July 14, 1942. L. L. MALLARD 2,289,847

ICE CUBE TRAY

Filed Nov. 9, 1938

Fig. 1.

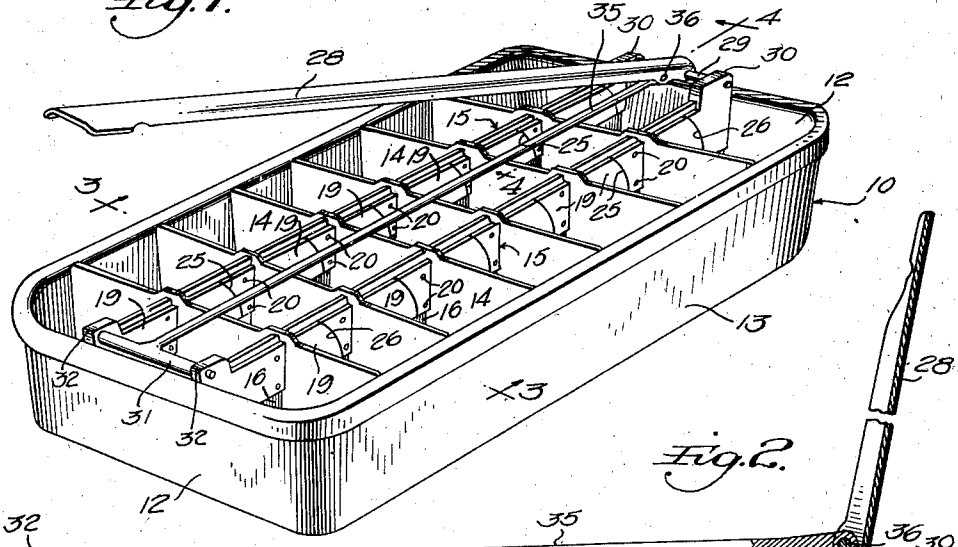


Fig. 2.

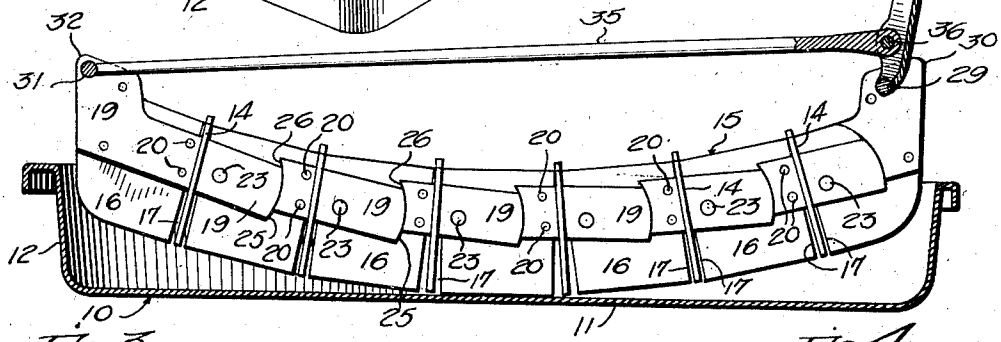


Fig. 3.

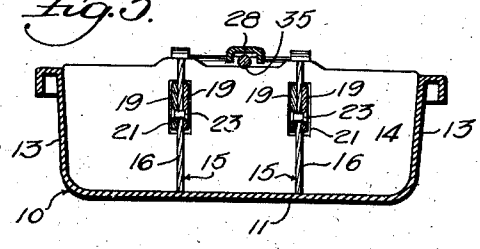
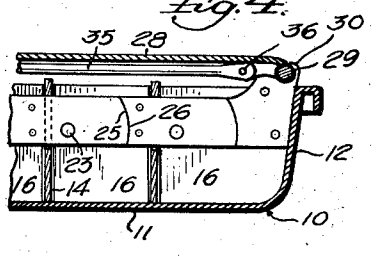


Fig. 4.



