Dec. 23, 1941. C. R. CARNEY 2,267,441

ICE TRAY GRID

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FIG. 1.

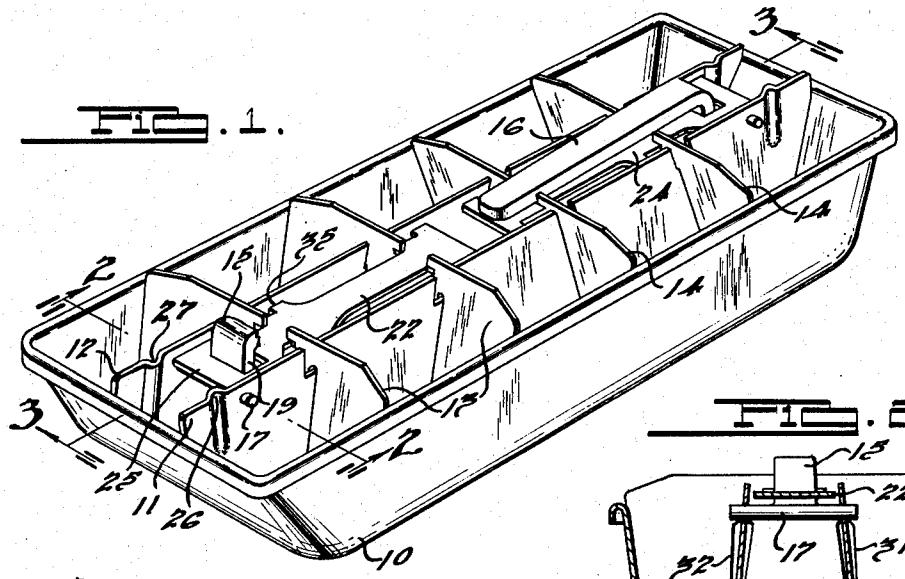


FIG. 2.

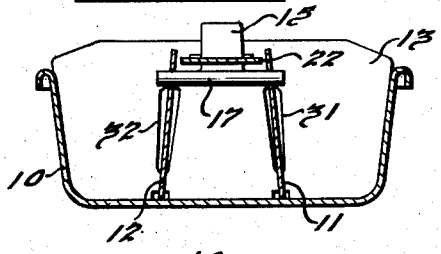
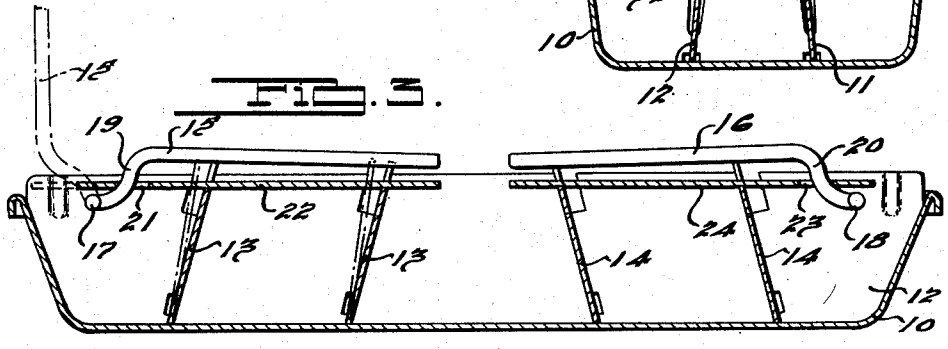


FIG. 3.



