ICE BLOCK HARVESTING ARRANGEMENT
Lloyd M. Keighley, Kettering, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware
Filed Mar. 26, 1963, Ser. No. 267,997
6 Claims. (Cl. 62—353)

This invention relates to refrigeration and particularly to making ice blocks and harvesting them from a tray in which they are frozen.

Heretofore in the use of ice molds or trays in conjunction with household refrigerator cabinets a person has been required to remove an ice tray from a freezing chamber thereof and to operate a lever to lift walls of a grid therein for loosening ice blocks therefrom or to remove a tray and insert same over an ice storage bucket at which time a lever is operated to eject ice blocks from the tray into the bucket and/or to remove a tray and apply a twisting force thereto for loosening ice blocks therefrom. Such ice block harvesting movements of an ice tray involves too many manipulations, is sometimes detrimental to the skin of a person's hand or fingers during manipulation of the cold tray, is highly objectionable and has resulted in complaints being lodged with manufacturers of refrigerators. I contemplate the provision of a new principle for harvesting ice blocks from a tray located on a support in a chamber of a household refrigerator cabinet which, in addition to facilitating ice block harvesting operations, increases versatility in the use of an ice tray in conjunction with a refrigerator and more particularly reduces the aforesaid objections and complaints to a minimum.

The primary object of my invention is to provide an improved method of and arrangement for loosening ice blocks from walls of compartments or pockets in an ice tray as the tray is withdrawn in an upright position outwardly of a support therefor in a freezing chamber of a refrigerator cabinet so as to enable removal of a few selected ice blocks from the tray while other ice blocks therein remain undisturbed and are not loosened or ejected therefrom and wasted.

In carrying out the foregoing object, it is another object of my invention to associate a movable means with a support for an ice tray in a freezing chamber of a refrigerator cabinet which means when moved forms an obstruction in the path of removal of the tray from its support and is effective in response to withdrawing the tray in an upright position from the support for distorting a wall of separate independently distortable pockets of the tray to shift ice blocks therein and loosen them from walls thereof.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:
FIGURE 1 is a front view of a refrigerating system associated with a refrigerator cabinet provided with food storage chambers and showing a door of one of the chambers opened with a freezing container supported therein;
FIGURE 2 is an enlarged fragmentary section taken on the line 2—2 of FIGURE 1 showing a side view of the freezing container supported on a support member in the one cabinet chamber and a hand operable lever associated with the member;
FIGURE 3 is a fragmentary section taken on the line 3—3 of FIGURE 2 showing a front view of the support in the one chamber with the freezing container thereon;
FIGURE 4 is a fragmentary sectional view taken on the line 4—4 of FIGURE 3 showing ice blocks frozen in the container and the hand lever associated with its support moved to rotate cam obstructions into the path of removal of the container from the support;
FIGURE 5 is a view similar to FIGURE 4 with the container being partially withdrawn from its support member and showing a wall of a pocket in the container distorted by the cam obstruction to loosen an ice block from the pocket;
FIGURE 6 is a fragmentary sectional view taken on the line 6—6 of FIGURE 2 showing the cams on a shaft rotatable by the hand lever; and
FIGURE 7 is a top plan view of the ice block container or tray employed in the present invention.

Referring to the drawings, for illustrating my invention, I show in FIGURE 1 thereof a multiple chambered refrigerator cabinet 10 having walls providing an upper freezing or frozen food storage chamber 11, with its insulated door 12 in open position, and a lower unfrozen food storage chamber (not shown), insulated from the upper chamber, normally closed by an insulated door 13.
Insulation 14 within walls of cabinet 10 (see FIGURES 2 to 5) may be of any suitable or conventional material. The lower chamber in cabinet 10 is cooled to a temperature above freezing, such, for example, as between 37° and 43° F., preferably by a plate-like sheet metal evaporator, generally indicated by the reference numeral 16, of a closed refrigerating system associated with the refrigerator and diagrammatically illustrated in FIGURE 1. This refrigerating system also includes a sealed motor-compressor unit 17, a refrigerant condenser 18 and another refrigerant evaporator 19 all connected to one another by suitable pipes or conduits as is conventional and well known in the art. Upper chamber 11 of cabinet 10 is cooled to a temperature well below 32° F. and preferably between 0° and 10° F. by evaporator 19 of the refrigerating system for freezing foods, storing frozen foods and/or for freezing water in containers such as molds or trays into ice blocks for table use, in chilling salads or the like and drinks in glasses. The evaporator 19, in the present illustration, is in the form of a conduit coiled around and secured in metal-to-metal contact with the metal liner of chamber 11. However, the interior of chamber 11 may, insofar as my invention is concerned, be cooled below 32° F. in any desired manner.

