March 16, 1943. F. W. GERARD ET AL 2,313,932

REFRIGERATING APPARATUS

Filed June 27, 1941 4 Sheets-Sheet 1

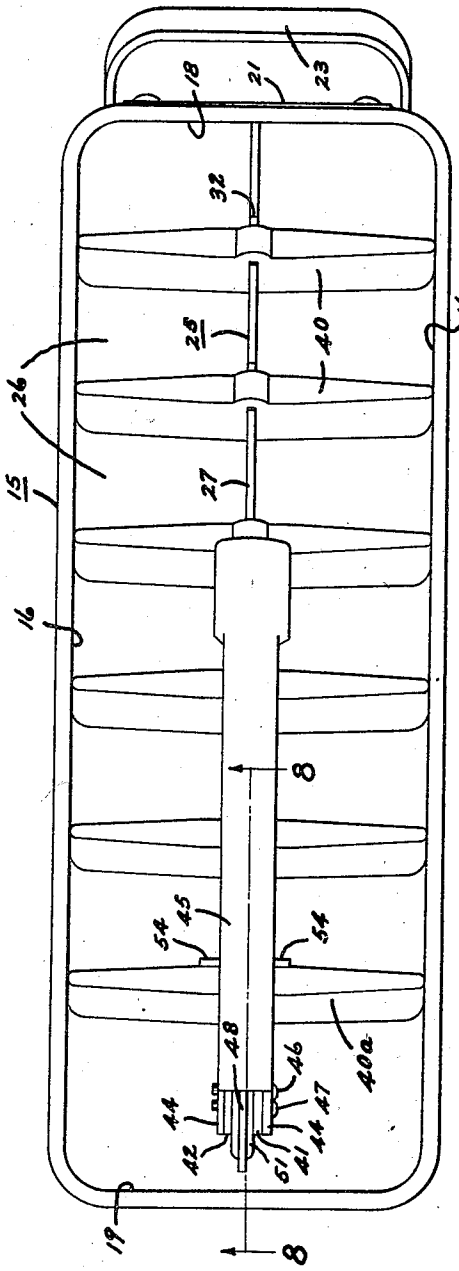


Fig. 1

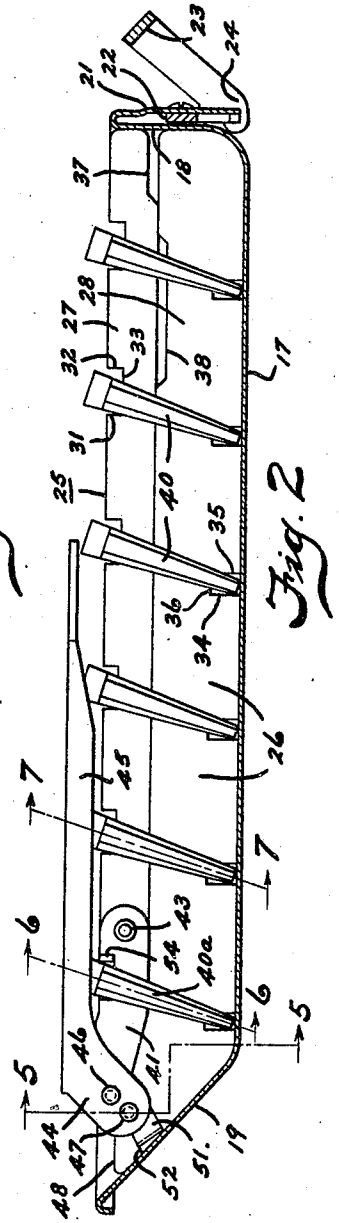


Fig. 2

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FRANK W. GERARD, FRANCIS I. RATAICZAK AND SYLVESTER M. SCHWELLER.
BY Spencer, Hardman and Fehr.

