Feb. 3, 1942. W. H. KITTO 2,271,558

REFRIGERATION

Filed Oct. 5, 1938 2 Sheets-Sheet 1

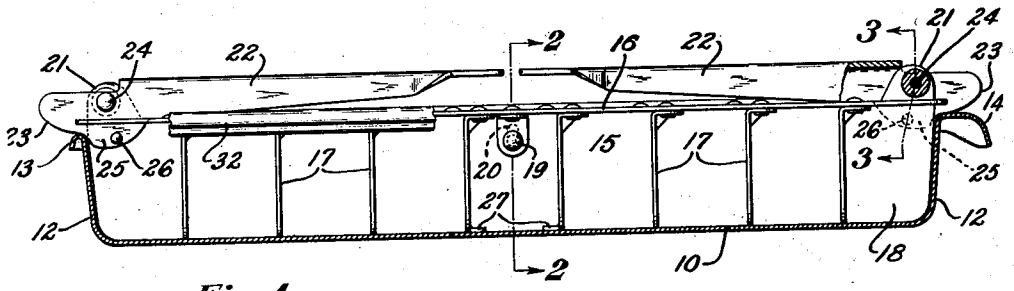


Fig. 1

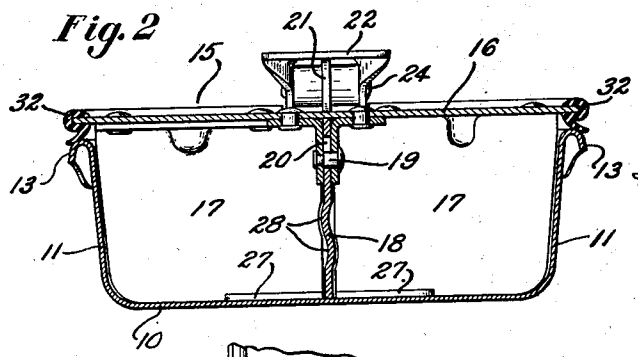


Fig. 2

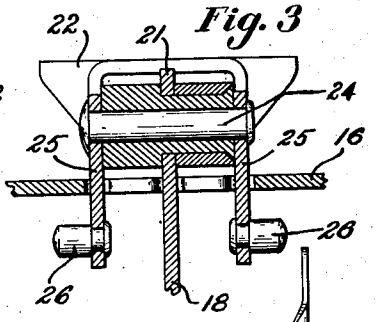


Fig. 3

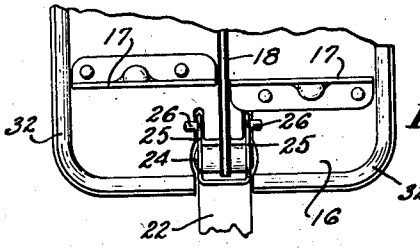


Fig. 5

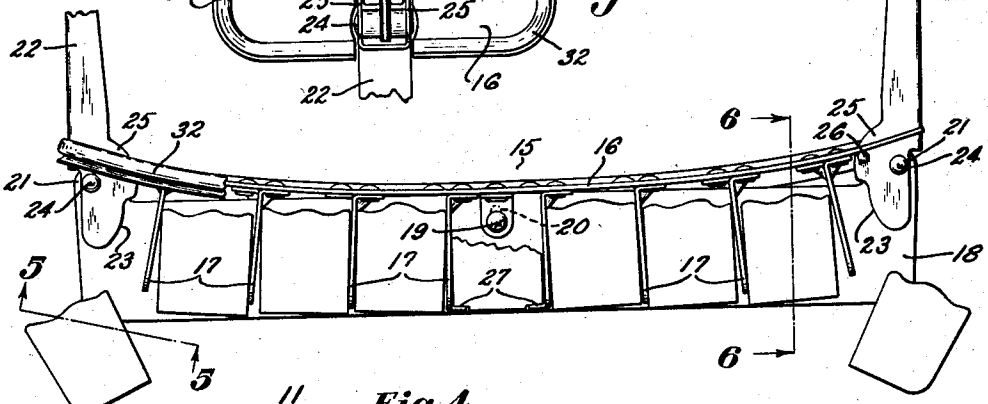
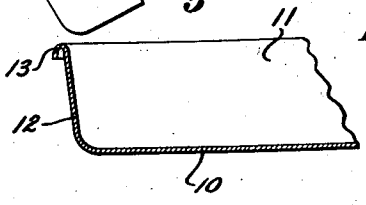