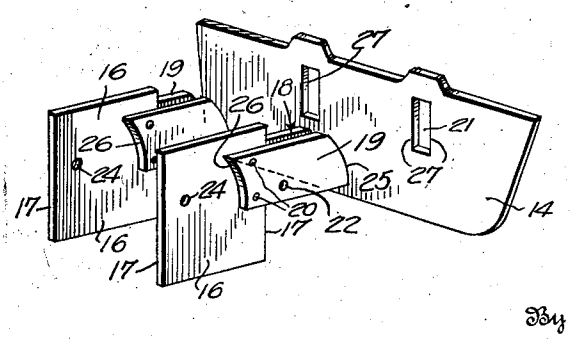


Fig. 5.

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ICE CUBE TRAY

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Application November 9, 1938, Serial No. 239,724

16 Claims. (Cl. 62—108.5)

This invention relates to an ice cube tray and more particularly to a metal grid structure providing at least three rows of ice cube compartments and composed of relatively movable parts having mechanical means for securing the release of the ice cubes from the tray.

The present invention is an improvement upon the invention illustrated and described in my copending application Serial No. 204,646, filed April 27, 1938. In that application I illustrated and described a novel metal ice cube tray having a grid structure arranged therein formed of relatively movable parts and having lever means connected thereto for effecting relative movement of the parts whereby the cubes would be released from the tray and ejected from the grid structure, thereby eliminating the necessity of running water over the tray and grid structure in order that the cubes may be released from the tray as is the case with the conventional ice cube tray having a metallic receptacle provided with a rigid grid structure arranged therein.

In the above mentioned application, I disclosed a grid structure for an ice cube tray which provided two rows of ice cube compartments. In many cases, it is desirable to provide three or more rows of ice cube compartments but such trays are objectionable by reason of the difficulties encountered in attempting to release the cubes from the middle or interior compartments provided by the grid structure. For example, in the conventional rigid grid structure for an ice cube tray wherein it is necessary to run water over the tray to release the ice cubes therefrom, the outer rows of cubes are first released and thereafter the cubes from the middle or inner rows. To release ice cubes from such interior compartments, it is necessary to run water over the grid structure not only until the frozen bond between the ice and metal has been released but until the size of the ice cubes has been materially reduced by melting.

The difficulty encountered in securing the release of ice cubes from such interior compartments is due to the fact that ice first forms in the outer compartments and thereafter in the inner compartments. When the ice forms in the inner compartments, substantial pressure is exerted by the ice against the walls of the interior compartments which pressure must be dissipated by partially melting the cubes of ice before there can be any release of the ice cubes therefrom. It is this condition which has rendered it particularly difficult to provide mechanical cube release means for ice cube trays having three or more rows of ice cube compartments.

An important object of this invention is to provide a grid structure for an ice cube tray providing at least three rows of ice cube compartments which will readily permit the release of the ice cubes from the interior row or rows of compartments.

A further object is to provide a grid structure for an ice cube tray wherein there are at least two rows of longitudinal separator plates, providing at least three rows of ice cube compartments in the tray, and which are readily movable away from each other to facilitate the release of the ice cubes from the interior row of compartments.

A further object is to provide a grid structure for an ice cube tray composed of relatively movable parts providing at least three rows of ice cube compartments, and which has mechanical means for effecting relative movement of the parts to effect the release of all the ice cubes from all the compartments.

A further object is to provide a grid structure for an ice cube tray comprising a plurality of transverse grid members and a plurality of longitudinal grid units each formed of a plurality of plates and mounted to partake of movement transversely of the grid structure, and to provide mechanical means for moving the individual plates of the longitudinal grid units to effect the release of the ice cubes from the grid structure.

A further object is to provide an ice cube tray of the character referred to wherein a single operating means is provided for the mechanical means through which the individual plates of the longitudinal grid units are relatively movable to loosen the ice cubes from the grid structure.

