Feb. 29, 1944. H. Y. JENNINGS ET AL 2,342,670

REFRIGERATION

Filed April 29, 1940 2 Sheets-Sheet 1

Fig. 1

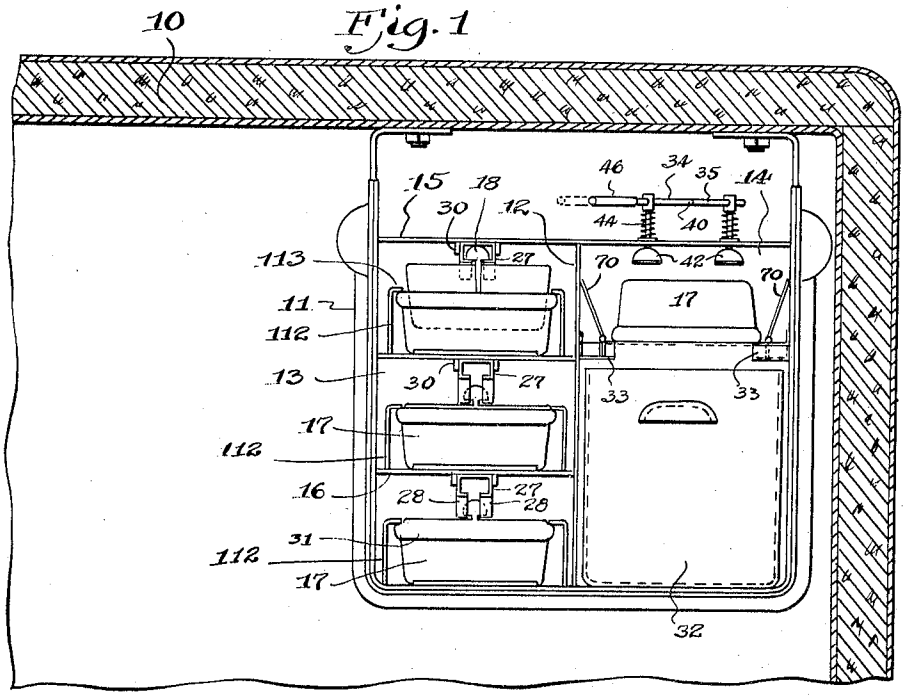
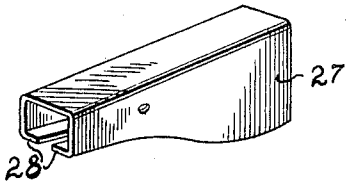


Fig. 2



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Feb. 29, 1944. H. Y. JENNINGS ET AL 2,342,670