Fig. 4



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Feb. 3, 1942. W. H. KITTO 2,271,558

REFRIGERATION

Filed Oct. 5, 1938 2 Sheets-Sheet 2

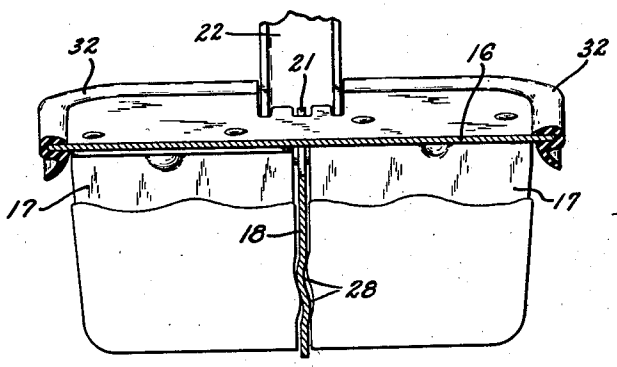


Fig.6

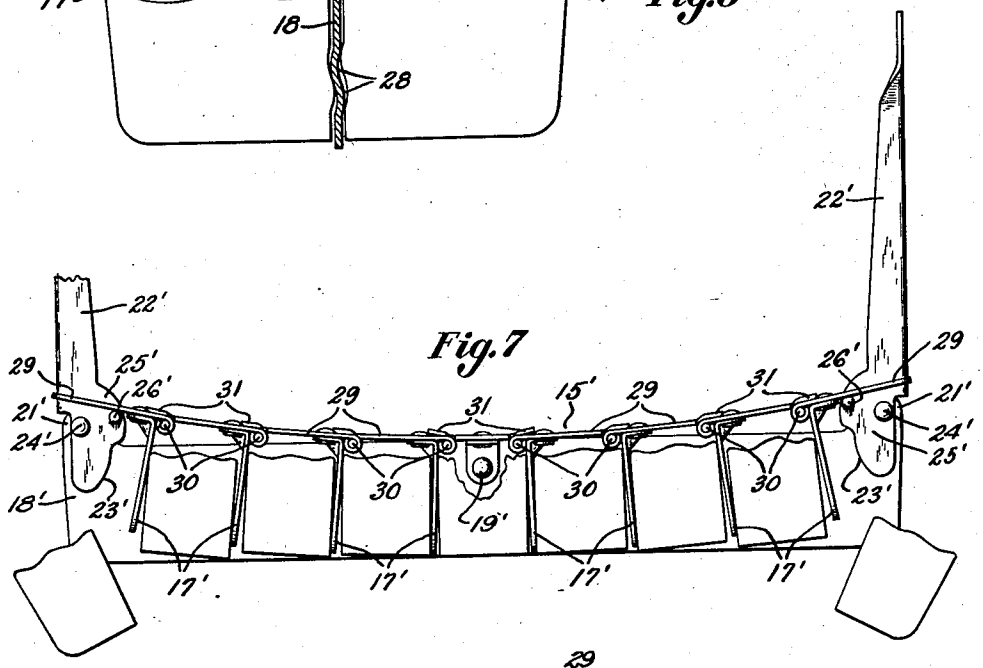


Fig. 7

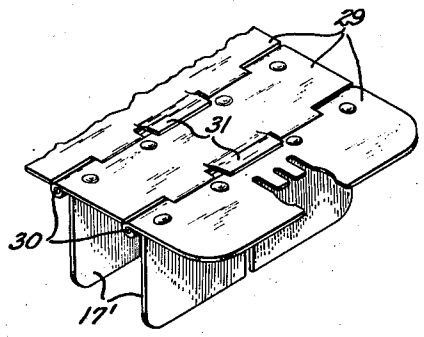


Fig. 8

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Patented Feb. 3, 1942 2,271,558

UNITED STATES PATENT OFFICE

2,271,558

REFRIGERATION

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Application October 5, 1938, Serial No. 233,361

16 Claims. (Cl. 62—108.5)

This invention relates to refrigeration, and more particularly, to an ice cube tray for domestic refrigerators with means for releasing frozen ice cubes therefrom.

