Aug. 26, 1941. J. W. JACOBS 2,253,624

REFRIGERATING APPARATUS

Filed Jan. 12, 1939 4 Sheets-Sheet 1

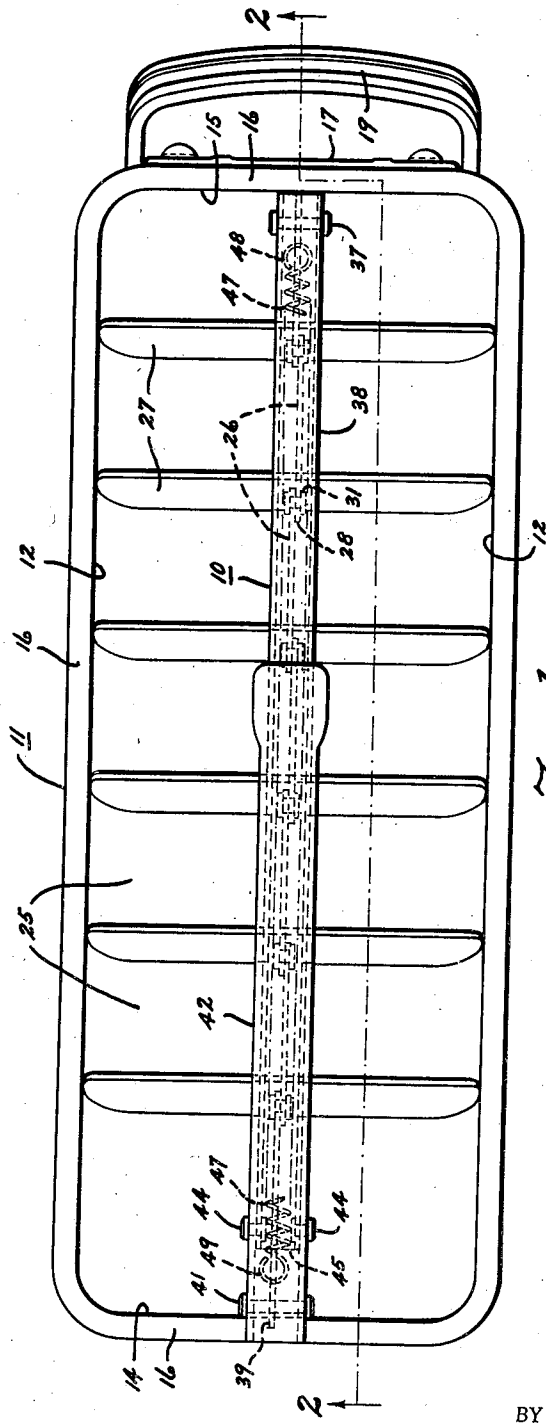


Fig. 1

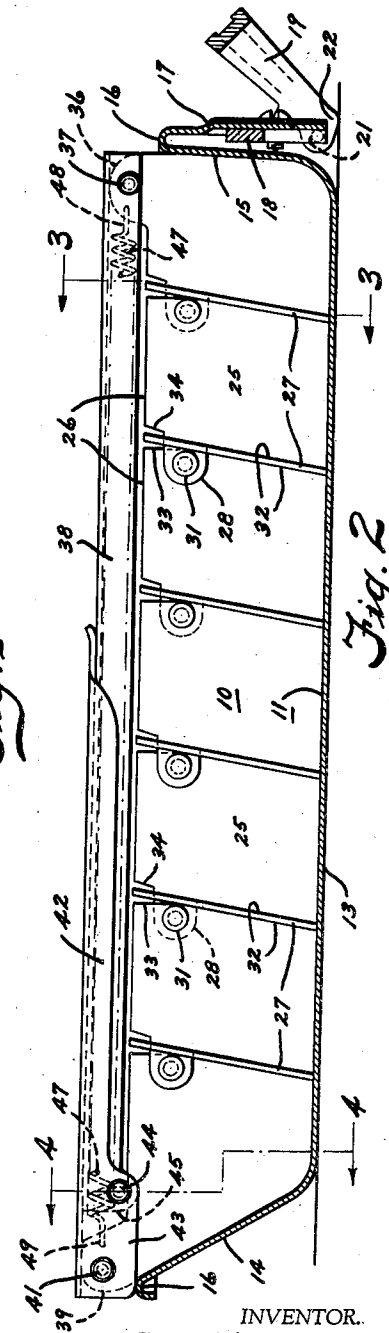


Fig. 2

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REFRIGERATING APPARATUS