REFRIGERATION

Filed April 29, 1940 2 Sheets-Sheet 2

Fig. 3

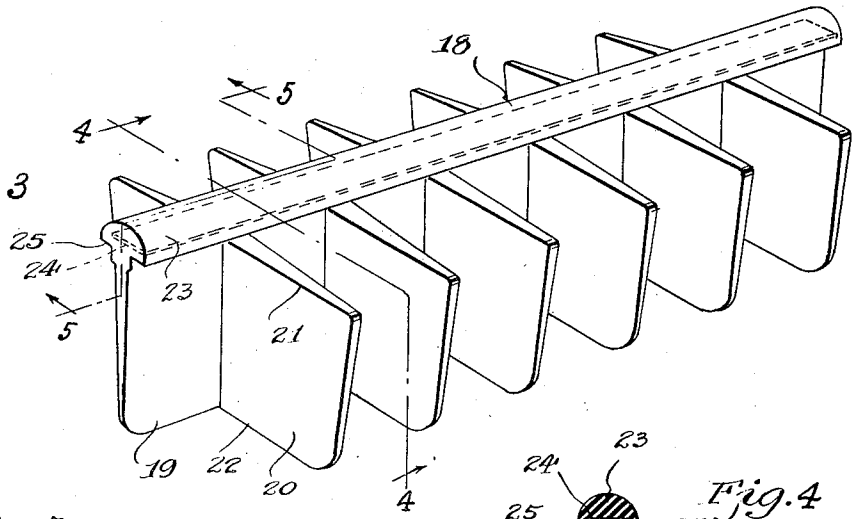


Fig. 4

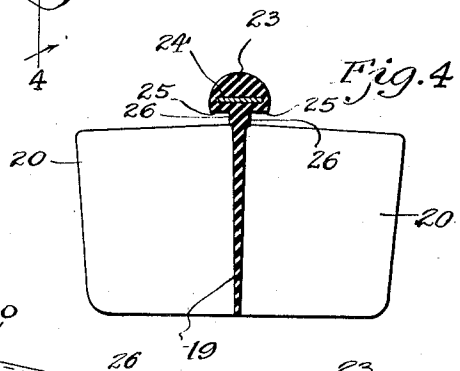
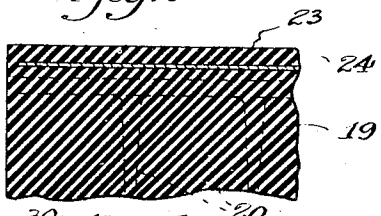


Fig. 5



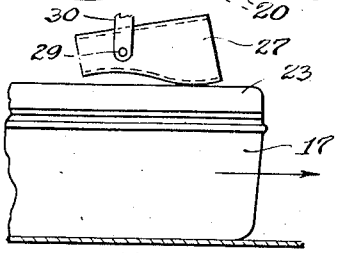


Fig. 6

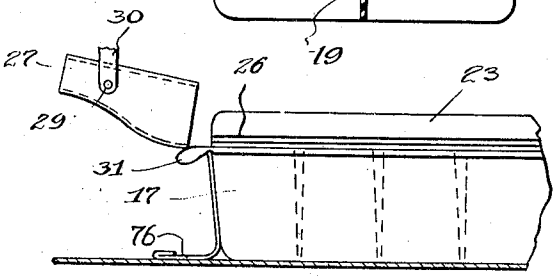


Fig. 7

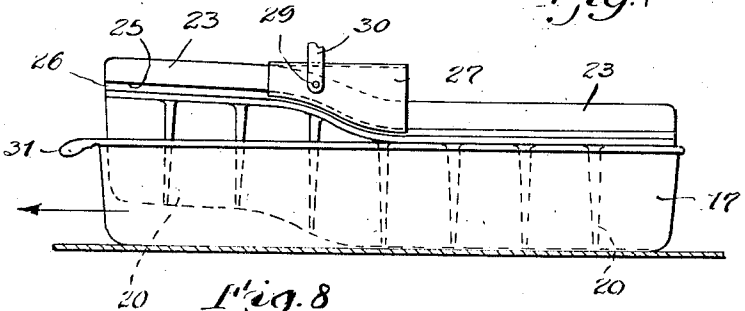


Fig. 8

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UNITED STATES PATENT OFFICE

2,342,670

REFRIGERATION

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Application April 29, 1940, Serial No. 332,250

15 Claims. (Cl. 62—108.5)

This invention relates to refrigeration and particularly to that phase of refrigeration relating to the manufacture and dispensing of ice blocks or "cubes," as they are commonly known. More specifically the invention relates to methods and apparatus particularly adapted for the removal of ice cubes from the container in which they are frozen and the dispensing of the same as they are required by the user, which methods and apparatus are capable of use in association with or in proximity to the mechanism, as for example the evaporator or low temperature compartment in which the ice cubes are frozen.

In Patent No. 2,113,014, issued April 5, 1938, to Lloyd G. Copeman, and in application Serial No. 125,607, filed February 13, 1937, by H. Y. Jennings et al., both of which are assigned to the assignee of the present application, there are described various methods and apparatus for ejecting ice cubes from a container into a storage compartment, and in each case both the ejection apparatus and the storage compartment are disposed within the confines of the refrigerated space. The apparatus disclosed in each of these cases and particularly the tray structure for forming the ice cubes is such that in the patent the grid or cube separator is formed integrally with the tray, and in the application the ice is formed in a series of individual cups. Each of these devices presents certain constructional problems which render them less satisfactory from the commercial viewpoint than a simple tray with a removable and separate grid or divider unit.

