Oct. 22, 1940. D. H. REEVES 2,219,079

REFRIGERATING APPARATUS

Filed Sept. 24, 1937 4 Sheets-Sheet 1

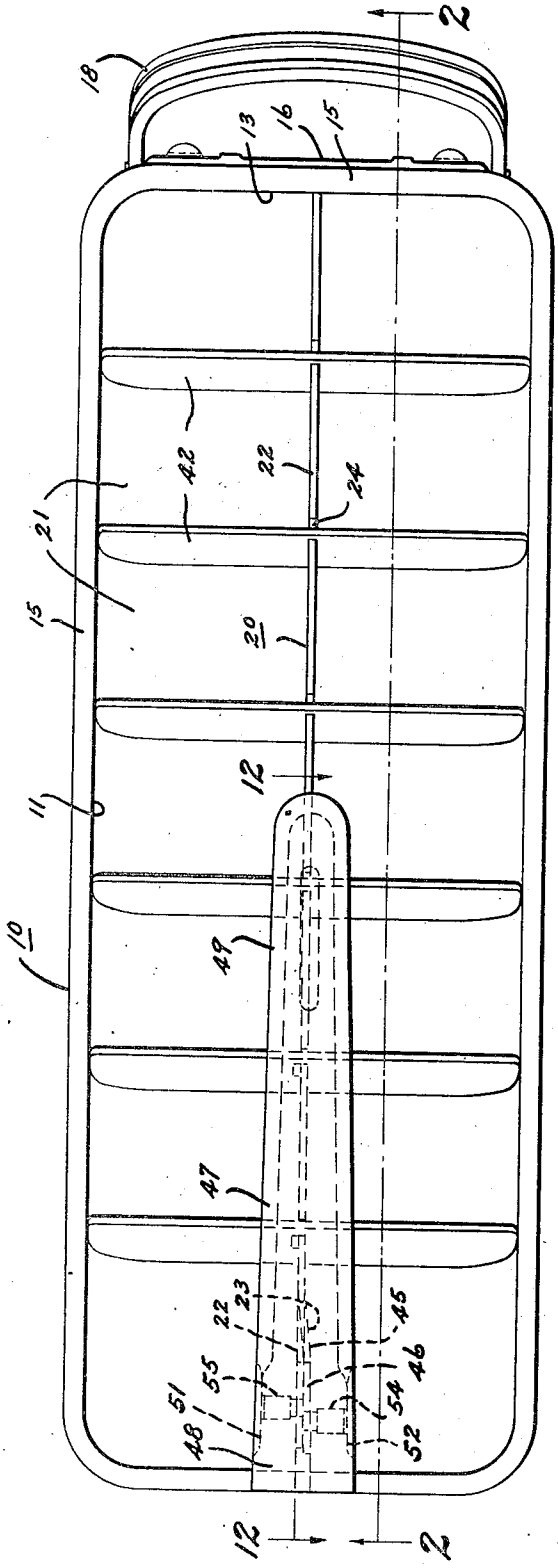


Fig. 1

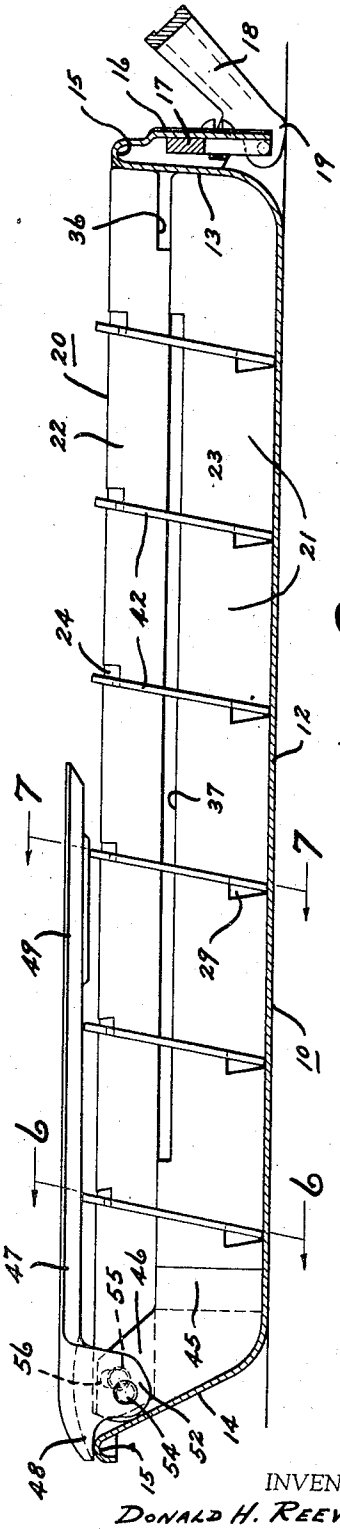


Fig. 2

INVENTOR.
DONALD H. REEVES.