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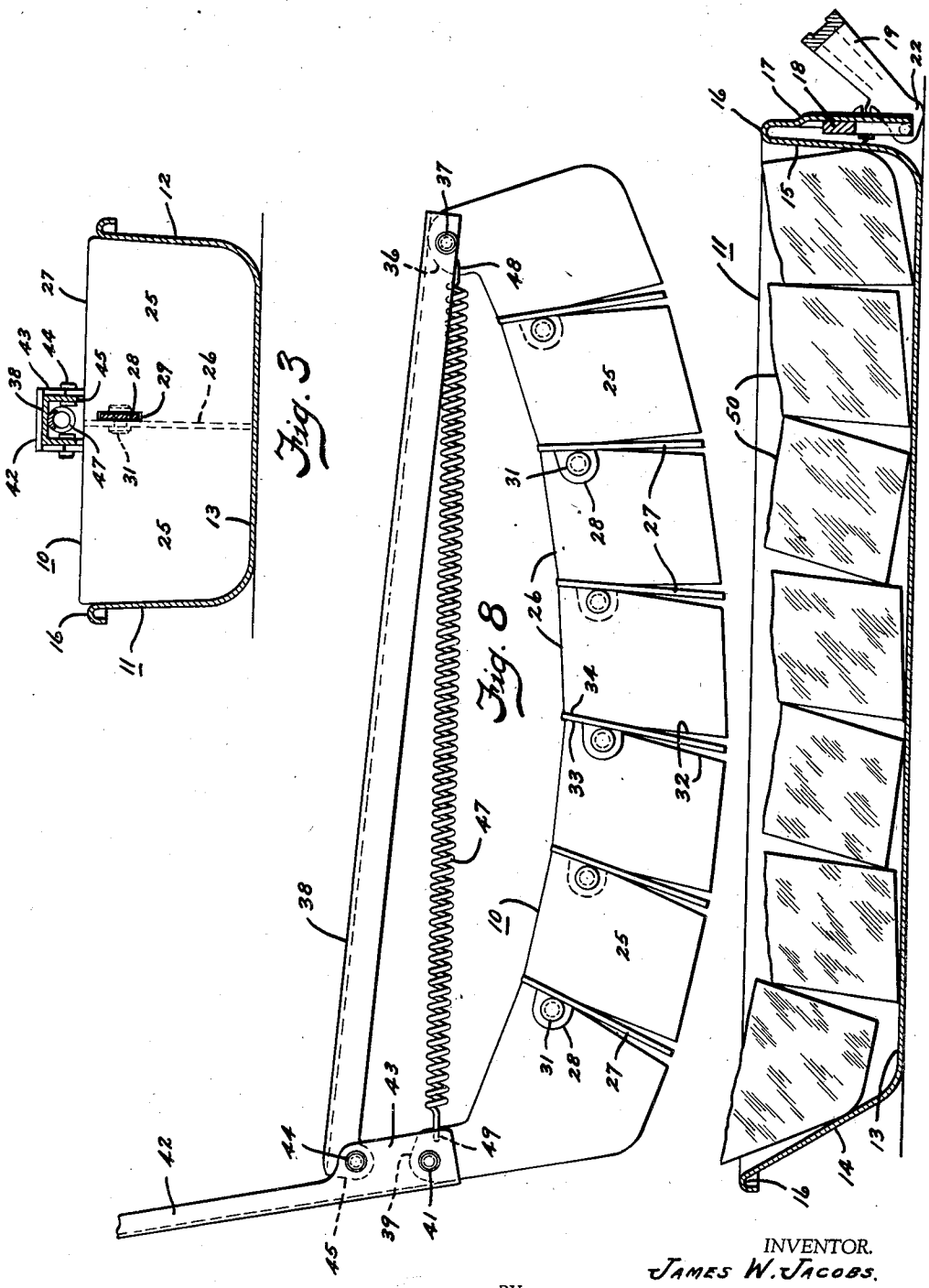


Fig. 3

Fig. 8

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REFRIGERATING APPARATUS

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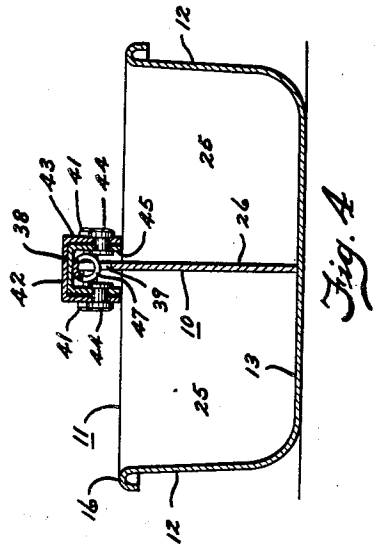