However, in order that the user may remove the separate grid from the tray, in the devices of this character now available, it is invariably necessary that the tray, with the grid frozen solidly in it, be withdrawn from the freezing compartment and then manipulated in some manner to release the grid and frozen cubes from the tray, and the cubes from the grid. This is not particularly disadvantageous if all the ice cubes are to be used immediately, but if only one or a few cubes are desired, and the remainder of the cubes are to be stored, the inevitable melting of the surface which takes place when the cubes are exposed to the warm air of the room, even though this exposure takes place for only a relatively short time, causes the cubes to freeze firmly together when they are returned to the low temperature storage compartment. Thus when additional ice is required the firmly adhering cubes must be removed from the storage compartment and separated or shattered by some physical means such as an ice pick or hammer.

An additional objection to the usual tray with a removable grid is that the user is required to handle a very cold device for a considerable length of time in manipulating the tray and grid to free the cubes from these parts. While the various operations described above are being performed with the usual devices available, the door of the refrigerator cabinet is often left open for a considerable period of time with a resultant loss of refrigeration, or rather a considerable inflow of heat into the refrigerator cabinet.

This invention has as an object to provide an ice tray having a removable grid, which tray can be used in conjunction with the methods and apparatus described and claimed in the Copeman patent and the Jennings et al. application aforesaid.

A further object of the invention is to provide a freezing tray and grid assembly in which the grid can be removed from the tray and frozen ice mass without subjecting the ice blocks to a thawing temperature.

Still another object of the invention is to provide a means whereby the removal of the tray from the space in which it is frozen simultaneously removes the grid from the tray and the frozen cubes.

A further object is to provide a grid structure which possesses such constructional feature that it can be removed from the frozen ice mass in the tray without disturbing the adhesion between the ice cubes and the tray itself.

Still another object of the invention is to provide a means for causing relative movement between an ice tray and a grid as the tray is withdrawn from the freezing space of a refrigerator.

Other objects and advantages of the invention will be readily apparent from the following description and accompanying drawings wherein:

Fig. 1 is a front elevational view, partly in section showing a cooling unit or evaporator of a refrigerating unit embodying one form of the invention and disposed in the usual refrigerating cabinet.

Fig. 2 is an enlarged perspective view of the grid removal device shown in Fig. 1.

Fig. 3 is a perspective view of a form of grid used in practicing the invention.

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3.

Fig. 6 shows the position of the grid removal

device while the tray is being inserted into a freezing compartment.

Fig. 7 shows the grid removal device in position to remove the grid after the tray has been inserted into the feezing compartment.

Fig. 8 is a side elevation of a tray and grid with the grid partly removed.

Generally speaking, the invention comprises the provision of a device associated with a refrigerator cabinet, and preferably with the evaporator, for stripping the grid from the tray as the tray is removed from the evaporator, thus doing away with the necessity of carrying the tray to a table or other support in order to remove the grid.

We have found that the most suitable tray and grid combination for practising our invention comprises a flexible metal tray, such as the anodized aluminum trays now in common use, together with a flexible rubber grid of the general type shown in the patent of Harley Y. Jennings No. 2,303,938, issued December 1, 1942, preferably with some modifications in construction as will be hereafter described.

Referring to the drawings for a detailed description of the invention, **10** designates generally a refrigerator cabinet of any suitable type cooled by a suitable cooling unit or evaporator **11**. The evaporator **11** shown in Fig. 1 is the conventional U-shaped sheet metal evaporator well-known in the art. The evaporator is divided by a vertical partition member **12**, extending substantially for the full length and height of the evaporator, into two sections which will be here referred to as a freezing section **13**, and a storage section **14**. A horizontal top plate **15** may also be provided, extending from one vertical wall of the evaporator to the other and forming a top closure for the freezing and storage sections.

