broken away to show the interior thereof;

Figure 3 is a plan view of the evaporator and freezing chest for the refrigerator with the front closure thereof in its open position;

Figure 4 is a front elevational view of the evaporator shown in Figure 3.

Figure 5 is an end elevational view of the evaporator shown in Figures 3 and 4;

Figure 6 is a plan view of the movable storage shelf and partition;

Figure 7 is a front elevational view of the structure shown in Figure 6;

Figure 8 is an end elevational view of the structure shown in Figure 6; and

Figure 9 is a cross-sectional view taken on substantially the line 9—9 of Figure 6.

Briefly the invention comprises a refrigerator food storage chamber having a freezing chest at the top, which preferably extends substantially entirely across the chamber. The freezing chest is cooled by the cooling unit of a mechanical refrigerating system. Below the freezing chest is a combination partition and storage shelf which is spaced slightly from the walls of the chamber but which is of substantially the same area as the cross-section of the storage chamber, and may be removably mounted in guides on the side walls of the storage chamber. The partition preferably has an opening at its center. The size of the opening is varied by means of a sliding closure.

The air within the storage chamber is cooled by contact with the freezing chest causing a constant circulation of air within the chamber between the edges of the partition and the chamber walls, and through the opening in the partition. This circulation may be regulated by moving the sliding closure to vary the size of the opening. In this manner the relative temperature and humidity within the chamber above and below the partition may be varied. The temperature and humidity may be regulated also by removing the partition from its guides and placing it in another set of guides at a different level.

Referring now more specifically to the drawings, Figures 1 and 2 illustrate a refrigerator cabinet 10 in which the invention is embodied. The cabinet 10 is provided with a food storage chamber 11 which is divided into three compartments A, B and C. Compartment A is the freezing chest. Compartment B is a high humidity compartment having a temperature slightly higher than A. Compartment C is a still warmer compartment having a low humidity. Compartments B and C are formed by dividing the space below the freezing chest into two parts by means of a partition 12 which also functions as a storage shelf.

The freezing chest, which forms compartment A, is shown in Figures 3, 4 and 5. It comprises a sheet metal housing having a top wall 13, a bottom wall 14, a back wall 15, and end walls 16 and 17, all rigidly secured together. The front of the housing is closed by a hinged closure 21.

Attached to the end walls 16 and 17 adjacent their front edges is a pair of depending brackets 18. A laterally outwardly projecting pivot pin 19 is connected to the lower end of each bracket. Secured to the upper end of each bracket is a stop pin 20 which projects laterally outwardly therefrom.

The closure 21 is preferably a sheet metal pan-like structure having a nob 22 attached to the central part of its outer face. Secured to each

end of the closure 21 and projecting rearwardly therefrom is a roughly triangular plate 23. Each plate 23 is provided adjacent its lower front corner with a hole which receives the pivot pin 19, thereby forming a hinge connection between the closure 21 and the main part of the housing. Wrapped around each pivot pin 19 is a conventional hinge spring 24. One end of the spring is connected to the plate 23 and the other end is attached to the adjacent side wall of the housing. The lower rear end of the plate 23 is provided with an extension lug 23a which cooperates with stop pin 20 to prevent the closure 21 from opening beyond a substantially horizontal position. Thus it will be apparent that when the closure is in its fully opened position, as shown in Figures 3 to 5, it may be employed as a temporary shelf upon which to place articles while rearranging the contents of the freezing chest. As soon as all of the weight of the articles is removed from the closure 21 the springs 24 automatically return it to its upright or closed position.

The upper front corner of each plate 23 is provided with an extension lug 23b similar to the lug 23a. The lugs 23b contact the stop pins 20 when the closure 21 is in its closed position and hold the closure in spaced relation to the front edges of the top, bottom and end walls of the main part of the housing. Thus, the closure 21 never quite contacts the main part of the housing and is prevented from freezing shut by an accumulation of frost on the housing.

The means for cooling the refrigerator food storage chamber comprises an evaporator coil 25 which surrounds the top, bottom and end walls of the freezing chest. The evaporator also includes a boiler 26 which is mounted below the freezing chest. The coil 25 is connected at one end to a compressor and condenser (not shown) by means of a tube 27. The other end of the coil discharges into the boiler 26. The boiler is connected by a return tube 28 to the low pressure side of the compressor. The coil 25 is soldered or otherwise secured in metal to metal contact with the top, bottom and end walls of the housing in order to absorb heat from the aforementioned walls, which in turn absorb the heat in the freezing chest.

The freezing chest is mounted in the food storage chamber 11 by means of brackets 28 which are secured to the side walls of the food storage chamber. The walls of the freezing chest are spaced a slight distance from the adjacent top, side and rear walls of the food storage chamber in order to allow air to circulate entirely around the freezing chest and to be cooled by contact with the evaporator coil 25.

