HOUSEHOLD REFRIGERATOR WITH THROUGH-THE-DOOR ICE SERVICE

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ABSTRACT OF THE DISCLOSURE

A household refrigerator divided by a horizontal partition into an upper freezer compartment and a lower fresh food compartment includes an ice dispenser in the freezer compartment, an ice service area in the face of the fresh food compartment door and aligned passages in the partition and the fresh food door for conducting ice from the dispenser to the service area.

BACKGROUND OF THE INVENTION

Many modern household refrigerators feature automatic ice makers including a receptacle for receiving and storing a supply of ice at below freezing temperatures. All of the commercially available refrigerators including this feature require opening of the freezing compartment door whenever the user desires to obtain ice pieces from the receptacle and regardless of the number of ice pieces required at any one time. Each door opening results in entrance of moist air into the freezer compartment and loss of refrigerated air from that compartment. To avoid the resultant increase load on the refrigeration system and for added user convenience, it is desirable to provide means for dispensing the stored ice pieces exteriorly of the refrigerator cabinet. In previously proposed services of this type, the ice pieces have been dispensed through a passage provided in a stationary wall of the cabinet as shown for example in Patent 2,212,405 Rose et al. issued Aug. 20, 1940. However, such arrangements cannot be adapted to modern refrigerator cabinets in which the only exposed surfaces may be the door or doors which overlap the front edges of the cabinet and thus form the entire face of the cabinet.

SUMMARY OF THE INVENTION

The present invention is particularly concerned with a combination refrigerator freezer including a horizontal partition dividing the refrigerator cabinet into an upper freezer compartment and a lower fresh food compartment and an ice service area in the lower or fresh food compartment door at a convenient level, as for example substantially at counter top level. The ice dispenser is positioned within the upper or freezer compartment and means for conducting ice pieces from the dispenser to the service area comprises a first passage extending through the partition with its upper end positioned to receive ice pieces from the dispenser and its lower or outlet end positioned to discharge these ice pieces into a second passage provided in a fresh food compartment door or more specifically in the upper edge portion thereof. The second passage is arranged to conduct the ice pieces directly to the service area.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a front elevational view of a household refrigerator including the ice dispensing service of the present invention;
FIG. 2 is a vertical sectional view taken generally along line 2—2 of FIG. 1;
FIG. 3 is an enlarged view of a portion of the door structure shown in FIG. 2; and
FIG. 4 is a rear elevational view of the door structure illustrating additional details thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIGS. 1 and 2 of the accompanying drawing, there is illustrated a combination household refrigerator including an upper freezer compartment 1 and a lower fresh food compartment 2 separated from the freezer compartment by a horizontal partition 3. The front access openings to these compartments are respectfully closed by a freezer compartment door 4 and a fresh food compartment door 5.

The fresh food door 5 comprises spaced outer and inner panels 6 and 7 with the peripheral edges of the door, including the top edge 8, comprising part of the inner panel 7 and being of a substantial width. More specifically as illustrated in FIGS. 2 and 3 of the drawing, the upper edge 8 of the fresh food door is of a width such that when the door is closed it substantially overlaps the front or mullion portion 9 of the partition 3.

The outer panel wall 6 forming the face of the fresh food door 5 includes a recess 10 generally defining a service area or area at which ice pieces are delivered exteriorly of the cabinet from an ice dispenser 11 positioned in the freezer compartment 1.

The illustrated ice dispenser 11 is of the type more fully described and claimed in the copending application of Robert J. Alvarez, Ser. No. 668,364 filed Sept. 18, 1967 (now Patent No. 3,422,994) and assigned to the same assignee as the present invention. Briefly described it includes, as shown more particularly in FIG. 2, a receptacle 14 for receiving and storing ice pieces produced by an automatic ice maker 15 and rotatable dispensing means 16 positioned in the receptacle and driven by speed reduction drive means including a motor 18. The receptacle includes a discharge opening 19 at the front thereof and upon rotation of the dispensing means 16, ice pieces stored in the receptacle are conveyed to the discharge opening 19 through which batches of the stored ice are periodically discharged.

In accordance with the present invention, means are provided whereby the batches of ice periodically discharged through the opening 19 are delivered directly to the service area represented by the recess 10. To this end, the partition 3 includes a passage 20 having its inlet end 21 in the upper surface of the partition for receiving ice pieces from the discharge opening 19 and its lower end 22 terminating in the front or mullion portion 9 of the partition above the upper edge 8 of the fresh food compartment door. The fresh food compartment door 5 includes a passage 22 having its inlet 24 in the upper door edge 8 aligned with the outlet end 22 of the partition pas-
sage 23 when the door is closed and its outlet end 25 in the top wall of the service recess 10.

Preferably both of the passages 20 and 24 are composed of a heat insulating material such as a plastic material. Both of the passages 20 and 24 means for limiting or preventing the circulation of air through these passages. The passage 20 includes a trap door 27 adjacent the lower outlet front end thereof which is either gravity or spring biased to a normally closed position and which is opened by the weight of the ice during discharge of the ice through the passage 20. The trap door 27 is pivoted from the recess 10 and supported by means connected to the trap door 27 and the trap door 27 depends to some extent upon the size of the ice pieces being conducted into the service area 10. When these ice pieces are of the usual "cube" size, the passage 20 and the trap door 27 are designed to permit the passage of the ice pieces and to substantially or completely prevent the flow of air through the passage 20 which as will be seen from FIG. 2 of the drawing in effect connects the freezer compartment 1 with the fresh food compartment 2. However, if crushed ice provided for example by the crushing means described and claimed in the copending application of the present assignee and assignor No. 756,734 is used. Moreover, the present invention is included in the ice service, it is desirable that the passage 20 be operating continuously at below freezing temperatures to prevent the crushed ice from adhering to the walls thereof.