March 16, 1943. F. W. GERARD ET AL 2,313,932

REFRIGERATING APPARATUS

Filed June 27, 1941 4 Sheets-Sheet 2

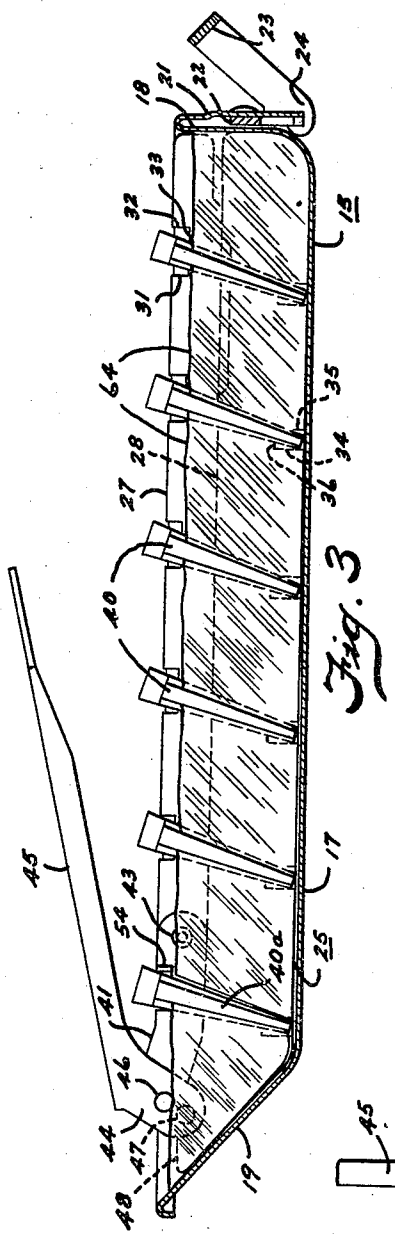
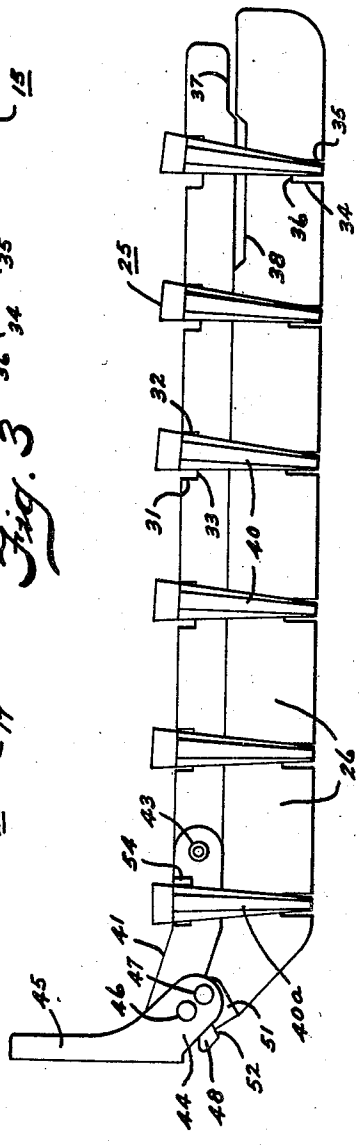


Fig. 3



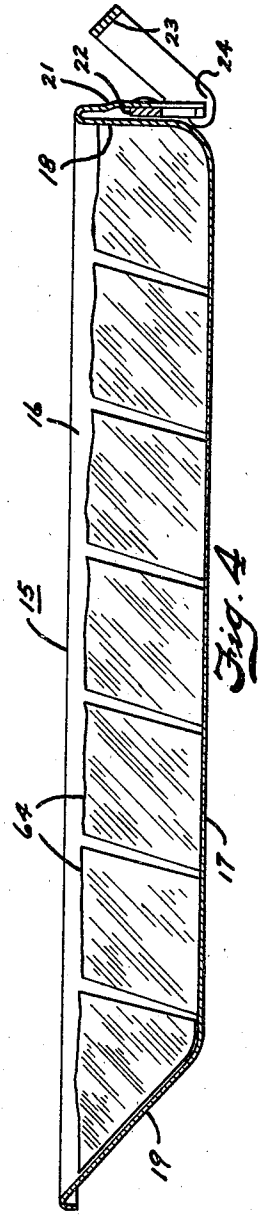


Fig. 4

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March 16, 1943. F. W. GERARD ET AL 2,313,932