BY
Spencer, Hardman and Fehr.
HIS ATTORNEYS.

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Filed Sept. 24, 1937 4 Sheets-Sheet 2

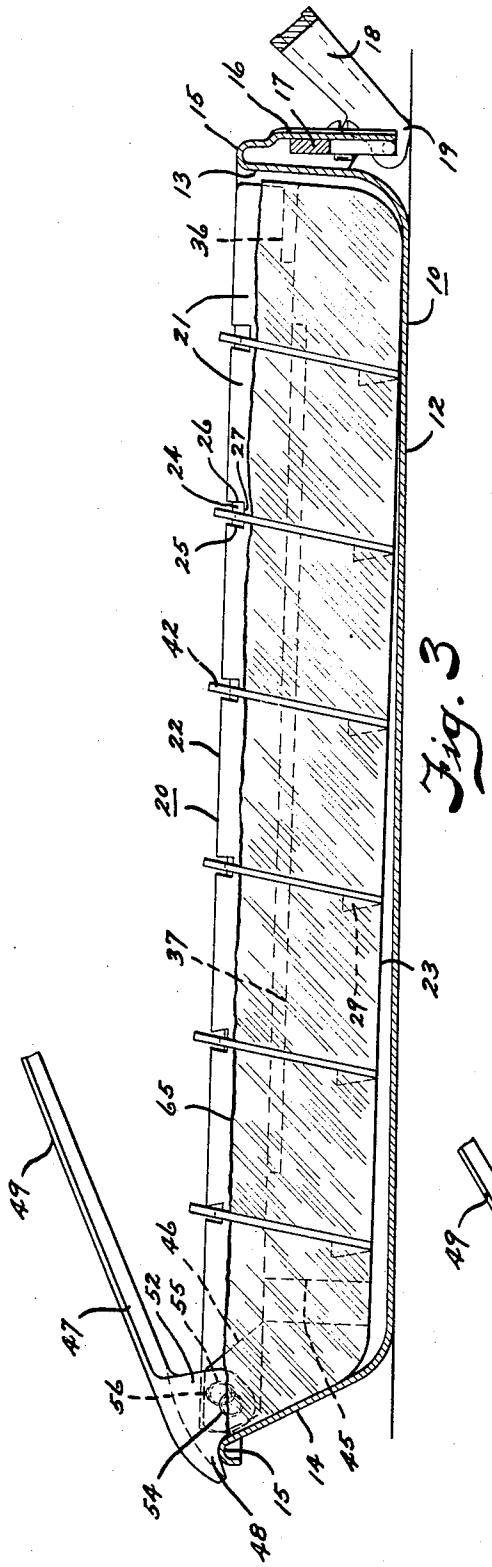


Fig. 3

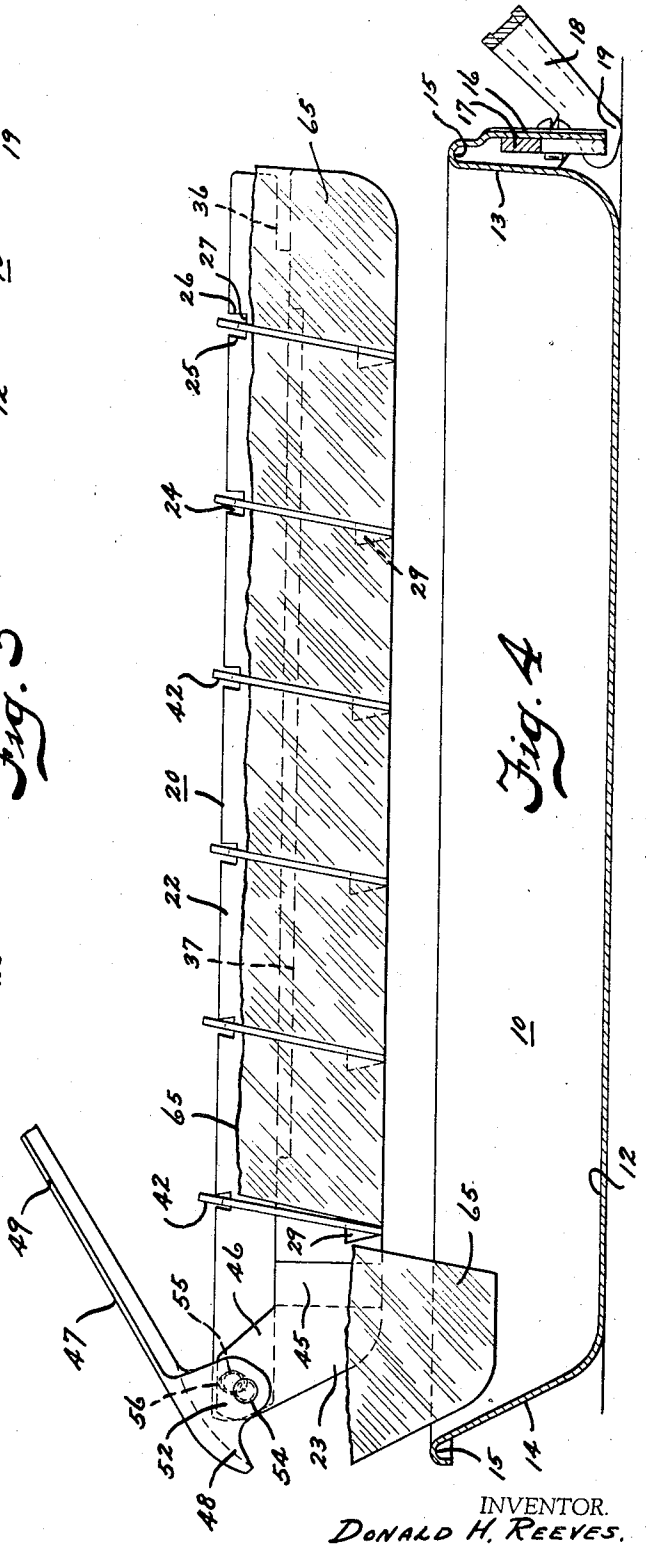


Fig. 4

INVENTOR.
DONALD H. REEVES.

BY
Spencer, Hardman and Fehr.
HIS ATTORNEYS.

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Filed Sept. 24, 1937 4 Sheets-Sheet 3

