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HOUSEHOLD REFRIGERATOR INCLUDING ICE AND WATER DISPENSING MEANS

Original Filed Aug. 2, 1967

Sheet 1 of 2

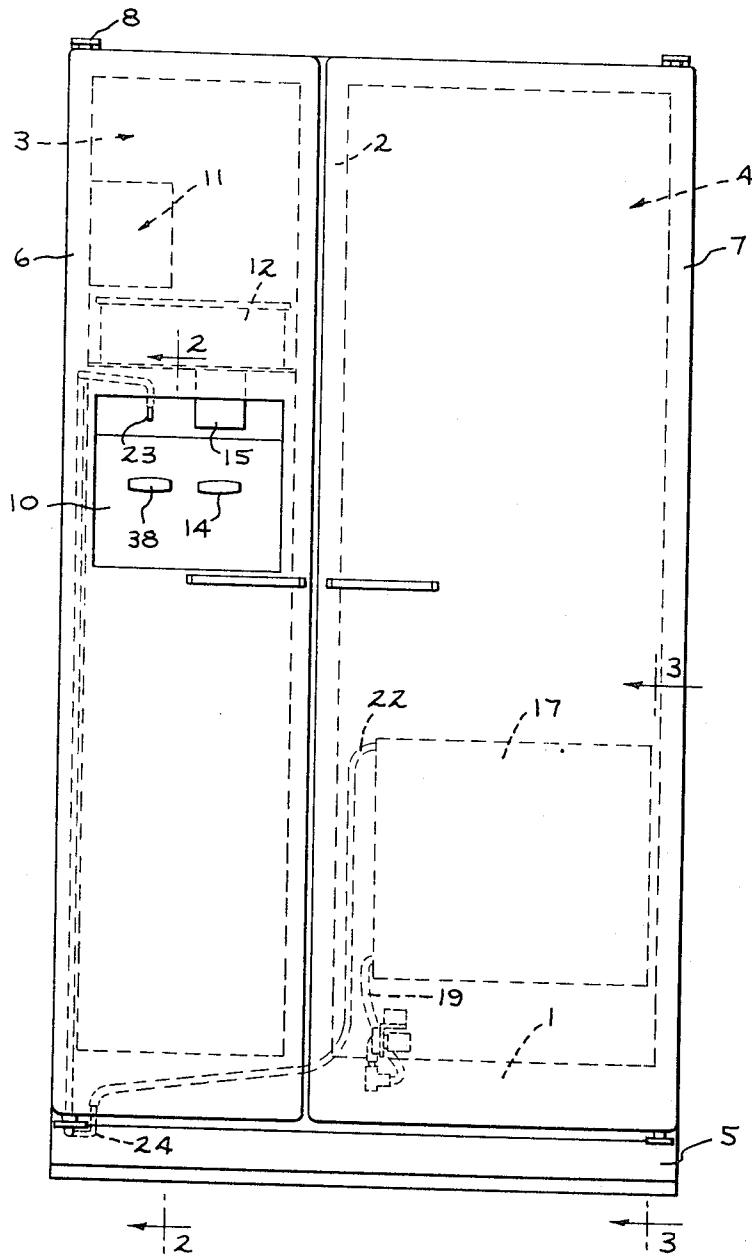


FIG. 1

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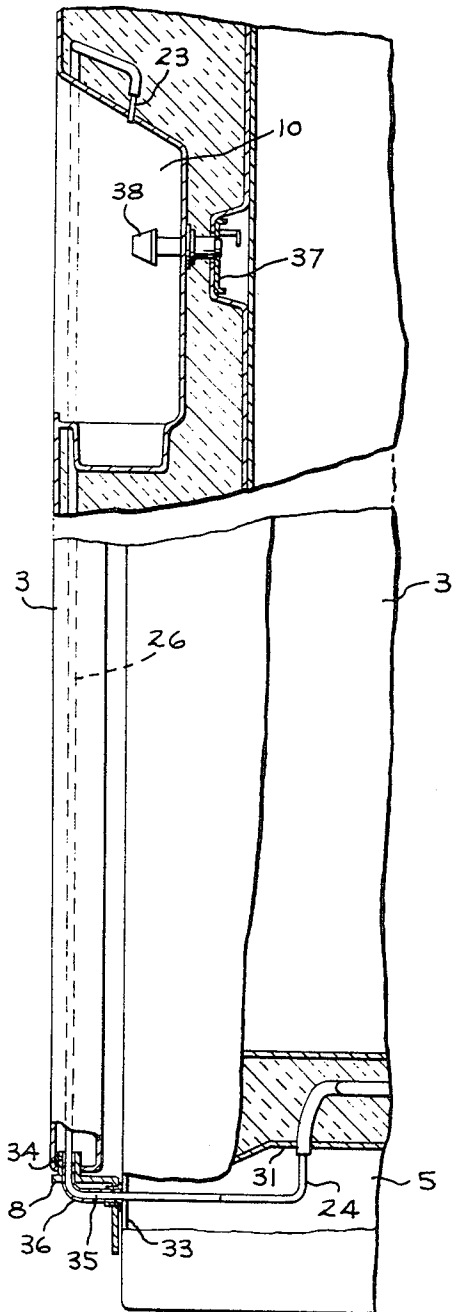


FIG. 2

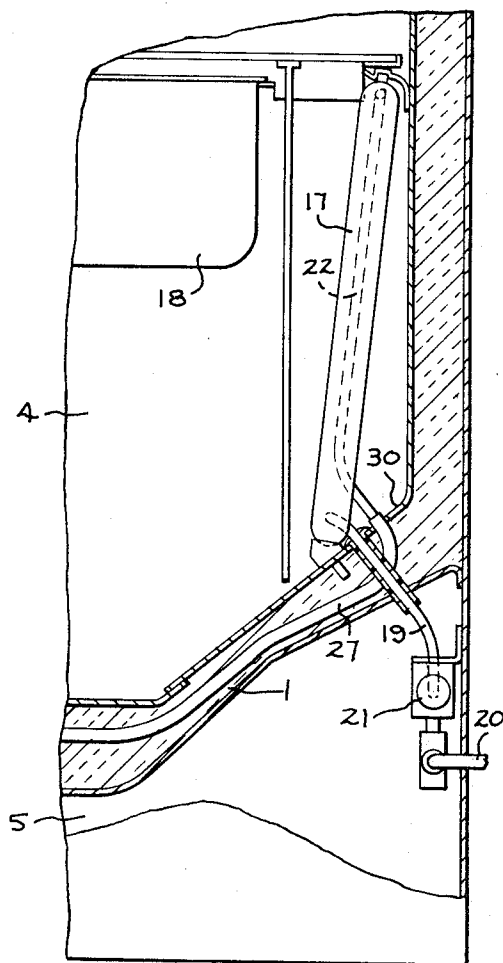


FIG. 3

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## HOUSEHOLD REFRIGERATOR INCLUDING ICE AND WATER DISPENSING MEANS

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Continuation of application Ser. No. 657,940, Aug. 2, 1967. This application Feb. 9, 1968, Ser. No. 704,493  
U.S. Cl. 62—339 10 Claims  
Int. Cl. F25d 23/12; B67d 5/62

### ABSTRACT OF THE DISCLOSURE

A household refrigerator comprising freezer and fresh food compartments includes an ice and cold water service area on the freezer door and water supply means for supplying water cooled in the fresh food compartment to the service area.

### Cross-reference to related application

This application is a continuation of application No. 657,940 filed Aug. 2, 1967, now abandoned.

### Background of the invention

Many modern refrigerators include a freezer compartment operating at below freezing temperatures, a fresh food compartment operating at above freezing storage temperatures and separate doors for closing the access openings to the two compartments. In present day cabinet design, the doors form substantially the entire front or face area of the cabinet with the result that any means designed for dispensing ice cubes, refrigerated drinking water or the like without opening one or both doors must be provided within one or both doors. Since ice cubes or pieces must be made and preferably stored at below freezing temperatures, means for dispensing ice pieces is most conveniently provided in the freezer door.

Various arrangements have also been proposed for dispensing cold water in combination with the ice dispensing means. The cooling of the water supply at either atmospheric or water supply line pressures within the freezer compartment requires the provision of some means for preventing the water from freezing. Means used or proposed for this purpose have included either substantial insulation of the storage tank or heating of the tank. Such solutions to the freezing problem are costly and the heating adds an additional thermal load to the refrigeration system. While various arrangements have also been used or proposed for cooling the water in the above freezing temperatures of the fresh food compartment, the water dispensing component of such arrangements has been either within the fresh food compartment or in the door associated with that compartment.