The freezing section, which is shown in the left portion of the evaporator **11** in Fig. 1, may be provided with one or more shelves **16** for supporting trays **17** containing substance to be frozen, and any one or more of these shelves may be refrigerated by suitable coils (not shown) as is well known in the art.

An important feature of the present invention is the provision of means for removing the grid from the frozen ice mass in the tray without the necessity of removing the tray to a location outside the refrigerator cabinet. To accomplish this result we have found it desirable that the grid be so constructed that it will strip from the ice with the least possible effort. We have found that there are two important factors in effecting the desired ease of removal, one of which is the material or materials from which the grid is made, the other being the shape of the grid.

As has been previously stated, we have found that a tray and grid combination of the type described in the patent of Harley Y. Jennings, No. 2,303,938, with some modifications as are herein described, is particularly effective for accomplishing the desired results. We prefer to use a standard aluminum tray such as the tray **17** (Figs. 1 and 8) and preferably this tray has an anodized or oxidized surface without any additional surface finish. This tray should also be flexible enough to be capable of being readily distorted when the proper force is applied to it. Such a tray offers firm adhesion between the individual ice cubes and the tray surfaces which they contact, but readily releases the cubes when the tray is flexed after the grid has been removed.

The removable grid is preferably made of rubber or a rubber compound, and by the word "rubber" we include any resilient, flexible and distortable material, or any material having rubber-like properties. Referring to Fig. 3, the grid, generally designated by the numeral **18**, comprises a longitudinal center strip **19** and a plurality of transversely extending cross-strips **20** moulded integrally with the center strip. It is desirable that when the grid is inserted in the tray the upper edge of each cross strip adjacent the side wall of the tray should be at least flush with or slightly above the upper edge of the said side wall and should then slope inwardly and upwardly toward the center strip as shown in Fig. 4. This construction ensures that no ice will form over the top of the cross strips when the contents of the tray expand as they freeze.

The center strip **19** is here shown as tapering from its top toward its bottom edge. Each cross strip **20** also tapers from its top edge **21** toward its bottom edge **22**. Each cross strip **20** also tapers outwardly from the top portion where it contacts the center strip toward its outer edge. Thus the preferred grid construction has cross strips which gradually decrease in cross-sectional thickness from the upper part of the juncture between the cross strips and the center strip toward the tray-contacting edges of the cross strips. This construction of the cross strips may be sometimes hereafter referred to as "fan-shaped." Such a construction greatly facilitates the slipping of the grid from the ice.

For ease in removal it is preferable that the tray and grid be not much more than twice as wide as they are deep, as we have found by experiment that the effort required to remove a grid of the type herein described increases materially in proportion as the width of the grid exceeds more than twice the depth. Wider grids will of course work effectively but more force is required to remove them because of the increased angle at which the pulling force is applied.

The longitudinal center strip **19** carries on its upper edge an integrally molded bead or reinforcing strip **23**. This bead, which may be arcuate in cross-section as shown in Fig. 4, should be heavy enough to withstand a substantial pull and also heavy enough to maintain the grid in substantially straight alignment. It may be desirable in some cases to mold a flat spring member, such as is shown at **24** in Figs. 3 and 4, in this reinforcing bead **23**. If it is used, this spring should lie horizontally so as to permit vertical flexing of the bead **23**. Due to its shape, however, it materially restricts lateral flexing of the bead, and thus assists in maintaining the grid in alignment. The under side of the reinforcing bead is preferably a flat surface extending laterally from each side of the center strip as indicated at **25** in Fig. 4. It should be noted that the reinforcing bead **23** together with its flat under-surfaces **25** is spaced a short distance above the junctures of the cross strips **20** with the center strip **19**. By this construction a channel **26** is formed on each side of the center strip **19** for a purpose to be hereafter described.