It is the usual practice to remove ice cubes from the freezing tray from a domestic refrigerator by running hot water over the bottom of the tray so as to melt the grid assembly and attached cubes from the tray and thereafter running additional hot water over the grid assembly to remove the individual cubes therefrom.

This has the disadvantage that the ice is wasted since the cubes become appreciably smaller in melting them loose. It also has the disadvantage that the surface of the ice is wet and slippery and water drips around the place where the cubes are being removed which necessitates wiping up after each removal of the cubes.

It has also been proposed to remove ice cubes from the freezing tray of a domestic refrigerator by a mechanical leverage mechanism, but these devices have not been entirely satisfactory because of the excessive force necessary to be applied to release the cubes, their complexity, high cost of manufacture and the fact that they get out of order easily necessitating their frequent replacement.

In all the prior methods, it is necessary to release all the cubes and if only a few are needed, the remainder have to be stored in a cold place or thrown away.

The frost which collects on the evaporator of a domestic refrigerator gets contaminated by the odors from food kept in the cabinet, and when the evaporator is defrosted, this contaminated water drips down into the ice tray contaminating the ice therein which necessitates throwing away the cubes and refilling the tray with water. This requires operation of the machine to again freeze the cubes, and consequently delay and inconvenience.

It is an object of this invention to provide a freezing tray for a domestic refrigerator which eliminates the disadvantage of the prior methods.

It is another object of this invention to provide a freezing tray for a refrigerator in which a flexible plate-like member has grid members connected therewith together with means for removing the grid assembly from the tray and the individual cubes from the grid assembly singly or collectively as the operator desires.

It is another object of this invention to provide a freezing tray for a refrigerator in which the grid assembly includes a cover member attached thereto for preventing contaminated water dripping into the tray with means associated therewith for releasing the grid assembly from the tray and for freeing the individual ice cubes from the grid assembly.

It is another object of this invention to provide a freezing tray for refrigerators having a flexible cover with cross grid members secured to the under side thereof and a longitudinal grid member secured thereto preferably at a single point, whereby the cover may be flexed to release the cubes from the longitudinal grid member, and whereby the cross grid members may be spread relative to each other in such manner as to separate them from the cubes in succession.

Another feature of this invention is a novel method of removing cubes from a grid assembly in which a shearing stress is applied to the bond between the cubes and the longitudinal grid member and a combined tearing and shearing stress is applied to the bond between the cubes and the cross grid members.

It is another object of this invention to provide a freezing tray for refrigerators which is simple in operation, simple and economical to manufacture, and which will not get out of order.

Other objects and advantages of the invention will become apparent as the description proceeds when taken in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal section of a tray with one embodiment of the grid assembly positioned therein;

Figure 2 is a cross sectional view on line 2—2 of Figure 1;

Figure 3 is a sectional view on line 3—3 of Figure 1;

Figure 4 shows the grid assembly of Figure 1 removed from the tray and depicting the manner in which the individual cubes may be released therefrom;

Figure 5 is a detailed view of a portion of the device taken on line 5—5 of Figure 4;

Figure 6 is a transverse sectional view on line 6—6 of Figure 4, showing the cubes released from the longitudinal grid member;

Figure 7 is a side elevational view of another embodiment of the invention showing the individual cubes being released from the grid assembly; and

Figure 8 is a detailed view of a portion of the device shown in Figure 7.

Referring to Figures 1 to 6, inclusive, 10 indicates an ice tray of conventional form having side walls 11 and end walls 12. The side walls

11 and end walls 12 are extended upwardly and outwardly to form a rib 13, the portion of the rib at the front of the tray being extended to form a suitable handle member 14.

