The present invention relates to household refrigerators and more particularly to a refrigerator including a semi-automatic ice service arrangement for producing and storing the ice pieces.

In recent years various devices have been proposed or used for making, harvesting and storing ice pieces in domestic refrigerators on either an automatic or semi-automatic basis. Semi-automatic ice services of this type are shown and described for example in Patents 3,089,312—Harle, issued May 14, 1963, and 2,955,441—Dahlgren et al., issued October 1, 1963, both of which patents are assigned to the same assignee as the present invention. In the ice services described in these patents, both the freezing tray and the ice storage receptacle are positioned within the freezer compartment proper of a refrigerator.

The present invention has as its principal object the provision of a semi-automatic ice service of this type including new and improved means for the storage of the ice pieces in a receptacle disposed or supported on the inner liner of the door closing the access opening to the freezer compartment. A more specific object of the invention is to provide a refrigerator cabinet including a freezer compartment and a door for closing the access opening to the compartment constructed and arranged to support an ice storage receptacle and including means forming part of the inner door liner for positioning a flexible ice tray so that a force applied to an unsupported portion thereof will cause ice pieces contained therein to be harvested and discharged into the receptacle.

Additional objects and advantages of the invention will become apparent as the following description proceeds and the features of novel and original characterizing the invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In accordance with the illustrated embodiment of the present invention, there is provided a semi-automatic ice service including a flexible or disposable tray supported on a pivoted frame within the freezer compartment of the refrigerator and means for automatically introducing the required amount of water into the tray whenever it is empty and in its freezing position on the frame. For the manual harvesting of ice pieces from the tray and for the storage of such ice pieces, there is provided an ice harvesting and storage area on the inner liner of the freezer door including vertical wall sections defining a recess, means for removably supporting an ice storage receptacle in the bottom portion of the recess and means for supporting the freezing tray in an inclined, inverted position above the receptacle in such a manner that the tray can be manually flexed for harvesting of the ice pieces. More specifically, the inner liner and receptacle are so designed that one edge of the tray is supported on the receptacle and an adjacent edge on a supporting surface forming part of the liner in a position such that the tray is inverted and partially inclined relative to the receptacle. A force applied to an unsupported portion of the tray engages the tray to flex and the ice pieces to fall into the receptacle.

For a more detailed description of the present invention reference may be had to the accompanying drawing in which:

FIGURE 1 is a vertical side elevational view, partly in section, of a portion of a refrigerator embodying the present invention.

FIGURE 2 is a perspective view of the inner liner or panel of a refrigerator door embodying the present invention.

FIGURE 3 is a sectional view taken generally along line 2—3 of FIGURE 2.

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 above freezing temperatures. The two compartments are separated by a horizontal insulated partition 3. The access opening to the front of the freezer compartment is closed by an insulated door 4 and 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 a 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 horizontal 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 freezing compartment through an inlet passage 10 adjacent rear wall 11 of the freezer compartment.

A combination freezing tray housing and air deflector generally indicated by the numeral 14 is designed to be supported on the bottom wall of the freezer compartment in the position overlying the air inlet 16. More specifically this housing includes a top wall 16 including an air outlet passage 17 at the front thereof and side walls 19 forming a tunnel-shaped enclosure through which below-freezing air from the passage 10 flows. The front of the housing is provided with an access opening facing the freezer door 4 which access opening is closed by a pivoted door 20. In addition to forming a passage for the circulation of cooled air to the front of the compartment 1, the housing 14 is designed to contain a flexible freezing tray 21 of polyethylene or the like containing a plurality of compartments in which water is frozen and means for automatically filling the tray with water whenever the tray is empty and in its freezing position within the housing 14.

To this end, the tray 21 is slidable supported on a wire frame 23 pivotally supported at its front end on pivots 23 while the rear or free end of the frame is supported by a weighing device generally indicated by the numeral 24 and including an arm 25 in supporting engagement with the rear portion of the frame 22. The weighing device 24 is adapted to support the rear end of the frame and hence the tray carried thereby in an upper position when the tray is empty and to permit it to drop to a lower position when the tray is filled with the proper charge of water.