Fig. 4

Fig. 7

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Aug. 26, 1941. J. W. JACOBS 2,253,624

REFRIGERATING APPARATUS

Filed Jan. 12, 1939 4 Sheets-Sheet 4

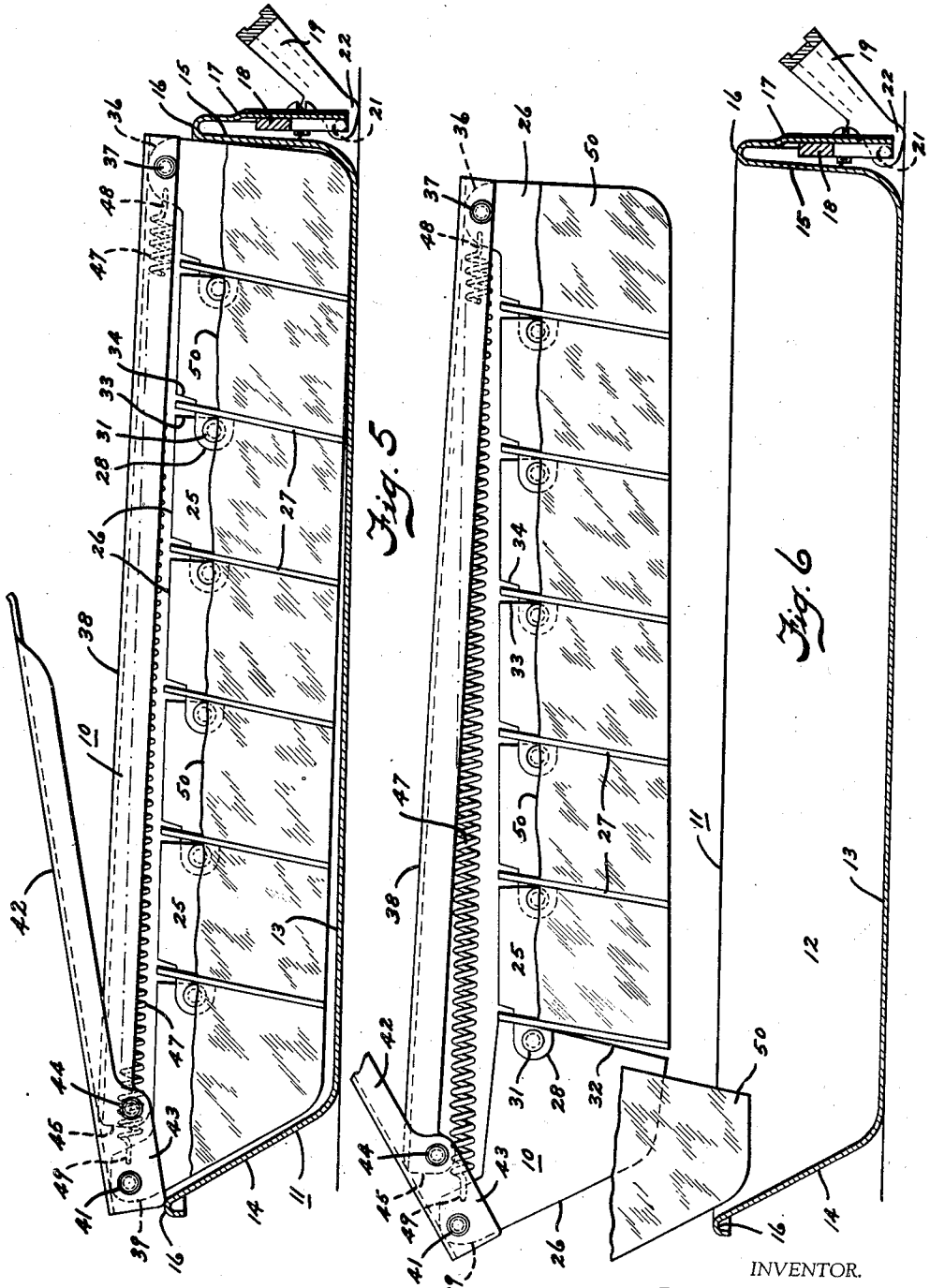


Fig. 5

Fig. 6

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Patented Aug. 26, 1941 2,253,624

UNITED STATES PATENT OFFICE

2,253,624

REFRIGERATING APPARATUS

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Application January 12, 1939, Serial No. 250,583

10 Claims. (Cl. 62—108.5)

My invention relates to freezing devices and particularly to grids for use in trays employed in household refrigerators.