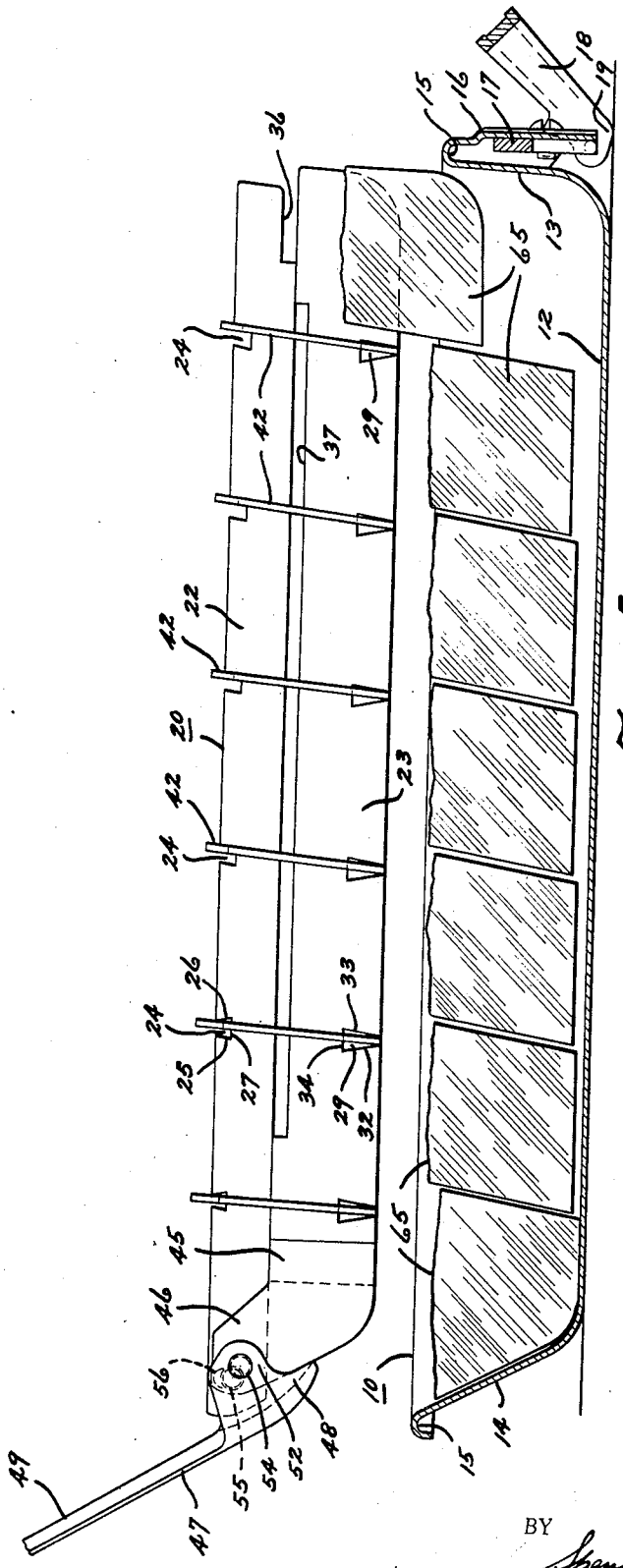


Fig. 5

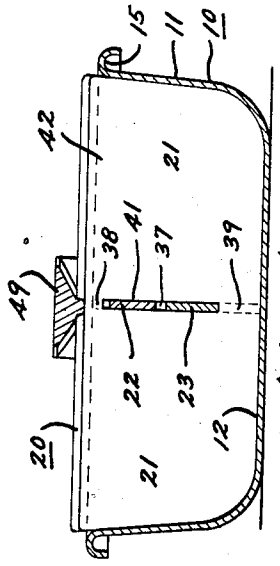


Fig. 7

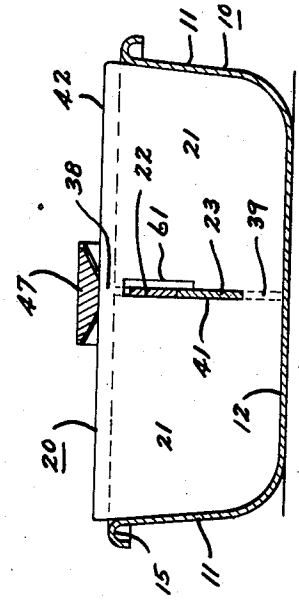


Fig. 6

INVENTOR.
DONALD H. REEVES.

BY Spencer, Hardman and Fehr.
HIS ATTORNEYS.

Oct. 22, 1940. D. H. REEVES 2,219,079

REFRIGERATING APPARATUS

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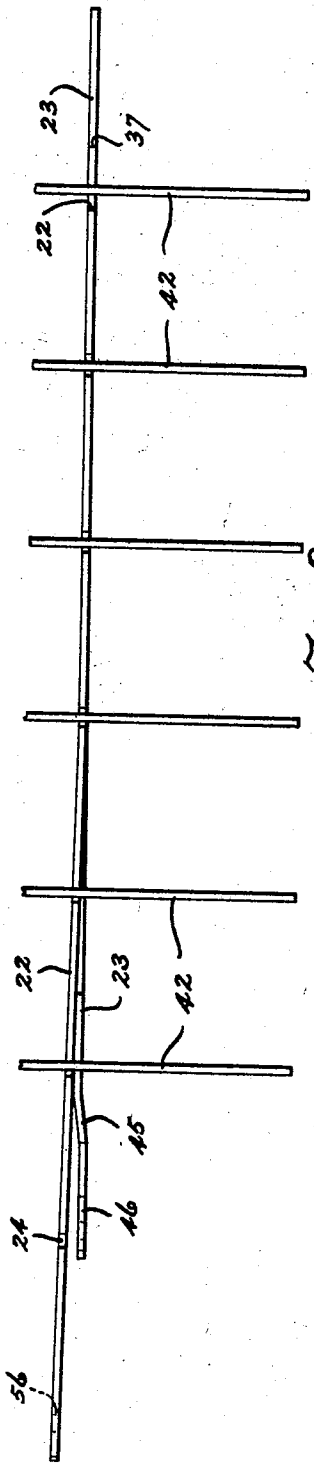


