June 10, 1941. J. W. JACOBS 2,245,440

REFRIGERATING APPARATUS

Filed May 26, 1939 3 Sheets-Sheet 1

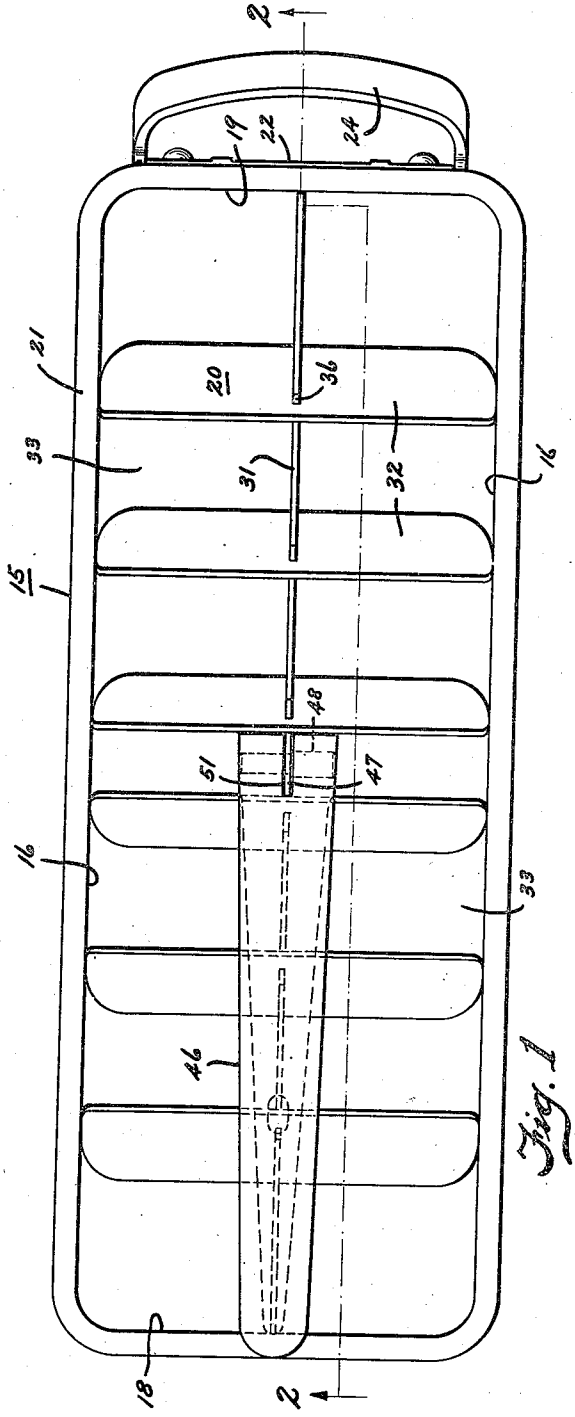


Fig. 1

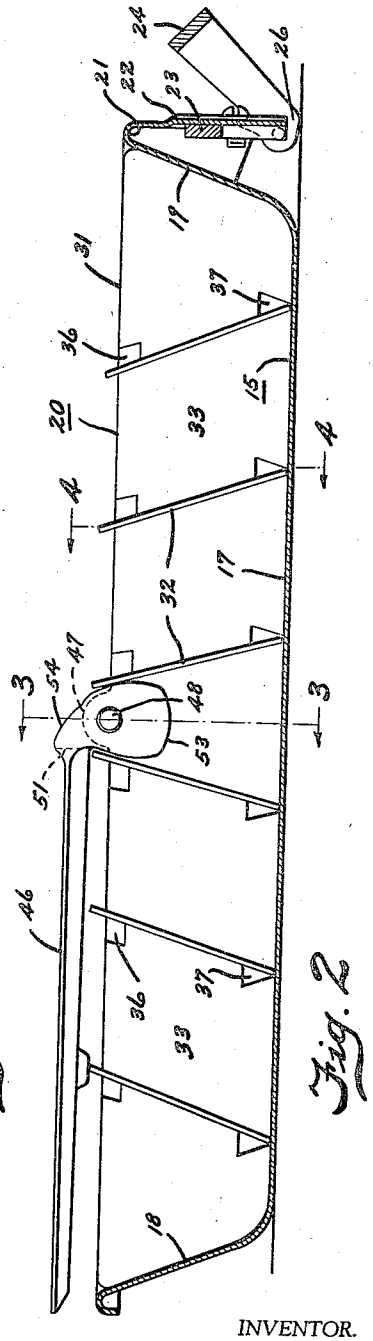


Fig. 2

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Filed May 26, 1939 3 Sheets-Sheet 2