A substantially U-shaped shelf or support member 21 having the top of legs of the "U" stationarily secured to the ceiling of the liner of chamber 11 is for supporting, in an upright position thereon, a mold or tray generally represented at 22. The base portion 23 of U-shaped member 21 forms the support for tray 22 and portions of legs
thereof are directed inwardly as at 24 so as to form a first means thereon which overlaps the top of opposed sides of tray 22. The first means associated with member 21 provides a stop adapted to be engaged by the top of tray 22, as will be hereafter described, and this stop could be formed with the ceiling itself of chamber 11. The inwardly directed ledge-like portions 24, base or support portions 23 and the legs of U-shaped member 21 cooperate to form a sleeve-like device which provides a predetermined substantially straight-line guided path of movement for tray 22 onto and off of its support in chamber 11 of cabinet 10. Tray 22 is an elongated nonmetallic freezing container (see FIGURE 7) and is preferably, although not necessarily, formed entirely of a molded plastic material such, for example, as linear polyethylene of high density and is provided with a somewhat rigidified upper reinforcing bounding rim 26. Downwardly directed part of rim 26 along ends of tray 22 is spaced a greater distance from the main body thereof than at its sides to provide hand grips or handles thereat. The tray has a plurality of integral walls 27 dividing the interior thereof into or defining rows of separate spaced-apart pockets or compartments 28 therein having peaks tops disposed slightly below bounding rim 26. Open top pockets 28 are preferably half circular or hemispherical in shape and, while such tray compartment or pocket configuration is not new or novel, it does nevertheless greatly contribute to the present innovation in a fashion to be hereinafter described. Bottom surfaces of tray 28 are water repellent and the inherent characteristics of the material from which it is formed renders a wall one of pockets 28 thereof, preferably their rounded bottom wall, flexible or resilient within certain limits and capable of being independently distorted relative to other walls of the pockets or tray. Compartment lower pockets 28 of tray 22 are adapted to receive water to be frozen therein into ice blocks within chamber 11 of cabinet 10. By locating the open top of pocket 28 below rim 26 in tray 22, the space between their open top and the rim on the tray forms a water distributing weir or the like for all of the pockets to facilitate filling them with water without overflowing the tray.

U-shaped member 21 is provided at each of its sides at least near the front thereof with an ear 29 depending below the base or tray support portion 23 (see FIGURES 2 to 5). Spaced-apart openings or apertures 32 (see FIGURES 4 and 6) are provided in member 21 and these openings are located adjacent the front edge of support 23 so as to be forwardly of tray 22 when same is supported upon its support. A shaft 33 (see FIGURES 3 and 6) is journaled in holes provided in the ears 29 and a hand-operated lever 34 is secured, by a pin 35, to one end of shaft 33 for rotating same. The hand-operated lever or arm 34 is biased in one direction against a pin 36 by a spring 37 (see FIGURES 2 and 3) and its rotation is limited by another stop pin 38. Both pins 36 and 38 are riveted to sides of member 21. Cams 39 are secured by pins 41 to shaft 33 (see FIGURES 2 and 6) and these cams are spaced apart so as to register with and fit in the openings 32 for movement therein above the top surface of support 23 to provide or form an obstruction in the guided path of movement of tray 22 off its support. When cams 39 are elevated above support 23, in front of the tray thereof (see FIGURES 4 and 5), they form a rigid obstruction to the one or bottom wall of each pocket 28 of the rows thereof in tray 22 during withdrawal of the tray and stop their course. Cams 39 on shaft 33 together with lever 34 form a second means, movable with respect to support 23, in the present arrangement for accomplishing objects of my invention.

