

- [54] **HOUSEHOLD REFRIGERATOR INCLUDING EXTERIOR ICE SERVICE**
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- [73] Assignee: **General Electric Company**
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- [58] Field of Search ..... **222/146; 62/351, 344, 275, 62/320; 219/200, 201, 214; 137/341**

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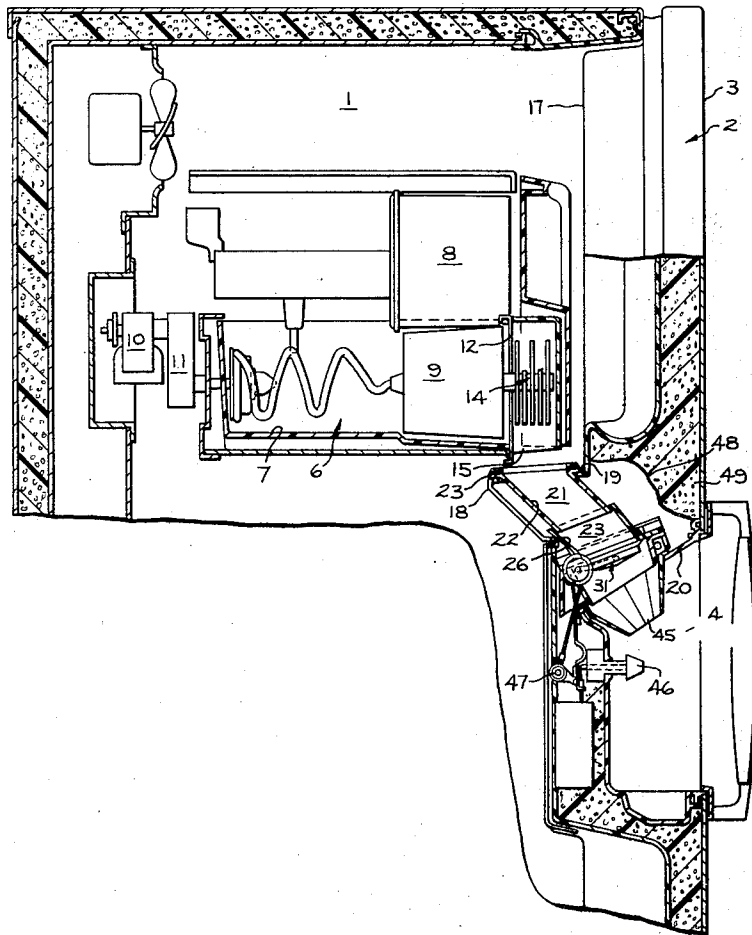
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[57] **ABSTRACT**

A refrigerator including an ice dispenser and crusher in a freezer compartment and an ice delivery passage through the refrigerator door for delivering ice exterior of the cabinet. The passage includes a normally closed closure member and a heater and is so constructed and arranged within the door as to maintain the various portions of the passage at temperatures preventing the accumulation of ice slush and water in the passage and the freezing of the closure member.