A general object of my invention is to provide an improved grid structure for disposition in an ice tray and a novel method of removing ice blocks from the grid structure without applying artificial heat thereto.

Another object of my invention is to provide an improved grid structure having a plurality of rigid substantially aligned metal walls movably connected together with rigid transverse walls interlocked therebetween for dividing the interior of an ice tray into rows of ice block compartments and which substantially aligned walls are movable about their connection to cause bowing of the grid structure, for breaking a bond between ice blocks and their compartment walls, and movement of the transverse walls relative to one another and to the substantially aligned grid walls for enlarging the ice block compartments and liberating the released ice blocks therefrom.

Another object of my invention is to provide a unitary rigid walled grid structure with an energy storage means which is held by a mechanism in an ineffective position while the grid walls are in a normal ice block forming position and which mechanism is movable to release said means and render same effective to cause the energy stored therein to be applied to the structure for moving its walls and forcing the structure into a bowed or flexed position.

A further object of my invention is to provide a grid structure of the type described in the preceding objects with a mechanism for releasing the energy storage means to permit same to apply its force to walls of the structure to cause flexing or bowing of the grid, which mechanism is so constructed and arranged that it can be employed to cause flexing or bowing of the grid should the energy storage means incorporated in the structure become ineffective or broken.

In carrying out the foregoing objects it is a more specific object of my invention to construct the releasing means or mechanism of the energy storage means in a grid structure of the type described in such manner that it will have a double purpose in that it will break the bond between ice blocks in the grid structure and the tray walls prior to releasing the energy storage means.

Still further and more specific objects and advantages reside in the simplicity of construction and operation of my improved grid structure and in novel combinations and arrangements of parts thereof to provide a durable structure of low manufacturing costs as will more fully appear in the course of the following description.

In the drawings:

Fig. 1 is a top plan view of an improved freezing device having a grid structure constructed according to my invention disposed in the tray thereof;

Fig. 2 is a longitudinal vertical sectional view of the tray taken on the line 2—2 of Fig. 1 and showing the grid of the device in elevation;

Fig. 3 is a transverse vertical sectional view of the freezing device taken on the line 3—3 of Fig. 2 showing the connection between certain walls of the grid structure;

Fig. 4 is a sectional view similar to Fig. 3 taken on the line 4—4 of Fig. 2 and showing the connection between certain operating parts of the grid structure;

Fig. 5 is a view similar to Fig. 2 illustrating ice blocks within the device and showing the grid structure and ice bonded thereto elevated relative to the tray of the device;

Fig. 6 shows the grid structure removed from the tray with certain walls of the grid moved relative to other walls thereof to illustrate the start of bowing or flexing of the grid;

Fig. 7 is a view similar to Fig. 6 illustrating additional walls of the grid moved relative to other walls thereof in the process of bowing the grid structure; and

Fig. 8 shows all the walls of the grid structure moved relative to one another and illustrates the grid in its fully bowed position with ice blocks released therefrom.

The improved freezing device of the present invention comprises a metallic grid structure 10 removably disposed in a metal tray 11. The tray 11 has side walls 12 (see Figs. 3 and 4), a bottom wall 13 and opposed end walls 14 and 15. The tray side walls 12 may be converged outwardly toward the top of the tray and the rear end wall 14 is converged outwardly toward the top of the tray at a greater angle than the side walls to facilitate removal of a mass of ice from the tray. The walls 12, 14 and 15 of tray 11 have their upper edge rolled or bent over to form a rim 16 which extends continuously around the top of the tray. A portion of the metal of tray 11 is extended downwardly from rim 16, as at 17, at the front end thereof and provides a mounting for a heavy metal piece 18 which has a handle 19 pivotally secured thereto as at 21. The handle 19 has cams 22 formed on its legs and these cams serve to break an ice bond between the

tray and its support, upon manipulation of the handle, to facilitate removal of the freezing device from an evaporator or the like of a refrigerating system.