Fig. 8

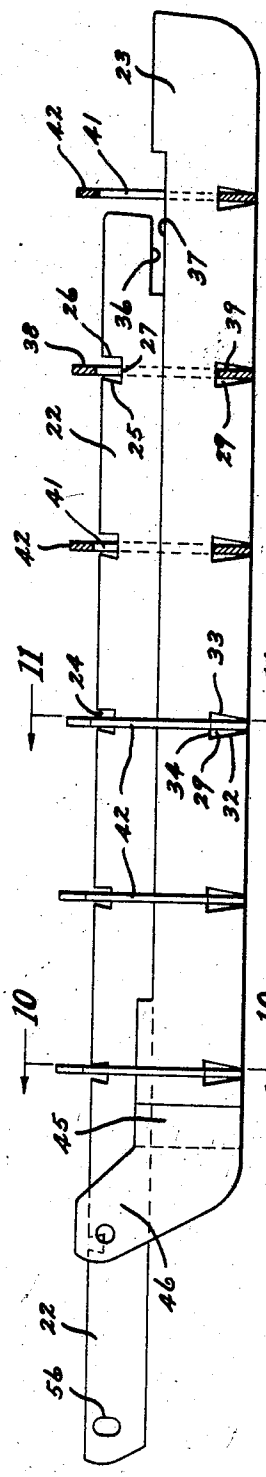


Fig. 9

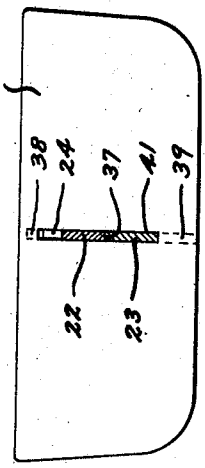


Fig. 11

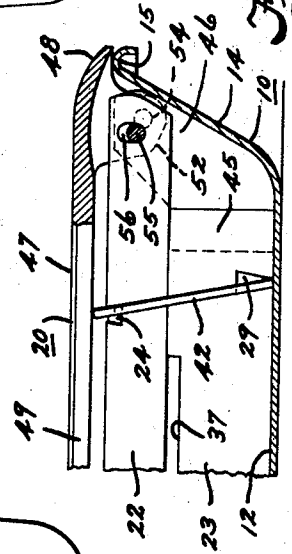


Fig. 12

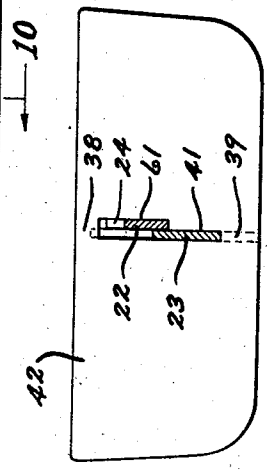


Fig. 10

INVENTOR.
DONALD H. REEVES.

BY
Spencer, Hardman and Fehr.
HIS ATTORNEYS.

Patented Oct. 22, 1940

2,219,079

UNITED STATES PATENT OFFICE

2,219,079

REFRIGERATING APPARATUS

Donald H. Reeves, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application September 24, 1937, Serial No. 165,550

2 Claims. (Cl. 62—108.5)

This invention relates to freezing devices such as ice trays used in household refrigerators and particularly to grid structures adapted to be disposed in the trays.

One of the objects of my invention is to provide an improved grid structure adapted to be disposed in an ice tray for dividing the interior thereof into a plurality of ice block compartments and a novel method of removing the grid together with ice blocks adhering thereto from the tray and liberating ice blocks from the grid structure without applying heat thereto.

Another object of my invention is to provide an ice tray with a removable substantially rigid single walled metal unitary grid structure which has certain of its ice block forming compartment walls movable progressively relative to certain other walls thereof for enlarging the ice block compartments and releasing ice blocks therefrom.

A further object of my invention is to provide an ice tray grid structure in which certain walls thereof are movably disposed at an acute angle to form ice blocks that are substantially of parallelogram form in one direction and in which structure these certain walls are progressively moved out of their normal angled position to successively enlarge the ice block compartments and break ice blocks therefrom.

A still further object of my invention is to provide an improved metallic grid structure having longitudinal dividing members disposed one above the other in substantially the same vertical plane and one of which dividing members is movable in a single direction of motion relative to the other dividing member to impart a tilting movement to dividing members associated therewith and extending transversely thereto for moving the transverse members out of a normal angled position into a substantially vertical position to simultaneously break the bond between the members and ice formed in the structure and to enlarge the ice compartments of the structure for releasing ice blocks therefrom.

In carrying out the foregoing objects it is a still further and more specific object of my invention to provide an improved method of and arrangement for movably locking transverse grid wall dividing members to a split longitudinal grid wall dividing member so that movement of one of the dividing members of the longitudinal grid wall lengthwise only relative to the other member of the longitudinal wall will cause movement of the transverse grid walls and which arrangement provides advantages residing in details of construction of the improved grid structure as will more fully appear in the course of the following description.