A further object is to provide an ice cube tray which embodies the desirable characteristics of the structure shown in my copending application referred to in a grid structure having two or more longitudinal grid units thereby providing means for easily and effectively releasing the cubes from a materially larger ice cube tray than has been possible with prior constructions.

The above and other advantages of the invention will become apparent during the course of the following description.

In the drawing I have shown one embodiment of the invention. In this showing:

Figure 1 is a perspective view showing a tray having a grid structure arranged therein,

Figure 2 is a central vertical longitudinal sectional view showing the grid structure in cube

releasing position, parts being shown in elevation,

Figure 3 is a vertical sectional view taken along the line 3—3 of Figure 1,

Figure 4 is a vertical longitudinal sectional view taken along the line 4—4 of Figure 1, showing the handle lever in normal position, and

Figure 5 is a perspective view of a transverse grid plate and two longitudinal grid plates, the parts being shown in unassembled relationship.

Referring to the drawing, the numeral 10 designates a conventional ice cube tray having a bottom 11, end walls 12 and side walls 13, the walls preferably diverging upwardly, as shown. The ice tray forms no part of the present invention per se and may be of any desired form.

The grid structure is arranged within the tray and comprises a plurality of transverse plates 14 and a plurality of separator units 15 arranged longitudinally of the receptacle and in parallel relationship to each other whereby at least three rows of ice cube compartments will be provided in the receptacle 10. The plates 14 and longitudinal separator units 15 are connected together for relative movement with respect to each other in a manner to be described.

Each of the longitudinal separator units 15 comprises a plurality of individual separator or longitudinal plates 16 arranged in end to end relation. The longitudinal plates 16 are provided with substantially vertical edges 17 which operate to space the transverse members 14 from each other and to divide the transverse compartments formed by the transverse plates 14 into separate individual ice cube compartments. The edges 17 of adjacent longitudinal members 16 are spaced from each other a distance slightly greater than the thickness of the metal of the transverse plates 14, for a purpose which will become apparent.

Each pair of adjacent longitudinal plates 16 of each separator unit 15 are pivotally connected together for relative movement with respect to each other. To this end, each pair of longitudinal separator plates 16 are provided with a combined connecting and ejecting unit 18 comprising a pair of identical members 19. The members 19 are rigidly secured to one of the longitudinal plates 16 by rivets 20 which are preferably countersunk flush with the surface of the connecting members 19.

Each transverse plate 14 is provided with openings or slots 21 formed therein and through which the connecting unit 18 extends. The connecting members 19 are drilled as at 22 for the reception of a pivot pin 23 which operates to pivotally connect the members 19 to an adjacent longitudinal plate 16, the plates 16 being drilled as at 24 to provide an opening for the reception of the pivot pin 23. The width of each slot 21 is greater than the combined thickness of two of the connecting members 19 and one of the longitudinal plates 16 whereby relative movement of the longitudinal separator members 15 toward and away from each other will be permitted. This relative movement of the separator units is an important feature of the present invention and will be referred to in detail later.

It will be apparent that the above described arrangement of the plates 16 and connecting members 19 will provide members 19 slidable over the surfaces of each plate 16 to which the members 19 are pivotaly connected by the pivot 23. The members 19 connect the longitudinal plate 16 to each other and are arranged in abutting end to end relationship as shown in Figures 2 and 4. Each of the plates 19 will have an end 25 in sliding relationship with an end 26 of a plate 19 secured to one of the adjacent plates 16. In order to permit this sliding abutting relationship, each end 25 of each plate 19 is formed on an arc having as its center the opening 22 in the member 19. The ends 26 are shaped to coincide with and to engage against the respective ends 25.

