Dec. 24, 1940. R. M. STORER 2,226,184

ICE FREEZING MOLD

Filed July 6, 1937 2 Sheets-Sheet 1

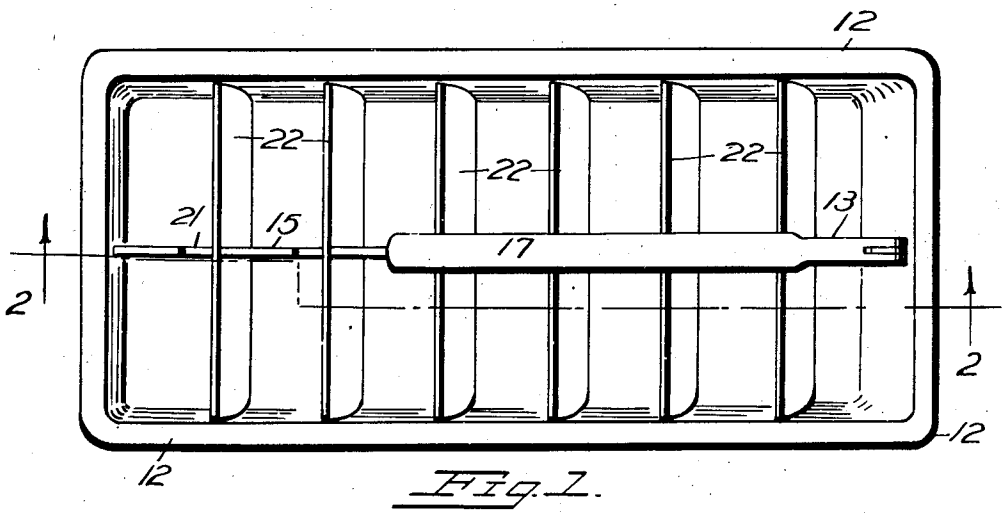


Fig. 1.

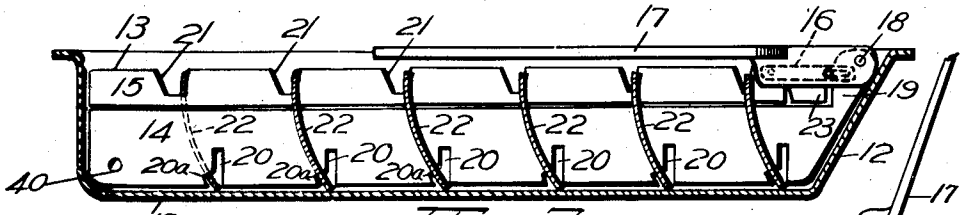


Fig. 2.

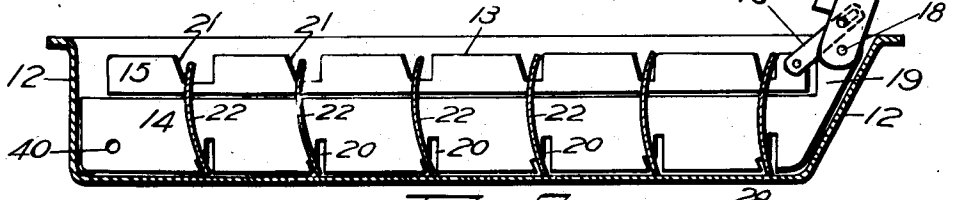


Fig. 3.

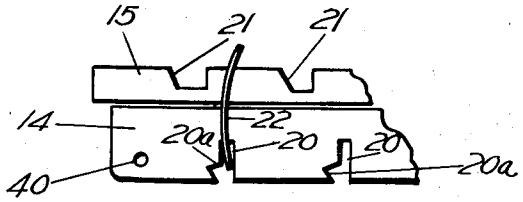


Fig. 4.

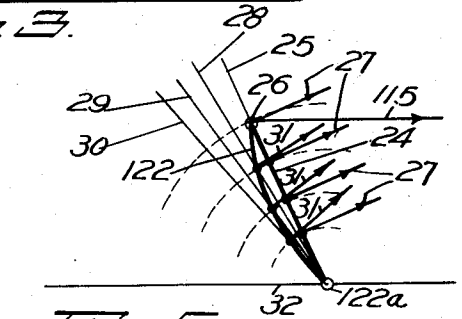


Fig. 5.