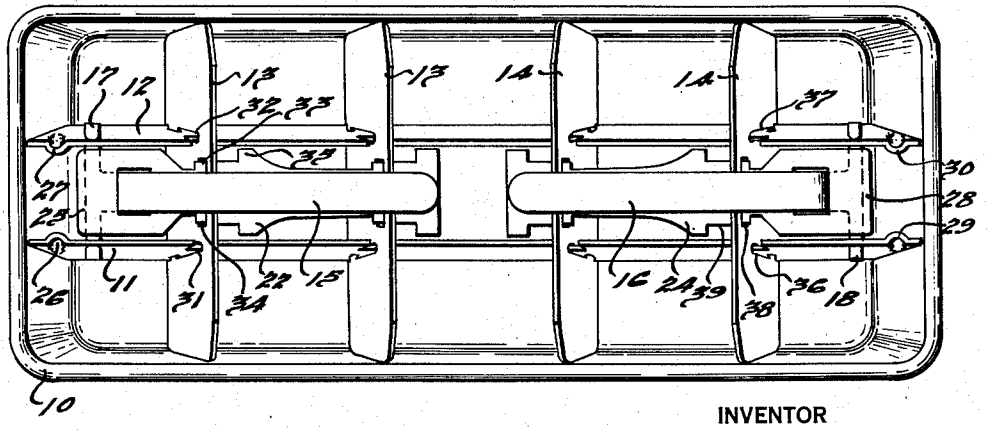


FIG. 4.

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ICE TRAY GRID

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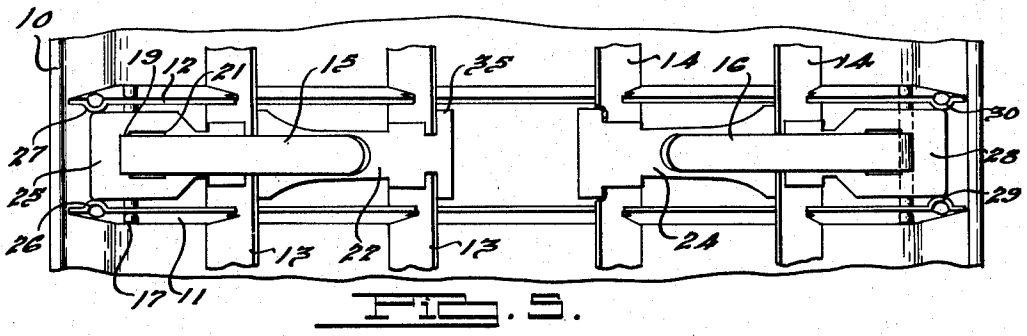

FIG. 5.

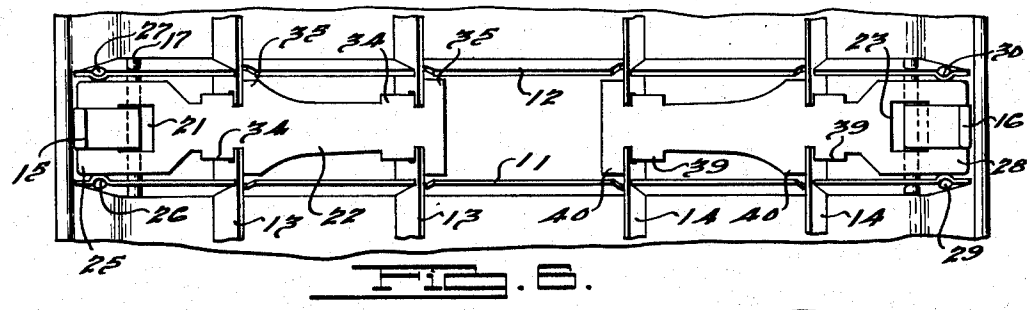

FIG. 6.

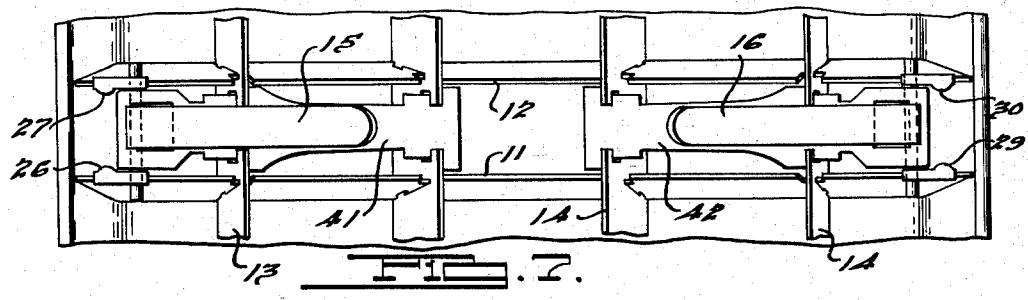

FIG. 7.

