ICE CUBE TRAY

Fig. 1

Fig. 2

Fig. 3

Fig. 4

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This application is a continuation in part of applications Serial No. 418,753, filed November 12, 1941, and Serial No. 575,798, filed February 2, 1945.

This invention relates to freezing trays and more particularly to freezing trays for forming ice cubes and the like.

The difficulties of removing ice cubes from freezing trays are generally well known. Freezing trays most widely sold have been made of metal and rubber. Neither has served the purpose satisfactorily. Metal trays were first provided with the common dividers which required the messy task of running water over the trays and the dividers to partially melt the cubes before they could be removed. A substantial portion of the cubes melted and the entire tray had to be refrozen each time, even though only one or two cubes were desired. The next step in the metal tray development was the use of levers tending to jar the dividers to release the cubes without the use of water. These levers are not entirely satisfactory because they tend to break at their connection with the dividers. They also tend to shatter the ice cubes if the latter have been frozen at low temperatures, so that it becomes impossible to remove whole cubes. Again, all the cubes are disturbed and it is impossible to use few cubes and refill the tray without completely emptying the tray, thus wasting the unused cubes.

Rubber trays have been less valuable and have become practically extinct as the result of unsatisfactory use over a period of several years. Rubber trays will not readily free the cubes. Each cube must be "peeled out." The tedious task involved has also resulted frequently in the use of warm water over the tray to melt the cubes in the same manner as the metal trays.

There have been attempts in the case of both metal and rubber trays to coat the surfaces of the compartments in an effort to minimize the bond between the ice and the walls of the trays. These coatings will in practice last for a short time and will disappear after some twenty to thirty freezings of the tray. Hence, these coatings are effective only while the trays are new.

Both the metal and rubber trays tend to freeze to the walls of the refrigerator chest and accumulate frost therewith so that either the refrigerator unit must be defrosted to remove the trays, or considerable tugging and chopping are necessary to loosen the trays. In the trays of the prior art, no regard has been given in the construction to the expansion of the ice cubes upon freezing increasing the bond holding the cubes tightly in the cube compartments, and hence, no effort has been made to utilize the expansion as a means to eject the cubes, say, when the contact between the ice cubes and the tray walls is disturbed.

An object of the invention is to provide a new and improved type of ice cube tray having walls of a tough resilient material with a wax-like surface which, when bowed, will have a retractile force capable of ejeeling the ice cubes from the compartment when the contact between the ice cubes and the tray walls is disturbed.

The present invention is based upon the discovery that the expansion of the ice upon freezing may be utilized in a tapered wall preferably to effect a quick release of the cubes by causing this expansion of the ice to bow the wall or at least place it under such tension or resiliency that the resultant retractile force will eject the cubes when the contact between the ice cubes and the tray walls is disturbed sufficiently to allow the bowed walls to return to their original position.

A further object of the invention is to provide a new and improved type of ice cube tray and to use in this tray a material known specifically as polyethylene.

A still further object of the invention is to provide a new and improved type of ice cube tray made of polyethylene or equivalent material which will overcome the defects of the prior art structures, to wit; which will provide for quick release of the ice cubes without the use of mechanical aids or require the running of water on the tray to melt the ice cubes in order to free them, which will provide for removal of one or more cubes without requiring the waste of the remaining cubes upon refreezing, and which will provide for easy removal of the tray itself from the refrigerator chest without requiring defrosting of the refrigeration unit or the tugging or chopping at the tray to free the same.

A still further object of the invention is to provide a freezing tray which will eject the cubes by actually popping the same out of the tray compartments by a mere twist after the tray is gripped at the ends.

A still further object of the invention is to provide an improved freezing tray which will remain stable at temperatures as low as minus 50° Fahrenheit, and which will be non-toxic, odorless and sanitary, and capable of relatively rough usage for a long period of time.

Other objects and advantages of the invention
will be apparent from the following detail description when taken in connection with the accompanying drawings forming a part thereof, in which:

Figure 1 is a view illustrating the way the ice cubes are ejected from the freezing compartments when the tray is twisted at the ends to release the contact between the cubes and the bowed walls of the compartments, so that these bowed walls will be in a contractile action with the cubes upwardly out of the compartment;

Fig. 2 is a view in perspective of the tray;

Fig. 3 is a top plan view of the tray to illustrate how the freezing compartments are distorted to permit the bowed walls thereof to release their contact with the ice cubes;

Fig. 4 is an enlarged view in section of several freezing compartments to illustrate how the expansion of the ice cubes during freezing causes the side walls of the freezing compartments to bow slightly;

Fig. 5 is a view of these same compartments after the ice cubes are removed to illustrate how the bowed walls return to normal position;

Fig. 6 is an ice cube frozen in a compartment of the freezing tray disclosed herein;

Fig. 7 illustrates an ice cube frozen in a metal tray;

Fig. 8 is a longitudinal section of the tray;

Fig. 9 is a bottom view of the same; and

Fig. 10 is a transverse section of the tray taken on line 10-10 of Fig. 9.