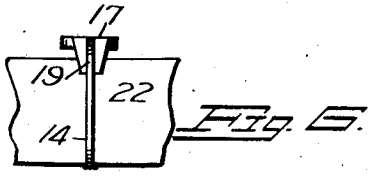


Fig. 6.

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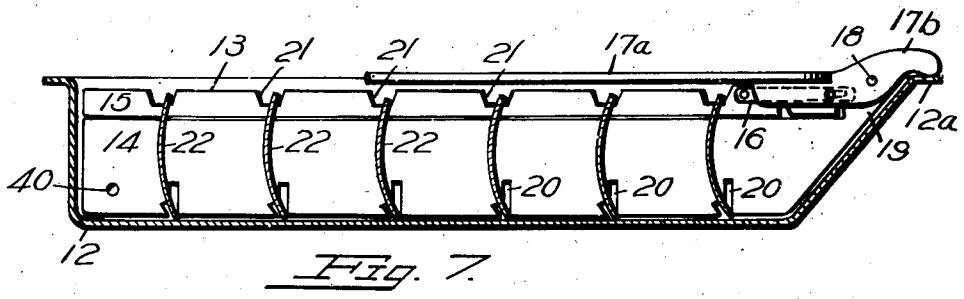


Fig. 7.



Fig. 8.



Fig. 9.

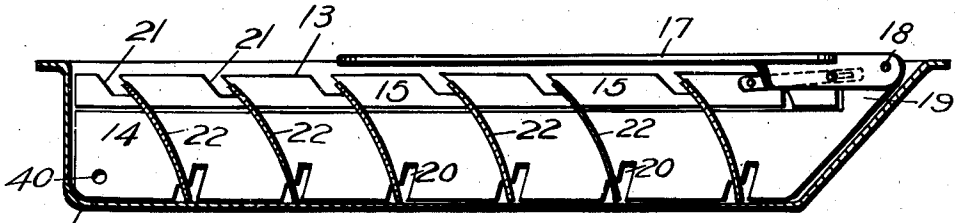


Fig. 10.

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2,226,184

ICE FREEZING MOLD

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Application July 6, 1937, Serial No. 152,116

15 Claims. (Cl. 62—108.5)

This invention relates to improvements in grids for ice trays in mechanical refrigerators.

The removal of ice bodies from a grid and tray in and by which they are formed, has presented certain difficulties due to the adherence of the ice to its forming surfaces.

It is an object of this invention to provide a grid assembly for an ice tray, that is designed and arranged for a maximum efficiency in the harvesting of ice bodies therefrom.

Another object of the invention is the provision of a grid design wherein the component parts may be readily assembled, after fabrication, to their operating positions.

A further object is to provide a grid element for an ice tray, whereby ice bodies may be loosened from the tray and from the grid surfaces, while retaining the grid in the tray.

A still further object is to provide a device of this kind that will have a minimum probability of breakage of the ice during its removal therefrom.

Other objects and advantages will be more fully disclosed in the following description and in the drawings wherein like parts have been similarly designated and in which;

Figure 1 is a plan view of the improved grid assembly in a freezing tray;

Figure 2 is a longitudinal section thereof taken approximately on the line 2—2 of Figure 1;

Figure 3 is another longitudinal section showing the grid in its operative position;

Figure 4 is a fragmentary detail of the grid assembly;

Figure 5 is a mathematical diagrammatic representation of forces involved in the operation of the improved grid;

Figure 6 is a fragmentary detail of the pivoted end of the lever element;

Figure 7 is a longitudinal sectional view illustrating a freezing mold built according to a modified form of the invention;

Figures 8 and 9 are cross sectional views illustrating modified forms of transverse members which are suitable for use in the present invention; and

Figure 10 is a longitudinal sectional view illustrating a further modified arrangement.

In the drawings reference character 12 denotes an ice tray of the usual type in which is a grid assembly 13 for the purpose of shaping a plurality of bodies of ice or the like that are frozen in the tray. The grid assembly comprises a central longitudinal wall member 14 above which is a relatively movable longitudinal member 15 that is connected by means of toggle linkage 16 to a lever handle 17 that is pivoted at 18 to an upturned end 19 integral with the longitudinal member 14.

