May 14, 1946. C. E. QUINN 2,400,135

REFRIGERATOR

Filed April 1, 1944 3 Sheets-Sheet 1

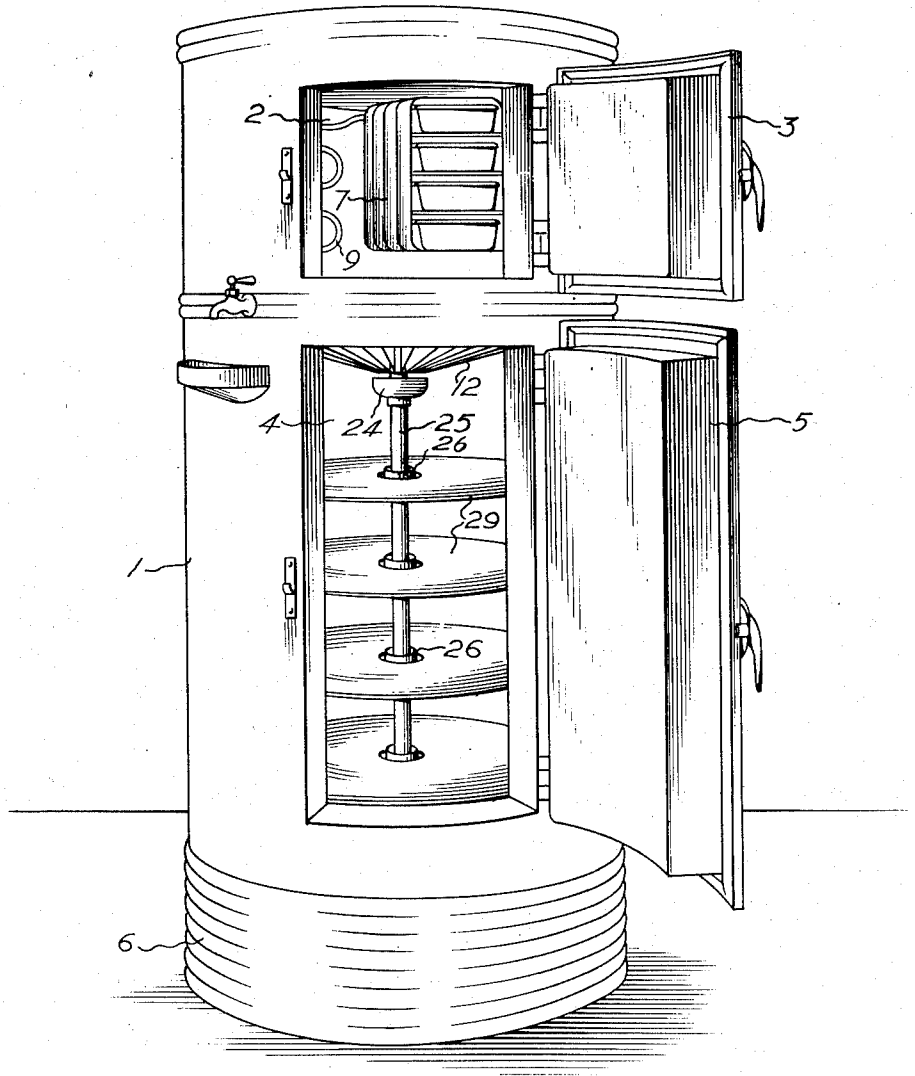


Fig. 1.