In the drawings:

Fig. 1 is a top plan view of an ice tray having a unitary grid structure constructed in accordance with my invention positioned therein;

Fig. 2 is a side view of the freezing 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 and adhering thereto elevated to the tray;

Fig. 4 is a view disclosing the grid and ice blocks adhering thereto removed from the tray and showing certain walls of the unitary grid structure moved relative to other walls thereof for releasing ice blocks therefrom;

Fig. 5 is a view similar to Fig. 4 showing the position of the grid walls after they have been moved to release all ice blocks therefrom;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2 showing the locking arrangement of the movable portions of the longitudinal grid wall within an end transverse wall of the grid;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2 showing the association of the movable portions of the longitudinal grid wall within another transverse wall of the grid;

Fig. 8 is a fragmentary top plan view of the grid walls in a position during assembly thereof to form a unitary structure;

Fig. 9 is a side view partly in section of the position of the grid walls during assembly thereof as shown in Fig. 8;

Fig. 10 is a sectional view taken on the line 10—10 of Fig. 9 showing the position of the movable members of the longitudinal grid wall during assembly thereof into an end transverse grid wall;

Fig. 11 is a sectional view taken on the line 11—11 of Fig. 9 showing the position of the movable members of the longitudinal grid wall during assembly thereof into other transverse walls of the grid structure; and

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 1 showing a vertically elongated opening at the connection of a lever with the upper movable member of the split longitudinal grid wall.

Referring to the drawings, for the purpose of illustrating my invention, I have disclosed in Figs. 1 to 7 a metal ice tray 10 having side walls 11 (see Figs. 6 and 7), a bottom wall 12 and opposed end walls 13 and 14. The tray side walls 11 and the front end wall 13 thereof converge outwardly toward the top of the tray. The back

wall 14 of tray 10 converges outwardly toward the top of the tray a greater distance than other walls thereof for a purpose which will become apparent hereinafter. The walls 11, 13 and 14 of tray 10 have their upper edge rolled over to form a rim 15 which extends continuously around the top of the tray. A portion of the metal tray 10 is extended downwardly from rim 15, as at 16, at the front end thereof and provides a mounting for a metal piece 17 which has a handle 18 pivotally secured thereto. The handle 18 facilitates placing of tray 10 in or on a cooling element of a refrigerating system and a cam surface 19 formed thereon functions, upon actuating handle 18, to break an ice bond between the tray and its support to permit removal of the tray and its frozen contents from the cooling element or evaporator as is well-known in the art.