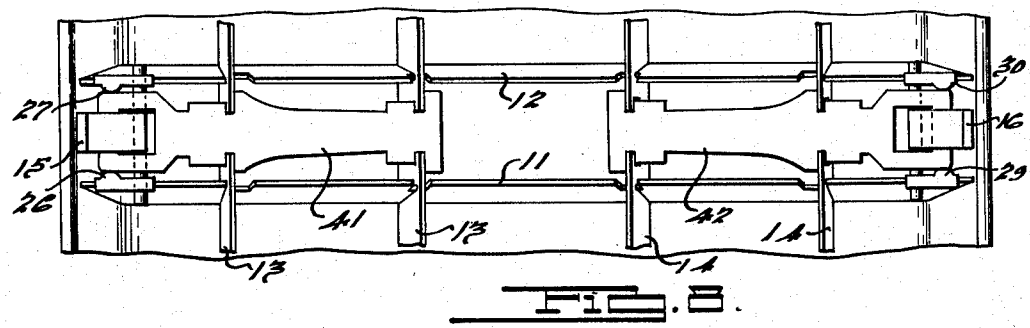

FIG. 8.

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2,267,441

ICE TRAY GRID

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Application June 24, 1940, Serial No. 342,026

15 Claims. (Cl. 62—108.5)

The present invention relates to an ice tray grid construction for use in a refrigerator ice pan. The grid construction of the present invention is intended to be used with pans in domestic refrigerators to provide a desired quantity of frozen ice cubes which may be easily removed from the tray.

The objects of the present invention are:

First, to provide an ice tray grid, which upon actuation will readily release ice cubes frozen between the various compartments of the grid member, the grid being of a simplified construction and readily adapted for large scale manufacture on a production basis.

Second, to provide an ice tray grid of simplified construction, which is economical to manufacture, efficient in its operation, and which is rugged and durable in its construction.

Third, to provide an ice tray grid constructed of a plurality of rigid members which are connected together to provide for limited movement of all members of the grid relative to each other for the purpose of breaking the frozen bond between the surfaces of the ice cubes and the adjacent surfaces of the grid members and the pan and in which the actuating levers and force-supplying members are an integral part of the grid structure.

Other objects and advantages of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views, and in which—

Fig. 1 is a view in perspective of an ice pan and grid embodying the present invention and showing the positions of the respective parts prior to freezing ice cubes therein or of freeing frozen ice cubes therefrom;

Figs. 2 and 3 are sections taken respectively on the lines 2—2 and 3—3 of Fig. 1 looking in the direction of the arrows;

Fig. 4 is a top plan view of the pan and grid structure shown in Fig. 1;

Figs. 5 and 6 are fragmentary top plan views showing the relative positions of the various parts of the grid structure and operating handles during the movement which is required to free ice cubes therefrom;

Figs. 7 and 8 are fragmentary top plan views similar to Figs. 5 and 6 but showing a modified form of grid-operating mechanism embodying the present invention.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings and particularly to Fig. 1, a grid structure of the present invention is adapted for use in a refrigerator pan 10 and comprises longitudinal grid members 11 and 12 to which are hingedly connected a plurality of transverse grid members 13 which in the present instance are two in number and are inclined at an angle from the vertical in an ice forming position. Secured to the ends of the longitudinal grid members 11 and 12 opposite the ends where the transverse grid members 13 are secured, are a plurality of transverse grid members 14, which also are hingedly connected with the longitudinal grid members 11 and 12. In the present instance the grid members 14 are two in number and are normally inclined from the vertical in the direction opposite to the direction of inclination of the transverse grid members 13.