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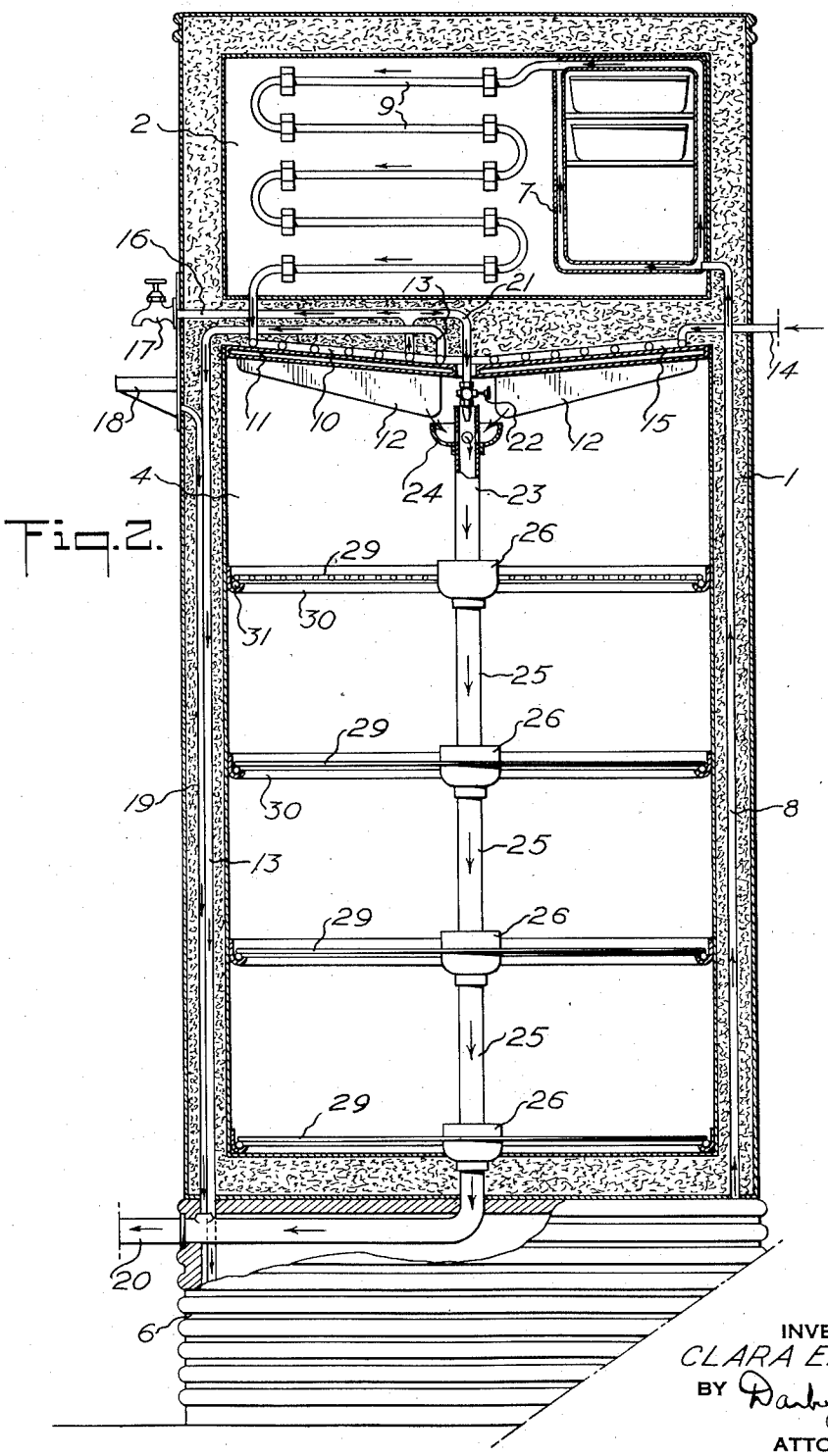


Fig. 2.

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Fig. 3.