Each of the transverse plates 14 being spaced from each other by two pairs of adjacent plates 16, it will be apparent that substantial movement of the transverse plates 14 from a position substantially at right angles to the longitudinal separator members 15 will be prevented. The edges 27 of the slots 21, although permitting relative movement of the members 15 toward and away from each other, will operate to retain the members 15 in a position substantially at right angles to the transverse plates 14. Accordingly, it will be apparent that the transverse plates 14 and longitudinal plates 16 are connected for relative movement with respect to each other.

A lever system is connected to the end plates 16 of each separator 15. This lever system is substantially similar to the one shown in my copending application Serial No. 239,723, filed November 9, 1938. The lever system comprises a lever 28 secured to a pivot member 29 which extends transversely of the device for pivotal connection with both adjacent end plates 16. These plates include upwardly projecting portions 30 carried by the adjacent plates 16 and through which the pivot member 29 slidably projects. The ends of the member 29 may be reduced to limit sliding movements of such member through the projections 30. A similar pivot member 31 is connected to projections 32 formed on the members 19 of the end plates 16 at the opposite ends of the longitudinal separators 15. A connecting rod 35 is secured at one end to the pivot member 31 and is pivotally connected at its other end to a pivot 36 on the lever 28. The pivot 36 is located adjacent the pivot member 29 in order to provide a high leverage ratio on initial movement of the lever 28 and a relatively decreasing leverage ratio on further movement of the lever 28 as described in my above mentioned copending application.

The operation of the apparatus is as follows:

The tray is filled with water to a level slightly below the upper edge of the tray and placed in a refrigerator with the lever 28 lying flat against the member 32. Ice will initially form in the outer compartments of the grid structure and thereafter in the inner compartments. The expansion of the ice initially forming in the outer compartments will cause movement of the longitudinal separators 15 toward each other, such movement being permitted by the openings 21 in the transverse plates 14. As ice forms in the inner compartments, there will be an expanding force exerted by the ice against the walls of the inner compartment which will tend to retain the cubes of ice positioned therein in tight engagement with the walls of such compartments.

After the water has frozen into cubes of ice defined by the pockets in the tray and it is desired to release the cubes, the tray is removed from the refrigerator and placed on a suitable supporting surface. The free end of the lever 28 is then lifted and given a turning movement about the pivot member 29. Such movement of the lever 28 will carry with it the adjacent end of the connecting member 35 and it will be apparent that as such movement of the lever 28 takes place, relative movement of the pivot

members 29 and 32 toward each other will occur.

Initial substantial movement of the lever 28 will cause relatively slight movement of the pivot members 29 and 31 toward each other whereby a high leverage ratio will be obtained in the initial operation of the device. However, as the lever 28 approaches the cube releasing position shown in Figure 2, correspondingly smaller movements of the lever 28 will result in relatively greater movements of the pivot members 29 and 31 toward each other since the member 35 approaches a position wherein it is tangential to the circle described by the movement of the pivot 36 about the pivot member 29.

Initial movement of the lever 28 will cause the cubes of ice to be released from the receptacle 10. In addition, it will be apparent that continued movement of the lever 28 will cause relative pivotal movement of the separator plates 16 of each row with respect to each other. Such relative movement of the separator plates 16 will cause sliding movement of the members 19 over the surfaces of the longitudinal plates to which they are respectively pivoted. This sliding movement of the members 19 over the surfaces of the separator plates 16 will serve to break the bond between the cubes of ice and the surface of the plates 16 and impart an ejecting motion to the cubes of ice.

As the grid structure approaches the cube releasing position shown in Figure 2, the cubes of ice positioned in the outer compartments will be initially released therefrom. Thereafter, the expanding force exerted by the cubes of ice within the interior compartments outwardly against the inner surfaces of the separator plates 16 of the longitudinal separators 15 will cause a relative movement of the latter away from each other. Such movement, as explained above, is permitted by virtue of the width of the openings 21 in the plates 14 and the wedging force which would otherwise retain the cubes of ice within such interior compartments will be dissipated and the cubes of ice positioned within such interior compartments will be released therefrom.