REFRIGERATING APPARATUS

Filed June 27, 1941 4 Sheets-Sheet 3

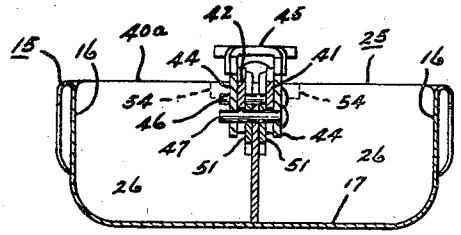


Fig. 5

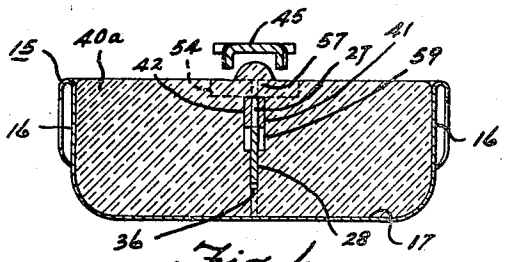


Fig. 6

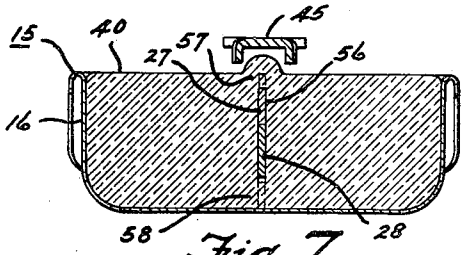


Fig. 7

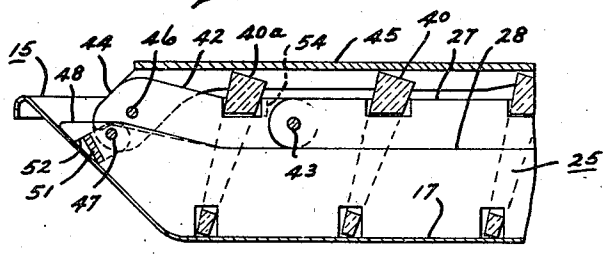


Fig. 8

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March 16, 1943. F. W. GERARD ET AL 2,313,932

REFRIGERATING APPARATUS

Filed June 27, 1941 4 Sheets-Sheet 4

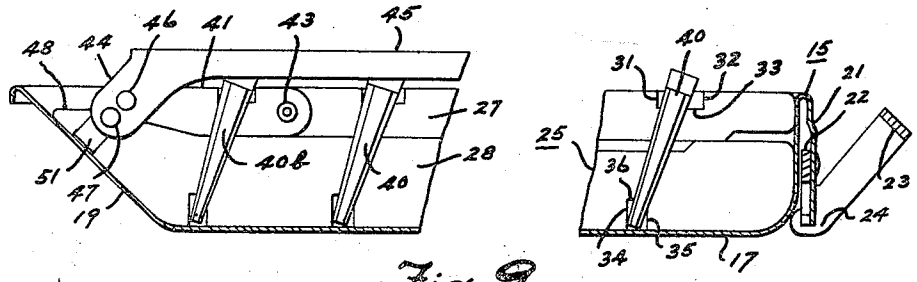


Fig. 9

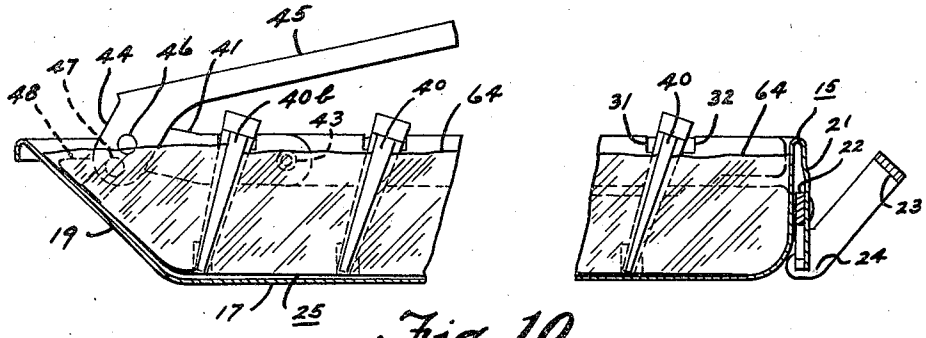


Fig. 10

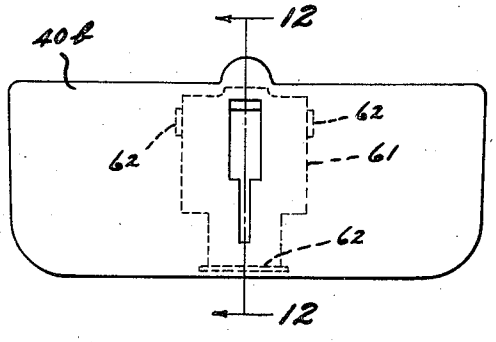


Fig. 11

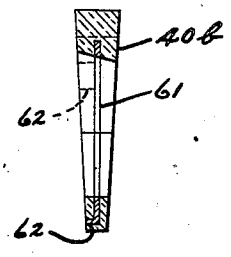


Fig. 12

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Patented Mar. 16, 1943 2,313,932