For the purpose of automatically filling the tray with water whenever it is empty and in freezing position on the frame 22, there is provided a water supply line 28 including a solenoid operated valve 29 connected to a source of water, as for example the house water supply, in such manner that when the valve 29 is opened, water flows through the supply line 28 into the freezing tray 21.
operation of the valve 29 is under control of a switch means 30 including an arm 31 adapted to be engaged by a rear top edge portion 32 of the tray supported on the frame 22 when the tray is in position on the frame 22 and is empty 50 then when the switch 31 is raised by that engagement, it operates switch 30 to open the valve 29. As the weight of the water within the tray 21 causes the supporting frame 22 to pivot downwardly, downward movement of the switch arm 31 actuates switch 30 to close the solenoid valve 29 thereby controlling the quantity of water introduced into the tray 21.

In accordance with the present invention, the inner liner 35 of the freezer door 4 is provided with means for periodically harvesting ice pieces from the tray 21 and storing these ice pieces for future use. More specifically the inner door liner 35, which is preferably composed of a plastic material, is formed to include spaced vertical wall portions 36 and 37 defining a recess 38. A storage receptacle 39 is adapted to be supported within the lower portion of the recess 38 as for example on the bottom wall 40 thereof. The receptacle 39 includes a decorative handle 41 extending along the forward edge portion thereof and beyond the two side edges 42 and 43. One or more brackets 45 positioned on either the inner or outer sides of the vertical wall portions 36 and 37 include an upturned end portion 46 adapted to engage the adjacent portion of the handle 41 and to latch the receptacle 39 in position within the recess 38.

The forward upper edge portions of the two receptacle side walls 42 and 43 are provided with grooves or slots 48 forward of the adjacent portions of the side walls 36 and 37. These slots are adapted to receive, as illustrated in FIGURE 3 of the drawing, one edge 44 of the tray 21 when it is positioned with the open top thereof facing the door panel 35. A ledge or shoulder 50 inclined upwardly and rearwardly from the top portion of the storage receptacle 41 along the wall 37 provides means for supporting the tray 21 in an inverted and inclined position above the receptacle 39. With the tray 21 thus supported along one edge by the grooves or slots 48 and along an adjacent edge by the shoulder 50, a force applied to either of the remaining unsupported vertical or horizontal edges causes the tray to flex as illustrated in FIGURE 3 of the drawing thereby discharging ice pieces from the various tray compartments into the storage receptacle 39. Means for limiting the flexing movement of the tray 21 are also provided. In the illustrated embodiment the limiting means is in the form of a second inclined shoulder 53 on the opposite vertical wall 36, which shoulder is either recessed within the recess 38 a greater distance than the shoulder 50 or has a greater inclination than the shoulder 50 so that it is engaged by a free portion of the tray only after the tray has been flexed a suitable degree to release the ice pieces contained therein.

After the ice pieces have been harvested from the tray, the empty tray is returned to the housing 14 by sliding it onto the open front of the frame 22. Since the tray is empty, the switch 30 will be actuated to open the valve 29 and introduce a fresh charge of water into the tray.

While there has been shown and described a specific embodiment of the present invention it will be understood that it is not limited thereto and 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. In combination, a refrigerator including a freezer compartment having an access opening and a door for closing said opening,

   said door including an inner liner including spaced vertical walls defining a recess therein,
   a flexible tray comprising a plurality of compartments for containing a liquid to be frozen and from which ice pieces are harvested by flexing of the tray,
and a door for closing the access opening to said compartment,
said door including an inner liner including vertical walls defining a recess therein,
a rectangular flexible freezing tray from which ice pieces are harvested by flexing of said tray,
a receptacle in the lower portion of said recess for receiving and storing the ice pieces including an edge portion extending forwardly from the adjacent portions of said walls and forming therewith slots adapted to receive and support one edge of said tray, means including said slots and a shoulder on one of said walls disposed above and rearwardly of said slots for contact by an adjacent edge of said tray for supporting said tray in an inclined inverted position above said receptacle whereby said tray can be flexed to harvest the ice pieces by the application of force to an unsupported edge portion thereof,
said liner including means for limiting flexing movement of said tray.

References Cited by the Examiner

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