Attention is invited to the fact that the means for effecting turning movement of the separator plates 16 need be connected only to the remote or end plates 16 of each longitudinal separator 15. In this connection, it will be noted that the pivotal turning movement of each adjacent pair of plates 16 is limited by engagement of the upper ends of the adjacent edges 17 of such plates against opposite faces of the corresponding transverse plate 14 above the opening 21 therein. Accordingly, the end plates 16 of each row will initially turn until the upper ends of their inner edges 17 engage against the adjacent plates 14 with the latter bearing against the upper ends of the edges 17 of the second plates from the ends of the grid structure. Further movement of the lever 28 will then act to turn the second plates from the ends of the grid structure. This operation is repeated with successive plates until all have been turnd on their pivots to assume the positions shown in Figure 2. Such turning movement will cause the lower edges 17 of adjacent plates 16 to move apart and the transverse members 14 will occupy a position substantially bisecting the angle between the adjacent edges 17 of the plates 16. The turning movement of adjacent plates 16 with respect to each other and the transverse plates 14 together with the sliding movement of the ejecting members 19 over the surfaces of the plates 16 will effectively release the cubes of ice from their bond with the grid structure.

It will be apparent that the above construction provides a grid structure composed of relatively movable parts providing at least three rows of ice cube forming compartments. The lever means will effectively cause relative movement of the various parts of the grid structure to effectively secure the release of all of the cubes from all of the compartments.

So far as I am aware, no ice cube tray with mechanical release means has been previously perfected involving the use of two or more longitudinal grid units because of the substantial difficulties involved in releasing the inner ice cubes, that is, cubes which are engaged on all four sides by the longitudinal and transverse plates. It has been the common practice, of course, to provide grid structures having two or more longitudinal grid units rigidly fixed with respect to the transverse plates, but such devices have not been provided with mechanical cube release means and it has been necessary to melt the cubes from the tray by running water over the grid after removing the latter from the tray. It is well known that in such a device, the running of water over the grid first releases the cubes along the sides and ends of the grid, such cubes being engaged by the grid structure only on two or three sides of the cubes. Substantial melting action is required for releasing the interior cubes with a resulting loss of ice and a raising of the temperature of the cubes before they are released.

The present device provides a relatively simple construction through which a grid structure including a plurality of longitudinal grid units is provided with mechanical cube release means. This has been possible only by mounting the longitudinal grid units in such a manner as to permit them to partake of movement toward and away from each other. This result has been accomplished while retaining the advantages of the structure of my copending application Serial No. 204,646, filed April 27, 1938, the cubes being ejected from their compartments by relative movement of the members 19 over the surfaces of the longitudinal grid plates, and a simple lever means being employed for turning the longitudinal grid plates. In this connection, it will be apparent that the present device employs only a single lever for turning all of the plates of the several longitudinal grid units. Single pivot members 29 and 31 are provided for the respective ends of the grid structure and the ends of the members 29 and 31 are reduced to permit the relative movement of the longitudinal grid units with respect to each other without permitting undue sliding movement of the members 29 and 31.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A grid for an ice cube tray comprising a plurality of longitudinal grid elements and a plurality of transverse grid elements, said longitudinal elements being connected and arranged with respect to said transverse elements to partake of limited relative movement toward and away from one another throughout their lengths,

each of said longitudinal elements being formed of a plurality of plates connected to one another for relative movement substantially in their own planes, and common means for effecting the latter relative movement of the plates of said longitudinal units.

2. A grid for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal plates, said transverse plates being provided with a plurality of sets of substantially aligned openings corresponding in positions to the planes of the respective rows of longitudinal plates, and means connecting the plates of each row through said openings for relative movement substantially in their own planes, said openings being wider than said connecting means whereby said rows of longitudinal plates are relatively movable to a limited extent toward and away from each other.