An operating handle 15 is operatively connected with the longitudinal grid members 11 and 12 and actuates the transverse grid members 13. An operating handle 16 is operatively connected with the opposite end of the longitudinal grid members 11 and 12 and is operatively connected for actuation of the transverse grid members 14. The handle 15 is mounted on a shaft 17 which is rotatable in journals provided in the longitudinal grid members 11 and 12 adjacent one end thereof. The handle 16 is mounted on a rotatable shaft 18 which is mounted in journals provided on the opposite end of the longitudinal members 11 and 12. The handle 15 is provided with a bent portion 19 and the handle 16 is provided with a bent portion 20 which form cam surfaces which move the grid-operating slide members as hereinafter described. The handle 15 extends through an opening 21 which is provided in the grid-actuating slide member 22 which operates to spread the ends of the longitudinal members 11 and 12 and for thereafter moving the transverse grid members 13. The handle 16 extends through an opening 23 in a slide member 24 which acts to spread the opposite ends of the longitudinal members 11 and 12 and thereafter to actuate the transverse grid members 14.

The slide member 22 is provided with a curved end 25 which is so constructed as to provide an enlarged end which will contact with the inwardly extending cam 26 on the longitudinal member 11 and the inwardly extending cam 27 on the longitudinal member 12. This construction is such that upon longitudinal movement of the slide member 22 in a substantially horizontal plane the ends 25 and the slide member 22 will contact the cams 26 and 27 and exert a force on the longitudinal members 11 and 12 causing them

to be moved away from each other. The slide member 24 is provided with an enlarged end portion 28 which is curved and enlarged to provide for contact with the inwardly extending cam 29 on the longitudinal member 11 and the inwardly extending cam 30 on the longitudinal member 12.

The longitudinal members 11 and 12 extend through slots provided in the transverse members. Each transverse member 13 is provided with a generally vertically extending slot 31 for receiving the longitudinal member 11 and with a generally vertically extending slot 32 for receiving the longitudinal member 12. Each of the transverse members 13 is also provided with a generally horizontally extending slot 33 which is adapted to receive and guide the slidable tongue 34 of the slide member 22. Enlarged ears 35 are provided on the slide member 22 adjacent the slidable tongue 34 and are adapted to contact an adjacent face of each of the transverse grid members 13 to transmit a sufficient force to the face of such grid member to move it from its normally inclined or ice forming position towards a position approaching the vertical.

Each transverse member 14 is provided with a generally vertically extending slot 36 for receiving the longitudinal member 11 and with a generally vertically extending slot 37 for receiving the longitudinal member 12. Each transverse member 14 is also provided with a generally horizontally extending slot 38 for receiving and guiding the slidable tongue 39 of the slide member 24. Enlarged ears 40 are provided on the slidable tongue 39 and are adapted to contact an adjacent face of the transverse member 14 and to transmit a force thereto which is sufficient to raise the transverse grid member from its normally inclined ice forming position to a position approaching the vertical.

In the construction of the slide members 22 and 24, shown in Figs. 1 through 6, it is intended that upon actuation of the handles 15 and 16 the adjacent transverse members will be moved simultaneously. In other words, there is no delayed movement between one of the transverse members 13 and the other of the transverse members 13 or between one of the transverse members 14 and the other transverse member 14. There may, however, be a difference in timing of the movement of the transverse members 13 and of the transverse members 14.

In the modified form shown in Figs. 7 and 8, the slide member 22 has been replaced with a slide member 41 and the slide member 24 has been replaced with a slide member 42. The members 41 and 42 are generally the same in construction as the slide members 22 and 24 previously described except that there is a larger spacing between the extending ears which contact the transverse members, so that as shown in Fig. 8, as the handle 15 approaches the completely raised position, the first of the transverse members 13 is raised almost to its completely vertical position while the other of the transverse members 13 is raised to but an intermediate point approaching the vertical position. Also, when the handle 16 approaches its completely raised position, as shown in Fig. 8, the first of the transverse grid members 14 is raised to the end of its movement towards the vertical while the other of the transverse members 14 has been raised to an intermediate position toward the vertical. Thus, by substituting slide members 41 and 42 for the slide members 22 and 24, it is possible to provide for a progressive movement of the transverse members 13 relative to each other and of the transverse members 14 relative to each other. In certain types of construction this progressive movement is thought to be desirable since it requires the application of proportionately less force to the handles 15 and 16 than is required when simultaneous movement of the members is desired. It is apparent that to move but one transverse member at a time requires less force to break the adhesion between the frozen ice blocks and one of the transverse members than that which would be required to break a similar adhesion between the frozen ice blocks and more than one of the transverse members.