UNITED STATES PATENT OFFICE

2,313,932

REFRIGERATING APPARATUS

Frank W. Gerard, Oakwood, and Francis I. Rataiczak and Sylvester M. Schweller, Dayton, Ohio, assignors to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application June 27, 1941, Serial No. 400,064

8 Claims. (Cl. 62—108.5)

This invention relates to freezing devices employed in mechanically refrigerated household refrigerators.

Ice trays employed in household refrigerators have recently been equipped with grids comprising rigid metallic walls movable relative to one another to break ice blocks from the compartments formed by the grid and tray walls. Recently these grid walls have been formed of aluminum and these walls have had a film or coating of wax applied to their surfaces for rendering the walls water repellent so as to reduce bonding of ice thereto and to facilitate release of ice blocks therefrom. In order to render the aluminum walls capable of receiving and retaining the wax film or coating thereon, it has been necessary to anodize or activate the surface of these walls. Thus, it has been necessary to subject aluminum to an anodizing or activating process and thereafter a wax process before this material is rendered suitable and practical for use as ice tray grid walls. We, therefore, contemplate the making or forming of smooth surfaced ice tray grid walls from a material which has the inherent property of repelling water so as to eliminate the two separate, troublesome and expensive processes mentioned.

An object of our invention is to provide an improved grid structure for use in ice trays which structure facilitates the removal of ice blocks from the grid walls.

Another object of our invention is to form substantially inflexible movable walls of an ice tray grid structure from a material having the inherent property of repelling water.

A further object of our invention is to form substantially inflexible movable walls of an ice tray grid from a molded plastic material having the inherent property of providing the walls with smooth water repellent surfaces.

A still further object of our invention is to provide means associated with one of the grid walls formed of a material as described in the foregoing objects which means distributes force applied thereto, by a force applying means in order to move same relative to other walls over a substantial area thereof beyond the intersection of the walls.

Other and more specific objects and advantages reside in novel combinations and arrangements of parts of the ice tray grid structure as will more fully be apparent in the course of the following description.

In the drawings:

Fig. 1 is a top view of an ice tray having a grid constructed in accordance with the present invention positioned therein;

Fig. 2 is a side view of the device shown in Fig. 1 and is taken on the line 2—2 thereof;

Fig. 3 is a view similar to Fig. 2 showing the grid together with ice blocks frozen therein elevated relative to the tray;

Fig. 4 is a view showing the grid walls moved relative to one another and ice blocks removed from the grid structure;

Fig. 5 is a vertical sectional view taken on the line 5—5 of Fig. 2 showing the mounting of a lever on the grid;

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 2 showing the interlocking of one transverse wall on the longitudinal grid partition;

Fig. 7 is a vertical sectional view taken on the line 7—7 of Fig. 2 showing the interlocking of other of the transverse grid walls on the longitudinal partition;

Fig. 8 is a fragmentary vertical sectional view taken on the line 8—8 of Fig. 1;

Fig. 9 is a fragmentary view similar to Fig. 2 showing a modified form of grid structure having the present invention incorporated therein;

Fig. 10 is a view similar to Fig. 3 showing the modified grid structure elevated relative to the tray;

Fig. 11 is a front view of one transverse wall of the modified grid structure showing an insert therein; and

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11 showing the insert in the transverse wall.