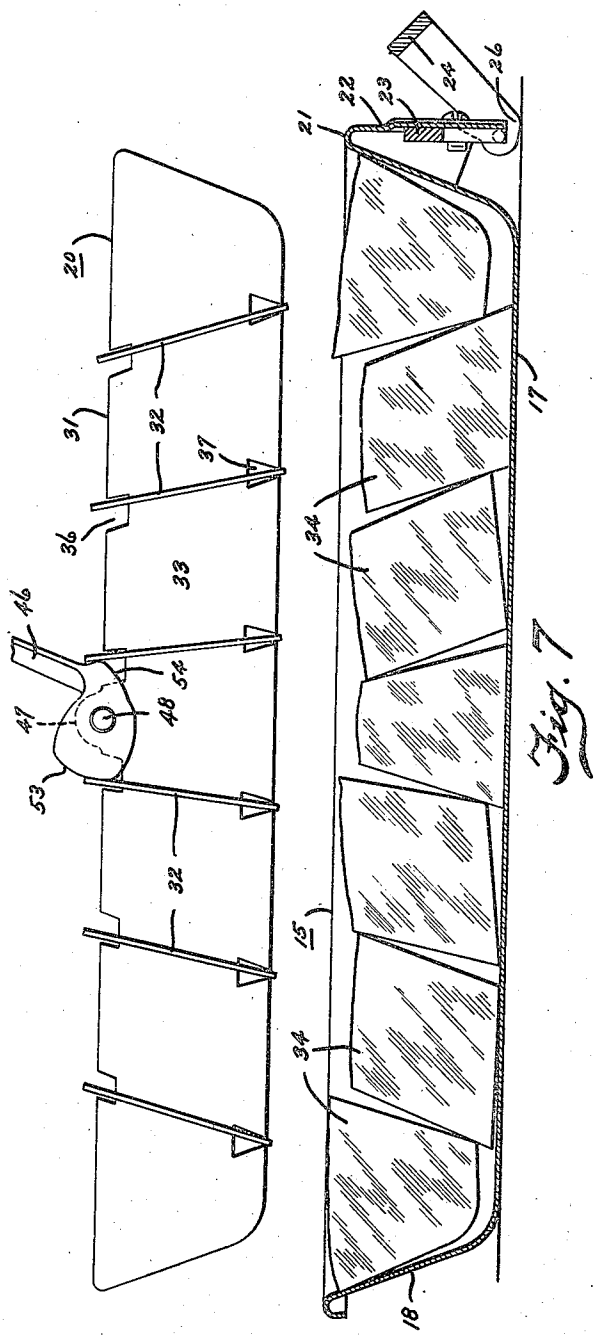


Fig. 7

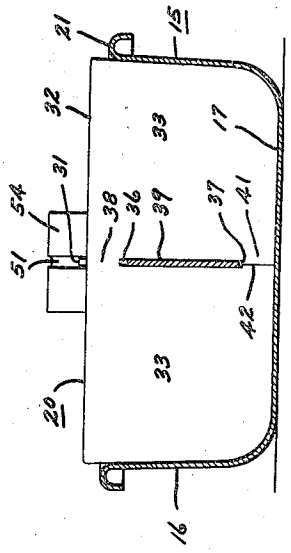


Fig. 4

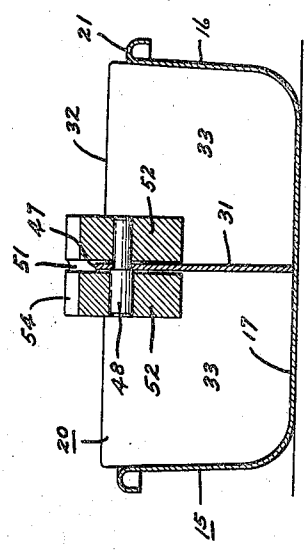


Fig. 3

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REFRIGERATING APPARATUS

Filed May 26, 1939 3 Sheets-Sheet 3

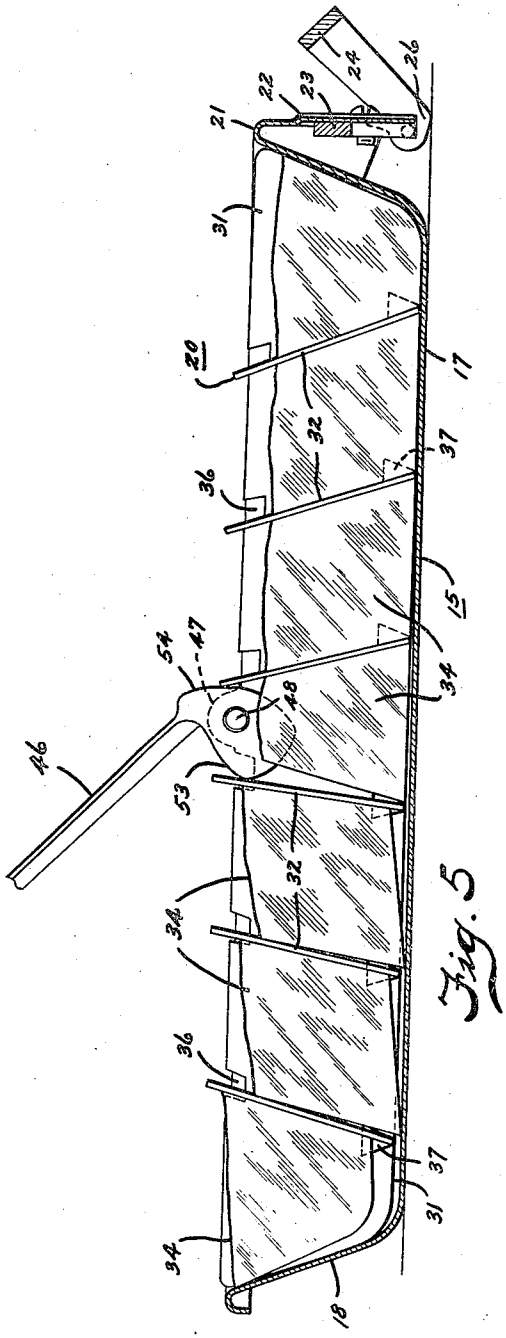


Fig. 5

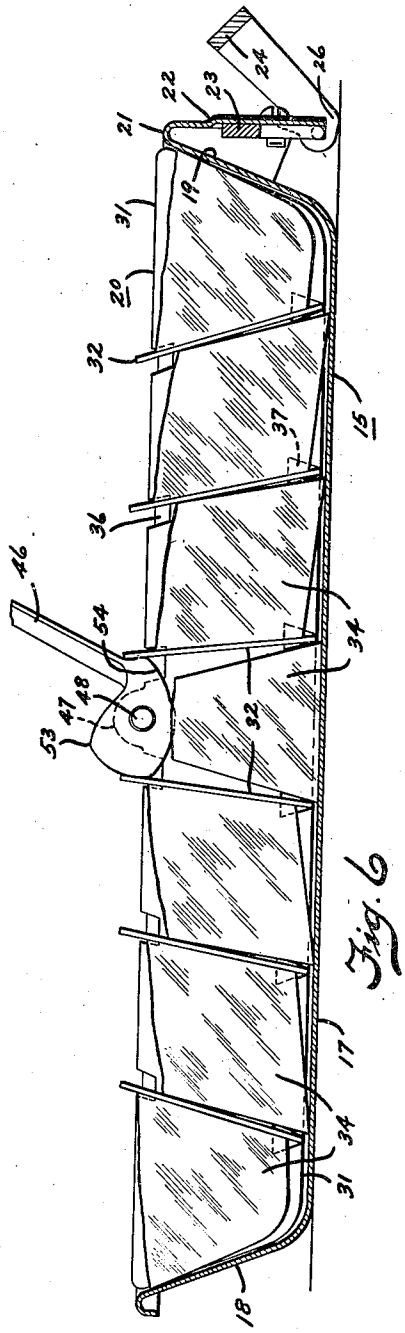


Fig. 6

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Patented June 10, 1941 2,245,440

UNITED STATES PATENT OFFICE

2,245,440

REFRIGERATING APPARATUS

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Application May 26, 1939, Serial No. 275,943

8 Claims. (Cl. 62—108.5)

This invention relates to liquid freezing devices and particularly to ice trays and grids therefor employed in household refrigerators.