Pockets 28 of tray 22 are filled with water in the usual manner and the tray is inserted into chamber 11 of cabinet 10 and removably supported in an upright position on support 23 of member 21 until the water freezes into ice blocks 45 (see FIGURES 4 and 5) within the tray pockets. Since elongated tray 22 has a handle portion on each of its ends, it makes no difference which end thereof is directed into member 21. It is to be understood that the water may be frozen by contact of tray 22 with a refrigerated surface, for freezing the water by thermal conduction therewith, or it may be frozen by circulating air in a tray is insolated from such surface and cooled below 32° F. by convection chilled air in the chamber or by a stream of chilled air directed thereinto. I mention this because of the fact that regardless of the manner in which ice blocks are frozen in pockets 28 of tray 22, it is important to my invention to insure loosening of the ice blocks 45 from all walls of the pockets as or in response to withdrawing the tray in an upright position from the support 23 to thereby minimize handling of tray 22 thereafter, particularly during a certain ice block harvesting operation. Assume that only a few ice blocks 45 are needed to chill a drink in a glass and selected ice blocks are now to be harvested from tray 22. One hand of an operator is utilized to move arm orlever 34 away from pin 36 and into engagement with pin 38 (see FIGURES 4 and 5) for rotating shaft 33 to move or swing cams 39 thereon, within openings 32, so that a lobed part of the cams projects upwardly above 23, for withdrawing of tray 22 along support 23. These cam lobes form obstructions in the guided path of withdrawal of tray 22 outwardly of its support. The front end of tray 22 is then grasped by the operator's other hand to move the tray forwardly along support 23. Elevated lows on cams 39 are aligned with the rounded bottom surface of tray 22 and its support 23. when the tray is withdrawn, slid or moved along support 23, in its guided path of movement, the bottom wall of these pockets become impinged against a cam or obstruction 39. The impingement of a wall of pockets 28 against an obstruction 39 simultaneously moves the front end of tray 22 upwardly. It should be understood its support 23 as the tray is on the tray to engage or bear against the first means or the underside of inwardly directed stop portions 24 on member 21. Tray 22 being substantially wedged between stops 24 and rigid obstructions or cams 39 is now forcibly withdrawn or slid further outwardly of member 21 (see FIGURE 5) and the one or bottom wall of the rows of pockets 28 of the tray is flexed and distorted independently of one another as these pockets pass the obstruction or lobes on cams 39 to shift ice blocks therein and loosen them from all walls of the pockets. The blunt of the force applied by or stop 24, for withdrawing of ice blocks 45, when the walls of pockets 28 are glazed over the lobes on cams 39 and flexed or distorted, is transmitted through these cams, shaft 33 and lever arm 34 to stop pin 38 and is therefore not absorbed by a hand of the operator. Since only a few ice blocks are now to be harvested, movement of tray 22 may be terminated at any desired point of withdrawal thereof from its support 23, beyond the position of the tray shown in FIGURE 5, depending upon the number of ice blocks to be freed from the tray pockets. Thereafter fingers of one of the operator's hands are brought into engagement with the top of loosened ice blocks 45, in the portion of tray 22 protruding out of member 21, to rotate them in their pockets upwardly and outwardly thereof, substantially as shown in the G. H. Kennedy, Jr. Patent No. 1,868,503 dated July 26, 1932, whereby the selected ice blocks may be plucked from the tray and melted into the glass containing a drink to be cooled. The ceiling of chamber 11 is offset rearwardly from the front face of cabinet 10 in the vicinity of member 21 only (see FIGURES 1 and 2) for permitting access of the operator's fingers to loosened ice blocks in the withdrawn end of tray 22. In the present arrangement, selected ice blocks are loosened from walls of their pockets and may be harvested from tray 22 merely by partially withdrawing it from member 21 thus rendering further handling of the tray, such as removal thereof from chamber 11 to a point remote from cabinet 10 unnecessary. Pockets 28 adjacent the front end of tray 22 from which selected ice blocks are removed can, if similar sub-
sequent ice block harvesting operations are anticipated or desired, be refilled with water at the front of cabinet 10 by a port therein, (a) turning the tray back into its support member 21. In this respect the selective ice block harvesting feature of my invention is to be distinguished from such mechanisms that twist an entire tray on a support to loosen all ice blocks from walls thereof, the tray removed from a refrigerator, emptied of its ice block content, refilled with water at a faucet in a kitchen sink and then replaced into the refrigerator.