Referring to the drawings, for illustrating the present invention, there is disclosed an ice tray 15 having side walls 16, a bottom wall 17 and opposed end walls 18 and 19. The tray rear end wall 19 converges outwardly toward the top of the tray for a purpose which will become apparent hereinafter. The walls 16, 18 and 19 of tray 15 have their upper edge rolled over to form a rim which extends entirely around the top of the tray. A portion of the tray 15 is extended downwardly from the tray rim, as at 21, at the front end thereof and provides a mounting for a heavy metal piece 22 which has a handle 23 pivotally secured thereto. Handle 23 facilitates placing of tray 15 in or on a cooling element or evaporator of a refrigerating system and a cam surface 24 formed on this handle functions, upon actuating handle 23, to break an ice bond between the tray and its support to permit removal

of the tray and its frozen contents from the evaporator in the well known manner.

A unitary grid structure, generally represented by the reference character 25, is removably disposed within tray 15 and divides the interior of the tray into a plurality of rows of open top cells or compartments 26. The grid structure 25 includes two metal sections which are movable relative to one another and which are in the form of longitudinal members 27 and 28 disposed one above the other in substantially the same vertical plane to provide a longitudinal partition or partitioning member. By disposing the members 27 and 28, as stated, they form complementary portions of a single thickness longitudinal member which is common to a plurality of the ice block compartments 26. The upper member 27 is provided with a plurality of spaced apart notches extending downwardly from its top edge. These notches include side walls 31 and 32 and a bottom horizontal wall 33. The lower member 28 is provided with a plurality of spaced apart notches extending upwardly from its bottom edge. The notches in member 28 include side walls 34 and 35 and a horizontal top wall 36. It will be noted that the upper member 27 has a cut away portion 37 and that the lower member 28 has a cut away portion 38 which portions facilitate assembly of these members into a plurality of substantially inflexible non-metallic transverse members 40 to be more specifically described hereinafter. It will also be noted that the notches provided in the lower member 28 of the longitudinal partition are equally spaced apart and that the notches of the upper member 27 are progressively wider relative to one another toward the rear end of grid 25 or toward the front of the tray 15. Upper member 27 is somewhat shorter than the lower member 28 and a link in the form of two metal pieces 41 and 42, disposed on opposite sides of the member 27, extends beyond the member 27. One end of link forming pieces 41 and 42 is pivotally secured to member 27 by a pin or rivet 43. The other end of the link forming pieces 41 and 42 is pivotally secured to leg portions 44 of a force multiplying means or lever 45 by a rivet or pin 46. A pin or rivet 47 extending through the legs 44 of lever 45 passes through an opening provided in the raised portion 48 of the lower longitudinal member 28 to pivotally mount the lever 45 upon the grid structure 25. A metal piece 51, fitting within a notch 52 provided in the inclined edge portion of member 28, is bent around the raised portion 48 of member 28. The pin or rivet 47 passes through openings provided in the end portions of bent piece 51 to lock this piece in place so that it serves to structurally strengthen the portion 48 of member 28 located adjacent the pin or rivet 47. The link formed by the metal pieces 41 and 42 is provided with a notch similar to the notches in the upper member 27 and is formed by cutting away a portion thereof and bending this portion outwardly of each piece 41 and 42 to provide extending ears 54. The cut away parts of members 41 and 42 and the bent portions or ears 54 thereof form the walls of the notch which receives the one transverse member 40a at the lever end of the grid. Integral bent ears 54 of pieces 41 and 42 extend outwardly a substantial distance beyond the point of intersection of transverse member 40a with the metal pieces 41 and 42 of the longitudinal partition so as to distribute force, transmitted through the link pieces by the force applying lever 45, over a substantial area of this one transverse wall or member 40a.

In the present disclosure the transverse grid walls or partitioning members 40 and 40a consist of or are formed of a plastic material such as polystyrene. This material is obtainable on the market under the trade name of Styron and is a powder. The powdered styrene is heated in a vessel to between 180° and 300° F. to cause melting thereof whereupon it is forced under pressure into a mold. The molten material is permitted to cool and solidifies in the mold and is then removed therefrom in the form of a substantially inflexible unitary polystrene glass-like piece of a shape desired to provide transverse grid walls or members. Polystyrene is a material of the character which inherently possesses the property of repelling water and, therefore, this property of the molded plastic members provides the members 40 and 40a with smooth water repellent surfaces. While the use of polystyrene is preferred, because of its adaptation to rapid production, other materials having the inherent property of repelling water are also suitable for use in making grid walls of the character described. For example, polyvinyl-acetate or polyvinyl-chloride sold under the trade name of Vinylite is another material having the inherent property of repelling water.