Positioned in the tray 10 is a grid assembly generally indicated at 15. The grid assembly comprises a cover member 16 made from thin flexible material such as spring steel. Secured to the underside of the cover member 16, as by rivets, are a plurality of cross grid members 17. A longitudinal grid member 18 is secured to the cover member 16 at its central portion by means of one or more pins 19 having limited movement relative to the longitudinal grid member 18 by means of slot 20 in the longitudinal grid member 18.

The longitudinal grid member 18 has extensions 21 extending through slots in the cover member 16 to form a pivotal mounting for levers 22. These levers are provided with cam portions 23 positioned to engage the edge of the tray when the ends overlying the central portion of the tray are raised. The levers 22 are secured to the extension 21 by means of pivot members 24. Plate members 25 are formed integrally with handle 22 so as to move therewith, and extend downwardly through openings in the cover member 16 and carry projections 26 at their lower ends adapted to engage the cover when lever 22 is raised. The two cross grid members 17 adjacent the middle of the tray are preferably provided with inturned flanges or feet 27 extending into the central cube compartments.

As is clearly shown in Figures 2 and 6, longitudinal partition 18 is corrugated at 28 throughout its length for a purpose to be described presently. The grid assembly 15 extends above the top of the tray and is provided with a seal 32 to prevent contaminated water entering the tray.

In operation, the tray is filled with water, the grid assembly positioned therein, and the tray is then placed on the evaporator shelf of a refrigerator until the water becomes frozen. The operator may then grasp the adjacent ends of the levers 22 and raise the same upwardly causing the cams 23 to engage the edge of the tray and raise the grid assembly and attached cubes free of the tray. Due to the fact that the cubes have a greater area in contact with the grid assembly than with the tray, they will be raised from the tray along with the grid assembly.

Further upward movement of the levers will cause projections 26 to engage the underside of the flexible cover member 16 so as to flex it upwardly. It will be obvious that the cover will become flexed into an arc, and since the transverse grids will tend to remain normal to the cover at the point of attachment, the lower ends of these grids will tend to spread. This action sets up a high shearing stress between the cubes and the grids and breaks the bond. As the cubes near pivots 21 become freed, the force applied by the operator is transferred principally to the next pair of cubes, and so on until as many as are desired have been freed. Attention is also called to the fact that the relative movement between the cover and the longitudinal member 18 causes the cubes to be forced apart transversely of the tray due to the action of corrugations 28 as will be readily apparent. This movement of the cubes takes place simultaneously with the spreading of the lower ends of the transverse grids 17.

As will be apparent upon reflection, the bond between the cube and the longitudinal member 18 is subjected to a shearing stress and the bond between the cube and the cross grid member 17 is subjected to a combined tearing and shearing stress. In applying a tearing stress, only a small portion of the bond is under stress at any one time so that it is easier to break the bond.

When the pin 26 first engages flexible cover 16 to flex it upwardly, the end pairs of cubes will be released first, and continued movement of the lever 22 will release each succeeding pair of cubes in succession. The reason for vertical slot 20 in partition 18 is to assure release of the central cubes due to the eventual relative movement between the central portion of the cover and partition 18, and the upward movement of the feet 27. If desired, the central portion of the cover may be suitably reinforced to prevent its permanent bending.

The longitudinal grid member 18 need not be secured to the flexible cover member 16 at its central portion but could be secured thereto near one end if desired. In this event only a single lever 22 would be required. This would result in the pair of cubes at the end of the tray having the lever being released before the others, and thereafter each succeeding pair in succession.

The modification of Figures 7 and 8 is substantially the same as that just described with the exception that the cover member 16 instead of being made of thin flexible steel is made up of substantially non-flexible sections 29 pivotally connected together at 30. These sections, except those at each end, are provided with a lug 31 extending over the adjacent section, as indicated in Figure 8. These lugs are so arranged that when levers 22' are raised upwardly each lug will engage the top of the adjacent section after that section has pivoted slightly about its pivot 30. The next section toward center pin 19' will then pivot until it is stopped by the lug 31 on the next section. As will be seen from Figures 7 and 8, transverse grids 17' are rigidly secured to each of sections 29 on opposite sides of longitudinal partition 18' which partition may be corrugated as in the first embodiment. A narrow flat spring extending the full length of the cover member, or torsion springs in the pivot, may be provided, if desired to restore the sections to their initial positions. As will be evident from Figure 7, the cubes at either end of the tray are the first to be released, and the cubes in the adjacent cells are freed next thus providing for the sequential releasing of as many cubes as are desired, as well as the application of the force applied by the operator to first one pair of cubes and then another.