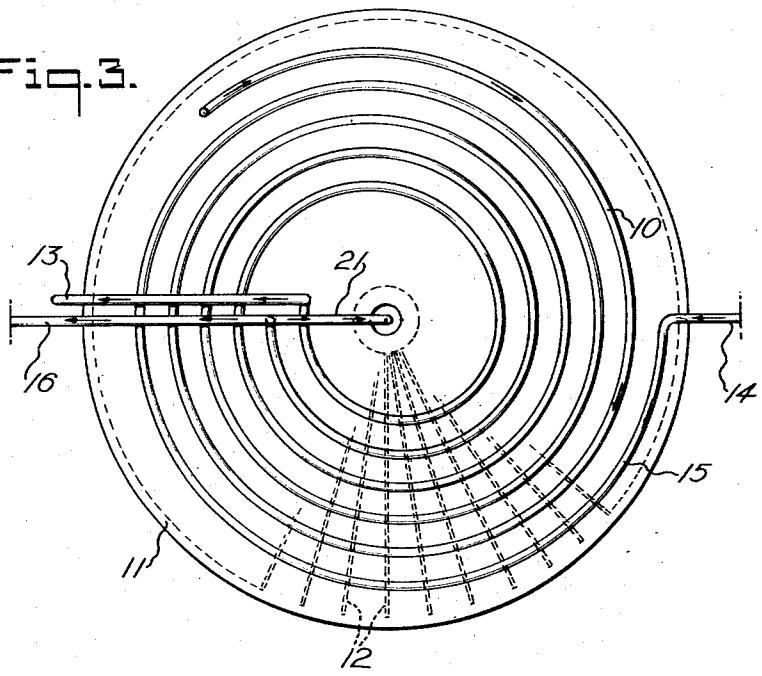


Fig. 4.

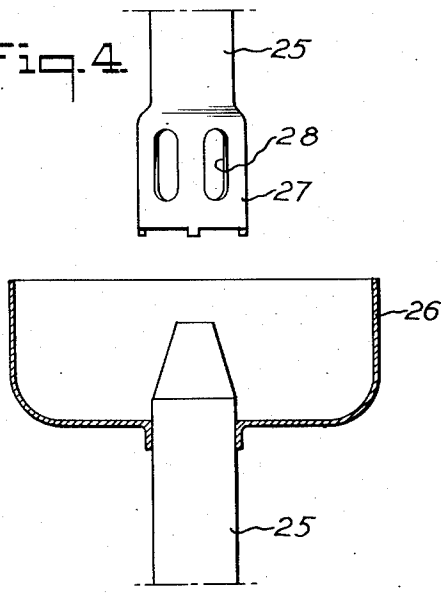
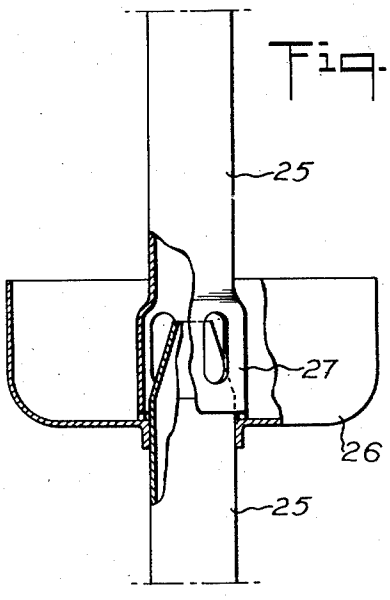


Fig. 5.



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UNITED STATES PATENT OFFICE

2,400,135

REFRIGERATOR

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Application April 1, 1944, Serial No. 529,051

13 Claims. (Cl. 62—116)

This invention relates to improvements in refrigerators and particularly to refrigerators adapted for home use.

An object of this invention is to provide a compact refrigerator, preferably in cylindrical form, having an ice cube compartment, a frozen food compartment and the usual food storage compartment maintained at lower temperatures than the other compartments.

A further object of this invention is to provide as a part of such a refrigerator an arrangement for supplying cold drinking water.

A further object of the invention is to provide means for maintaining high humidity conditions within the food storage compartment at lower temperature.

A still further object of the invention is to provide a novel shelf construction for a cylindrical refrigerator which shelves may be rotated to bring all parts thereof opposite the door opening of the refrigerator.

A still further object of the invention is to provide a shallow disassembled humidifying and shelf structure to facilitate cleaning.