At spaced intervals along the lower edge of the longitudinal wall member 14 is a series of notches 20, each of which has a side cut-out 20a. Along the upper edge of the movable longitudinal member 15 is a series of notches 21 which, in the form illustrated in Figure 2, are progressively widened from right to left, as shown. A series of curved transverse wall members 22 embrace the two longitudinal members and are positioned in the respective notches, the upper edge of each transverse member being positioned in one of the notches in longitudinal member 15 and the lower edge of each transverse member being positioned in one of the notches in the lower longitudinal member 14.

Figure 4 illustrates the mode of assembly of the transverse members onto the longitudinal members wherein it will be observed that the curved transverse members 22 each has a central slot through which the lower longitudinal member 14 is first passed to a position where the transverse member 22 may be raised in one of the notches 20 to the position shown. In this position the movable longitudinal member 15 may be also inserted through the slot until one of the notches 21 therein is in alinement with the transverse member whereupon the transverse member may be lowered to its normal operative position as shown in Figures 2 and 3. In their operative positions the transverse members normally engage the side cut-out 20a in the lower longitudinal member.

Attached to the handle member 17 and in alinement with the longitudinal wall members is a relatively small wall section 23 which raises with the handle, as shown in Figure 3, to provide space into which the upper movable longitudinal member 15 may be moved by the same raising motion of the lever handle, through the intermediary of the linkage 16 as shown in Figure 3. Due to the progressive widening of the notches 21 in the movable longitudinal member, the respective transverse members will be progressively rotated toward an upright position from their normal inclined position, since the narrower notches engage and start to move their respective transverse members sooner than do the wider notches toward the left end of the assembly.

It will be observed particularly in Figures 1 and 2 that in the normal position for freezing ice bodies the lever handle member 17 is in its down-

ward substantially horizontal position and the movable longitudinal member 15 is at its extreme left position and is so held and locked by the toggle linkage 16. In this position each of the transverse curved wall members is inclined upwardly and to the left. As the handle lever 17 is raised about its pivot 18 the movable longitudinal member 15 is moved toward the right and progressively acts upon the respective transverse wall members to rotate them upwardly and to the right toward a substantially upright position.

A particular advantage is effected by having the movable transverse wall members curved in their cross sectional shape as shown in Figures 2, 3 and 4. A mathematical diagrammatic representation of the direction of forces employed in the operation of the improved grid to loosen bodies of ice from the tray and from the wall members of the grid, is shown in Figure 5 wherein the direction of the force applied to the transverse wall members through the intermediary of the movable longitudinal member 15 is shown by the arrow 115. A curved transverse wall member is represented at 122 and for the sake of comparison a straight transverse wall member having a similar inclination is shown at 24.

It is to be understood that the transverse wall members as shown in Figures 1, 2 and 3 are loosely held in their supporting notches and they are arranged in such a manner that when they are acted upon by the movable longitudinal member 15 they rotate about their lowermost edges 20a as axes. In the diagram this axis of rotation is represented by reference character 122a and it will be seen that a force applied in the direction of arrow 115 to a member mounted for angular movement about the axis 122a, will be converted into a moment of force acting upon the movable members 122 and 24 which become lever arms and are rotated about the axis 122a.

The movable longitudinal member 15 serves as a connecting rod to transmit the movement of the leverage mechanism to the transverse wall members and the longitudinal movement of the member 15 is converted into angular movement of the transverse members.

In the diagram the direction of the moments of force acting to rotate the hypothetical members 122 and 24 is graphically shown as follows: A radius 25 is drawn from the axis 122a through a point 26 which is common to both the straight and curved rotative members. Since a moment of force acting upon a lever arm acts in a direction that is perpendicular to the arm the arrows 27 are parallel and graphically represent the direction of the moments of force acting upon the straight rotative member 24. Other radii 28, 29 and 30 are drawn from the center 122a through various points on the curved rotative member 122. The moments of force acting upon the member 122 are graphically illustrated by arrows 31 which are perpendicular to the respective radii 28, 29 and 30 which truly represent the effective lever arms at their respective points of intersection with the curved rotative member 122.

It is obvious that the arrows 31 have a greater upward component of direction from the horizontal 32 than do the arrows 27. It is further obvious that the lowermost arrow 31 has a greater upward component than the uppermost arrow 31. The advantage of a curved transverse grid wall member in lifting ice bodies from the bottom of an ice tray as compared with the similar function of a straight transverse member, is thus clearly proven.

