Oct. 25, 1966 B. J. GRIMM ETAL 3,280,584

SEMI-AUTOMATIC ICE MAKER WITH AIR DISTRIBUTING MEANS

Filed May 12, 1965

2 Sheets-Sheet 1

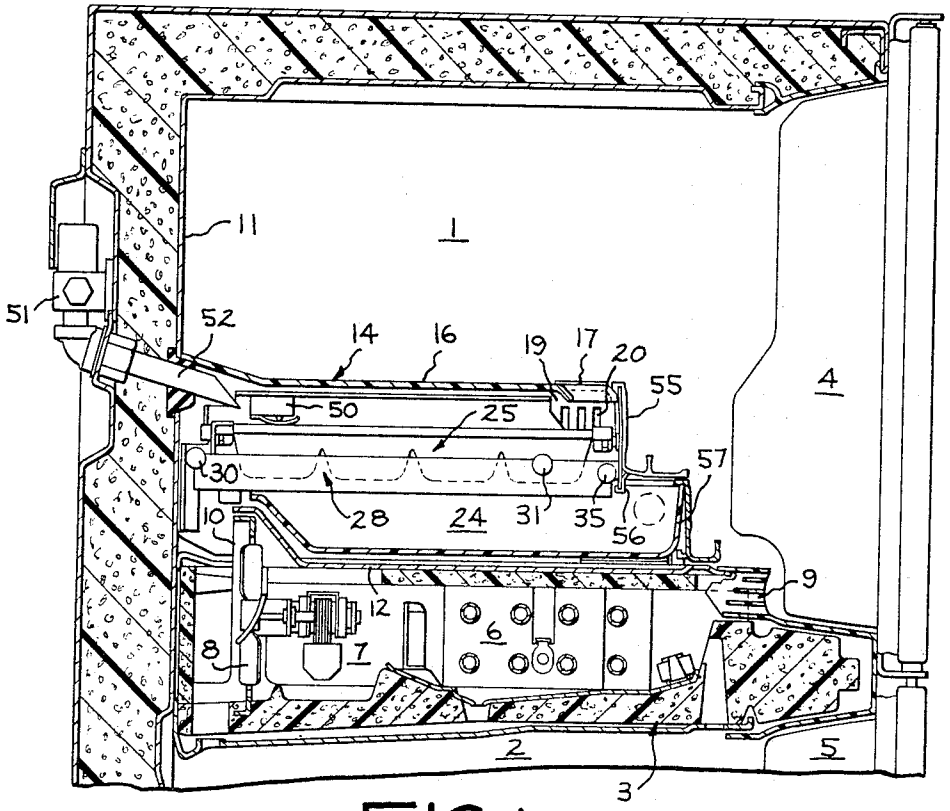

FIG.1

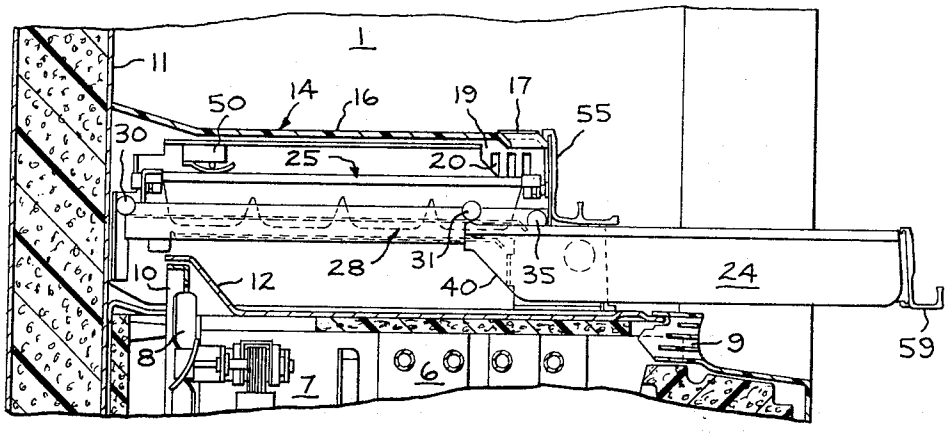

FIG.2

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2 Sheets-Sheet 2

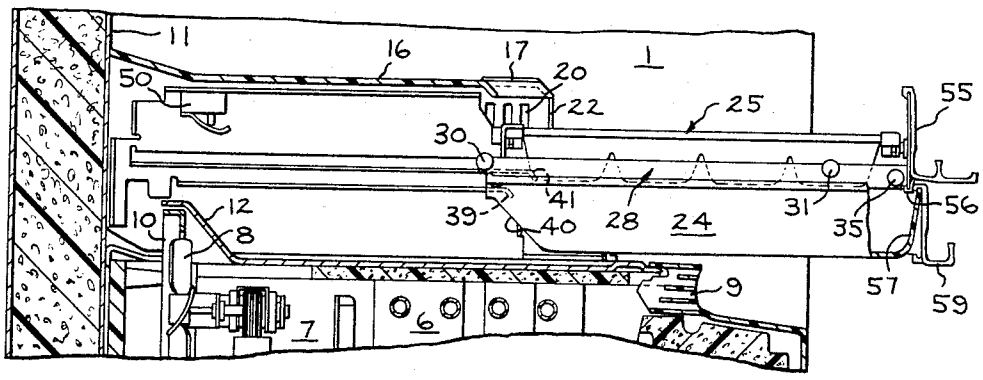

FIG. 3

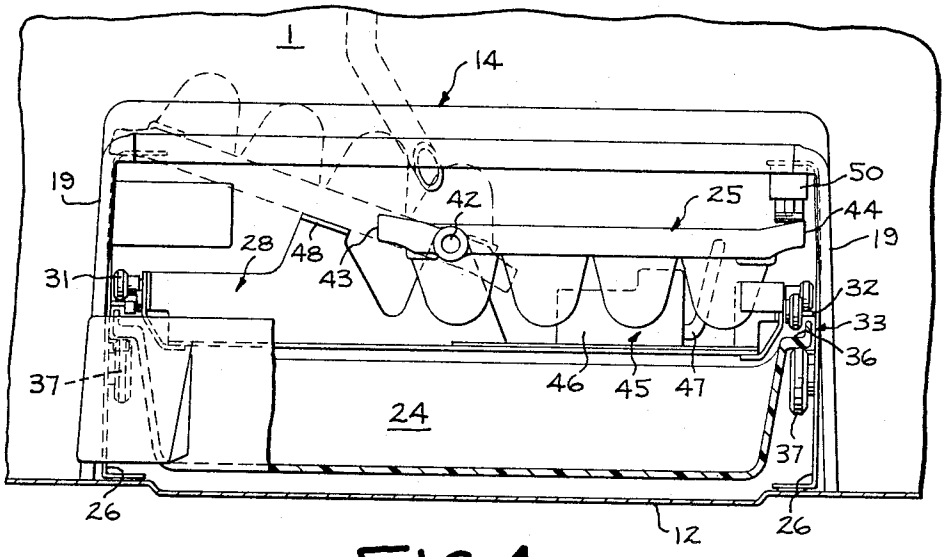

FIG. 4

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3,280,584
SEMI-AUTOMATIC ICE MAKER WITH AIR DISTRIBUTING MEANS

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2 Claims. (Cl. 62—344)

The present invention relates to semi-automatic ice makers and is more particularly concerned with an improved semi-automatic ice service for household refrigerators including a freezer maintained at below freezing temperatures by cooled air circulated through the freezer compartment.

Refrigerators including a freezer compartment cooled by means of a stream of air from an evaporator generally disposed outside of the freezer compartment are well known. In the design of such refrigerators, it is desirable to provide means for evenly distributing throughout the compartment refrigerated air supplied thereto. It is also desirable to provide within the freezer compartment means for manufacturing ice cubes or pieces.

The present invention has as its principal object the provision of a household refrigerator including, within the freezer compartment thereof, a housing for receiving cooled air and for distributing the air through the compartment and means contained within the housing for manufacturing, harvesting and storing ice pieces.