I am aware of the fact that there is now in commercial use liquid freezing devices for household refrigerators including a tray and a grid therefor wherein the grid is of a rigid metal wall unitary construction and divides the interior of the tray into a plurality of ice block compartments. In these devices the grid is ordinarily removable from the tray and has certain of its rigid ice block compartment walls movable relative to certain others thereof for breaking a bond between the compartment walls and ice blocks bonded thereto to thereby liberate the ice blocks from the grid structure. Devices of this type have been expensive to manufacture due to the fact that the grid structure thereof is usually provided with an operating bar which spans and engages the plurality of ice block compartment walls to be moved by a lever or other force multiplying means. The provision of an operating bar complicates the structure and in addition renders the grid difficult to clean thus resulting in an unsanitary structure. More recently, however, others have endeavored to reduce the cost of such grid structures by eliminating the operating bar and by making a certain ice block compartment wall in two parts, one of which parts is movable relative to the other thereof, upon application of force thereto by a lever, for transmitting force directly to each of the walls of the grid to be moved. While this latter type of grid construction has been placed on the market and used quite extensively, it has not been entirely satisfactory because of the fact that the inherent difficulty of moving a part of a grid wall through the large body of ice frozen in the grid structure and relative to the other part of the wall to move the movable grid walls causes the ice blocks to shatter or causes sections of the ice blocks to break away from the main portion of the blocks. I have found that by utilizing the ice blocks themselves to transmit force from one grid wall to another thereof and by arranging the grid walls so that they will be moved by the force applied to the ice blocks shattering or breaking of the blocks is eliminated. Due to my discovery, I contemplate the construction of a more simplified and low cost liquid freezing device from which ice blocks can be readily and effectively harvested while at the same time maintaining certain desirable structural features.

A general object of my invention is to provide an improved liquid freezing device for refrigerating systems and a novel method of removing the grid of the device from the tray thereof and ice blocks from the tray and grid without the application of heat.

Another object of my invention is to provide an improved liquid freezing device wherein force applied to a certain ice block compartment wall of the grid structure thereof is transmitted through blocks of ice adjacent thereto to other of the grid walls to move same and wherein such wall and ice block movement frees the grid from the tray of the device and also liberates ice blocks from the grid walls forming the compartments.

A further object of my invention is to provide an improved liquid freezing device wherein force applied to an ice block compartment wall located centrally of an elongated non-flexible grid structure in the tray of the device moves other of the grid walls toward an end of the grid structure by transmitting the force solely through ice blocks disposed between the ice block compartment walls.

In carrying out the foregoing objects, it is a still further and more specific object of my invention to provide an improved liquid freezing device including a tray and a rigid grid wall structure disposed in the tray to divide the interior of the tray into ice block compartments wherein the grid walls are normally inclined with respect to the bottom of the tray, are disposed at an acute angle relative to one another and are tiltable in a direction lengthwise of the device by transmission of force through blocks of ice therein to substantially squeeze the ice blocks out of their compartments.

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 form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a top plan view of a freezing device comprising a tray and grid constructed in accordance with my invention;

Fig. 2 is a side view of the freezing device showing the tray in section and is taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical transverse sectional view of the device taken on the line 3—3 of Fig. 2 and showing the mounting of a lever on the grid thereof;

Fig. 4 is a vertical transverse sectional view taken on the line 4—4 of Fig. 2 and showing the interlocking connection of cross walls of the grid with the longitudinal wall thereof;

Fig. 5 is a view similar to Fig. 2 showing ice

blocks in the freezing device and disclosing the grid structure elevated relative to the tray with ice blocks in one portion of the device broken loose from walls of the grid and tray.