Assuming that the pan 10 containing the grid embodying the present invention has been filled with water, placed in the evaporator of a refrigerator, and has been frozen so that when the parts occupy the positions shown in Fig. 1 the various compartments formed between the structural members of the grid member and the pan are each filled with an ice block. When the parts are in this condition, the handles 15 and 16 lie in substantially horizontal planes and may be moved upwardly about the respective pivots to occupy the dotted line position shown in Fig. 3 at the completion of the desired movement of the respective handles. The movement of the handles 15 and 16 is identical and effects identical movement of the structural members of the grid, although the application of force applied to the handles 15 and 16 is applied through opposite ends of the longitudinal grid members 11 and 12. Accordingly, the operation of the grid embodying the present invention will be described with reference to the movement of the handle 15 to effect a spreading movement of the ends of the longitudinal members 11 and 12 adjacent the slide member 22 and to effect the desired movement of the transverse members 13. It is understood that the same movements will be effected on the opposite ends of the members 11 and 12 by actuation of the handle 16 which is connected to the slide member 24 to effect movement of the transverse members 14.

When the handle 15 is moved from its normally horizontal position to a partially raised position as shown in Fig. 5, it will be seen that the ends of the cam members 26 and 27 on the longitudinal members 11 and 12 are contacted by the enlarged end 25 of the slide member 22. The bent portion of the handle 15 contacts the forward portion of the slot 21 and moves the whole slide member 22 toward the end of the pan 10. As shown in Fig. 2, the normal position of the longitudinal members 11 and 12 when the pan and grid are in the normal or frozen condition as shown in Fig. 1, is that both are inclined angularly so that the upper longitudinal edges of the members 11 and 12 are spaced a lesser distance apart in a transverse direction than are the lower longitudinal edges thereof. Thus, the spreading of the members by contact of the end 25 with the cams 26 and 27 moves the upper longitudinal edges of the members 11 and 12 in the slots in the transverse separator members towards positions approaching the vertical.

Continued movement of the handle 15 causes a continued sliding movement of the member 22 relative to the transverse members 13. As this movement is continued, the transverse members 13 are subjected to the application of forces

thereon which cause the members 13 to be moved from their normally inclined or ice forming positions, as shown in Fig. 3, to positions approaching the vertical, as shown in Fig. 5, and at the final freeing of the ice cubes, to the positions shown in Fig. 6. This movement causes a transverse movement of the inclined upper edges of the longitudinal members 11 and 12 and at the same time effects a pivotal movement of the transverse members 13 from their normally inclined positions to positions approaching the vertical.

By the simultaneous operation of the handles 15 and 16, as shown in Figs. 5 and 6, the breaking force is transmitted to both ends of the longitudinal members 11 and 12 simultaneously and at the same time movement is effected of the transverse members 13 and the transverse members 14.

By mounting the handles 15 and 16 as here shown, the actuation of the handles sets up motion in the connected parts of the grid member and sufficient force is transmitted to the connected parts of the grid member so as to assure the desired movement thereof. As shown in these constructions, the handles 15 and 16 are so mounted that they may be moved upwardly relative to the top surface of the grid member and forwardly toward adjacent ends of the pan 10. By swinging the handles 15 and 16 in these directions, it will be seen that opposed forces are applied to the handles 15 and 16 which assist in holding the pan and grid against movement on a supporting surface during the above described operation for freeing the ice cubes therefrom. It is to be understood, however, that it is not necessary to actuate the handles 15 and 16 simultaneously, particularly if it is not desired to release at one time all of the ice cubes from said grid members. The handles 15 and 16 may be independently operated and in the embodiment of the invention shown in Figs. 1 to 6, inclusive, each handle controls the movement of but two transverse members. It will be seen that the operation of either handle alone will free six ice cubes during each operation. It is to be understood, however, that but four of these cubes will be made available since the two central cubes are immediately beneath the slide member 22 and are not available unless the entire grid member is actuated and is broken loose from the pan 10.