To assure such cooling of the walls of the passage 20, the trap door 27 is designed so that it does not completely close the passage 20 when in its normal or closed position but rather permits the flow of a small amount of the relatively heavy below freezing air from the freezing compartment 1 downwardly through the passage 20 during normal operation of the refrigerator. If the refrigerator is the type shown in FIG. 13 in the accompanying drawing in which both the freezer compartment and fresh food compartment are maintained at their proper operating temperatures by the circulation of air over an evaporator section 28 positioned within the portion 3 by means of a fan 31, the duct work providing the air circulation may be designed so that a slightly higher pressure is maintained within the freezer compartment 1 than in the fresh food compartment 2 thus assuring a downward flow of freezer air through the passage 20 whenever the fan 31 is running.

As the door passage 23 is in communication with the ambient or room air, it is desirable that a more positive sealing means be provided for preventing flow of air through this passage. Thus there may be employed a mechanically operated trap door 33 pivotally mounted by means of a shaft 32 within the upper end of passage 23 and adapted to seat against shoulders 34 formed by the reduced inlet end of the passage 23. The means for operating the trap door 33 comprises, as shown particularly in FIGS. 3 and 4 of the drawing, a push rod 35 slidably mounted in the rear wall 36 of the recess 10 and having a rear end portion adapted to engage an offset or crank portion 37 of a drive member 38 pivotally mounted on the rear surface of the wall 36. This drive member 38 also includes a arm 40 connected by a link 41 to an arm 42 forming part of the shaft 32. Thus rotation of the member 38 moves the arm 42 downwardly and thus pivots the trap door 33 about the axis of its shaft 32. When the switch 51 is released, spring 44 returns the trap door to its closed position.

Rearward movement of the rod 35 is also employed to operate the ice dispenser. When the rod approaches its innermost position, a finger 50 carried by rod 35 contacts and closes a switch 51 which controls the energization of the dispenser motor 18.

Thus it is seen that when pressure is applied to the rod 35 by glass or other receptacle inserted into the recess 10, the trap door operating mechanism pivots the trap door 33 downwardly to its open position before the switch 51 closes to operate the ice dispenser. Batches of ice pieces are thereupon dispensed into the glass or other receptacle until pressure on the rod 35 is removed. In order to prevent ice pieces which have just been discharged from the dispenser from being trapped by the closing of the trap door 33, there is preferably provided a time delay for keeping the trap door 33 open for a few seconds after opening the switch 51. Any suitable device may be employed for this purpose. The illustrated means, generally indicated by the numerals 54 comprises a dash pot arrangement mounted rearwardly from the recess 10 and pivotally connected to the crank arm 40. The dash pot 54 delays the action of the spring 44 in returning the trap door 33 to its closed position.

While there has been shown and described what is considered to be the preferred embodiment of the invention, it is to be understood that the invention is not limited thereto and is intended by the appended claims to cover all modifications falling 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 comprising an upper freezer compartment, a lower fresh food compartment, a partition separating said compartments and a door for closing the access opening to said lower fresh food compartment and having an upper edge in overlapping relation to a front portion of said partition when said door is in its closed position:

ice service means comprising an ice dispenser positioned in said freezer compartment, an ice service area in the outer face of said door and means for conducting ice pieces from said dispenser to said area;

said conducting means comprising a first passage extending through said partition and having an upper end positioned to receive ice from said dispenser and a lower end in said front portion of said partition; and

a second passage in said door for receiving ice pieces from said first passage and conducting said ice pieces to said service area.

2. The refrigerator of claim 1 including normally closed means in at least one of said passages for restricting air circulation therethrough;

said means being opened as ice pieces pass through said passages.

3. The refrigerator of claim 2 in which said restricting means is positioned adjacent the outlet end of said first passage.

4. The refrigerator of claim 1 including normally closed air circulation restricting means in said second passage and operating means in said service area for concurrently opening said air circulation restricting means and operating said dispenser.

5. The refrigeration of claim 1 including means for maintaining at least the upper portion of said first passage at below freezing temperatures.

6. In a refrigerator comprising an upper freezer compartment, a lower fresh food compartment, a horizontal partition separating said compartments, a door comprising spaced inner and outer panels for closing the access opening to said lower fresh food compartment and having an upper edge overlapping a portion of said partition when said door is in its closed position:

ice service means comprising an ice dispenser positioned in said freezer compartment and having a discharge opening in the front wall thereof, an ice service area in the outer face of said door and means for conducting ice from said dispenser to said area;

said conducting means comprising a first passage extending through said partition and having an inlet end positioned to receive ice from said discharge opening and an outlet end above said upper edge of said door, and
5 a second passage in said door for receiving ice from said first passage and conducting it to said service area.

7. The refrigerator of claim 6 including a normally closed trap door in said first passage for restricting air flow therethrough.

8. The refrigerator of claim 6 in which said trap door permits sufficient flow of air from said freezer compartment through said first passage to maintain the walls of said first passage at below freezing temperatures.

9. The refrigerator of claim 6 including also a normally closed trap door in said second passage.

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