If more than a few selected ice blocks such as all ice blocks 45 in the tray are desired to be harvested therefrom at one time, tray 22 is entirely withdrawn or slid outwardly off its support 23 in the guided path of movement thereof. This complete removal or withdrawal of tray 22 causes progressive impingement of the one or bottom wall of pockets 28 in the rows thereof and simultaneous and intermittent engagement of the tray rim 26 with stops 24, in response to moving the tray outwardly of its support 23, to thereby independently flex or distort the pocket walls one after another in succession as the bottom wall of the pockets pass over the rigid obstructions or elevated lobes of cams 39. This shifts all of the ice blocks in their pockets and loosens them from walls thereof whereby the loosened ice blocks 45 can be individually rotated out of their pockets as previously described without inverting tray 22 or the tray can then be inverted to cause the ice blocks to freely fall out of the pockets. The lever 34 is released after ice block harvesting operations and automatically returned, by the biasing influence of spring 37, to its normal position against pin 36 so as to hold the lobes on cams 39 below the surface of support 23 to thereby eliminate obstructions in the path of placing a water filled tray 22 onto the support or inserting same into the member 21.

From the foregoing it should be apparent that I have provided for the harvest of a few selected ice blocks from a tray in a refrigerator cabinet without a multiplicity of obstructions of the tray and without removing all ice blocks therefrom and wasting some of them. My invention insures loosening of ice blocks from compartment or pocket walls of a tray as the tray is moved in an upright position outwardly of its support to thereby render ice blocks selectively harvestable from a tray in a refrigerator. By insuring loosening of all ice blocks within a tray, in response to withdrawing it from a refrigerator, the improvement renders and additional or superfluous act of reinserting a withdrawn tray and its ice block content in an inverted position into the refrigerator and/or placing the removed tray with ice blocks bonded therein upon a combined storage receptacle and ice block ejecting device either in or outside the refrigerator, before ice blocks can be harvested from the tray, unnecessary. By virtue of my improvement a more versatile use of an ice blocks tray in conjunction with a refrigerator cabinet is provided and objections to handling an ice tray throughout several maneuverings is minimized. While I have, for the sake of simplicity, illustrated my invention as being incorporated in a somewhat standard type refrigerator cabinet, it is to be understood that advantages derived therefrom are particularly feasible in more modern so-called "Frost-Proof" or "Frost Free" type household refrigerators because a frost formation or ice accumulation in the vicinity of ice block forming trays therein is non-existent and therefore problems formerly encountered in arrangements of the character disclosed are eliminated.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination:
   (a) a cabinet provided with a chamber having a support therein,
   (b) a refrigerating system associated with said cabinet including a refrigerant evaporator for cooling the interior of said chamber to a temperature below 32° F.,
   (c) an elongated nonmetallic tray provided with a plurality of integral walls defining a row of separate spaced-apart pockets therealong adapted to receive water,
   (d) said tray being insertable into said chamber and removably supported in an upright position on said support therein to freeze water in said pockets of the tray into ice blocks,
   (e) the bottom wall of each of said pockets in the tray being flexible and distortable independently of one another relative to other walls thereof,
   (f) a first means associated with said support providing a predetermined guided path of movement for said tray onto and off of the support,
   (g) a second means associated with said support forwardly of the tray thereon and normally located out of the path of movement of said tray onto the support,
   (h) said second means being movable with respect to said support upwardly above the supporting surface thereof in front of the tray to form an obstruction in said path to removal of said tray from the support,
   (i) said tray being drawable in said upright position thereof from the support while its removal path is obstructed, and
   (j) the bottom wall of said pockets being progressively impinged against said obstruction and said tray being intermittently moved into engagement with said first means simultaneously with said impingement solely in response to withdrawing the tray from said support whereby said bottom walls of the pockets are distorted one after another in succession as said pockets pass over the obstruction for shifting ice blocks therein to loosen them from all walls thereof.