A unitary metallic grid structure, generally represented by the reference character 20, is removably disposed within tray 10 and divides the interior of the tray into a plurality of rows of open-top molds, cells or compartments 21. The grid structure 20 includes sections which are movable relative to one another and which are in the form of longitudinal dividing members 22 and 23 disposed one above the other in substantially the same vertical plane. By disposing the members 22 and 23 one above the other respectively they form complementary portions of a longitudinal wall of a single thickness which wall is common to a plurality of the ice block compartments 21. Member 22 is provided with a plurality of spaced apart slots or notches 24 extending downwardly a short distance from its top edge. These slots or notches 24 include side walls 25 and 26 cut at opposite angles to one another and a bottom horizontal wall 27. Member 23 is provided with a plurality of spaced apart slots or notches 29 extending upwardly from its bottom edge. The slots or notches 29 include side walls 32 and 33 cut at opposite angles to one another and a top horizontal wall 34. It is to be noted that the bottom edge of member 22, which rests upon the uppermost edge of member 23, is cut away inwardly of its one end as at 36 and the top edge of member 23 is cut away as at 37 for a purpose to be hereinafter more fully described. The slots or notches 24 and 29 in dividing members 22 and 23 respectively cooperate with one another to receive the upper and lower bounding portions 38 and 39 of an opening 41 cut in members 42 (see Figs. 6 and 7) which members 42 extend transversely to the longitudinal members 22 and 23 to divide the interior of the tray into the compartments 21. Thus the two longitudinal members 22 and 23 extend through and are movably locked to the plurality of transverse members 42. By referring again to Fig. 2 it will be noted that the slots or notches 24 and 29 are arranged to normally hold the portions 38 and 39 of transverse members 42 against the wall portions 26 and 33 respectively of the notches. This abutment of transverse members 42 with walls 26 and 33 of the longitudinal members 22 and 23 normally maintains the members 42 in parallel relation to one another and in a predetermined position disposed at an acute angle to a line extended perpendicularly to the longitudinal extension of the grid structure 20 or to the bottom wall 12 of tray 10. This normal angled position of the transverse grid walls or members 42 provides the ice block compartment 21 with a vertical cross-sectional contour or area, taken on the line 2—2 of Fig. 1, which is in the form of a parallelogram. This normal angled disposition of the transverse grid wall members 42 is for a purpose to be hereinafter more fully explained.

The one end portion of dividing member 23 is bent outwardly as at 45 (see Figs. 1 and 8) from the longitudinal plane of the main portion thereof and has an upwardly directed extension 46 provided thereon. Thus the one end portion of member 22 lies adjacent the extension 46 provided on member 23. A lever 47, having a short lever end part 48 and a relatively long handle portion 49, is provided with a pair of legs 51 and 52 (see Fig. 1) which straddle the upwardly extending portion 46 of member 23 and the one end portion of member 22 lying adjacent the extension 46. A pin 54 extends through the one leg 52 of lever 47 and is secured to member 23 by being staked in a suitable opening provided in the upwardly extended portion 46 of the member 23. A second pin 55 extends through and is staked to the other leg 51 of lever 47. This pin 45 passes through a vertically elongated opening 56 provided in the upper dividing member 22. The pin 54 pivotally attaches lever 47 to the grid structure to thereby include the lever as an integral part of the unitary grid structure 20. The elongated opening 56 in dividing member 22 and pin 55 disposed therein are located slightly above and to one side of the pin or pivotal mounting 54 of lever 47 for the purpose of permitting the lever to be elevated or rotated about its pivot a short distance without causing movement of walls of the grid relative to one another. During the short movement of elevating lever 47 pin 55 freely moves upwardly within the elongated slot 56. The attachment of the legs 51 and 52 of lever 47 to the members 22 and 23 respectively as described and the interlocking arrangement of the members 22 and 23 with transverse members 42 secures all parts and walls of the grid structure together to form the unitary grid structure 20.

The slots 24 in member 22 are of such configuration and of progressively increased width relative to one another from the lever end of the structure to the opposite end thereof as to cause the upper longitudinal member 22, upon being moved lengthwise of the lower longitudinal member 23, to successively move or tilt the transverse members 42 from the lever end to the opposite end of the structure to thereby produce a progressive movement of the transverse members. This progressive movement of the members 42 decreases the force required to move same out of their normal angled position to enlarge the ice block compartments as will be more fully described hereinafter in the description of the operation of the device. Having described the construction of the unitary grid structure I will now describe the method of assembling the wall members thereof together in locked but movable relation to one another.