3. A grid for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal plates, said transverse plates being provided with a plurality of sets of substantially aligned openings corresponding in positions to the planes of the respective rows of longitudinal plates, means connecting the plates of each row through said openings for relative movement substantially in their own planes, said openings being wider than said connecting means whereby said rows of longitudinal plates are relatively movable to a limited extent toward and away from each other, and common means for moving all of the longitudinal plates of said rows relative to each other in their own planes.

4. An ice cube tray comprising a receptacle, a grid structure arranged in said receptacle comprising a plurality of transverse plates dividing said receptacle into a plurality of transverse compartments, and a plurality of rows of separator plates arranged longitudinally of said receptacle dividing each of said transverse compartments into at least three ice cube forming compartments, said plate structures being connected for relative movement with respect to each other, said rows of longitudinal plates being connected and arranged with respect to said transverse plate structures to be relatively movable toward and away from each other throughout their lengths, and means for effecting relative movement of said plate structures, whereby cubes of ice in said compartments will be released therefrom.

5. An ice cube tray comprising a receptacle, a grid structure arranged in said receptacle comprising a plurality of transverse plates dividing said receptacle into a plurality of transverse compartments, and a plurality of rows of separator plates arranged longitudinally of said receptacle dividing each of said transverse compartments into at least three ice cube forming compartments, each of said rows comprising a plurality of separator plates spacing said transverse plates from each other, means pivotally connecting the separator plates of each row for relative movement throughout their lengths with respect to each other and said transverse plates, and means for effecting turning movement of said plates on their pivot means whereby cubes of ice in said compartments will be released therefrom, said rows of longitudinal plates being connected and arranged with respect to said transverse plates to be relatively movable toward and away from each other.

6. A grid structure for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal separator plates, each of said rows comprising a plurality of individual separator plates arranged to space said transverse plates from each other, and means pivotally connecting said separator plates for relative movement with respect to each other and said transverse plates comprising members rigid with each of certain successive separator plates and pivotally connected to the adjacent separator plate at one end thereof, said transverse plates being provided with openings through which said connecting members loosely extend permitting movement of said rows toward and away from each other.

7. A grid structure for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal separator plates, each of said rows comprising a plurality of individual separator plates arranged to space said transverse plates from each other, and means pivotally connecting said separator plates for relative movement with respect to each other and said transverse plates comprising members rigid with each of certain successive separator plates and pivotally connected to the adjacent separator plate at one end thereof, said members being slidable over the surface of the separator plates to which they are pivoted to loosen ice cubes adhering thereto, said transverse plates being provided with openings through which said connecting members loosely extend permitting movement of said rows toward and away from each other.

8. A grid structure for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal plates, each of said rows comprising a plurality of individual separator plates connected for relative movement with respect to each other and said transverse plates, said separator plates being connected and arranged with respect to said transverse plates to be relatively movable toward and away from each other, and a single lever means connected to the end longitudinal plates of opposite ends of said rows for moving such end plates toward each other for effecting said first named relative movement of said separator plates in each of said rows.

9. A grid structure for an ice cube tray comprising a plurality of transverse plates, a plurality of longitudinal units each comprising a plurality of individual separator plates arranged substantially in end to end relationship and spacing said transverse plates from each other, and means connecting each separator plate to an adjacent separator plate for relative movement with respect thereto, said transverse plates being provided with openings through which said connecting means extend, said openings being wider than said connecting means to permit relative movement of said units toward and away from each other, and a single lever means connected to the end longitudinal plates of opposite ends of said rows for moving such end plates toward each other for effecting said first named relative movement of said separator plates in each of said rows.

10. A grid structure for an ice cube tray comprising a plurality of transverse plates, a plurality of longitudinal units each comprising a plurality of individual separator plates, means connecting each separator plate to an adjacent separator plate for turning movement with respect thereto substantially in its own plane, said transverse plates being provided with openings through which said connecting means extend, said open-

ings being wider than said connecting means to permit limited relative movement of said units toward and away from each other, parallel pivot members extending through the end separator plates at opposite ends of the grid structure, and lever means connected to said pivot means for effecting movement of said pivot members toward each other, whereby bowing movement may be imparted to said grid structure by the operation of said lever means.