The grid structure, generally represented by the reference character 10, disposed within tray 11 of the freezing device divides the interior of the tray into longitudinal rows of open-top cells or compartments 25. The grid structure 10 includes a vertically disposed longitudinal partition consisting of a plurality of rigid metal walls 26 and a plurality of rigid metal cross or transverse walls 27. Walls 26 have an integral ear portion 28 extending therefrom and the walls 27 are each provided with an opening 29 (see Fig. 3) which receives the ear portion 28. A wall 27 is assembled against a wall 26 in transverse relation thereto by inserting the ear portion 28 of wall 26 into the opening 29 of wall 27 and another wall 26 is then movably secured to the first wall 26, the wall 27 interlocked therebetween, by a rivet, pin or the like 31 which passes through a small hole provided in the other wall 26 and a hole provided in the ear portion 28 of the first wall 26. This assembling operation is repeated until a longitudinal partition or grid construction of any desired length has been formed. It will be noted that the edge portions of walls 26 of the longitudinal partition, between which the transverse walls 27 are interlocked, are inclined as at 32 so as to engage the face surfaces of walls 27 and normally maintain these transverse walls 27 at an acute angled disposition relative to the vertical disposition of walls 26 or relative to the bottom of tray 11. This normal acute angled disposition of walls 27 provides the ice block compartments 25 with a parallelogram form in one direction of cross section therethrough. The inclined edges 32 of walls 26 of the longitudinal partition correspond or are parallel with one another from the point of connection between the walls 26 to the bottoms thereof. However, the continuation of the edges 32 on the one end of walls 26, from the point of connection of walls 26 together upwardly to their top edges, is vertical as shown at 33 and on their other ends from the ear portion 28 thereof to their top edges are cut at a greater inclination relative to the edge 32 as shown at 34. The end wall portions 33 and 34 of walls 26 provide a slot or clearance area so that the walls 26 may be moved relative to one another about their pivotal connecting pins 31 to provide for bowing or flexing of the grid longitudinal partition. The top surface of a wall 26 at the one end of the grid structure 10 is provided with a raised portion 36 having a hole therein which receives a rivet or pin 37 extending through an inverted U-shaped bar member 38 to pivotally secure the bar 38 to the grid structure. The top surface of a wall 26 at the other end of the grid 10 is provided with a raised portion 39 having a hole therein which receives a rivet or pin 41 extending through a lever or releasing arm 42 to pivotally secure the lever or arm 42 to the grid structure. Members 38 and 42 are thus pivotally secured to the grid structure to provide a mechanism which has a function to be hereinafter more fully described. Lever or arm 42 is shaped to straddle the raised portion 39 of the end wall 26 and the bar or member 38 and leg portions 43 formed thereon each have a rivet or pin 44 extended therethrough and which rivets or pins pass through leg portions 45 at the free end of bar member 38 (see Fig. 4). Thus, the pins 44 pivotally connect the arm 42 to the bar member 38. It will be noted that the rivets or pins 37 and 41 are in substantially the same horizontal alignment with one another and that the rivets or pins 44 are disposed slightly below the plane of alignment of rivets or pins 37 and 41 for a purpose to be hereinafter more fully explained. It will also be noted that the method of movably securing the plurality of walls 26 and 27, the bar member 38 and lever or arm 42 together and to one another forms a unitary grid structure.

In order to provide the unitary grid structure 10 with an energy storage means to carry out the objects of the present invention in causing movement of the grid walls 26 and 27 relative to one another and bowing or flexing of the grid structure when the energy storage means is released, I place a spring 47 within the inverted U-shaped bar member 38. I secure one end 48 of the spring 47 to the raised top edge portion 36 of the one end wall 26 of the longitudinal partition and secure the other end 49 of spring 47 to the raised top edge portion 39 of the other end wall 26 of the grid. Spring 47 may, if desired, be made of a metallic material which will contract at low temperatures to thereby increase the power thereof or to increase the energy stored therein when subjected to the freezing temperatures prevailing in an evaporator of a refrigerating system upon or into which the present freezing device is placed. The spring 47 is stretched between the two ends of the grid to thereby store energy therein and normally lies between the two rivets or pins 37 and 41 and on the same horizontal plane therewith. As long as the rivets or pins 44 are in their normal lowered position relative to rivets or pins 37 and 41 to maintain the bar member 38 in horizontal alignment with the spring 47, the energy stored in spring 47 is ineffective to cause movement of the grid walls. Obviously, spring 47, which forms the energy storage means of the present disclosure, tends to at all times pull on the end walls of the grid structure, but as long as the releasing mechanism or bar member 38 is maintained in its normal position or in a horizontal position parallel with spring 47 the bar 38 together with lever or arm 42 forms a rigid connection between the ends of the grid and prevents the force of spring 47 from bowing or flexing the structure. Thus, it will be seen that when the rigid connection between the ends of the grid structure, formed by the mechanism including bar 38 and lever or arm 42 located in their normal position, is moved or released the force of spring 47 is rendered effective to pull on the ends of the grid and this force moves an end wall 26 upwardly about its pivotal mounting 31. This force is usually effective to move the end grid wall at a lever end because the releasing movement of lever 42 aids in moving this end wall first. However, the structure is constructed and arranged so that it is immaterial which end wall moves first so long as the walls are moved and the structure bowed. While I have disclosed a certain type of energy storage means it is within the realm of the present invention to provide other forms of energy storage means coming within the scope of the appended claims.