Another object of the invention is to provide a compact semi-automatic ice service in which both a freezing tray and an ice storage receptacle are contained within a housing or tunnel in which they are subjected to the coldest air supplied to the freezer compartment.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with the illustrated embodiment of the present invention, there is provided a refrigerator including a freezer compartment having an access opening at the front thereof and an air inlet for introducing refrigerated or cooled air into the freezer compartment. A housing or tunnel is provided within the freezer compartment for receiving the cooled air supplied to the compartment through the air inlet and for distributing that air throughout the compartment. The housing has an access opening at the front thereof and contains a semi-automatic ice service including an ice receptacle slidably supported within the housing for movement between a normal position within the housing and an access or extended position forward of the access opening. Also contained within the housing above the receptacle is a sliding frame which is likewise movable between a first or normal position within the housing and a second or access position forward of the housing. On the frame there is pivotally mounted a freezing tray in which water is frozen into ice pieces. In its freezing or upright position, the tray overlies one side portion of the frame and is pivoted adjacent its inner edge whereby it can be rotated to an inverted position above the other side portion of the frame in which position ice pieces from the tray are discharged into the receptacle when both the frame and receptacle are in their forward or extended positions. Means are provided for automatically introducing into a tray a charge of water when the tray and frame are within the housing and the tray is empty. The frame and receptacle are so constructed that, while the receptacle may be moved to its extended or access position independently of the frame and the freezing tray supported thereon, movement of the frame through

the access opening to the housing also causes the receptacle to move forwardly with the tray to a position for receiving ice pieces discharged from the tray.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

FIGURE 1 is a side elevational view, in section, of a household refrigerator embodying the present invention;

FIGURE 2 is a view similar to FIGURE 1 with the ice receptacle in a forward or access position;

FIGURE 3 is a view similar to FIGURE 2 with both receptacle and freezing tray and frame in their forward or access positions; and

FIGURE 4 is a front view, partly in section, of the semi-automatic ice service of the present invention.

With reference to the drawing, there is shown a refrigerator comprising insulated walls defining an upper freezer compartment 1 intended to operate at a temperature below freezing and a lower fresh food compartment 2 adapted to operate at an above freezing temperature. The two compartments are separated by a horizontal insulating partition 3. The access opening at the front of the freezer compartment is closed by an insulated door 4 while the access opening to the fresh food compartment is closed by an insulated door 5. The two compartments are maintained at their desired operating temperatures by circulating air from the two compartments over an evaporator 6 contained within a chamber 7 formed within the insulated partition 3. It is to be understood that condensed refrigerant is supplied to the evaporator 6 from a condensing unit (not shown) generally housed within the machinery compartment in the lower portion of the cabinet.

Air circulating means including a fan 8 and suitable air passages connecting the two compartments with the evaporator chamber 7 are provided for circulating air from the two compartments over the evaporator 6 and returning refrigerated or cooled air to the compartments. Air from the freezer compartment 1 enters the front end of the evaporator chamber 6 through a horizontally extending louvered passage 9 in the front portion of the partition 3 and after passing over the evaporator 6, cooled air is returned by the fan 8 to the freezer compartment through an inlet passage 10 adjacent the intersection of the rear wall 11 and the bottom wall 12 of the freezer compartment. Similar passages in the lower portion of the partition 3 interconnect the frest food compartment and the evaporator chamber 7.

A combination ice service housing and air deflector generally indicated by the numeral 14 is provided in the freezer compartment. This housing 14 is designed to be supported on the bottom wall 12 of the freezer compartment in a position overlying the air inlet 10 More specifically, the housing 14 includes a top wall 16 which is solid over substantially its entire area except for a recess 17 forming an air passage in the front edge thereof and opposed side walls 19 which support the housing on the bottom wall of the freezer compartment. Suitable air passages such as the passages 20 in the side walls 19 may be provided for directing some of the air from the housing 14 towards the opposed sides of the freezer compartment 1. The front of the housing is generally open to provide an access opening 22 facing the access opening to the freezer compartment closed by the door 4. Thus the below freezing air supplied to the freezer compartment through the inlet passage 10 passes through the housing before entering the main portion of the compartment 1 through the various passages 17 and 20 while air from the freezer compartment is withdrawn into the evaporator chamber 7 through the return passage 9 at the front of the partition 3.