Fig. 6 is a view similar to Fig. 5 showing the grid structure elevated relative to the tray with all the ice blocks in the device broken loose from walls of the grid and tray; and

Fig. 7 is a view showing the grid of the freezing device removed from the tray thereof with ice blocks liberated from the grid structure and contained in the tray.

Referring to the drawings, for illustrating my invention, I have disclosed a freezing device for liquids adapted to be placed in or on a support associated with a cooling element or evaporator of a refrigerating system. The freezing device includes a substantially rigid metal tray 15 having side walls 16, a bottom wall 17 and opposed end walls 18 and 19. The tray side walls 16 are diverged outwardly toward the top of the tray and the end walls 18 and 19 are diverged outwardly toward the top of the tray a greater distance than the side walls for facilitating removal of a unitary grid structure 20, disposed in tray 15, from the tray as will be more fully described hereinafter. The walls 16, 18 and 19 of tray 15 have their upper edge rolled or bent over to form a rim 21 which extends continuously around the top of the tray and increases the structural strength thereof. A portion of the metal tray 15 is extended downwardly from rim 21, as at 22, at the front end thereof and provides a mounting for a metal piece 23 which has a handle 24 pivotally secured thereto. The handle 24 facilitates placing of the freezing device on its support in the evaporator of the refrigerating system and a cam surface 26 formed thereon functions, upon actuating handle 24, to break an ice bond between the tray and its support to permit removal of the freezing device and its frozen content from the evaporator as is well known in the art.

The unitary grid structure, generally represented by the reference character 20, is removably disposed within tray 15 and comprises a rigid upright one-piece metal longitudinal partition or wall 31 and a plurality of rigid metal partitions or walls 32 extending transversely through the plane thereof in spaced apart relation along the length of said longitudinal partition. The partitions or walls 31 and 32 of grid structure 20 divide the interior of tray 15 into a plurality of rows of compartments 33 adapted to have a liquid frozen therein in the form of ice blocks 34.

Longitudinal partition or wall 31 of grid 20 has a plurality of spaced apart notches 36 extending downwardly from its top edge and has a plurality of V-shaped slots 37 cut upwardly from its bottom edge, the number of notches 36 corresponding to the number of slots 37 to provide for the interlocking of the desired number of transverse walls 32 in movable relation with longitudinal wall 31. Trasverse walls 32 each have a web portion 38 located above an elongated opening 39 provided therein (see Fig. 4) and which web portion 38 is disposed in a notch 36 with the main body portion of longitudinal wall 31 disposed within the opening 39 of the transverse wall. A lower web portion 41 of each transverse wall 32 (see Fig. 4) fits in a slot 37 of the longitudinal wall 31 and this web portion 41 is slit, as at 42, to permit assembly of the transverse walls or partitions 32 upon or into movable interlocking relation with the longitudinal partition or wall. The edges of the slit 42 at the web portions 41 are bent outwardly away from one another to provide a clearance space which permits sliding of the transverse walls 32 over the longitudinal wall 31. After the transverse walls are located in their respective notches and slots of the longitudinal wall the edges of the slits 42 are bent back into alignment to movably lock the transverse walls 32 on the wall 31. The slit 42 at the webs 41 may be closed, if desired, by soldering or welding the edges thereof together. The arrangement of the notches 36 relative to the slots 37 in longitudinal wall 31 and the loose interlocking of walls 32 with wall 31 are such that the transverse walls 32 assume an inclined position relative to the vertical disposition of the longitudinal wall 31 when the grid structure 20 is placed in the tray 15. In addition, I space the slots 37 at different distances from one another to normally dispose the rigid transverse partitions or walls at an acute angle relative to one another when the grid walls are in an ice block forming position within tray 15. The normal acute angled disposition of the transverse grid walls relative to one another provides the ice block compartments 33 with a trapezoid form in one direction of cross section therethrough which facilitates the liberation of ice blocks 34 from the compartments 33. In other words, the compartments 33 are tapered or are of a greater horizontal cross sectional area at their bottoms than at their tops. A lever 46 is pivotally mounted upon an upstanding ear 47 provided on the central top portion of longitudinal grid wall 31 by a pin or peg 48. The thick pivotally mounted portion of lever 46 is slotted as at 51 (see Fig. 3) to provide a pair of legs 52 that straddle the longitudinal wall 31 and each of which legs 52 have like cam portions 53 and 54 formed thereon. Lever 46 is, in the present disclosure, disposed between the two centralmost transverse walls near the top of the grid structure 20, and the cam portions 53 and 54 of the lever are adapted to directly engage the upper part of these central transverse grid walls in a manner and for a purpose to be hereinafter more fully described.