The entire grid assembly 13 is removable from the tray 12. However, due to the lifting action of the curved inclined transverse members, ice bodies may be readily separated from the bottom of the tray and from the walls of the grid by the operation of the lever handle 17 while the grid assembly remains in the tray. The longitudinal members 14 and 15 are in superposed relation and together serve as a central wall member of the grid, forming an inner end for each individual ice compartment, but it will be readily understood that any connecting member that is arranged to transmit force to the transverse members to rotate them from their normal inclined position toward an upright position, would serve the purpose. In this type of grid it is unnecessary to apply any mechanical force against the tray other than through the intermediary of the ice bodies themselves as the lifting forces are applied thereto as explained above.

A further advantage in the curved shape of the transverse wall members resides in the fact that an ice body being lifted from the tray bottom by angular movement of the transverse members, slides upwardly along the curved surfaces more readily than it would along a straight surface. Still another advantage in the curved grid members over similarly inclined straight grid members resides in the fact that at the upper surfaces of the ice bodies the angle formed between the cross members that are curved is greater than the angle that would be formed between the upper surface of the ice and a similarly inclined straight cross member. This gives greater strength in the ice body to resist chipping and breaking adjacent its upper surface, as the dislodging forces are applied to the ice.

The cross-sectional shape of the respective transverse walls is shown as concavo-convex, the concave faces being upward and forward in their normal freezing position. However, similar lifting forces could be applied to an ice body by other types of cross walls that have a concave inclined surface facing the direction of rotation.

The portion of the lever adjacent the pivoted end is downwardly widened to such an extent that it may be frozen into the ice. To facilitate its easy separation from the ice, this part of the lever is tapered downwardly as shown in Figure 6.

A relatively small aperture 40 is located through the longitudinal wall 14 adjacent the rear end thereof, to facilitate loosening of the ice bodies formed at the rear of the tray since there is no movable cross wall back of them to act thereon. When the entire grid element is moved with reference to the tray, the neck of ice that extends through the aperture, pulls the adjacent ice bodies free from the tray. After this operation, the respective ice bodies may easily be broken from the small neck of ice that connects them through the aperture.

In the modified form illustrated in Figure 7, a lever arm 17a has an extended right end 17b that bears upon the tray-rim 12a when the handle portion of the lever is rotated upwardly. This action will raise the entire grid assembly with reference to the tray bottom.

It will be noted that in this form the curved tarnsverse grid walls are normally in a substantially vertical position and the combined effects of the raising of the grid assembly as a whole and the angular movement of the individual trans-

verse walls, will raise and loosen the ice bodies from all contacting surfaces. It is to be understood that the operating mechanism in the form shown in Figure 7 is similar to that hereinabove described.

In Figure 8 a type of cross wall grid member is illustrated which has one side straight and the other side concave.

The transverse wall member illustrated in Figure 9 has both sides concave. Under certain conditions, cross walls having the cross sectional shape illustrated in Figure 8 or the one illustrated in Figure 9, may be desirable.

The component parts of the assembly illustrated in Figure 10 are similar to the ones hereinabove described, with the exception that the curved transverse wall members are reversed in their positions so that they are convex on the sides thereof that are positioned toward the direction of their ice-dislodging movements. In this arrangement a favorable sliding movement of the cross wall members against their respective ice bodies, is effected. It is to be understood that either type of lever arm may be used with any of the cross wall members that have been disclosed.

What I claim and desire to secure by Letters Patent is:

1. A freezing mold comprising a tray, and a cell-forming grid element therein consisting of a longitudinal wall, a plurality of inclined concave walls transverse to the longitudinal wall and positioned for angular movement relative thereto and held in spaced relation to each other by the longitudinal wall, an actuating member connecting the transverse walls, and mechanism on the grid element for imparting angular movement to the transverse walls through the intermediary of their actuating member.

2. In a freezing mold, a tray, an inclined concave wall member mounted for angular movement relative to the tray, and mechanism operatively connected with the wall to rotate it toward an upright position to dislodge ice on the concave side thereof.

3. A cell-forming grid for an ice tray, comprising a longitudinal wall, a plurality of concave inclined walls transverse to said longitudinal wall and positioned in spaced relation along the longitudinal wall, an actuating member connecting the transverse walls, and mechanism on the grid operatively connected with the actuating member to rotate the transverse walls relative to the tray in ice-dislodging movement.

4. A cell-forming grid for an ice tray, comprising a longitudinal wall, a plurality of concavo-convex inclined walls transverse to said longitudinal wall and positioned in spaced relation along the longitudinal wall, an actuating member connecting the transverse walls, and mechanism on the grid operatively connected with the actuating member to rotate the transverse walls relative to the tray in ice-dislodging movement.