### Summary of the invention

The present invention is directed to a household refrigerator including a freezer compartment, a fresh food compartment, means in the freezer door for exteriorly dispensing cooled water and improved means for refrigerating water supplied to the cabinet from the usual household water supply line in the fresh food compartment and conveying the cooled water to the freezer door dispensing area without passing through the freezer compartment.

In the illustrated embodiment of the invention, the refrigerator includes a freezer compartment and a fresh food storage compartment in side-by-side relationship and separate doors for closing the front access openings of the two compartments. The freezer door includes a recess in the front surface thereof defining an ice and cold water dispensing area. The cold water supply means for

supplying cold water to the dispensing area or recess includes a cooling reservoir mounted in the fresh food storage compartment having an inlet connected to a high pressure water supply line. A flexible plastic water supply tube for conveying refrigerated water from the outlet of the cooling reservoir to the freezer door recess extends through the insulated bottom wall of the cabinet and through the front of the cabinet below the freezer door. The supply line then extends upwardly through a hollow hinge pin forming part of the hinge means for supporting the freezer door on the face of the cabinet and through the freezer door to the dispensing recess. By this arrangement no portion of the water supply means is subjected to the sub-freezing temperatures of the freezer compartment so that regardless of the temperature maintained in the freezer compartment or the rate of water consumption, there is no danger of any portion of the water supply means being cooled to a temperature such that the water freezes. Preferably, the cooling reservoir is positioned along the lower rear wall of the fresh food compartment, i.e., in the least accessible portion of the storage area. The water supply line leading from the cooling reservoir to the dispensing area comprises a flexible plastic tube which is heat insulating and which also permits a twisting action over the length thereof within the freezer door so that the door can be rotated between its closed and open positions without collapsing or damaging the tube.

### Brief description of the drawings

With reference to the accompanying drawing,

FIGURE 1 is a front elevational view of a side-by-side refrigerator-freezer cabinet incorporating the present invention;

FIGURE 2 is a vertical sectional view taken generally along line 2—2 of FIGURE 1; and

FIGURE 3 is a vertical sectional view taken generally along lines 3—3 of FIGURE 1.

### Brief description of the preferred embodiment

While the invention is applicable to any combination refrigerator-freezer in which a water service area is provided in the door closing the access opening to the freezer compartment, it will be particularly described with reference to a refrigerator including two vertically extending compartments separated by a vertical partition. The cabinet illustrated in FIGURE 1 of the drawing comprises insulating walls including an insulated bottom wall 1 and an insulated vertical partition 2 separating the cabinet volume into a freezer compartment 3 and a fresh food compartment 4. The bottom wall 1 separates these two compartments from the machinery compartment 5 in the lower portion of the cabinet. The access openings to the two compartments 3 and 4 are respectively closed by a freezer door 6 and a fresh food door 7 pivotally mounted on the face of the cabinet at their outer edges by means of pivot hinges 8.

The refrigerator also includes a suitable refrigeration system (not shown) for maintaining the freezer compartment 3 at sub-freezing temperatures and the fresh food compartment 4 at above freezing storage temperatures. In accordance with the usual practice, the condensing component of the refrigeration system is contained within the machinery compartment below the bottom wall 1.

A recess or depression 10 is provided in the front or exterior surface of the freezer door 3. This recess or depression 10 defines a service or dispensing area for dispensing either ice pieces or refrigerated water exteriorly of the cabinet so that either of these items are made available without opening the doors.

Any suitable means may be provided within the freezer compartment 3 for manufacturing, storing and dispensing

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ice pieces to the dispensing area represented by the recess 10. These components are schematically illustrated in the drawing as including an automatic ice maker 11 mounted in the upper portion of the freezer compartment 3 and an ice storage and dispensing means 12 positioned below the ice maker 11 in a position to receive the ice pieces produced by the ice maker. The storage and dispensing means 12 includes electrically operated means and control circuitry (not shown) including a control switch operated by a switch operating means 14 provided in the recess 10 to dispense one or more ice pieces through a chute 15 provided in the upper wall of the recess 10. By this arrangement, the ice pieces are manufactured, stored and dispensed in the below freezing environment of the freezer compartment 3.