**6 Claims, 2 Drawing Figures**

- [56] **References Cited**
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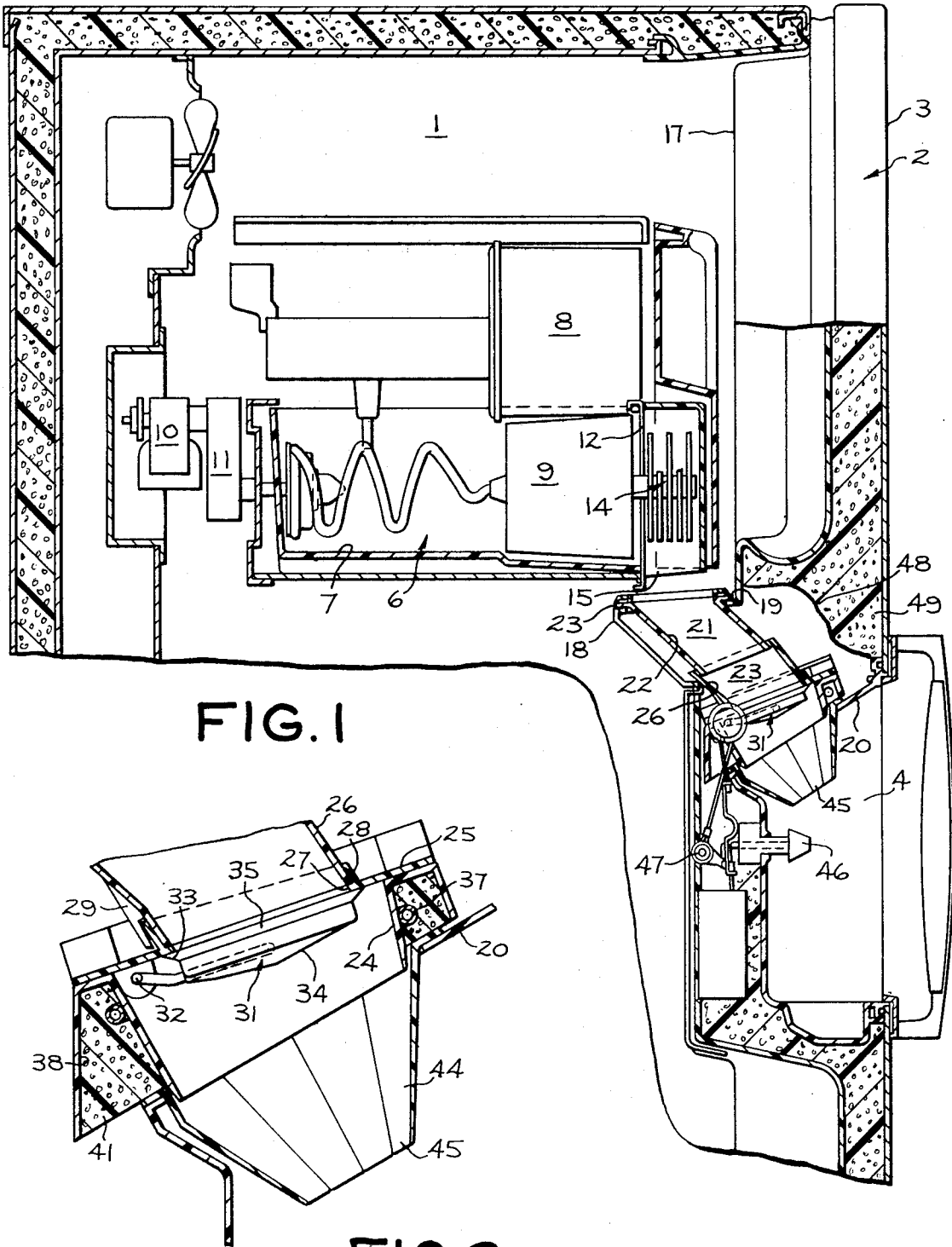


FIG. 1

FIG. 2

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## HOUSEHOLD REFRIGERATOR INCLUDING EXTERIOR ICE SERVICE

In the copending application Ser. No. 803,316, filed Feb. 28, 1969 in the name of Robert Joseph Alvarez and assigned to the same assignee as the present invention, there is described and claimed a household refrigerator including means for dispensing either cube or crushed ice exterior of the refrigerator. More specifically, the Alvarez application describes a refrigerator including a freezer compartment containing a ice storage receptacle and dispenser, means for selectively crushing the ice dispensed from the receptacle and a delivery passage extending, for example, through the freezer door for receiving the cube or crushed ice and conveying the ice to a service area on the exterior surface of the door. It has been found that the satisfactory dispensing of crushed ice through such a passage and the proper operation of the passage closure member provided for normally closing the passage requires a very careful control of the passage operating temperatures.

The present invention is directed specifically to a passage so constructed and arranged within a freezer door that crushed ice will readily pass through the passage without sticking to the passage walls and the passage closure member will be maintained at above freezing temperatures such that the closure member cannot be frozen in a closed position and any moisture collecting thereon or adjacent thereto will be evaporated.

### SUMMARY OF THE INVENTION

In accordance with the illustrated embodiment of the present invention, there is provided a household refrigerator including a freezer compartment having a door for closing the access opening to the compartment and an ice dispenser in the compartment including an outlet and an ice crusher adjacent the door. The door comprises spaced inner and outer panels with the inner panel being formed to include a substantially horizontal area having an opening therein which underlies the crusher outlet when the door is closed. The outer panel includes a service recess extending into the space between the inner and outer door panels below the inner panel horizontal area. The door also includes means defining a slanting ice conducting passage having an outlet opening into the recess and its inlet supported in the opening in the inner horizontal area of the inner door panel. More specifically, the passage comprises a lower section supported on the outer panel and an upper section which is supported on the inner panel and which extends loosely into the upper end of the lower section. The lower section of the passage also includes a port intermediate the ends thereof and a normally closed closure member for the port pivotally mounted below the port. A heater surrounding the lower part of the lower section adjacent the port is adapted to maintain the closure member and the portions of the lower section adjacent the port at temperatures above freezing. The heat from the heater is confined to the desired areas by means of the skirt surrounding and spaced from the lower part of the lower section. Preferably also, the space or area between the inner and outer panels of the door which includes the passage is free of solid insulating material.

### BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a vertical sectional view of a portion of the freezer compartment of a household refrigerator including the ice dispenser service of the present invention; and

FIG. 2 is an enlarged sectional view of a portion of the ice passage forming part of the ice service.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

While the exterior ice service of the present invention may be provided in any refrigerator including a freezer compartment and a door for closing the access opening to that compartment, it will be particularly described in its application to a cabinet containing, in side-by-side relationship, a freezer

compartment and a fresh food compartment. More specifically, in the accompanying drawing, there is illustrated a refrigerator including a freezer compartment 1 extending substantially the full height of the cabinet and having an access opening at the front thereof closed by a door 2. The door includes an outer panel 3 forming the outer surface or face of the door and provided with a recess 4 generally defining a service center or area to which ice is delivered exteriorly of the cabinet from an ice dispenser 6 disposed in the upper portion of the freezer compartment, that is above the level of the recess 4.

The ice dispenser 6 is of a type designed to dispense crushed ice, or selectively crushed or cubed ice. The illustrated ice dispenser is more fully described and claimed in the copending application of Robert J. Alvarez, Ser. No. 756,934, filed Sept. 3, 1968, and assigned to the same assignee as the present invention. Briefly described, it includes a receptacle 7 for receiving and storing ice pieces produced by an ice maker 8. The receptacle contains a dispensing means 9 driven by a motor 10 through a speed reduction drive means 11. Upon rotation of the dispensing means 9, ice pieces stored in the receptacle are advanced by the dispensing means for discharge through an opening 12 in the front wall of the receptacle. A crusher, generally indicated by the numeral 14, supported in front of the discharge opening 12 includes a plurality of crusher arms rotatable with the dispensing means 9 and operable for dispensing crushed ice through the discharge opening or outlet 15 below the crusher 14.

The inner door panel 17 is spaced from the outer door panel 3 and is formed to include an inwardly projecting ledge 18 having a substantially horizontal top surface 19 underlying the outlet 15 of the crusher 14. This ledge, or more specifically the upper surface 19 thereof, extends inwardly from the main portion of the door above the top wall 20 of the service recess 4.

A passage 21 extending from the upper surface 19 of the ledge 18 and through the top wall 20 of the service area recess 4 is provided for conveying ice pieces discharged by the dispenser 6 to the service area.

In accordance with the present invention, this passage includes an upper tubular portion 22, preferably of plastic material, provided with a flange 23 at the upper end thereof for supporting the member 22 on the ledge surface 19. This upper portion 22 extends loosely and telescopically into a lower passage portion 23 supported on the top wall 20 of the recess 4. More specifically, in accordance with the illustrated embodiment of the present invention, this lower portion 23, which is also composed essentially of plastic material includes a lower part 24 supported on the recess top wall 20, a port portion 25 supported on the lower part 24 and an upper part 26 resting on the port portion 25. The port portion 25 includes an opening or port 27 surrounded by flange 28 which telescopically receives the lower end of the part 26. A hook member 29 provided on the outer surface of the part 26 and adapted to engage an adjacent portion of the flange 28 serves to position the part 26 on the port portion 25.

The passage is normally closed by means of a closure member 31 which is pivotally mounted as at 32 below the port 27. This closure member 31 is preferably of a hollow plastic structure and includes a dish upper surface forming an annular flexible lip 33 adapted to engage the lower surface of the member 25 around the port 27 in sealing engagement therewith when the member 31 has closed.

The primary purpose of the closure member 31 is to prevent the loss of cold air from the interior of the freezer compartment 1 or the entrance of warm ambient air into the freezer compartment. It will be seen that with the closure member 31 positioned intermediate the inlet and outlet ends of the passage 21, its lower surface 34 is exposed to ambient temperatures and normally operates at a temperature substantially above freezing while its upper surfaces 35 and the portions of the passage 21 above the closure member are exposed directly to the below freezing temperatures of the freezer compartment.

In order to prevent the closure member 31 from freezing in its closed position due to the freezing of moisture which may collect on the surfaces thereof for any of a number of reasons, there is provided an annular heater 37 surrounding and in heating engagement with the outer surface of the lower part of the passage 24 adjacent and immediately below the port part 25. This heater 37 is adapted to provide sufficient heat to maintain the portions of the closure member 31 and the portions of the passage contacted thereby at above freezing temperatures, preferably slightly above 30° F. In order to concentrate convected heat from the heater 37 to the selected areas, the lower part 24 is also provided with a skirt 38 spaced from the walls of the part 24 and extending downwardly from the top portion thereof with the space beneath the skirt 38 filled with suitable heat insulating material 41. This heat insulating material 41 prevents loss of heat to other areas of the door and concentrates most of the heat from the heater 37 to the section of the passage 21 including the closure member 31.