Other and more detailed objects of the invention will be apparent from the following disclosure when taken in connection with the attached drawings.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in detail below.

In the accompanying drawings,

Figure 1 is a front elevational view of a refrigerator embodying the subject matter of this invention;

Figure 2 is a vertical, central, cross-sectional view through the upper part of the structure showing most of the base in elevation;

Figure 3 is a top plan view of the cooling unit for the food storage compartment;

Figure 4 is a view partly in elevation and partly in section of a portion of the humidifying arrangement showing the parts separated; and

Figure 5 is a similar view showing the parts in operative relationship.

The refrigerator herein disclosed and as illustrated in the drawings comprises a heat insulated casing 1 of suitable size and of horizontal cross-sectional shape provided generally with the upper and lower spaces 2 and 4 respectively separated from each other by a heat insulating wall, as shown in Figure 2. Access to the upper space is provided through an opening in the housing which is normally closed by a door 3 which seals that opening. Similarly the lower space is opened through a doorway which is normally closed and sealed by the door 5. The base is shown generally at 6 and includes the usual compressor and motor and appurtenant equipment not shown in the drawings.

Within the upper space 2 is an evaporator 7 in the form of a double walled metallic housing forming a confined space and provided with shelves for supporting ice cube pans. The fluid refrigerant line 8 extends from the base, not shown, through one wall of the housing 1 to the space formed between the double walls of the evaporator 7. The delivery line 8 supplies the refrigerant which may be any suitable liquid, as for example "Freon," into the bottom of the evaporator while the space between the double walls is connected at its upper end to one end of a cooling coil 9 in the frozen food compartment 2, which coil may be mounted on one wall thereof. The discharge end of this coil after passing downwardly through the wall separating the compartments 2 and 4, connects to one end of a spiral coil 10, as clearly shown in Figure 3.

The coil 10 is mounted upon and in contact with the upper wall of a flat metallic container 11, preferably dished towards the center, as shown, and forming a heat absorbing unit mounted against the lower face of the wall dividing compartment 2 from compartment 4, so that the coil 10 is substantially buried in the heat insulating wall, as shown. Attached to the end face of the shallow container 11 and lying in a radial direction are a plurality of metallic fins 12 which are in heat conducting relation with the container 11 and exposed to the circulation of air within the compartment 4. The fins 12 are of gradually increasing depth inwardly towards the center so that any condensate formed thereon will run towards their inner ends, for a purpose to be described later. The other end of the coil 10 is connected by a pipe 13 embedded in the wall of the casing 1 to the compressor unit in the base 6.

A fresh water connection 14 extends to a second spiral coil 15 nested with the coil 10 and likewise attached to the upper wall of the shallow dished container 11. The inner end of the coil 15 is connected by a pipe 16 which extends to the exterior of the cabinet 1 and is provided with a faucet or valve 17, as clearly shown in Figure 2. A drain shelf 18 is mounted under the valve 17 and is connected by a drain pipe 19 lying in the wall of the cabinet 1, to the main

waste drain 20. The connection 16 has a branch 21 which extends downwardly through a center aperture in the container 11, as shown in Figure 2, to a valve 22 having a discharge nozzle at its other side, as clearly illustrated in this figure.