2. In combination:
   (a) a cabinet provided with a chamber having a support therein,
   (b) a refrigerating system associated with said cabinet including a refrigerant evaporator for cooling the interior of said chamber to a temperature below 32° F.,
   (c) a tray provided with a plurality of integral walls defining separate spaced-apart pockets adapted to receive water,
   (d) said tray being insertable into said chamber and removably supported in an upright position on said support therein to freeze water in said pockets of the tray into ice blocks,
   (e) one wall of each of said pockets in the tray being flexible and distortable independently of one another relative to other walls thereof,
   (f) a first means associated with said support providing a predetermined guided path of movement for said tray onto and off the support,
   (g) a second means associated with said support forwardly of the tray thereon and normally located out of the path of movement of said tray onto the support,
   (h) said second means being movable with respect to said support in front of the tray to form an obstruction in said path to removal of said tray from the support,
   (i) said tray being drawable in said upright position thereof from the support while its removal path is obstructed, and
   (j) the one wall of said pockets being impinged against said obstruction and said tray being intermittently moved into engagement with said first means simultaneously with said impingement solely in response to withdrawing the tray from said support whereby said one wall of the pockets is dis-
torted as said pockets pass the obstruction for shifting ice blocks therein to loosen them from all walls thereof.

3. In combination:
   (a) a cabinet provided with a chamber having a substantially U-shaped support therein,
   (b) a refrigerating system associated with said cabinet including a refrigerant evaporator for cooling the interior of said chamber to a temperature below
   (c) an elongated nonmetallic tray provided with a plurality of integral walls defining a row of separate spaced-apart pockets therefore adapted to receive water,
   (d) said tray being insertable into said chamber and removable supported in an upright position on said support therein to freeze water in said pockets of the tray into ice blocks,
   (e) the bottom wall of each of said pockets in the tray being flexible and distensible independently of one another relative to other walls thereof,
   (f) upstanding legs of the U-shaped support overlapping the top of the opposed sides of said tray and providing a predetermined guided path of movement for the tray onto and off of said support,
   (g) means associated with said U-shaped support forwardly of the tray thereon and normally located out of the path of movement of said tray onto the support,
   (h) said means being movable with respect to said support upwardly above the supporting surface thereof in front of the tray to form an obstruction in said path of removal of said tray from the support,
   (i) said tray being withdrawable in said upright position thereof from the support while its removal path is obstructed, and
   (j) the bottom wall of said pockets being progressively impinged against said obstruction and the top of said sides of the tray being intermittently moved into engagement with said overlapping legs of the U-shaped support simultaneously with said impingement solely in response to withdrawing said tray from said support whereby said bottom walls of the pockets are distorted one another in succession as said pockets pass over the obstruction for shifting ice blocks therein to loosen them from all walls thereof.

4. In combination:
   (a) a cabinet provided with a chamber having a substantially U-shaped support therein,
   (b) a refrigerating system associated with said cabinet including a refrigerant evaporator for cooling the interior of said chamber to a temperature below
   (c) a tray provided with a plurality of integral walls defining separate spaced-apart pockets adapted to receive water,
   (d) said tray being insertable into said chamber and removable supported in an upright position on said support therein to freeze water in said pockets of the tray into ice blocks,
   (e) the bottom wall of said pockets in the tray being flexible and distensible independently of one another relative to other walls thereof,
   (f) upstanding legs of the U-shaped support overlapping the top of opposed sides of said tray and providing a predetermined guided path of movement for the tray onto and off of said support,
   (g) means associated with said U-shaped support forwardly of the tray thereon and normally located out of the path of movement of said tray onto the support,
   (h) said means being movable with respect to said support in front of the tray to form an obstruction in said path to removal of said tray from the support,
(f) a second means associated with the support and normally located out of the path of movement of said tray onto said support,

(g) said second means including a lever for moving same upwardly above the supporting surface of said support in front of the tray thereon to form an obstruction in said path to removal of said tray from the support, and

(h) said tray being withdrawable in its said upright position from the support while the removal path thereof is obstructed by said second means whereby said bottom walls of the row of pockets in the tray progressively engage said obstruction and are distorted thereby one after another in succession as they pass over the obstruction to shift ice blocks in said pockets for loosening them from all walls thereof.

References Cited by the Examiner

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor(s)</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,217,681</td>
<td>10/1940</td>
<td>Jennings et al.</td>
<td>62-364</td>
</tr>
<tr>
<td>2,342,743</td>
<td>2/1944</td>
<td>Lutes et al.</td>
<td>62-362</td>
</tr>
<tr>
<td>2,809,500</td>
<td>10/1957</td>
<td>Frei</td>
<td>62-364</td>
</tr>
<tr>
<td>2,957,604</td>
<td>10/1960</td>
<td>Goldman et al.</td>
<td>62-364</td>
</tr>
</tbody>
</table>

ROBERT A. O'LEARY, Primary Examiner.