There are a number of advantages in this heater arrangement. First it melts slush which may accumulate during the dispensing of crushed ice and thereby prevents ice buildup which would occur if the closure member and adjacent areas of the passage were maintained at below 32° F. It also prevents the sealing lip 33 from freezing to its mating surface should either of these surfaces become wet. In addition, it reevaporates condensed moisture in this portion of the passage and this reevaporated moisture migrates to the freezer compartment under normal operating conditions. It also maintains the exposed or lower side of the closure member at temperatures which prevent sweating thereof.

The loose telescopic fit between the upper and lower portions of the passage 21 serves to limit the conduction of heat from the heater 37 to the upper portion of the passage so that the upper portion of the passage will normally operate at below freezing temperatures.

Preferably there is also provided at the lower end of the passage a funnel shaped member 44 composed of a plurality of flexible fingers 45 which serve to direct ice dispensed through the passage into a glass or other suitable receptacle positioned within the recess 4.

Exteriorly operable means from moving the closure member 31 to its open position after dispensing ice through the passage 21 comprises a push rod 46 in the rear wall of the recess adapted, through a cable linkage mechanism 47, to pivot the closure member 31 downwardly about its pivot point 32 when the rod 46 is depressed. This same rod 46 also operates a switch means (not shown) for energizing the dispensing motor 10 when the closure member 31 is opened. Thus the closure member 31 is opened only when the ice is being dispensed through the passage.

Preferably also and in order to maintain the desired operating temperatures throughout the passage 21, the area of the door indicated generally by the numeral 48 adjacent the passage 21 is free of the usual heat insulating material 49 provided in other portions of the door, that is, in other areas between the inner panel 17 and the outer panel 3 of the door 2. By eliminating the heat insulating material from this area, the temperature distribution throughout that passage is dependent upon the composition, preferably a plastic material, forming these walls and the heat flow or distribution therethrough.

A further advantage of the passage construction of the present invention is the ease of assembly thereof. A service

area including the lower part 24 and port part 25 of the passage may be preassembled as a subassembly and mounted on the outer door panel 3. After assembling the inner and outer door panels, the upper part 26 of the lower passage section 23 can then be inserted through the opening 47 which receives the upper part or section 22 of the passage and positioned on the port part 25 by means of the hook or finger 29. The upper section 21 of the passage is then placed in position with the lower end thereof telescopically received in the lower section. Any slight misalignment between the inner panel 17 and the outer panel 3 of the door is compensated for by the relatively loose telescopic fit between the upper and lower portions 22 and 23 of the passage.

While there has been shown and described a particular specific embodiment of the present invention, it will be understood that it is not limited thereto and it is intended by the appended claims to cover all such modifications involved in the true 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 including a freezer compartment and a door for closing the access opening to said compartment; an ice dispenser in said compartment including an ice crusher adjacent said door for dispensing crushed ice; said door comprising spaced inner and outer panels; said inner panel being formed to include an area having an opening therein below the outlet from said crusher when the door is closed; said outer panel including a service recess extending into the space between said inner and outer panels below said inner panel area; means forming an ice conducting passage having its outlet opening into said recess; said passage forming means comprising a lower section supported on said outer panel and an upper section extending through said opening and supported at its upper end on said inner panel with the lower end thereof extending loosely into the upper end of said lower section; said lower section including a port intermediate the ends thereof and a normally closed closure member for said port pivotally mounted beneath said port; a heater surrounding the lower part of said lower section adjacent said port; said heater being adapted to maintain said closure member and the portions of said lower section adjacent said port at temperatures above freezing; said lower section including a skirt surrounding and spaced from said lower part of said lower section and said heater for confining the heat from said heater to the vicinity of said closure member.
2. The refrigerator according to claim 1 in which the area of said door including said passage is free of solid insulating material.
3. The refrigerator according to claim 1 in which said heater is an annular heater.
4. The refrigerator according to claim 1 in which said passage sections are composed of plastic material.
5. The refrigerator according to claim 1 in which said closure member is a hollow plastic structure.
6. The refrigerator according to claim 1 in which said area of said inner panel includes a substantially horizontal portion and said opening is in said portion.

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