It will be noted that the two transverse grid wall members 42 at the lever end of the structure have the opening 41 therein widened as at 61 (see Figs. 6 and 10) near the upper portion thereof to thus produce a wide portion and a relatively narrow portion in the opening 41 of these two end members 42 as distinguished from the tall narrow opening 41 in other of the members 42 for facilitating assembly of the members 22, 23 and 42. In assembling the members 22, 23 and 42 together the lower longitudinal dividing member 23 is passed through the opening 41 provided in the transverse dividing or grid wall

members 42. The slots 29 in member 23 are brought into straddling relation with the bounding wall portions 39 of opening 41 in members 42 to permit the longitudinal member 23 to be lowered in these openings until the bottom edge of member 23 is in the same horizontal plane with the bottom edge of the members 42 as shown in Figs. 9 and 10 of the drawings. The upper longitudinal dividing member 22 is then passed through the upper portion of openings 41 in members 42 with its bottom edge resting upon the cut-away part 37 of member 23. It will be seen by referring to Figs. 8 and 9 that the two end transverse members at the lever end of the grid, having the widened opening portion 61, permit flexing of the longitudinal member 22 around the shoulder portion extending above the cut-away part 37 in member 23 as shown in Fig. 8 during the act of sliding same through the opening 41 in transverse members 42 into vertical alignment with the lower longitudinal member 23. After the upper longitudinal member 22 has been moved into or through the openings 41 of the transverse members a sufficient distance to cause the shoulder adjacent the cut-away part 36 on member 22 to abut the shoulder adjacent the cut-away part 37 of member 23, at the end of the structure opposite the lever end thereof, the transverse members 42 are registered with the slots or notches 24 and the upper longitudinal member 22 can then be elevated. Elevation of member 22 at this time causes the bounding portion 38 of openings 41 in members 42 to move into the slots 24 and by moving the ends of the longitudinal member 22 into vertical alignment with the ends of the longitudinal member 23 the lower edge of member 22 will rest upon the elevated end portions adjacent the cut-out part 37 of member 23. With the ends of the upper and lower longitudinal members 22 and 23 registering the lever 47 may then be attached to the structure by the pins 54 and 55 in the manner heretofore described to provide the unitary grid structure 20.

Due to the normal disposition of the walls 42 of grid 20 to form the ice compartment shape described, movement or tilting of the walls 42 relative to the longitudinal wall, comprising the dividing members 22 and 23, out of their normal acute angled position into a vertical position toward the wall portion 33 of slots 29 will change the contour or cross-sectional area shape of the compartments 21 and this change progressively and momentarily enlarges each compartment to break ice blocks from the walls. The ice blocks upon being broken loose from the grid walls freely fall from the enlarged compartments into the tray or other receptacle adapted to receive them. This enlargement of the compartments 21 is illustrated in Figs. 4 and 5 of the drawings and can best be understood by measuring a line drawn at right angles to the extension of the transverse walls 42 and between two of these walls while they are in their normal acute angled position and by again measuring this line after moving same simultaneously with movement of the walls 42 into their vertical position it will be observed that the dimension of this line has been increased. Due to the small scale of the drawings and the slight enlargement of the compartments required to carry out the objects of the invention it may be difficult to observe the enlarging of the compartments 21 but with the present description this enlargement of the compartments can be readily ascertained by increasing the scale of the drawings.

Assume that water has been frozen in the tray 10 in the form of blocks 65 in compartments 21, by the cooling effect produced by an evaporator of a refrigerating system, and the tray handle 18 has been manipulated to remove the tray from the evaporator and it is now desirable to remove the ice blocks 65 from the unitary grid structure 20. The handle end 49 of lever 47 is therefore elevated to move the lever about its pivot pin 54 and to cause the short lever end part 48 thereof to engage the rim 15 of tray 10 and exert a force against the tray. This force applied to tray 10 causes the unitary grid structure 20, together with the ice blocks 65 adhering thereto, to be elevated relative to the tray (see Fig. 3). The elongated opening 56 in member 22 permits pin 55 to rise therein, during rotation of pin 55 about the axis of pin 54, without engaging the longitudinal member 22 during the initial movement of lever 47 to elevate the grid structure 20 and ice blocks 65 relative to the tray as explained. After the bond between the ice blocks 65 and tray 10 has been broken by elevation of the grid 20 relative to the tray the grid may be removed from the tray or raised above the same. Thereafter further movement of lever 47 in its single direction of motion about its pivot 54 causes the pin 55 to engage and exert a force to the wall of elongated opening 56 to move the upper dividing member 22 of the longitudinal grid wall lengthwise of the lower dividing member 23. Obviously the elongated opening 56 serves to prevent movement of the upper dividing member 22 of the longitudinal grid wall while the grid structure and ice blocks 65 are being elevated relative to the tray and this opening 56 therefore forms means for limiting movement of member 22 to a lengthwise direction. The initial movement of member 22 lengthwise of member 23 and toward the lever end of the grid structure 20 causes the side wall 26 of slot 24, nearest the lever end of the structure, to engage the portion 38 of the end transverse member or grid wall 42 to tilt the end member 42. This tilting of end transverse member 42 causes same to pivot about the juncture of walls 32 and 33 of slot 29 with the bottom edge of member 23 and moves member 42 out of its normal predetermined angled position (see Fig. 4) to release the two end ice blocks. The increased width of the slots 24 and their different contour relative to one another prevents movement of other of the transverse walls 42 during movement of the end transverse wall. However, continued rotation of lever 47 about its pivot 54 to move member 22 lengthwise of member 23 causes progressive engagement of walls 26 of the other slots 24 to move the remaining transverse walls 42 progressively from the lever end to the opposite end of the grid structure 20 as shown in Fig. 5 of the drawings to liberate all ice blocks 65 from the grid.