The longitudinal and cross grid members need not be secured to a flexible cover as shown, but can obviously be secured in the same way to a thin flexible member at their bottom edges so that the thin flexible member would rest in the bottom of the tray, thus assuring that the cubes would be removed from the tray along with the grid assembly. In this construction, the flexible member may be secured to the central partition at the midpoint, as in the other forms of the invention, but the handles are not necessarily connected to the central partition. The handles first cooperate with the tray to free the grid assembly therefrom, and then the flexible member is arched downwardly instead of upwardly to release the cubes in pairs.

From the foregoing it can be seen that this invention provides a grid assembly capable of being applied to a standard ice tray which is

simple in operation, easy and economical to manufacture, which will not get out of order, and in which water cannot drip into the tray and contaminate the contents thereof.

While I have shown but two embodiments of my invention it is to be understood that these embodiments are to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the exact structure shown, but to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. In combination, an ice cube tray, a grid assembly comprising longitudinal and cross grid members removably positioned therein, a cover for said tray secured to said grid assembly and force multiplying means carried by said longitudinal grid member cooperating with said cover for releasing ice cubes from said grid assembly.

2. A grid assembly adapted to be positioned in an ice cube tray for a domestic refrigerator comprising, a flexible plate-like member, lateral grid members secured to said plate-like member, a longitudinal grid member so secured to said plate-like member that the plate-like member may be flexed away from the longitudinal grid member, and means pivoted to said longitudinal grid member for flexing said plate-like member to move it away from said longitudinal grid member to release ice cubes from said longitudinal grid member and separate the adjacent lateral grid members to release an ice cube therebetween.

3. A grid assembly adapted to be positioned in an ice cube tray for a domestic refrigerator comprising, a flexible plate-like member, lateral grid members secured to said plate-like member, a longitudinal grid member secured to said plate-like member at a single point and means pivoted to said longitudinal grid member for removing said grid assembly from said ice tray and flexing said plate-like member away from said longitudinal grid member to release ice cubes from the longitudinal grid member and separate the adjacent lateral grid members to release an ice cube therebetween.

4. A grid assembly adapted to be positioned in an ice cube tray comprising, a flexible cover for said tray, lateral grid members secured to said cover, a longitudinal grid member secured to said cover at a single point and lever means pivoted to said longitudinal grid member for flexing said cover away from said longitudinal grid member to release ice cubes from said grid assembly.

5. A grid assembly adapted to be positioned in an ice cube tray for a domestic refrigerator comprising, a flexible cover for said tray, lateral grid members secured to said cover, a longitudinal grid member so secured to said cover that the flexible cover can be flexed away from the longitudinal grid member and means for flexing said cover away from said longitudinal grid member, said means and flexible cover being so constructed and arranged as to release pairs of cubes in succession.

6. A grid assembly adapted to be positioned in an ice cube tray for a domestic refrigerator comprising, a flexible cover for said tray, lateral grid members secured to said cover, and a longitudinal grid member secured to said cover at a single point whereby said cover can be flexed away from said longitudinal grid member to release ice cubes from said grid assembly, said cover comprising pivotally connected sections.

7. A grid assembly adapted to be positioned in an ice cube tray for a domestic refrigerator comprising, a flexible cover for said tray, lateral grid members secured to said cover, a longitudinal grid member so secured to said cover that said cover may be flexed away from said longitudinal grid member to move said lateral grid members and attached cubes relative to the longitudinal grid member and means on said longitudinal grid member for moving said ice cubes relative to said lateral grid members as they are moved away from said longitudinal grid member.

8. A grid assembly adapted to be positioned in an ice cube tray for domestic refrigerators comprising, a flexible cover for said tray, lateral grid members secured to said cover and a longitudinal grid member secured to said cover at a single point, said securing means being so constructed that the longitudinal grid member may have limited movement relative to said cover whereby said cover can be flexed away from said longitudinal grid member to release ice cubes from said grid assembly.