A grid of the design just described, and made according to standard formulations for flexible rubber, can be used to practice the invention described herein. However, far superior results can be obtained by using a grid, the surface of which has been treated or changed to increase its water repellency and to materially decrease

the sliding friction and adhesion when it is withdrawn from the ice.

Such a surface may be obtained by coating the grid with a smooth, water-repellent material as described in Hathorne, U. S. Patent No. 1,932,731. Other and even more desirable ways of producing such a surface are described in the patent of Harley Y. Jennings, No. 2,303,938.

An important object of the present invention is to remove the grid from the frozen substance in the tray as the tray is withdrawn from the freezing space in the evaporator. One manner of accomplishing this comprises the provision of a pivoted grid removal device as shown at 27 in Figs. 1 and 6. This device, which should be made of a rigid material such as metal, is channel-shaped or slotted, as shown in Fig. 2 and has a pair of inwardly extending horizontal flanges 28 along the lower edges of its side-walls. It will be noted from an inspection of Figs. 2 and 6 that the lower edges of the release device 27, including the flanges 28, curve inwardly and downwardly and that the device is pivotally supported as indicated at 29 by straps 30 which are fixed to and depend from the front end of the under side of each shelf 16 and the top plate 15 in Fig. 1. The device 27 is pivoted off center so that it normally occupies the position shown in Fig. 7. This position is the one it takes after a tray has been inserted in the freezing compartment. While the tray is being inserted in the compartment, the release device assumes the position shown in Fig. 6.

After the contents of the tray have been frozen the tray is grasped by the handle 31 and pulled steadily forward. When this forward movement is started the inner sloping edges of the flanges 28 contact the horizontal flat surfaces 25 of the bead 23. As this forward movement continues, the bead 23 rides up on the flanges 28 as shown in Fig. 8, and by the time the tray has been completely withdrawn from the shelf the grid has been stripped completely free from the ice. If all the cubes are desired for immediate use, the tray may then be manually flexed, releasing the cubes from the tray surfaces.

In order to hold the tray 17 down while the grid is being removed, we provide suitable means 112, rigidly fastened to the shelf 16 on each side of the tray and having inwardly extending flanges 113 which overhang the upper side walls of the tray. This means 112 may conveniently comprise a pair of spaced metal sheets slightly higher than the walls of the tray and extending the length of the shelf 16. The flanges 113 should be just wide enough to overhang the tray rim and should not extend over the cross pieces of the grid.

While we have shown a release device of the type just described in connection with each tray supporting shelf, it is obvious that, in the interest of economy, only one such device need be provided with each refrigerator, and that the frozen trays can be transferred to the shelf with which the removal device is associated, to assist in removing the grid frozen therein.

It will also be obvious that the position of the removal device may be reversed from that herein shown and described, so that the grid will be removed from the tray and the frozen substance while the tray is being pushed onto the shelf instead of as it is being withdrawn from the shelf, as is herein described.

However, it is more usual for only a few cubes to be used at one time and we accordingly prefer to dump the entire contents of the tray into a refrigerated storage bin such as the receptacle 32 (Fig. 1). The use of such a receptacle offers the advantage of a continuous supply of individual cubes, and the volumetric capacity of such a receptacle is considerably greater than that which would be available if the same space were occupied by separate ice trays.

While it does not form a part of the present invention we have, at the right hand side of the cooling compartment in Fig. 1, shown a means for supporting the tray over the storage receptacle after the grid has been removed, and for then mechanically flexing the tray to release the ice cubes into the storage bin. The supporting means comprises a pair of supporting ledges 33 fastened to the vertical partition member 12 and the opposite side wall of the evaporator respectively, and above the receptacle 32. When a tray is initially placed on the ledges it is supported only at diagonally opposite corners.