In accordance with the present invention, there is provided within the housing 41 a semi-automatic ice service comprising an ice storage receptacle 24 slidably supported

within the lower portion of the housing **14** and a freezing tray **25** slidably supported within the housing above the receptacle **24**. In the illustrated embodiment of the invention, means for supporting the receptacle **24** and freezing tray **25** comprises a pair of spaced vertically extending brackets **26** adjacent the opposed side walls **19** of the housing. The tray **25** is pivotally supported on a generally rectangular frame **28** including front and rear pairs of rollers **31** adapted to ride on the upper arm **32** of channel-shaped guides **33** affixed to the brackets **26**. The frame **28** also includes a front set of rollers **35** adapted to ride on the upper surfaces of flanges **36** on the opposed side edges of the receptacle **24** when the receptacle is in its extended position.

The side flanges **36** of the receptacle **24** are slidably supported within the channel members **33** and also ride on opposed rollers **37** mounted on the brackets **26** forward from the front edges of the channel **33**.

A downwardly extending stop **39** on the forward edge of the upper channel arm **32** adapted to be engaged by the rear wall **40** of the receptacle **24** and a similar stop **41** on the lower channel arm adapted to be engaged by the rear portion of the frame **28** when these two members are moved in the forward direction, limit forward travel thereof and prevent them from being accidentally withdrawn from the housing during normal use. However, these stops are so designed that either the frame **28** or the receptacle **24** can be removed from the support mechanism for cleaning purposes.

As is illustrated more clearly in FIGURE 4 of the drawing, the tray **25** is pivotally supported on the frame **28** by pivot pins **42** which mount the tray **25** on the frame **28** for pivotal movement about an axis adjacent to and spaced inwardly from the inner side edge **43** of the tray. The free or outer edge **44** of the tray is supported by means of a weighing device generally indicated by the numeral **45** which is designed to hold the tray, when empty, in an upper position and to permit the tray to drop to a lower position when filled with water. The weight actuated device contained within a housing **46** includes an arm **47** engaging a lower surface of the tray **25**. The particular weight actuated device forms no part of the present invention and the details of such a device are shown and described in Patent 3,163,025, issued to Dahlgren on December 29, 1964.

When it is desired to harvest a batch of ice pieces from the tray **25**, the frame and receptacle are first moved to their extended or access positions as shown in FIGURE 3 after which the tray, which is preferably composed of a flexible plastic material, is rotated to an inverted discharge position shown in dotted lines in FIGURE 4 of the drawing. In this position, the rear edge of the tray contacts a stop **48** provided on the frame **28**. Pressure on the forward edge of the tray causes the tray to flex and discharge the ice pieces therefrom through the open position of the frame **28** below the inverted tray.

When the tray is returned to its freezing position, the weight actuated device **45** supports the tray in a slightly elevated position so that when the tray and frame are moved to their recessed position in the housing, the outer edge **44** of the tray will contact and actuate a switch **50** mounted on the adjacent bracket **26**. The switch **50** forms part of control circuit for a solenoid operated water supply valve **51** adapted to introduce water through a supply line **52** into the tray when the valve is open. The valve is opened only when the tray is in its normal position within the housing and is empty. When the weight of the water in the tray **25** causes it to drop to a lower position against the biasing action of the weight actuated device **45**, operation of the switch **50** causes the solenoid valve **51** to close and interrupt the supply of water to the tray.