Mounted on opposite side walls of the food storage chamber 11 are a plurality of shelf supports 29. These shelf supports are arranged in vertically spaced groups and each group is adapted to support a shelf. The supports 29 are provided with grooves 30 to receive the edges of the shelves therein.

The partition 12 which separates compartments B and C from each other is slidably mounted in the uppermost group of supports 29. The partition comprises a base 31 consisting of a rectangular frame of heavy wire or rods and a plurality of transverse grid bars 32 soldered thereto. The ends of the outer frame of the base 31 are of a size to slidably fit in the grooves 30 in the shelf supports 29.

Mounted on the grid bars 32 and secured thereto by bolts 33 and clamps 34 is a lower drip pan 35. This drip pan is a substantially flat plate having a narrow upturned peripheral flange 36 extending completely around the same. In the center of the pan 35 is a rectangular opening bounded by another upturned flange 37. Near one corner of the drip pan 35 is a small drain hole 45 for a purpose which will appear presently.

An upper drip pan 38 is mounted above the lower drip pan 35 and secured thereto by the bolts 33. The upper pan 38 is spaced from the lower pan 35 by rubber spacing sleeves 39 which surround the bolts 33. The upper pan 38 has a relatively wide flange 40 extending around the ends and rear edge thereof. The flange also continues along the front edge, but is of much reduced height. Near the rear edge of the upper drip pan 38 are a plurality of drain holes 46.

Directly over the opening 37 in the lower pan is an opening 41. The opening 41 is substantially the same size as the opening 37. At the front and rear edges of the opening 41 are substantially Z-shaped guide members 42. One leg of the Z is welded to the pan 38 and the other leg is spaced slightly thereabove. A flat plate 43 is positioned with its front and rear edges below the inner legs of the Z-shaped guides and is slidable between the guides and the top surface of the pan 38. By means of this arrangement the size of the opening 41 may be readily varied.

At the front of the partition 12 is a strip of plastic material 44 which overlies and conceals the otherwise exposed front edges of the two pans 35 and 38 and the base 31. This strip enhances the appearance of the partition and forms a handle which may be easily grasped to remove the partition from the refrigerator storage chamber.

Any moisture collecting in the upper drip pan when the freezing chest is defrosted drains through the holes 46 into the lower pan 35. It then runs out of the hole 45 in the lower pan 35 and may be collected in any suitable receptacle below the latter opening.

Two drip pans 35 and 38 are provided to prevent moisture from dripping onto food stored within the food chamber below the partition 12. The upper drip pan is normally at such a low temperature by reason of its proximity to the freezing chest, that moisture condenses on its lower surface and drips therefrom. The lower drip pan 35 catches this moisture and delivers it through the drain hole 45 to the collecting receptacle. The air space between pans 35 and 38 maintains the temperature of the pan 35 high enough so that moisture does not condense on it.

The partition 12 is nearly but not quite as large as the cross-sectional area of the food chamber. Thus, there is formed a narrow gap extending entirely around the partition to permit a limited circulation of air throughout the food chamber. Air can also circulate through the openings 37 and 41, but this circulation can be controlled by the sliding plate 43.

It will be seen from the foregoing that this invention provides a refrigerator food storage chamber in which three different temperatures may be maintained. Obviously the temperature in the topmost compartment A is the coldest and the humidity therein is relatively high. The temperature in compartment B can be maintained at a much lower level than that of compartment C, but due to the circulation of air between compartments B and C, the temperature of compartment B will be higher than that of compartment A. Compartment B normally

has a very high humidity. However, the humidity as well as the temperature may be controlled to a considerable extent by varying the area of the partition 12 and thereby controlling the rate of circulation of air between compartments B and C. This variation of partition area is, of course, obtained by movement of the sliding plate 43.

The temperature and humidity of compartment B can also be varied by changing the location of the partition 12. This can be done by removing the partition 12 and shifting it into the lower groove of the topmost supports 29 or into one of the other groups of supports. Obviously the greater the volume of compartment B the warmer it will tend to become, and as its temperature rises the humidity will decrease.

It will also be evident that the invention provides a novel partition and storage shelf which is capable of being mounted in different positions within the storage chamber.

The scope of the invention is indicated in the appended claims.