11. A grid for an ice cube tray comprising a plurality of transverse plates and a plurality of rows of longitudinal plates, said transverse plates being provided with a plurality of sets of openings each arranged in the plane of one of said rows, connecting means extending through each of said openings, each connecting means being respectively rigid with one and pivotally connected to another of the longitudinal plates whereby each longitudinal plate is mounted for turning movement with respect to the next adjacent plate in its own plane, said openings being wider than said connecting means whereby said rows of longitudinal plates are relatively movable to a limited extent toward and away from each other, and common means for effecting turning movement of all of the longitudinal plates of said rows, each transverse plate extending between two consecutive plates of each of said rows, and the space between each two of said successive plates being greater than the thickness of the interposed transverse plate, whereby each transverse plate is engageable by the upper ends of the edges of two consecutive plates to cause each transverse plate to assume a position substantially bisecting the angle between the adjacent edges of the associated longitudinal plates.

12. An ice cube tray comprising a receptacle, a grid structure arranged in said receptacle comprising a plurality of transverse plate structures extending from side to side of said receptacle and arranged to divide said receptacle into a plurality of transverse compartments; a plurality of rows of separator plates, said rows being arranged longitudinally to divide each of said transverse compartments into at least three ice cube forming compartments, said separator plates being relatively moveable with respect to each other, and means interconnecting said transverse plates with said rows of separator plates, said means being constructed and arranged to permit transverse movement of said rows with respect to said transverse plates to insure the release of ice cubes frozen in said three compartments.

13. The combination of claim 12 that includes connecting the separator plates in each of said rows for relative movement with respect to each other and to said transverse plates, and means for effecting turning movement of said separator plates on pivot means whereby cubes of ice in said compartments will be released therefrom.

14. The combination of claim 12 that includes connecting means pivotally connecting the separator plates in each of said rows for relative movement with respect to each other and to said transverse plates, and means for effecting turning movement of said separator plates on their pivot means, said connecting means comprising a series of connecting members, each two consecutive separator plates in each of said rows being connected by one of said connecting members, one end of each of said connecting members being fixed to one of said two separator plates, and common means for effecting relative movement of all of said separator plates for release of ice cubes from said compartments.

15. The combination of claim 12 that includes connecting means pivotally connecting the separator plates in each of said rows for relative movement with respect to each other and to said transverse plates, and means for effecting turning movement of said separator plates on their pivot means, said connecting means comprising a series of connecting members, each two consecutive separator plates in said rows being connected by one of said connecting members, one end of each of said connecting members being fixed to one of said two separator plates, the other end of each connecting member being pivotally connected to the other of said two separator plates, and common means for effecting relative turning movement of all of said separator plates for release of ice cubes from said compartments, said connecting members being so constructed and arranged that they will extend beyond their pivot points and that they will be slidable over the surfaces of the separator plates to which they are pivoted during relative movement of said separator plates.

16. The combination of claim 12 that includes connecting means pivotally connecting the separator plates in each of said rows for relative movement with respect to each other and to said transverse plates, and means for effecting turning movement of said separator plates on their pivot means, said connecting means comprising a series of connecting members, each two consecutive separator plates in said rows being connected by one of said connecting members, one end of each of said connecting members being fixed to one of said two separator plates, the other end of each connecting member being pivotally connected to the other of said two separator plates, and common means for effecting relative turning movement of all of said separator plates for release of ice cubes from said compartments, said connecting members being so constructed and arranged that they will extend beyond their pivot points and that they will be slidable over the surfaces of the separator plates to which they are pivoted during relative movement of said separator plates, said transverse plates being provided with openings through which said connecting members project, said openings being wider than said connecting members to permit limited relative movement of said rows of separator plates toward and away from each other.

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