In accordance with the present invention, means are provided for supplying cold water to the recess 10 at above freezing temperatures. This cold water supply means includes water storage and cooling means such as a container 17 which is preferably located, as shown in FIGURE 3, in the lower rear portion of the fresh food storage compartment 4 behind one or more storage pans 18. The inlet 19 of the storage means 17 is connected to a high pressure water supply line 20 through a solenoid operated valve 21 located in the machinery compartment 5.

The outlet 22 of the storage means 17 is connected to a water tap 23 extending through the top wall portion of the recess 10 by means of a relatively small flexible plastic tube, generally indicated by numeral 24, extending through the insulated bottom wall 1, the lower hinge 8 and upward through the door 3 to the outlet 23. The plastic walls of tube 24 decrease heat transfer between the water flowing therethrough and the insulation or air surrounding that tube along its length and, since it is flexible, the portion thereof indicated by the numeral 26 extending upwardly through the door 3 can twist sufficiently to permit opening and closing of the door 3 without kinking or collapsing of the tube.

More specifically, the tube 24 is threaded through a metal conduit 27 extending from within the fresh food liner 30 through the wall 1 and outwardly through the bottom face 31 of that wall at a point in the machinery compartment 5 adjacent the lower hinge 8. The conduit 27 provides a passage for threading the tube through the wall 1 and also protects that tubing from the insulation contained within the wall 1.

After passing through the front wall 33 of the machinery compartment adjacent the hinge 8, the tube passes upwardly through a hollow hinge pintle 34 forming part of the hinge structure 8 into the insulated space within the door 3 for connection to the water outlet 23. Preferably the door 3 is insulated with glass fiber or similar material which does not bond or adhere to the tube so that during opening and closing of the door any twisting action is distributed over the full length of tube portion 26.

In order to prevent the portion of the tube indicated by the numeral 35 between the face of the front wall 33 of the machinery compartment and the hollow hinge pin 34 from bending and kinking during opening and closing movement of the door, a short length of bent copper tubing or other restricting means is provided between the lower end of the hinge pintle 34 and the face of the cabinet 33. Unless means such as the copper tube 36 is provided in this area for preventing bending of the tube during operation of the door, the tube may bend to an angle of at least 90° and either become damaged or eventually fail.

The operation of the valve 21 is electrically controlled by means of a switch 37 provided in the front door 3 rearwardly from the recess 10, this switch including an arm or actuator 38 in the form of a push rod extending into the recess and designed, when depressed, to close the switch 37 and open the valve 21.

It will be noted that the water supply control valve 21 is positioned in a portion of the water supply means ahead of the plastic tube 24. Thus the water in the plastic tube

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24 is at a low or atmospheric pressure and water supply line pressures are restricted to the portion of the water supply means ahead of the valve 21. While this valve has been shown as being connected into the inlet side of the water storage means 17, it is obvious that it could be connected to the outlet end thereof between that outlet and the tube 24.

In the assembly of the illustrated refrigerator the portion of the plastic tube 26 is positioned within the door 3 prior to the assembly of the inner and outer panels comprising this door. When the door is mounted on the face of the cabinet, the lower portion is threaded through the hollow hinge pin 34 and the tube 36 into the machinery compartment 5. It is then connected to the remaining threaded portion of tube 24 which has been threaded through the conduit 27 and the end thereof connected to the outlet 22 of the storage means 17. Since the entire water supply system is located either in the machinery compartment 5 or the fresh food compartment 4 or in an area of the door 3 which is not cooled to below freezing temperatures, the water contained therein is at no time subjected to freezing temperatures. However, it is cooled to acceptable or desired drinking temperatures during storage thereof in the storage means 17.

While there has been shown and described a specific embodiment of the invention it will be understood that it is not limited thereto and it is intended by the appended claims to cover all such modifications as fall within the spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a refrigerator cabinet; insulated walls defining a fresh food storage compartment and a freezer storage compartment, a machinery compartment separate from said storage compartments, an insulated door for closing the access opening to said freezer compartment, hinge means including a hollow hinge pin for pivotally supporting said door on the face of said cabinet, service means on the face of said door including means for dispensing cold water, and cold water supply means for supplying cold water to said cold water dispensing means comprising: a water storage means in said fresh food storage compartment having an inlet and an outlet, water supply means for connecting said water storage means inlet to a source of high pressure water, a water supply line extending through one of said insulated walls and through said hollow hinge pin for connecting said storage means outlet to said cold water dispensing means, valve means in said supply means disposed in said machinery compartment, and valve control means including an actuator operably positioned on said door for controlling the operation of said valve means.