It will be noted that the sliding lengthwise movement only of dividing member 22 of the longitudinal grid wall relative to member 23 thereof is afforded by the provision of the vertically elongated slot 56 and eliminates any force being imparted to the ice blocks 65 during the act of elevating the grid structure 20 relative to the tray. By virtue of positioning the transverse wall members 42 substantially parallel to one another and at an acute angle relative to a line extended perpendicularly to the longitudinal extension of the grid structure the distance between adjacent transverse wall members 42 will be increased upon movement of these wall members out of their normal angled position. The size of the parallelo-

gram shaped compartments is thereby momentarily and progressively increased beyond the size of the ice blocks 65 and when the ice blocks are tilted by movement of the walls 42 these ice blocks will be broken loose from the walls and will freely fall from the compartments. It will also be noted by referring to Fig. 5 of the drawings that after the various parts of the grid structure have been assembled and locked together movement of certain parts thereof relative to certain other parts to effect the release of ice blocks therefrom does not alter the unitary character of the structure. The arrangement and cooperation of various parts of the grid structure with other parts thereof provides a device which is substantially free of concealed pockets or crevices that may be difficult to clean. The walls of the grid structure may, if desired, be treated or coated with a waxy substance to facilitate removal of ice therefrom.

From the foregoing it will be seen that I have provided improved ice tray grid construction which is of low cost, strong and durable, capable of being operated with a minimum of force and effective to remove ice blocks therefrom. My improved structure by eliminating movement of certain walls thereof relative to other walls during the act of elevating the grid together with ice blocks from the tray prevents unduly shattering the ice blocks. By constructing the entire grid of metal I retain the fast freezing characteristics of metal tray and grid combinations. The improved structure can be operated with a minimum of force to release any desired number of ice blocks therefrom to thus overcome objections to prior devices wherein utmost effort is required to release ice blocks. In my present device a single lever, operable in one direction of motion only, serves to remove the unitary grid together with ice blocks adhering thereto from the tray and to progressively liberate ice blocks from the grid structure.

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.

What is claimed is as follows:

1. A removable unitary grid structure for disposition in a freezing tray comprising, a two-part longitudinal member and a plurality of partitioning members carried thereby and extending transversely thereto to form therewith walls of a row of ice block compartments on each side of said longitudinal member, one of said parts of said two-part longitudinal member being movable relative to the other part thereof to cause movement of said transverse partitioning members relative to said longitudinal member, a lever for applying force between said parts of said two-part longitudinal member, said lever being pivotally mounted to one part of said two-part longitudinal member and having a connection with the other part thereof, and said connection of said lever with said other part of said two-part longitudinal member being so constructed and arranged with respect to the pivotal mounting of said lever as to limit the application of force between said parts of said longitudinal member to a force acting only in a direction lengthwise of the grid structure for sliding one part of said longitudinal member relative to the other part thereof without tending to raise said one part with respect to the other part when said lever is actuated.

2. A removable unitary grid structure for disposition in a freezing tray comprising, a two-part longitudinal member and a plurality of partitioning members carried thereby and extending transversely thereto to form therewith walls of a row of ice block compartments on each side of said longitudinal member, one of said parts of said two-part longitudinal member being movable relative to the other part thereof to cause movement of said transverse partitioning members relative to said longitudinal member, a lever for applying force between said parts of said two-part longitudinal member, said lever being pivotally mounted to one part of said two-part longitudinal member and having a part movable therewith fitting in an opening provided in the other part thereof, and the wall of the opening in said other part of said longitudinal member being so shaped with respect to the pivotal mounting of said lever as to limit the application of force between said parts of said longitudinal member to a force acting only in a direction lengthwise of the grid structure for sliding one part of said longitudinal member relative to the other part thereof without tending to raise said one part with respect to the other part when said lever is actuated.

DONALD H. REEVES.