Due to the elongation of the opening 39 in the cross or transverse walls 32 being greater than the dimension of the body portion, between a notch 36 and a slot 37, of longitudinal wall 31, these transverse walls 32 normally depend a short distace below the bottom edge of the logitudinal grid wall. Therefore, when the unitary grid structure 20 is placed in the tray 15 the bottom edges of transverse walls 32 strike the bottom of tray 15 and are elevated whereupon they tilt about their pivot points, formed by the lower edges of slots 37, and the upper web portion 38 of walls 32 move against the upright wall portion of notches 36 that are closer to the pivotal mounting of lever 46. The arrangement of the notches 36 with respect to the slots 37 prevents the transverse grid walls 32 from attaining a vertical position and thus the walls 32 are always slightly inclined relative to the vertical disposition of longitudinal grid wall 31 or relative to the bottom wall 17 of tray 15 to cause the movement thereof described into a normal ice block forming position when the grid is placed in the tray. Since the plurality of transverse grid walls 32 are normally inclined and one wall thereof adjacent another wall is disposed at an acute angle relative to the said another wall, the ice block compartments are of a greater horizontal cross sectional area at their bottoms than at their tops. The transverse walls will inherently attain their different inclinations relative to one another when the grid structure 20 is placed in

the tray 15 with the grid walls 32 resting upon the bottom of tray 15.

In the present disclosure I have arranged the notches 36 and slots 37 in the rigid longitudinal grid wall 31 relative to one another so that the inclined rigid transverse partitions or walls 32 are loosely interlocked with the longitudinal partition or wall by these notches and slots and so that the transverse walls have a 3° difference of inclination relative to one another to provide the normal acute angled disposition thereof. In other words, the first walls 32 on each side of the pivotal mounting of lever 46 are normally disposed at a 75° included angle which is 75° from the horizontal bottom edge of longitudinal grid wall 31 or from the bottom wall 17 of tray 15 to provide the central compartments 33 with an isosceles trapezoid form in one direction of cross section therethrough. The walls 32 adjacent the 75° angled walls are normally disposed at a 72° included angle which is 72° from the horizontal bottom edge of longitudinal grid wall 31 or from the bottom wall 17 of tray 15. End transverse walls 32 are normally disposed at a 69° included angle which is 69° from the horizontal bottom edge of longitudinal grid wall 31 or from the bottom wall 17 of tray 15. All the transverse partitions or walls 32 are of the same dimension in height, and consequently the ice block compartments 33 beyond the central compartments are, when the transverse walls are in their normal ice block forming position within tray 15, of substantially a trapezoid form in one direction of cross section therethrough. While I have set forth a preferable differentiation in the acute angled disposition of the transverse grid walls relative to one another in their normal position of inclination, it is to be understood that I do not wish to be limited to this specific example given.