Assume that water has been frozen in the freezing device in the form of ice blocks 50 in compartments 25, by the cooling effect produced by an evaporator of a refrigerating system, and

it is now desired to harvest these ice blocks. Handle 19 on tray 11 is moved outwardly and downwardly to cause the cams 22 to engage the freezing device support in or on the evaporator, and force applied to the handle thereby causes the cams to break the bond between the freezing device and its support to permit removal of the device from the evaporator. After removal of the freezing device from the evaporator the long end of the releasing arm or lever 42 is grasped by the hand and raised relative to the grid structure 10. This initial raising of arm or lever 42 causes its short end to bear against the rim 16 of tray 11 to elevate the grid structure 10 together with ice blocks bonded thereto relative to tray 11 as shown in Fig. 5 of the drawings. It will be noted that in this position of arm or lever 42 the pins 44 secured thereto and connecting the end portion 45 of bar 38 have been elevated into horizontal alignment with the pins 37 and 41. In this position of the releasing mechanism the rigid connection between the ends of the grid 10 is still maintained to thereby prevent the force of spring 47 from acting upon the grid to bow same. Therefore, since the bond between the ice blocks 50 in the grid and the tray walls has been broken the unitary grid structure together with ice adhering thereto can now be readily raised from the tray 11 of the device. After raising grid 10 and ice adhering thereto out of the tray 11 lever or arm 42 is then raised from the position thereof shown in Fig. 5 of the drawings to its position shown in Fig. 6 to move the pins 44 above the center line of alignment of pins 37 and 41 to thereby destroy the rigid connection across the top of the structure between the ends of the grid. The rigid connection having been broken or destroyed by movement of the releasing mechanism causes the spring 47 to exert its power or force stored therein upon the end members or walls 26 of the grid. The force or power of spring 47 is of such intensity that it initially causes movement of the end wall 26 about its pivotal mounting pin 31 relative to an adjacent wall 26. This movement of the end wall 26 of the longitudinal partition breaks the bond between the end ice blocks 50 and their confining walls as shown in Fig. 6 of the drawings and causes the upper vertical end wall portion 33 of this end wall 26 to engage the face of the first transverse wall 27 and move same relative to the next adjacent wall 26 of the longitudinal partition as shown in Fig. 7. The first transverse wall 27 moves or swings until its upper portion strikes the short greatly inclined wall portion 34 of the next adjacent wall 26 to thus cause the force of spring 47 to be transmitted to this next adjacent wall 26 to move same in the same manner the first or end wall of the longitudinal partition was moved. Movement of the transverse walls 27 enlarges at least that portion of the ice compartments 25 below the pivot point of connection of walls 26 together to thereby permit the released ice blocks 50 to freely fall from the grid structure 10. It is to be understood that movement of the grid walls in the manner described takes place successively from the lever end of the structure to its opposite end as shown in Fig. 8 of the drawings. By virtue of the loose fit of walls 27 upon walls 26 and the hinged or pivotal connection of walls 26 with one another the rigid walled grid structure 10 is flexed or bowed into the position illustrated in Fig. 8 to liberate all ice blocks 50 therefrom. While the spring 47 may possess ample power to cause further bowing of the grid structure such further bowing is unnecessary and is prevented by the short wall portions 33 and 34 of walls 26 being forced against the transverse walls or partitions 27. I have described and illustrated the initial and further movements of walls of the grid structure 10 in step by step like manner but it is to be understood that all the steps of wall movements occur momentarily or in rapid succession, due to the force exerted thereto by the energy storage means or spring 47 when released, to thereby quickly bow or flex the rigid walled grid for liberating ice blocks therefrom. The return of the releasing arm or lever 42 to its position parallel with bar 38 will push on this bar to cause movement of all the grid walls 26 about their pivot pins 31 to thereby move the walls 26 and 27 into their normal ice freezing position and will also reestablish the rigid connection across the top of the grid structure, formed by the releasing mechanism, to thereby reset the energy storage means or spring 47.