9. In combination, an ice tray, a grid assembly comprising, longitudinal and cross-grid members removably positioned therein, a cover for said tray secured to said grid assembly and force multiplying means carried by said longitudinal grid member cooperating with said cover for releasing ice cubes from said grid assembly, said means and cover being so constructed and arranged as to release pairs of cubes in succession.

10. A grid assembly adapted to be positioned in an ice tray to form a plurality of compartments for receiving material to be frozen comprising, a longitudinal grid member, a flexible member secured to said longitudinal grid member in such manner that the flexible member can be flexed away from the longitudinal grid member over a portion of its length, means carried by said flexible member to cooperate with said longitudinal member to form a plurality of compartments and force multiplying means coacting with said longitudinal grid member and flexible member to flex the flexible member away from said longitudinal grid member.

11. An ice tray, in combination with a grid assembly adapted to be positioned in said tray to form a plurality of compartments for receiving material to be frozen, said grid assembly comprising a longitudinal grid member, a flexible member secured to said longitudinal grid member in such manner that the flexible member can be flexed away from the longitudinal grid member over a portion of its length, means carried by said flexible member and cooperating with said longitudinal member to form a plurality of compartments and force multiplying means coacting with said longitudinal grid member and flexible member to flex the flexible member away from said longitudinal grid member, said force multiplying means having means associated therewith for cooperation with said ice tray for raising said grid assembly in said tray.

12. In combination, an ice tray, a divider positioned in said tray having a longitudinal dividing member and a plurality of transverse dividing members, a flexible member biased to normally lie in a flat condition secured at one portion thereof to said longitudinal dividing member, all of said transverse dividing members being carried by said flexible member, said flexible member having a free end adapted to be moved with

respect to said longitudinal dividing member and force multiplying means carried by said divider for flexing said flexible member away from said longitudinal dividing member whereby the transverse dividing members will be moved into diverging relationship with each other.

13. In combination, an ice tray, a divider positioned in said tray having a longitudinal dividing member and a plurality of transverse dividing members, a flexible member secured at one portion thereof to said longitudinal dividing member, said transverse dividing members being carried by said flexible member, said flexible member having a free end adapted to be moved with respect to said longitudinal dividing member and means for flexing said flexible member away from said longitudinal dividing member, said means having a portion thereof adapted to cooperate with said tray for raising said divider in said tray whereby upon operation of said means said divider is first lifted from said tray and the transverse dividing members are moved into diverging relationship with each other.

14. A grid assembly adapted to be positioned in an ice cube tray for use in a domestic refrigerator comprising, a flexible plate-like member biased to normally lie in a flat condition, lateral grid members secured to and carried by said plate-like member and a longitudinal grid member so secured to said plate-like member that the plate-like member may be flexed away from said longitudinal grid member to release ice cubes from said longitudinal grid member and separate the adjacent lateral grid members to release an ice cube therebetween, said lateral and longitudinal grid members being adapted to form a plurality of ice compartments when the grid assembly is inserted in an ice tray and force multiplying means carried by said grid assembly for flexing said plate-like member.

15. A grid assembly adapted to be positioned in an ice tray to form a plurality of compartments, said grid assembly comprising a longitudinal grid member, a plurality of transverse grid members and a flexible cover biased to normally lie in a flat condition, all of said transverse grid members being secured to and carried by said flexible cover and said flexible cover being movably secured to said longitudinal grid member so that it can be flexed away from said longitudinal grid member to release ice cubes from said grid assembly.

16. A grid assembly adapted to be positioned in an ice cube tray to form a plurality of compartments, said grid assembly comprising a longitudinal grid member, a plurality of transverse grid members and a flexible member biased to normally lie in a flat condition, all of said transverse grid members being secured to and carried by said flexible member, said flexible member being secured to said longitudinal grid member at a single point and manually operable means for flexing said flexible member away from said longitudinal grid member, said manually operable means and flexible member being so constructed and arranged as to release pairs of cubes in succession.

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