2. The cabinet of claim 1 in which said one of said insulated walls separates said storage compartments from said machinery compartment.

3. The cabinet of claim 1 in which said supply tube is a plastic tube.

4. The cabinet of claim 1 including an ice service for dispensing ice pieces to said service means.

5. In a refrigerator cabinet comprising insulated walls including a bottom wall defining a fresh food storage compartment and a freezer compartment having an access opening at the front thereof, a machinery compartment below said bottom wall,

- an insulated door for closing said access opening, said door including a bottom flange, hinge means for supporting said door on said cabinet including a hollow hinge pin extending through said flange,

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said door including a recess in the front face thereof spaced from said bottom flange,  
ice piece storage means in said freezer compartment including means for dispensing ice pieces into said recess,

a water outlet in said recess,

means for supplying cold water to said outlet comprising;

a water cooling reservoir positioned in said fresh food compartment for operation at the temperature of said compartment, said reservoir including an inlet and an outlet,

a water supply line for supplying water under pressure to said reservoir inlet,

a conduit extending generally through said insulated bottom wall from a point within said fresh food compartment adjacent said reservoir into said machinery compartment adjacent said hinge means,

a flexible plastic tube having one end connected to said reservoir outlet, said tube passing through said conduit and said hollow hinge pin and upwardly through said door to said water outlet,

electrical valve means in said water supply means for controlling the flow of water to said outlet,

and electrical switch means including switch operating means in said recess for controlling the operation of said valve means to effect flow of water from said outlet.

6. In a refrigerator cabinet comprising insulated walls including a bottom wall defining a fresh food storage compartment and a freezer compartment having an access opening at the front thereof, a machinery compartment below said bottom wall,

an insulated door for closing said access opening, said door including a bottom flange,

hinge means for supporting said door on the front of said cabinet including a hollow hinge pin extending through said flange,

said door including a recess in the front face thereof spaced from said bottom flange,

ice piece storage means in said freezer compartment and means for dispensing ice pieces into said recess,

a water outlet in said recess and means for supplying cold water to said outlet comprising;

a water cooling reservoir positioned in the rear portion of said fresh food compartment for cooling water to the temperature of said compartment, said reservoir including an inlet and an outlet,

a water supply line including an electrically operated valve disposed in said machinery compartment for supplying water under pressure to said reservoir inlet,

a conduit extending generally through said insulated bottom wall from a point within said fresh food compartment adjacent said reservoir into said machinery compartment adjacent said hinge means,

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a flexible plastic tube having one end connected to said reservoir outlet, said tube passing through said conduit and said hollow hinge pin and upwardly through said door to said water outlet,

and valve control switch means in said recess for controlling the operation of said valve to effect flow of water from said outlet.

7. The cabinet of claim 6 in which the length of tube in said door between said hinge and said outlet is of a length sufficient to permit opening of said door without collapsing said tube.

8. In a refrigerator cabinet;

insulated walls defining a fresh food storage compartment and a freezer storage compartment,

a machinery compartment separate from said storage compartments,

an insulated door for closing the access opening to one of said compartments,

hinge means including a hollow hinge pin for pivotally supporting said door on the face of said cabinet,

means on the face of said door for dispensing cold water,

and cold water supply means for supplying cold water to said cold water dispensing means comprising:

a water storage means in said fresh food storage compartment having an inlet and an outlet,

a water supply line for connecting said water storage means inlet to a source of high pressure water,

a water supply line extending through one of said insulated walls and through said hollow hinge pin for connecting storage means outlet to said cold water dispensing means,

valve means in said supply means,

and valve control means including an actuator operably positioned on said door for controlling the operation of said valve means.

9. The cabinet of claim 8 in which said one of said insulated walls separates said one of said compartments from said machinery compartment and said valve means is in said machinery compartment.

10. The cabinet of claim 8 in which said supply tube is a plastic tube.

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