While the primary purpose of arm 42 is to move the pins 44 above the center line of alignment of pins 37 and 41, as shown in Fig. 6 of the drawings to release the spring 47, this arm 42 is constructed and arranged in the form of a lever so that it will have inherent secondary purposes in the structure disclosed. For example, the lever or arm 42 serves to engage the tray 11 for elevating the grid 10 and ice blocks 50 bonded thereto relative to the tray as previously described and as shown in Fig. 5 and may also serve, since it is in a lever form rather than a mere releasing finger or the like, to move walls of the grid to cause bowing or flexing of the structure should the energy storage means or spring 47 become ineffective or broken. In regard to this latter secondary purpose of lever arm 42 it will be noted that the construction and arrangement of parts of the unitary grid structure are such that, should the spring 47 be broken or become ineffective for any reason, upon manual application of force to lever 42 in an upward direction it will transmit this force through member 38 and pins 37, 41 and 44 to the end walls 26 of the grid to cause movement of the grid walls and bowing or flexing of the unitary grid structure. This feature of the structure disclosed permits continued use of the freezing device should the energy storage means or spring 47 be broken, to thus eliminate the automatic bowing or flexing of the structure 10, until the device can be repaired or replaced. From the foregoing, it will be seen that I have provided a freezing device having an improved grid structure therein which is of low cost, strong and durable, capable of being operated automatically, by virtue of the inclination in the grid structure of an energy storage means, to break the bond between its walls and ice blocks adhering thereto and to bow the structure to enlarge the ice block compartments and liberate the released ice blocks therefrom. By constructing the grid structure so that walls thereof are progressively moved to successively enlarge the ice block compartments, an automatic means or energy storage means for moving the grid walls is thereby rendered practical because the power stored in such means need only be of sufficient strength or force to break a few walls at one time loose from ice blocks. The improved grid structure is of such novel construction that ice blocks are removed therefrom without unduly

shattering the blocks while at the same time being constructed entirely of metal to thereby retain the fast freezing characteristics of metal tray and grid combinations.

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 grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of substantially non-flexible walls movably connected together to form rows of ice block compartments, energy storage means independent of and in addition to said grid walls, said means being carried by said grid structure and adapted to apply force to said grid walls to move same relative to one another and mechanism normally preventing the force of said energy storage means from moving said grid walls, said mechanism being movable to release said energy storage means and permit same to apply its force to said grid walls and move the walls relative to one another, and said connection between said grid walls being so constructed and arranged that movement of the grid walls relative to one another by said means causes bowing of said grid structure.

2. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of substantially non-flexible walls movably connected together to provide a longitudinal partition, a plurality of spaced apart walls associated with the walls of said partition and extending transversely thereto to form rows of ice block compartments on each side of said longitudinal partition, energy storage means independent of and in addition to said grid walls, said means being carried by said grid structure and adapted to apply force to said grid walls to move same relative to one another, and mechanism normally preventing the force of said energy storage means from moving said grid walls, and said mechanism being movable to release said energy storage means and permit same to apply its force to said grid walls and move the walls relative to one another.

3. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of substantially non-flexible walls movably connected together to provide a longitudinal partition, a plurality of spaced apart walls associated with the walls of said partition and extending transversely thereto to form rows of ice block compartments on each side of said longitudinal partition, energy storage means independent of and in addition to said grid walls, said means being carried by said grid structure and adapted to apply force to said grid walls to move same relative to one another, and mechanism normally preventing the force of said energy storage means from moving said grid walls, said mechanism being movable to release said energy storage means and permit same to apply its force to said grid walls and move the walls relative to one another, and said connection between said grid walls being so constructed and arranged that movement of the grid walls relative to one another by said means causes bowing of said grid structure.

4. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of walls movably connected together to provide a longitudinal partition, a plurality of spaced apart walls associated with the walls of said partition and extending transversely thereto to form rows of ice block compartments on each side of said longitudinal partition, a spring stretched across the top of said longitudinal partition and having its ends secured to the opposite end walls of said grid structure, and a mechanism normally disposed in the same horizontal plane with said spring and forming a rigid connection between said opposite end walls to prevent the tension of said spring from moving said movable grid walls, and said mechanism being movable out of the horizontal plane of said spring to permit the tension thereof to apply force to said grid walls and move the walls relative to one another.

5. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of walls movably connected together to provide a longitudinal partition, a plurality of spaced apart walls associated with the walls of said partition and extending transversely thereto to form rows of ice block compartments on each side of said longitudinal partition, a spring stretched across the top of said longitudinal partition and having its end secured to the opposite end walls of said grid structure, and a mechanism normally disposed in the same horizontal plane with said spring and forming a rigid connection between said opposite end walls to prevent the tension of said spring from moving said movable grid walls, said mechanism being movable out of the horizontal plane of said spring to permit the tension thereof to apply force to said grid walls and move the walls relative to one another, and said connection between said grid walls being so constructed and arranged that movement of the grid walls relative to one another by said spring causes bowing of said grid structure.

6. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of rigid metal walls pivotally connected together adjacent their upper ends to provide a sectional longitudinal partition, a plurality of rigid metal walls interlocked between the walls of said longitudinal partition substantially at the point of connection therebetween and extending transversely thereto to form rows of ice block compartments on each side thereof, energy storage means carried by said grid structure and adapted to apply force to the end walls of said longitudinal partition to move said grid walls about their pivotal connection, and mechanism normally preventing the force of said energy storage means from moving said pivotally connected grid walls, and said mechanism being movable to release said energy storage means and permit same to apply its force to said grid walls and move the walls relative to one another.

7. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of rigid metal walls pivotally connected together adjacent their upper ends to provide a sectional longitudinal partition, a plurality of rigid metal walls interlocked between the walls of said longitudinal partition substantially at the point of connection therebetween and extending transversely thereto to form rows of ice block compartments on each side thereof, energy storage means carried by said grid structure and adapted to apply force to the ends walls of said longitudinal partition to move said grid walls about their pivotal connection, and mecha-

nism normally preventing the force of said energy storage means from moving said pivotally connected grid walls, said mechanism being movable to release said energy storage means and permit same to apply its force to said grid walls and move the walls relative to one another, and said pivotal connection between said grid walls being so arranged that movement of the grid walls relative to one another by said means causes bowing of said grid structure and movement of said transverse walls.

8. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of rigid metal walls pivotally connected together adjacent their upper ends to provide a sectional longitudinal partition, a plurality of rigid metal walls interlocked between the walls of said longitudinal partition and extending transversely thereto to form rows of ice block compartments on each side thereof, said transverse grid walls being inclined with respect to the disposition of the walls of said longitudinal partition to provide said ice block compartments with a parallelogram form in one direction of cross section therethrough, energy storage means carried by said grid structure and adapted to apply force to the end walls of said longitudinal partition to move the walls thereof about their pivotal connection, and mechanism normally preventing the force of said energy storage means from moving said walls of said partition, and said mechanism being movable to release said energy storage means and permit same to apply its force to said walls of said partition and move the walls relative to one another.

9. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of rigid metal walls pivotally connected together adjacent their upper ends to provide a sectional longitudinal partition, a plurality of rigid metal walls interlocked between the walls of said longitudinal partition and extending transversely thereto to form rows of ice block compartments on each side thereof, said transverse grid walls being inclined with respect to the disposition of the walls of said longitudinal partition to provide said ice block compartments with a parallelogram form in one direction of cross section therethrough, energy storage means carried by said grid structure and adapted to apply force to the end walls of said longitudinal partition to move the walls thereof about their pivotal connection, and mechanism normally preventing the force of said energy storage means from moving said walls of said partition, said mechanism being movable to release said energy storage means and permit same to apply its force to said walls of said partition and move the walls relative to one another, and said pivotal connection between the walls of said partition being so arranged that movement of said walls relative to one another by said means bows said grid structure and causes movement of said transverse walls out of their normal inclined position to enlarge said parallelogram shaped compartments.

10. A grid structure for disposition in an ice tray and removable therefrom as a unit comprising, a plurality of members movably connected together to form a sectional longitudinal partition and a plurality of spaced apart members extending laterally therefrom and cooperating therewith to provide walls of a plurality of ice block compartments, and mechanism carried by said grid structure and including energy storing means, said mechanism also including a plurality of parts forming with said energy storing means a toggle connection for permitting movement of said means into either of two positions, the parts of said mechanism when in one position relative to one another rendering said toggle connection effective for preventing said energy storing means from moving said grid members, and the parts of said mechanism being movable relative to one another to render said toggle connection ineffective whereby said energy storing means moves said grid members about their movable connections to bow said grid structure and liberate ice blocks from said compartments.

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