Extending vertically and centrally of the cabinet 1 is a sectionalized drain pipe composed of the sections 23 and 25. The upper end of section 23 telescopes the nozzle at the end of valve 22 and is provided with a surrounding cup 24 mounted thereon and positioned adjacent the inner ends of the fins 12. The pipe 23 has a series of holes just above the floor of the cup 24 so that any condensate which is discharged into the cup may drain through these holes into the sectionalized drain pipe. Each of the pipe sections 25 has a surrounding cup 26 mounted on the upper end thereof, the construction and position of which is best seen from Figures 4 and 5. The upper end of each pipe section 25 is contracted and of conical form where it projects above the corresponding cup bottom. The lower end of each pipe section 25 as well as the pipe section 23 is provided with a slightly enlarged cylindrical end 27 having a series of slots or apertures 28 therein. In assembled relation these enlarged ends 27 fit over the conical ends of the pipes 25 and terminate a short distance above the bottom walls of the cups 26, as clearly illustrated in Figure 5. The end of the waste drain 20 is provided with a cup 26 and has a conical end like that shown in Figure 4. The lower end of the lowermost pipe section 25 is constructed as shown in Figure 4. Thus the sectionalized pipe extends ultimately to the drain 20. At 29 are a series of circular shelves having central openings to receive the cups 26, as clearly illustrated in the drawings. These shelves are supported on circular tracks 30 mounted on the inner wall of the campartment 1 and provided with a series of balls 31 on which the shelves are rotatively mounted at their apertures. In accordance with common ball bearing support construction, the channels 30 can be constructed to prevent the balls from being lost therefrom while permitting easy movement thereof.

The shallow container 11 is filled with some suitable secondary refrigerant liquid of which there are many well known types so that under the operating conditions to be encountered it will circulate therein under the thermo-siphonic forces involved without freezing.

The operation of the refrigerator will be briefly reviewed. The cooling liquid circulates from the compressor through the supply line 8, the evaporator 7, the cooling coil 9, the cooling coil 10 and by return line 13 to the compressor. The parts are proportioned and the temperature controlled so that ice cubes can be readily frozen within the evaporator 7 and the other usual functions of a unit of this type performed. The somewhat warm but still cool liquid in flowing through the coil 9 will maintain the compartment 2 sufficiently cold for the purpose of properly storing frozen foods. The liquid still cool flows through the coil 10 to absorb heat from the secondary refrigerating liquid in the shallow container 11 which is circulating under the thermo-siphonic forces resulting from the absorption therein of heat from the compartment 4 with the aid of the fins 12. The resultant warm liquid will then return through the line 13 to the compressor and appurtenant equipment to be recompressed and chilled for reuse. The liquid circulating in this part of the system will preferably be of a type which of course vaporizes as it absorbs heat and is reliquefied upon compression and condensation. The fresh water in the coil 15 will be sufficiently chilled for drinking purposes by the absorption of heat therefrom by the secondary refrigerant in the container 11. Thus cold water will be available as desired at the faucet 17.

One feature of this refrigerator is that there is always available partially chilled water for filling the ice cube pans so that ice can be quickly made when it is needed, in quantity.

The valve 22 is normally open so that a fine stream of water is delivered into the sectionalized pipe 23—25. This water flows into each cup and fills it to the level of the upper conical end of each pipe section 25, whereupon the excess flows over the end and into the sectionalized pipe. Thus each cup 26 is filled to the level of the conical end of the associated pipe 25 and the final excess is discharged through the drain 20. There is added to this water any condensate which collects on the fins 12 and drops into the cup 24. These small bodies of water exposed to the interior of the compartment 4 keep the humidity thereof high so as to combat the food dehydrating tendencies present in a refrigerator. Furthermore this movement of the water progressively downwardly will tend to increase the circulation of the air in the compartment at 4, and thus insure uniform temperature conditions throughout.

The cooling unit comprising the shallow container 11 is mounted at the top of the space 4 which, as is well known, is the warmest part of the compartment, thus insuring efficient heat absorption. The shallow container 11 forms the entire top of the compartment 4, so that the warm air as it rises will be sure to come into contact therewith. The radially extending fins 12 depending from the end face of the container 11 will also facilitate the formation of air currents, forming as they do, radial channels through which the air may flow in heat exchange relation with the fins in the lower wall of the container 11.

It will be seen that the sectionalized pipe 23—25 can easily be taken apart for cleaning, and as each section is taken out the shelves are freed for removal. Likewise it will be seen that all parts of each shelf can be brought opposite the door opening by rotating the shelves so that there are no places in this refrigerator not easily reached. The small extensions at the lower edges of the enlarged ends 27 hold the parts in proper spaced relation.