The structural members forming the grid of the present invention may be formed of any suitable material, preferably of a thermally-conductive metal such, for example, as aluminum or an aluminum alloy. If the metal is of a corrodible nature, it should be suitably treated to prevent corrosion when in contact with water or foodstuffs which it is desired to freeze. The pan 10 likewise is preferably formed of a thermally-conductive metal or metallic alloy, which if of a corrodible nature is also suitably treated to prevent corrosion when brought in contact with water. If the material used in the construction of the pan and grid is aluminum or an aluminum alloy, it is preferably treated to form a hard surface coating thereon which consists chiefly of aluminum oxide. This surface is thereafter impregnated with a suitable high-melting wax, such for example as carnauba wax. By the provision of the oxide coating on the aluminum, or the aluminum alloy and the impregnation of this coating with the high-melting wax, the force required for the breaking of the grid structure from the ice cubes is greatly diminished since the adhesion of the surface of the ice cubes to adjacent surfaces of the pan and grid members is less than the adhesion of such cubes to surfaces which have not been so treated.

It is to be understood in connection with the operation of the grid of the present invention that but a very slight movement is all that is required to break the adhesion between the adjacent surfaces of the ice cubes and the surfaces of the tray 10, the longitudinal grids 11 and 12 and the transverse grids 13 and 14. The construction here described provides a sufficient amount of movement of the members of the grid to assure a breaking of the ice cubes therefrom and thereafter to assure a slight movement of the ice cubes relative to the surfaces of the pan 10. Upon completion of the breaking movement, the grid will be found to be completely freed from the ice cubes and the cubes will be found to be freed from the adjacent surfaces of the pan. As this condition exists when the handles 15 and 16 are in the fully raised position, it is but a simple matter to lift the entire grid from the pan and from the ice cubes which will remain in the pan. Another desirable feature of the present invention is that the grid members 11 and 12 and the transverse grid members 13 and 14 will automatically occupy the proper positions when the grid is placed in the pan and the handles 15 and 16 are returned to the substantially horizontal position as shown in Fig. 1. Thus, it is not necessary to provide for any separate setting of the grid members in the pan 10 when water is added thereto and the grid is placed with the pan 10 in the evaporator or freezing compartment of an electric refrigerator.

From the foregoing it will be seen that I have provided a novel ice tray grid structure in which relative movements of the structural members forming the grid are initiated and controlled by actuation of the handles 15 and 16. Due to the multiplication of the forces applied to said handles through the slide members 22 and 24 and the integral parts of the grid structures which operate as mechanical force-multiplying means, it will be seen that the application of relatively small forces to the handles 15 and 16 is all that is required to actuate the grid members as above described to effect the breaking of the ice cubes therefrom and the release of the grid from the pan 10.

It will also be seen that the actuation of the handles 15 and 16 effects a movement of the longitudinal members 11 and 12 and the transverse members 13 and 14 according to a predetermined sequence of motions so that the members 13 may be actuated simultaneously as shown in Figs. 1 to 6, inclusive, or they may be operated in sequence as shown in Figs. 7 and 8. Likewise the transverse members 14 may be operated simultaneously as shown in the construction of Figs. 1 to 6, inclusive, or they may be operated in sequence according to the construction shown in Figs. 7 and 8.

The predetermined sequence of motion, as previously described, frees the grid from the ice cubes which are frozen in its various compartments and at the same time frees the cubes and the grid from the frozen surface adhesion to the pan. It will be seen that the grid structure of the present invention, while positive in its operation, is of a simplified design and construction which readily lends itself to large scale production on a commercial basis.