What is claimed is:

1. In a mechanical refrigerator including an insulated food storage chamber, a substantially imperforate horizontally extending partition disposed in the upper part of said chamber and arranged to form a freezing compartment thereabove, a second substantially imperforate horizontally extending partition disposed below and in closely spaced relation to said first partition and arranged to form a chilling compartment thereabove and a cooling compartment therebelow, each of said partitions being of a size to provide for only a limited circulation of air between the space thereabove and therebelow, said second partition being provided with an opening spaced inwardly from its perimeter, and an adjustable closure for said opening whereby to control the circulation of air between the space above and below said partition, and a refrigerant evaporator disposed in intimate heat exchange relation with said first mentioned partition and being directly exposed to the ambient atmosphere contained in the space between the two partitions, said evaporator comprising the sole means within the storage chamber for refrigerating the same.

2. In a mechanical refrigerator including an insulated food storage chamber, a substantially imperforate horizontally extending partition disposed in the upper part of said chamber and arranged to form a freezing compartment thereabove, a second substantially imperforate horizontally extending partition disposed below and in closely spaced relation to said first partition and arranged to form a chilling compartment thereabove and a cooling compartment therebelow, said second partition comprising a pair of walls secured in spaced relation to each other by non-heat conducting spacers, each of said partitions being of a size to provide for only a limited circulation of air between the space thereabove and therebelow, and a refrigerant evaporator disposed in intimate heat exchange relation with said first mentioned partition and being directly exposed to the ambient atmosphere contained in the space between the two partitions, said evaporator comprising the sole means within the storage chamber for refrigerating the same.

3. A mechanical refrigerator comprising a plurality of imperforate walls forming an insulated food storage chamber, a refrigerant evaporator disposed within the chamber and being of a horizontal extent substantially coextensive with the horizontal extent of the chamber, and a food storage shelf positioned below and in spaced relation to the evaporator, said shelf being constructed and arranged to provide substantially imperforate partition means substantially coextensive horizontally with the evaporator to serve as an obstruction to the free exchange of heat by radiation and conduction between the spaces above and below the shelf, the partition means being constructed and arranged to provide an upper extremity along one lateral side thereof which is disposed at a lower level than the upper extremities of the lateral edges along the other sides of the partition means.

4. A mechanical refrigerator comprising a plurality of imperforate walls forming an insulated food storage chamber, a refrigerant evaporator disposed within the chamber and being of a horizontal extent substantially coextensive with the horizontal extent of the chamber, and a food storage shelf positioned below and in spaced relation to the evaporator, said shelf being constructed and arranged to provide substantially imperforate partition means substantially coextensive horizontally with the evaporator to serve as an obstruction to the free exchange of heat by radiation and conduction between the spaces above and below the shelf, said partition means including an upstanding vertical flange about the lateral edges thereof, the height of the flange along one side of the partition means being substantially less than the height of the flange along the remaining sides of the partition means.

5. A mechanical refrigerator comprising a plurality of imperforate walls forming an insulated food storage chamber, a refrigerant evaporator disposed within the chamber and being of a horizontal extent substantially coextensive with the horizontal extent of the chamber, and a food storage shelf positioned below and in spaced relation to the evaporator, said shelf being constructed and arranged to provide substantially imperforate partition means substantially coextensive horizontally with the evaporator to serve as an obstruction to the free exchange of heat by radiation and conduction between the spaces above and below the shelf, the evaporator and partition means being constructed and arranged relative to each other and to the storage chamber whereby air is circulated by gravity between the spaces above and below the partition means with a downward flow of air substantially over one side edge only of the partition means and an upward flow of air over another side edge of the partition means.

6. A mechanical refrigerator comprising a plurality of imperforate walls forming an insulated food storage chamber, a first partition means disposed within the chamber and being of a horizontal extent substantially coextensive with the horizontal extent of the chamber, said means including a refrigerant evaporator, and a food storage shelf positioned below and in spaced relation to said first partition means, said shelf being constructed and arranged to provide a substantially imperforate second partition means substantially coextensive horizontally with the first partition means to serve as an obstruction to the free exchange of heat by radiation between the spaces above and below the shelf, the evaporator and said partition means being constructed and arranged relative to each other

and to the storage chamber whereby air is circulated by gravity between the spaces above and below the shelf forming the second partition means with a downward flow of air substantially over one side edge only of said second partition means and an upward flow of air over another side edge of said second partition means.

7. Refrigerating apparatus comprising a cabinet having a food storage chamber therein, a unitary partition disposed within the chamber to divide the latter into upper and lower compartments and to serve as an obstruction to the free exchange of heat by conduction between the upper and lower compartments, and a refrigerant evaporator disposed in the upper compartment, said partition being substantially imperforate and extending substantially from side to side and from front to rear of the chamber, the upper surface of the said partition being constructed and arranged to provide a shelf for the storage of articles to be refrigerated and to receive the drip from the said evaporator, said partition also being constructed and arranged to conduct away from the upper surface thereof the drip from the evaporator as it collects therein.

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