Assume that water has been frozen in the freezing device, comprising the grid 20 and tray 15, in the form of the ice blocks 34 in compartments 33 by the cooling effect produced by an evaporator of a refrigerating system, and the tray handle 24 has been manipulated to remove the device from its support on the evaporator and it is now desirable to harvest the ice blocks 34 from the freezing device. The lever 46 is elevated to rotate the cam portions 53 formed thereon about the pivot pin 48 and into engagement with the upper part of transverse grid wall 32, on opposite sides of longitudinal wall 31, at the left of the pivotal mounting of the lever. Force applied to the one transverse partition or wall, located on the left-hand side of the pivotal mounting of lever 46, by the cams 53 in an attempt to move or tilt this wall in a direction lengthwise of the device is transmitted solely through the ice blocks 34 adjacent this one transverse wall to the bottom of tray 15 and to other of the transverse partitions or walls beyond said one transverse wall and toward the left-hand end of the freezing device. The force exerted upon lever 46 is greatly multiplied by the relation of cam 53 to the pivotal mounting of lever 46 and by the point of engagement of cam 53 with the upper portion of the wall 32 relative to the pivot point of wall 32 which is at the bottom of the device. This multiplied force transmitted through the ice blocks breaks the bond between the ice blocks 34 and their compartment walls and between the ice blocks 34 and walls of tray 15. Due to the construction and arrangement of the transverse walls 32, all these walls to the left of the pivotal mounting of lever 46 move in a direction lengthwise of the longitudinal grid wall 31 or are tilted relative thereto and consequently substantially squeeze the ice blocks 34 out of the trapezoid shaped compartments 33. The force exerted against the ice blocks 34 to move same downwardly of their compartments 33 breaks the entire grid structure 20 and other ice blocks 34 remaining bonded to the opposite or right-hand end portion of the grid from the tray as shown in Fig. 5 of the drawings. The unitary grid structure 20 and ice blocks remaining bonded in the right-hand end thereof can then be withdrawn from tray 15 to thereby leave the already loosened ice blocks free within the tray for harvesting same therefrom. After harvesting of the loosened or liberated ice blocks 34, the grid structure 20 together with the ice blocks still remaining bonded thereto in the right-hand end thereof can be replaced in tray 15 and the tray repositioned in the evaporator until such time as harvesting of the remainder of the ice blocks is desired. However, if all the ice blocks 34 are desired to be harvested at the same time the lever 46 is moved, while the grid structure 20 remains in the tray, further in its single direction of motion, than the movement thereof to remove the ice blocks in the left-hand end thereof as described, about the pivotal mounting pin 48 to also rotate the second cam portions 54 into engagement with the one transverse grid wall or partition 32 located at the right-hand side of the pivotal mounting of the lever. Force applied to this one transverse wall or partition at the right of lever 46 in an attempt to move or tilt it is transmitted solely through the ice blocks adjacent thereto to other transverse walls beyond same and toward the right-hand end of the structure. The force and movement of the transverse grid walls 32 relative to the longitudinal grid wall 31 substantially squeezes the ice blocks 34 in the right-hand end portion of the grid from their compartments as shown in Fig. 6 of the drawings. If it is found, after liberating ice blocks from the left-hand end of the structure and after having removed the grid and ice blocks in the right-hand end thereof from the tray, that all the ice blocks are desired to be harvested the grid 20 with the blocks remaining bonded thereto, in the right-hand end portion thereof, may be repositioned in the tray or placed upon a table top and the lever 46 rotated further in its single direction of motion to move the transverse walls to which the remaining ice blocks are bonded to liberate these blocks. Ice blocks in the isoceles trapezoid shaped compartments below the central mounting point of lever 46 will be liberated from the grid by movement of their bounding transverse walls at the time ice blocks in the right-hand portion of the device are liberated. I have in Fig. 7 of the drawings shown the grid structure 20 removed from the tray 15, after having manipulated lever 46 to loosen all the ice blocks from walls of the grid and tray, and have disclosed the liberated ice blocks positioned in the tray to be harvested therefrom. In this manner, it will be seen that ice blocks 34 are liberated from the freezing device and grid structure 20 for harvesting by force transmitted solely through the blocks of ice from one transverse wall to another and without the aid of additional means connected to the lever and engaging each individual transverse grid wall. The force exerted upon the ice by lever 46 substantially breaks the bond between certain of the ice blocks and their compartment walls, to permit movement of cer-

tain of the ice block walls, simultaneously with the breaking of the bond between ice blocks remaining bonded to the grid and walls of the tray to cause the grid structure 20 to be moved upwardly of the tray 15. Breaking of the ice bonds between the ice block compartment and tray walls may be facilitated, if desired, by treating or coating the walls with a waxy or the like substance.