I claim:

1. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinal members, and means comprising cooperating cam wedge and lever members carried by said longitudinal and transverse members and positioned to lie above the normal ice freezing level for moving the upper edges of said longitudinal members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other.

2. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinal members, means for moving the upper edges of said longitudinal members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams carried by said longitudinal members, a handle pivotally mounted on said longitudinal members, and a slide member positioned to lie above the normal ice level and connected with said handle and adapted on pivotal movement of said handle to contact said cams and spread said longitudinal members and thereafter to effect movement of said transverse members.

3. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected to said longitudinally extending members, and means for moving the upper edges of said longitudinally extending members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams on each end of said longitudinal members, a handle pivotally mounted adjacent each end of said longitudinal members, and a slide member connected with each handle and with said transverse members adjacent thereto, each of said slide members having an end adapted to contact said cams and spread said longitudinal members upon pivotal movement of the handle connected therewith.

4. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinally extending members, means for moving the upper edges of said longitudinally extending members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams on each end of said longitudinal members, a handle pivotally mounted adjacent each end of said longitudinal members, a slide member connected with each handle and with the transverse members adjacent thereto, each of said slide members having a sliding connection with certain of said transverse members and having abutments thereon adapted to contact the face of said transverse members, and an end portion adapted to contact said cams on said longitudinally extending members and spread said longitudinally extending members upon pivotal movement of the handle connected therewith, said abutments being spaced relative to said end portion in such a manner as to actuate the transverse members after the longitudinally extending members have been spread apart.

5. An ice tray grid comprising a plurality of spaced longitudinal members extending through a plurality of transversely extending members and maintained therein in positions inclined from the vertical with the upper edges thereof a lesser distance apart than are the lower edges thereof, said plurality of transversely extending members being hingedly connected to said longitudinal members, and means positioned above the normal freezing level for moving the longitudinal members toward a vertical position with reference to the bottom of the tray, and for thereafter moving said transverse members relative to said longitudinal members.

6. An ice tray grid comprising a plurality of spaced longitudinally extending members normally positioned in planes inclined from the vertical, and a plurality of transverse members lying in planes inclined from the vertical and hingedly connected to said inclined longitudinal members, the transverse members adjacent each end of said longitudinal members being inclined towards the center of the tray.

7. An ice tray grid comprising a plurality of spaced normally angularly inclined longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinal members, said transverse members being inclined from the vertical, the transverse members adjacent each end of said grid structure being inclined in opposite directions, and force multiplying mechanical means carried by the grid for moving said transverse members relative to said longitudinal members and relative to each other and for moving the longitudinally extending members from their normal angularly inclined positions towards vertical positions.

8. An ice tray grid comprising a plurality of spaced longitudinal members extending through a plurality of transverse members and lying in planes inclined from the vertical, the upper edges of said longitudinal members being spaced a lesser distance apart than are the lower edges thereof, said plurality of transversely extending members being hingedly connected with said longitudinal members, and means for moving the upper edges of said longitudinal members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams on said longitudinal members adjacent the ends thereof, a handle pivotally connected on said longitudinal members and a slide member positioned to lie above the normal freezing level and connected to said handle and adapted on pivotal movement of said handle to contact said cams and spread said longitudinal members and thereafter to effect movement of said transverse members.

9. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinally extending members, said transversely extending members being inclined from the vertical, those transverse members adjacent one end of said grid being inclined angularly in the opposite direction from those adjacent the opposite end of said grid, and means for moving the upper edges of said longitudinal members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cam means carried by said longitudinal members, handle means pivotally mounted on said longi-

tudinal members, and slidable means connected with said handle means and adapted on pivotal movement of said handle means to contact said cam means and spread said longitudinal members and thereafter to effect movement of said transverse members from their normally inclined positions to positions approaching the vertical.

10. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members hingedly connected with said longitudinal members, said longitudinal members being inclined from the vertical with their upper longitudinal edges spaced a lesser distance apart than their lower longitudinal edges, said transverse members being inclined from the vertical, those transverse members adjacent one end of said grid being inclined in the opposite direction from those adjacent the opposite end of said grid, and means for moving the upper edges of said longitudinal members away from each other to move said longitudinal member to a position approaching the vertical, and for moving said transverse members relative to said longitudinal members to positions approaching the vertical, said means including cams on said longitudinal members, handles pivotally connected on said longitudinal members, and slide members connected with said handles and adapted on pivotal movement of said handles to contact said cams and spread said longitudinal members and thereafter to effect movement of said transverse members from their normally inclined positions to positions approaching the vertical.

11. An ice tray grid comprising a plurality of spaced longitudinal members mounted in inclined positions whereby the upper longitudinal edges are spaced a lesser distance apart than are the lower longitudinal edges thereof, a plurality of transversely extending members pivotally connected with said longitudinal members, and means for moving the upper edges of said longitudinal members away from each other to move said members towards positions approaching the vertical, and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams on each end of said longitudinal members, a handle pivotally mounted adjacent each end of said longitudinal member, and a slide member connected with each handle and with the transverse members adjacent thereto and each having an end adapted to contact said cams and spread said longitudinal members upon pivotal movement of the handle connected therewith, each of said slide members having sliding connections with the transverse members adjacent thereto and having abutments thereon adapted to contact the face of each of said transverse members and move said transverse members relative to said longitudinal members.

12. An ice tray grid comprising a plurality of spaced longitudinally extending members, a plurality of transversely extending members pivotally connected with said longitudinal members and normally maintained in positions inclined from the vertical, the transverse members adjacent one end of said longitudinal members being inclined in the opposite direction from the transverse members pivotally connected adjacent the opposite end of said longitudinal members, and means for moving the upper edges of said longitudinal members away from each other and for moving said transverse members relative to said longitudinal members and relative to each other, said means including cams on each end of said longitudinal members, a handle pivotally mounted adjacent each end of said longitudinal members, and a slide member connected with each handle and with the transverse members adjacent thereto, each of said slide members having an end adapted to contact said cams and spread said longitudinal members upon pivotal movement of the handle connected therewith, each of said slide members also having sliding connections with said transverse members and having abutments thereon adapted to contact an adjacent face of each of said transverse members to move said transverse members from said normally inclined positions to positions approaching the vertical.

13. An ice tray grid comprising a plurality of spaced longitudinally extending members maintained in inclined planes approaching the vertical, the upper longitudinal edges thereof being arranged a lesser distance apart than are the lower longitudinal edges thereof, a plurality of transversely extending members pivotally connected with said longitudinal members, the transverse members being normally maintained in angularly inclined positions, the members adjacent one end of said longitudinal members being inclined in a direction opposite from the transverse members adjacent the opposite end of said longitudinal members, and means for moving the upper edges of said longitudinal members away from each other to move said longitudinal members towards a position more closely approaching the vertical and for moving said transverse members relative to said longitudinal members towards positions more closely approaching the vertical, said means including cams on each end of said longitudinal members, a handle pivotally mounted adjacent each end of said longitudinal members, and a slide member connected with each handle and with the transverse members adjacent thereto, and each having an end adapted to contact said cams and spread said longitudinal members upon pivotal movement of the handle connected therewith, each of said slide members also having sliding connections with said transverse members and having abutments thereon adapted to contact an adjacent face of each of said transverse members and move said transverse members from their normally inclined positions to positions approaching the vertical.

14. An ice tray structure as defined in claim 13 and further characterized in that said abutments are spaced relative to said slide member and relative to said transverse members and all transverse members connected therewith are moved simultaneously from their inclined positions to positions approaching the vertical.

15. A grid as claimed in claim 13 and further characterized in that the abutments on said sliding member are spaced relative to said transverse members so that said transverse members are progressively contacted by movement of said abutments whereby a progressive movement of said transverse members from their normally inclined positions to positions approaching the vertical is effected.

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