Referring again to the drawings, it will be noted that the transverse walls or members 40 and 40a are tapered outwardly toward their tops and tapered outwardly from their sides toward the center thereof. Each transverse member is provided with a vertically elongated opening centrally thereof. The opening 56 in members 40 is bounded at the top by a raised web portion 57 and at the bottom by a web portion 58 (see Fig. 7). The opening 59, in the one transverse member 40a, is wider at the top than at its bottom portion so as to receive the two link forming pieces 41 and 42 (see Fig. 6). Notches in the upper longitudinal member 27 are normally disposed out of vertical alignment with the notches in lower longitudinal member 28 so as to hold the transverse partitioning members 40 in a normally inclined position relative to the vertical (see Fig. 2). Thus the members 40 and 40a are mounted upon the longitudinal partition for movement relative thereto when the upper member 27 is moved lengthwise of the lower member 28 in the manner and for the purpose to be presently described.

In a structure of the type described, movement of the transverse walls 40 is caused by upward movement of the force applying lever 45. This force is transmitted to the end transverse member 40a through the link forming pieces 41 and 42 to move member 40a prior to moving the adjacent members 40. Movement of the first transverse member 40a is utilized to wedge the ice blocks at the lever end of the grid against the converging or inclined end wall 19 of tray 15 so as to cause an upward movement of these end ice blocks. This wedging of the end ice blocks causes the bond between all the ice blocks and walls of the tray to be broken and, therefore, requires a greater force to be applied to the end transverse member 40a than to any other of the members 40 to move same. Thus, in order to prevent breaking of the end transverse member 40a under this greater force, the extensions or ears 54 of link forming pieces 41 and 42 are constructed and so arranged that they engage a relatively wide top portion of end member 40a

to distribute this force over a substantial area thereof. Since ice blocks intermediate the plurality of transverse members 40 are broken away from the tray walls by the initial movement of the end transverse member 40a, it is only necessary to break the bond between the ice blocks and the grid walls upon further or continued movement of lever 45 to cause release of the ice blocks and, therefore, no force distributing means is required to be associated with the members 40.

While we have shown and described the ears 54 as providing force distributing means in the preferred form of our structure, other force distributing means within the realm of the present teaching may be employed. For example, we show in Figs. 9 to 12 of the drawings, a modified structure wherein the molded plastic transverse member 40b, at the lever end of the grid is provided with a metallic insert 61 having a vertical opening therein registering with and conforming to the contour of the opening in the member 40b. This metal insert 61 may be located closely adjacent the face of member 40b to which force is applied by the ears 54 or it may be located centrally of the member 40b as disclosed and provided with outwardly turned flange portions 62. Outwardly turned flange portions 62 of the metal insert 61, serve to hold the insert centrally within a mold during the process of forcing the molten plastic material into the mold. The insert 61 extends outwardly a substantial distance from the point of intersection of transverse member 40b with the link pieces 41 and 42 so as to distribute the force applied to member 40b over a substantial area thereof for preventing the applied force from breaking the member.

Assume that water has been frozen in tray 15 in the form of blocks 64, in the compartments 26, by the cooling effect produced by an evaporator of a refrigerating system, and the tray handle 23 has been manipulated to remove the tray from the evaporator and it is now desirable to remove ice blocks from the unitary grid structure 25. The handle end of lever 45 is, therefore, elevated to pivot the lever about pin 47 and to cause movement of pin 46 and link pieces 41 and 42 toward the end 19 of the tray 15. Movement of pieces 41 and 42 causes the ears 54 or the metal insert 61 to apply force over a substantial area of the side wall of the one transverse member 40a or 40b to tilt same toward the vertical. Tilting of member 40a or 40b wedges the end ice blocks against the inclined tray wall 19 (see Figs. 3 and 10) and in breaking these end ice blocks loose and forcing them up the inclined tray wall the bond between all other ice blocks and the tray walls is also broken by elevation of the grid relative to the tray. Further movement of the link pieces 41 and 42 moves the upper longitudinal member 27, through pin 43, lengthwise of the lower longitudinal member 28. As before stated, the notches in longitudinal member 27 are progressively wider and, therefore, the wall 32 of the notch in which the transverse member 40 adjacent member 40a is located, engages the upper web part 57, of member 40, and tilts same toward the vertical. The progressively wider notches of member 27 causes, upon continued movement of lever 45, the rest of the transverse members to be engaged and tilted toward the vertical in succession to successively break the ice blocks 64 from the grid walls. Since the grid walls or transverse member 40 and 40a are normally inclined and are tilted toward the vertical, the compartments 26 are momentarily enlarged and the ice blocks 64 will, therefore, freely move out of the compartments and fall into tray 15 as illustrated in Fig. 4 of the drawings, upon elevating the grid 25 relative to the tray. The ice blocks can then be readily harvested from the tray.