From the above description it will be apparent that the features of this invention may be easily modified by those skilled in the art and I do not, therefore, desire to be strictly limited to the illustrative embodiment thereof disclosed herein. I prefer to be limited only as required by the claims.

What is claimed is:

1. A refrigerator comprising a heat insulated housing having a wall dividing it into upper and lower compartments, an ice cube unit and a cooling coil connected in series and mounted in the uppermost compartment, a shallow container forming the ceiling of the lower compartment and containing a secondary refrigerant, a cooling coil mounted on the upper wall of said shallow container and connected to the coil in the upper compartment, and leads for supplying and withdrawing a refrigerant liquid through said coil and unit.

2. In the combination of claim 1, said shallow container having a series of radial fins attached to its lower wall and exposed to the interior of the lower compartment.

3. In the combination of claim 1, said shallow container having a series of radial fins attached to its lower wall and exposed to the interior of the lower compartment, and a sectionalized drain supported centrally of the lowermost compartment, said fins being of decreasing depth towards the center and positioned to discharge conduit into said drain.

4. In the combination of claim 1, a fresh water cooling coil also mounted on the upper wall of said shallow compartment.

5. In the combination of claim 1, a fresh water cooling coil also mounted on the upper wall of said shallow compartment, a sectionalized drain mounted centrally of the lowermost compartment and terminating near the center of said shallow container, a connection from said water coil for discharging water into said drain, and means forming cups on said drain for holding pools of water.

6. In the combination of claim 1, a fresh water cooling coil mounted on the upper wall of said shallow container and having a faucet mounted on the exterior of said housing.

7. A refrigerator comprising a heat insulating housing of circular cross-section having a horizontal wall forming upper and lower compartments, an ice cube unit and a cooling coil mounted in the upper compartment and connected together in series, a shallow container forming the ceiling of the lower compartment and containing a liquid, a cooling coil attached to the upper wall of said container and connected at one end to the coil in the upper compartment and at the other end to a return line, a refrigerant supply line connected to said ice cube unit, and a fresh water cooling coil also mounted on the upper wall of said container and provided with a faucet exterior of said housing.

8. In the combination of claim 7, a plurality of radially depending fins mounted on the bottom wall of said container and exposed to the interior of the lower compartment.

9. In the combination of claim 7, a plurality of radially depending fins mounted on the bottom wall of said container and exposed to the interior of the lower compartment, and a sectionalized drain extending vertically and centrally of the lower compartment, said fins positioned to discharge condensate thereinto.

10. In the combination of claim 7, a plurality of radially depending fins mounted on the bottom wall of said container and exposed to the interior of the lower compartment, a sectionalized drain extending vertically and centrally of the lower compartment, said fins positioned to discharge condensate thereinto, and a connection from said fresh water coil for discharging water into said drain.

11. In the combination of claim 7, a plurality of radially depending fins mounted on the bottom wall of said container and exposed to the interior of the lower compartment, a sectionalized drain extending vertically and centrally of the lower compartment, said fins positioned to discharge condensate thereinto, a connection from said fresh water coil for discharging water into said drain, and means forming part of said drain forming cups for holding water therein exposed to the lower compartment.

12. In the combination of claim 7, a plurality of radially depending fins mounted on the bottom wall of said container and exposed to the interior of the lower compartment, a sectionalized drain extending vertically and centrally of the lower compartment, said fins positioned to discharge condensate thereinto, a connection from said fresh water coil for discharging water into said drain, means forming part of said drain forming cups for holding water therein exposed to the lower compartment, and rotatable circular shelves mounted in the lower compartment through which said drain passes.

13. In a refrigerator of the type described the combination of a heat insulating housing of circular cross-section, cooling means mounted in said housing and a vertical drain pipe supported centrally of said housing and comprising sections, the upper end of each section having a surrounding cup and the section terminating above the bottom of said cup, and the lower end of each associated section discharging into said cup.

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