The tray flexing mechanism comprises a pair of interlocking levers 34 and 35 pivoted at 36 and 37 to upright standards 38 and 39 respectively. The inner end of these levers are freely connected to each other, as by a pin and slot joint 40. Each of the levers 34 and 35 has pivotally attached thereto adjacent its end opposite the aforesaid pin and slot connection, a vertically depending link 41. A disc or plate 42 having a flat under surface is pivotally attached to the lower end of each link 41, and a cushioning pad of rubber 43 may be fastened to this flat under-surface to eliminate abrasive wear on the tray bottom. The standards 38 and 39 are supported on the upper surface of the top plate 15, and the depending links 41 extend through suitable apertures provided in the same top plate 15. Suitable springs 44 surround a portion of each link 41 and are interposed between the top plate and a nut 45 provided on each link, so that the levers 34 and 35 are normally maintained in the lifted position. The lever 34 may be provided with a handle member 46, and this handle member may be moved to cause contact between plates 42 and opposite corners of the tray 17 to flex the tray and release the cubes adhering to the tray into the receptacle 32.

The improved grid structure shown in Fig. 3 may of course, be slipped from the tray by hand, without the used of the releasing device 27. This is accomplished by holding the tray with one hand and pulling on one end of the grid with the other. We have found that this operation may be greatly facilitated by using a tray constructed as shown in Fig. 7. The tray here shown is of the usual shape, and may be made of aluminum or other suitable material. The front part of the tray is provided with a folded portion 31 comprising a handle. This folded portion is continued downward parallel to the front wall of the tray, and may be fastened to the lower part of the front tray wall by suitable means such as spot welding. The folded portion is then bent outwardly in the same plane as the bottom wall of the tray as indicated at 76, and projects forward from the tray front for a distance sufficient to enable the user to press down on said flange 76 with one hand while the grid is pulled upwardly with the other hand.

It will be readily apparent from the foregoing description that the invention herein described provides means for removing a grid from a tray containing frozen substance, by the relative movement between the tray and the surface on

which it is supported, as the tray is removed from that surface.

While specific embodiments of the invention have been described herein, it is readily apparent that other forms may be adopted, all coming within the scope of the following claims.

What we claim is:

1. In combination, a portable ice tray, a removable grid unit disposed in said ice tray having a distortable longitudinal connecting member thereon, and means for engaging said member progressively along its length in the removal of said grid unit from said ice tray and its frozen contents, said grid unit being removed from said tray and its frozen contents by relative horizontal movement between said means and said tray.

2. In combination, a cooling unit for refrigerating apparatus, a portable ice tray associated with said cooling unit, a removable grid unit disposed in said ice tray, and means associated with the cooling unit for elevating and removing said grid unit from said tray and its frozen contents as said tray is withdrawn horizontally from said cooling unit.

3. In combination, a cooling unit for refrigerating apparatus, a portable ice tray supported by said cooling unit, a removable grid unit disposed in said ice tray, the ice tray and grid unit being constructed of such materials that the adhesion between the tray and its frozen contents is greater than that between the grid unit and the frozen contents of the tray, and means associated with the cooling unit for removing the grid unit from the tray and its frozen contents as the tray is withdrawn from said cooling unit.

4. In combination, a cooling unit for refrigerating apparatus, a portable ice tray associated with said cooling unit, a removable grid unit disposed in said ice tray, and pivotally mounted means associated with said cooling unit and disposed above said ice tray for assisting in the removal of said grid unit from said tray, said means being so constructed that it is elevated as the tray and grid are inserted into the cooling unit, and is lowered to its grid releasing position after the tray has been fully inserted in the cooling unit.

5. In combination, an ice tray, means for supporting said tray in a substantially horizontal position, a removable grid unit disposed in said tray, and means mounted on said cooling unit above said tray for engaging a portion of said grid unit as said tray is moved in a horizontal direction with respect to said tray-supporting means, whereby to elevate said grid unit with respect to said tray and its frozen contents.