From the foregoing, it will be seen that we have provided an improved freezing device wherein the grid thereof includes transverse walls consisting of a material having the inherent property of repelling water. By employing walls for the grid made or formed of a material which inherently has the property of repelling water, bondage of ice blocks to the grid walls is materially minimized and the smooth water repellent wall surfaces facilitates movement of the walls relative to one another with the application of less force and facilitates release of ice blocks from their compartments. Such grid walls reduce manufacturing costs of grid structures for ice trays in that they eliminate one or more necessary processes to be carried out upon metal walls before they are rendered capable of serving their purpose.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adapted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse molded plastic members separate from and mounted upon said longitudinal member for movement relative thereto, means for applying force to said transverse members to cause said relative movement thereof, means associated with one of said transverse members and extending a substantial distance outwardly of the point of intersection thereof with said longitudinal member, and said last named means cooperating with said force applying means to distribute the force over a substantial area of said one transverse member.

2. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse molded plastic members separate from and mounted upon said longitudinal member for movement relative thereto, means for applying force to said transverse members to cause said relative movement thereof, means associated with said force applying means and extending a substantial distance outwardly of the point of intersection of one of said transverse members with said longitudinal member for contacting said one transverse member, and said last named means being so constructed and arranged as to distribute the force of said force applying means over a substantial area of said one transverse member.

3. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse molded plastic members separate from and mounted upon said longitudinal member for movement relative thereto, means for applying force to said transverse members to cause said relative movement thereof, a metallic insert within one of said transverse members and extending a substantial distance outwardly on both sides of the point of intersection of said one member with said longitudinal member, and said insert being so constructed and arranged as to distribute the force applied by said force applying means to said one

transverse member over a substantial area thereof.

4. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse members separate from and mounted upon said longitudinal member for movement relative thereto, said transverse members being formed of polystyrene, means for applying force to said transverse members to cause said relative movement thereof, means associated with one of said transverse members and extending a substantial distance outwardly of the point of intersection thereof with said longitudinal member, and said last named means cooperating with said force applying means and being so constructed and arranged as to distribute the force over a substantial area of said one transverse member.

5. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse members separate from and mounted upon said longitudinal member for movement relative thereto, said transverse members being formed of polystyrene, means for applying force to said transverse members to cause said relative movement thereof, means associated with said force applying means and extending a substantial distance outwardly of the point of intersection of one of said transverse members with said longitudinal member for contacting said one transverse member, and said last named means being so constructed and arranged as to distribute the force of said force applying means over a substantial area of said one transverse member.

6. A grid for an ice tray comprising, a longitudinal partitioning member and a plurality of substantially inflexible transverse members separate from and mounted upon said longitudinal member for movement relative thereto, said transverse members being formed of polystyrene, means for applying force to said transverse members to cause said relative movement thereof, a metallic insert within one of said transverse members and extending a substantial distance outwardly on both sides of the point of intersection of said one member with said longitudinal member, and said insert being so constructed and arranged as to distribute the force applied by said force applying means to said one transverse member over a substantial area thereof.

7. A grid for an ice tray comprising, a longitudinal member and a plurality of substantially inflexible transverse molded plastic partitions separate from and carried by said member for movement relative thereto, means for applying force to said partitions to cause said relative movement thereof, and means cooperating with said force applying means to distribute the force over a substantial area of one of said transverse partitions.

8. A grid for an ice tray comprising, a longitudinal member and a plurality of substantially inflexible transverse partitions separate from and carried by said member for movement relative thereto, said transverse partitions being formed of polystyrene, means for engaging said partitions and applying force thereto to cause said relative movement thereof, and at least one of said partitions being of increased thickness in the vicinity of engagement therewith of said means for facilitating distribution of the force over a substantial area thereof.

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