From the foregoing it will be seen that I have provided an improved freezing device and particularly an improved method of moving movable walls of a unitary grid structure. My invention permits the construction of a simplified grid structure of low manufacturing cost, strong and durable and capable of effectively removing ice blocks therefrom. My invention reduces to a minimum the number of parts to be assembled in the construction of a unitary removable grid structure and by eliminating the necessity of moving a part of an ice block compartment wall through the ice and relative to another part thereof, undue shattering of the ice blocks is prevented. In the freezing device disclosed, all or less than all of the ice blocks can be harvested at one time as desired and ice blocks not harvested can be replaced along with the grid into the tray, and the tray repositioned in the evaporator to preserve the remaining ice blocks until such time as their harvesting is desired. My improved freezing device lends itself to several different modes of liberating and harvesting ice blocks therefrom and in this respect is of increased utility over certain former constructions.

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 adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A unitary grid structure for an ice tray comprising, a longitudinal wall, a plurality of spaced apart walls extending transversely to said longitudinal wall and individually interlocked therewith for movement within fixed limits thereupon, said walls cooperating with the tray to form compartments in which a liquid is frozen into ice blocks, and movable means permanently attached to said grid for engaging and moving one of said transverse walls relative to said longitudinal wall and to move other of said transverse walls relative to said longitudinal wall by reason of force transmitted through ice blocks in said compartments.

2. A unitary grid structure for an ice tray comprising, a longitudinal wall, a plurality of spaced apart walls extending transversely to said longitudinal wall and individually interlocked therewith for movement within fixed limits thereupon, said walls cooperating with the tray to form compartments in which a liquid is frozen into ice blocks, and movable means permanently attached to a central part of said longitudinal grid wall for engaging and moving a first transverse wall on one side thereof and for engaging and moving a second transverse wall on the other side thereof in opposite directions to one another and to move other of said transverse walls beyond said first and said second transverse walls by reason of force transmitted through ice blocks in said compartments.

3. A unitary grid structure for an ice tray comprising, a longitudinal wall, a plurality of spaced apart walls extendings transversely to said longitudinal wall and individually interlocked therewith for movement within fixed limits thereupon, said walls cooperating with the tray to form compartments in which a liquid is frozen into ice blocks, a lever permanently attached to said longitudinal grid wall, all of said transverse walls on one side of said lever being inclined with respect to the vertical toward said lever, and said lever being movable to engage and tilt one of said transverse walls in a direction toward the vertical and to tilt other of said transverse walls toward the vertical by reason of force transmitted through ice blocks in said compartments.

4. A grid of the character described in claim 3 wherein the inclined transverse walls are normally in non-parallel relation to one another.

5. A unitary grid structure for an ice tray comprising, a longitudinal wall, a plurality of spaced apart walls extending transversely to said longitudinal wall and individually interlocked therewith for movement within fixed limits thereupon, said walls cooperating with the tray to form compartments in which a liquid is frozen into ice blocks, a lever permanently attached to a central part of said longitudinal grid wall, all of said transverse walls on one side of said lever being inclined with respect to the vertical toward said lever, all of said transverse walls on the other side of said lever also being inclined with respect to the vertical toward said lever, and said lever being movable to engage and tilt transverse walls adjacent thereto in a direction toward the vertical and to tilt other of said transverse walls toward the vertical by reason of force transmitted through ice blocks in said compartments.

6. A grid of the character described in claim 5 wherein the inclined transverse walls are normally in non-parallel relation to one another.

7. A grid of the character described in claim 5 wherein the lever is movable in a single direction of motion for engaging and moving the transverse walls adjacent thereto in opposite directions relative to one another and toward the vertical.

8. In combination, a grid for a freezing tray, said grid comprising a longitudinal main wall, a series of cross walls retained in spaced relation along the length of said main wall and defining ice block compartments therewith and with said tray, said cross walls being permanently interlocked with and tiltably mounted upon said main wall in such manner that said cross walls may be tilted in a direction longitudinally of said main wall to loosen the ice blocks from their frozen bond to the grid surfaces, at least one of said cross walls having its upper margin extending clear of and unobstructed by all adjacent portions of said main wall when in freezing position, and a hand lever arranged to forcibly pry said one cross wall to a tilted position by engaging its said unobstructed upper margin and by reacting upon a closely adjacent portion of said main wall.

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