6. A rubber grid for ice trays, said grid comprising a longitudinal center strip and a plurality of transversely extending cross-strips, and a bead molded integrally with said longitudinal center strip and extending the length thereof, said bead having flat undersurfaces disposed above the juncture between the cross strips and the center strip.

7. A rubber grid for ice trays, said grid comprising a longitudinal center strip and a plurality of transversely extending cross strips, and a bead molded integrally with said longitudinal center strip and extending the length thereof, the lowermost portion of said bead being spaced above the uppermost point of contact of said transverse strips with said center strip a distance sufficient to provide a channel between the lowest portion of said bead and the highest portion of said cross strips.

8. In combination, a cooling unit for refrigerating apparatus, a portable ice tray associated with said cooling unit, a removable grid unit disposed in said ice tray, and means pivotally mounted on the cooling unit above said ice tray for engaging the grid and lifting it vertically from said tray and its frozen contents as the tray is moved horizontally with respect to said pivotally mounted means.

9. In combination, a cooling unit for refrigerating apparatus, a portable ice tray associated with said cooling unit, a removable grid unit disposed in said ice tray, said grid member being formed of flexible material and comprising a center longitudinal strip and a plurality of transversely extending cross-strips, each of said strips being narrower at the bottom than at the top and means associated with the cooling unit for removing the grid unit from the tray and its frozen contents while leaving the frozen contents adhering to the tray as the tray is moved horizontally relative to the cooling unit.

10. The combination with an ice tray, of a flexible grid therefor having a stiffened backbone for mechanical removal thereof, and means shaped to engage said backbone progressively along the length thereof upon relative movement between said tray and said means, and to exert a localized bending force on said backbone to release the grid from the tray and frozen contents thereof.

11. An ice cube shaper and releaser comprising a tray body, a cube forming grid member in said tray body, means for maintaining said tray in a defined plane when moved longitudinally and means cooperating with said grid and responsive to said longitudinal movement to shift said grid out of said defined plane and away from said tray and its frozen contents.

12. In combination, a portable ice tray, a removable grid unit disposed in said ice tray, a member on said grid extending longitudinally thereof, and a force transferring means mounted on a stationary support and shaped to engage said member, and arranged to transfer the force of longitudinal movement of said tray relative to said support to a force on said member away from said tray and thereby release the grid from said tray and frozen contents therein.

13. In combination, a portable ice tray, a removable grid unit disposed in said ice tray, a longitudinal member on said grid extending above and longitudinally thereof, and a force applying means for removal of said grid comprising a guideway pivoted at a point between its ends to a stationary means and having one end spaced from said pivot point to exert a force on said longitudinal member away from said tray and another end spaced to exert a force on said longitudinal member toward said tray when said longitudinal member is passed through said guideway and moved relative thereto, said forces being such as to remove the grid from the tray and frozen contents thereof.

14. In combination, a portable ice tray, a removable grid unit disposed in said ice tray, a flexible longitudinal member on said grid extending above and longitudinally thereof, and a force applying means for removal of said grid comprising a curved guideway pivoted at a point between its ends to a stationary means and having one end spaced from said pivot point to exert a force on said longitudinal member away from said tray and another end spaced to exert a force on said longitudinal member toward said tray when said longitudinal member is passed through said

guideway and moved relative thereto, said forces being such as to remove the grid from the tray and frozen contents thereof.

15. In combination, a portable ice tray, a removable grid unit disposed in said ice tray, a flexible longitudinal member on said grid extending above and longitudinally thereof, and a force applying means for removal of said grid comprising a curved guideway pivoted at a point between its ends to a stationary means and having one end spaced from said pivot point to exert a force on said longitudinal member away from said tray and another end spaced to exert a force on said longitudinal member toward said tray when said longitudinal member is passed through said guideway and moved relative thereto, said forces being such as to remove the grid from the tray and frozen contents thereof, said guideway being pivoted at a point whereby the application of force toward said tray is a distance from the pivot greater than the application of force away from the tray.

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