5. The method of assembling two superposed parallel members through a transverse wall to form a freezing grid or the like which consists in forming a shouldered notch in an edge of one of the parallel members, providing a slot through the transverse wall, forming a notch in an edge of the other parallel member, passing the member having the shouldered notch through the slot and engaging an inner edge of said slot in the notch, passing the other parallel member through the slot, engaging an opposite edge of the slot in the notch of the last said member, the distance between said notches being less than the length of the slot and the distance from the shoulder to the nearest point of the opposite notch being approximately equal to the length of the slot, and engaging an edge of the slot in the shouldered position of the notch in the other member for loosely holding the assembly in its working arrangement.

6. In a grid for an ice tray, a longitudinal wall member, a rotatable concavo-convex wall transverse thereto, and means for rotating the transverse wall in the direction of its concave face and relative to said longitudinal wall.

7. In a grid for an ice tray, a longitudinal wall member, a rotatable convex wall transverse thereto, and means for rotating the transverse wall in the direction of its convex face and relative to said longitudinal wall.

8. In a device of the character described, a mold-element comprising a lengthwise member and a crosswise member mounted thereon for angular movement relative thereto to impart ice-dislodging movement to matter frozen in the mold, the crosswise member having a curved ice-engaging side to impart an upward component of force to ice adhering thereto throughout at least a portion of the range of its angular movement.

9. In a device of the character described, a mold-element comprising a lengthwise member and a normally-inclined crosswise member mounted thereon for angular movement to a substantially upright position to impart ice-dislodging movement to matter frozen in the mold, the crosswise member having a curved ice-engaging side to impart an upward component of force to ice adhering thereto during said movement.

10. In a device of the character described, a mold-element comprising a lengthwise member and a crosswise member mounted thereon for angular movement relative thereto to impart ice-dislodging movement to matter frozen in the mold, the crosswise member having an ice-engaging side curved to impart a component of force to ice adhering thereto in a direction other than the direction of the angular movement of such member.

11. The combination with a tray, and a mold in the tray defining a plurality of compartments for matter frozen in the tray, the mold being composed of a longitudinal member and transverse members of curved section movably mounted to impart angular movement to frozen matter in the compartments relative to the tray, the curvature of said members being effective for imparting a component of force in a direction other than the direction of the angular movement thereof, and mechanism in operative connection with the transverse members for initiating the angular movement thereof.

12. The improvement in molds for freezing trays in which one or more slotted members are movably mounted in a crosswise position on a lengthwise member having upper and lower cooperative notches against which the slotted surface of the crosswise member bears, which comprises a recess disposed at a side of one of said cooperative notches to provide a shoulder, the distance from the shoulder to the nearest point of the other cooperative notch being approximately equal to the length of the slot in the cross-member, whereby engagement of the slotted surface with the shoulder will seat the cross-

member against unauthorized movement in the opposing notch.

13. The improvement in molds for freezing trays in which one or more slotted members are movably mounted in a crosswise position on a lengthwise member having upper and lower cooperative notches against which the slotted surface of the crosswise member bears, which comprises a recess disposed at a side of the lowermost notch to provide a shoulder, the distance from the shoulder to the nearest point of the uppermost notch being approximately equal to the length of the slot in the cross-member, whereby engagement of the slotted surface with the shoulder will seat the cross-member against unauthorized movement in the uppermost notch.

14. In an ice-forming mold, a lengthwise wall member having a series of cooperative notches in its upper and lower surfaces with the notches in the upper surface facing upwardly and the notches in the lower surface facing downwardly, one notch of each cooperative pair of notches being shouldered, slotted transverse wall members mounted in cooperative notches along the lengthwise member for angular movement relative to the abutting shoulder of the notch, said shoulders being positioned to engage the respective movable transverse wall members during ice formation, and means for imparting said angular movement to the transverse wall members.

15. In an ice-forming mold, a lengthwise wall member having a series of cooperative notches in its upper and lower surfaces, one notch of each cooperative pair of notches being shouldered, slotted transverse wall members mounted in cooperative notches along the lengthwise member for angular movement relative to the abutting shoulder of the notch, said shoulders being positioned to engage the respective movable transverse wall members during ice formation, and means for imparting said angular movement to the transverse wall members.

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