In accordance with a further feature of the present invention, there is provided means whereby the receptacle **24** is automatically moved to its open or access or extended position whenever the frame **28** is withdrawn from the housing but which also permits the receptacle **24** to be independently slid forwardly to its access position without disturbing the frame **28** and the freezing tray **25** supported thereon. To this end, the forward portion of the frame **28** includes a front and handle section **55** including a lower edge portion **56** which normally extends downwardly into the interior of the receptacle **24**. As the frame **28** is moved forwardly from within the housing **14**, this lower edge portion **56** engages the front wall portion **57** of the receptacle **24** and causes the receptacle **24** to move forwardly along with the frame **28**. Movement of the receptacle **24** to its normal or recessed position within the housing also carries the frame **28** with it. However, the receptacle **24** can be independently withdrawn from the housing without disturbing the frame **28** and the tray **25** supported thereon.

The section **55** on the front of the frame **28** and the forward portion of the receptacle **24** which may include a handle **59** cooperate to close the front access opening **22** to the housing **14** when the receptacle and frame are in their normal or recessed positions.

When the tray and receptacle are in a recessed position within the housing, the refrigerated or cooled air from the evaporator **6** causes the contents of the tray and receptacle to be subjected to maximum freezing temperatures. In addition, by placing the entire ice service in the housing or tunnel **14**, the contents of the tray and receptacle are protected or separated from the remaining contents of the freezing compartment **1**.

While there has been shown and described a particular 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 changes and modifications as fall within the true spirit and scope of the invention.

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

1. A refrigerator including a freezer compartment having an access opening at the front thereof,

means including an air inlet adjacent the rear portion of said compartment for introducing cooled air into said compartment,

a housing including a top wall and side walls and an access opening at the front thereof, said housing being positioned in said compartment to receive the cooled air from said inlet,

said housing including at least one air outlet in a forward wall portion thereof for conducting cooled air from said housing into said compartment,

a receptacle slidably supported in said housing for movement between a normal position in said housing and an extended position in which at least a portion of said receptacle is positioned forwardly of said housing,

a frame and means for slidably supporting said frame in said housing above said receptacle for movement between a normal position in said housing and a second position forwardly of said housing,

a freezing tray pivotally supported on said frame for movement of said tray about an axis adjacent one edge of said tray between an upright freezing position overlying one side portion of said frame and an inverted discharge position overlying the other side portion when said frame is in its second position,

said frame including an opening in said other side portion for passage of ice pieces into said receptacle when said tray is in its discharge position,

means operable when said frame is in its normal position and said tray is empty in its freezing position for automatically introducing a charge of water into said tray,

said tray and receptacle including means for moving said receptacle to its access position when said frame is moved to its second position, said means

including a front wall on said frame including a lower edge portion extending into said receptacle and adapted to engage the front wall of said receptacle when said frame is moved towards its second position.

2. A refrigerator including a freezer compartment having an access opening at the front thereof,

means including an air inlet adjacent the rear portion of said compartment for introducing cooled air into said compartment,

a housing including a top wall and side walls and an access opening at the front thereof, said housing being supported on the bottom wall of said compartment and positioned in said compartment to receive the cooled air from said inlet,

said housing including a recess in the forward edge portion thereof for conducting cooled air from said housing into said compartment,

a receptacle slidably supported in said housing for movement between a normal position in said housing and an extended position in which at least a portion of said receptacle is positioned forwardly of said housing,

a frame and means for slidably supporting said frame in said housing above said receptacle for movement between a normal position in said housing and a second position forwardly of said housing,

a freezing tray pivotally supported on said frame for movement of said tray about an axis adjacent one edge of said tray between an upright freezing position overlying one side portion of said frame and an inverted discharge position overlying the other side portion when said frame is in its second position,

said frame including an opening in said other side portion for passage of ice pieces into said receptacle when said tray is in its discharge position,

means operable when said frame is in its normal position and said tray is empty in its freezing position for automatically introducing a charge of water into said tray,

said frame including a guard below said tray in its freezing position to prevent ice pieces in said receptacle from contacting said tray,

said tray and receptacle including means for moving said receptacle to its access position when said frame is moved to its second position, said means including a front wall on said frame having a lower edge portion extending into said receptacle and adapted to engage the front wall of said receptacle when said frame is moved towards its second position,

said front walls of said frame and receptacle closing said access opening to said housing when said frame and receptacle are contained within said housing.

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