For the purposes of illustration, I have shown one form of the invention. It is to be understood that this structure merely illustrates the invention disclosed so that those skilled in the art will be readily taught how to practice the invention.

The ice cube or freezing tray I comprises a plurality of individual compartments 2, and while they may be arranged in any desirable design, I have shown an appealing arrangement of two rows wherein these compartments are somewhat rectangular but in proper balance to produce a pleasing appearance. Each compartment 2 is defined by four side walls, 3, 4, 5, and 6, and a bottom wall 7. The inner end side walls may be designated 4 and the outer end side walls may be designated 3.

The upper portion of the side walls 3 to 6, inclusive, merge into what may be called an upper ledge 10 that extends across all sides of the tray as well as between the rows longitudinally of the tray and crosswise of the tray between adjacent compartments 2 of each row. These side walls are designed to taper inwardly from the top, which gives each compartment a smaller cross section at the bottom. Exteriorly of compartments 2, air spaces 11 extend crosswise of the tray between adjacent compartments of each row and an air space 12 extends longitudinally of the tray between the two rows.

Fig. 1 illustrates how the tray 1 may be given a torsional twist, that is, twisted by gripping the ends and rotated in opposite directions. By employing the structure disclosed herein, the contact between the ice cubes and the walls 3, 4, 5, and 6 is disturbed and the ice cubes 11 are forced out by a popping-like action. To limit the twisting action and to aid in transmitting the torsional twist, ribs 13 and 14 or their equivalent may be provided to connect adjoining compartments at the bottom. It will be apparent that the tray 1 will not suffer abuse readily from excessive twists that permanently distort the tray and will not be torn if handled improperly. These ribs 13 and 14 also transmit the twist and cause the walls of the respective compartments to more readily flex.

To carry out the invention, the walls of the compartments are made of a material preferably having a wax-like surface and of high tensile strength, yet yieldable to the expansion of the ice cubes 11 when freezing so that the walls 3, 4, 5, and 6 will be bowed as illustrated at 15 in Fig. 4, the cubes being held in the compartments 2 until the contact between these walls and the ice cubes is disturbed when the retractile force of the walls returning to their normal position ejects or Populate the cubes upwardly out of the compartments. This material is known as polyethylene, which is a polymerization of ethylene at high temperatures.

The purpose of the invention is to provide a tray with walls 3, 4, 5, 6, and sufficiently rigid so that they will not have a limp, rubbery action. These walls possess an urge to return to their original position when the force holding them under tension or bowed is released. They should also yield to a force pressing against them so that this force may increase without fracturing or cracking the walls. By having the walls bowed by this force, the ice cubes 17 may expand upon freezing and also continue with further expansion if subjected to lower temperatures as in a quick freeze regeneration unit without rupturing the wall. The bowing very aptly aids in popping the cubes out of the compartments.

Ice cubes 11 will have convex faces as indicated at 16 in Fig. 6, which will cause the walls 3, 4, 5, and 6 and the bottom wall 7 to yield and thus be bowed as illustrated at 15 in Fig. 4. The walls 3, 4, 5, and 6 promptly respond to any disturbance, the ice cubes are caused to be popped or ejected forcibly out of the compartments 2. These walls, when thus responding to such disturbance, will be restored instantly to their normal condition, and the ice cubes then being of larger cross section due to the convex walls 16 will not return into the compartments.

The walls are of such character that the retractile force restoring them to their original position will continue to hold them in their original position and prevent the ice cubes from being physically pushed back in position in the compartments. The frictional resistance between the walls of the compartments and the ice cubes should be less than the force restoring the walls to their normal position. Polyethylene has a wax-like surface and is not wettable by water. Ice will not adhere thereto. Consequently, the retractile force tending to return the bowed walls 3, 4, 5, 6, and 7 to normal position should not be too great. Polyethylene is classified as a rigid thermoplastic, but I find that if the walls 3 to 7 inclusive are made of a thickness ranging from .025 to .116 of an inch, the material will have a toughness and flexibility that will possess a retractile force returning the bowed walls to normal position only after the contact between the ice cubes and the walls has been disturbed as illustrated in Fig. 1. This retractile force will not disturb the ice cubes during freezing. The expansion of the ice cubes will, on the other hand, bow the walls and keep them bowed until their contact with the ice cubes is disturbed.

With the walls 3, 4, 5, and 6 being tapered, compartments 2 are larger cross sectionally at the top than at the bottom. Consequently, when the tray is twisted rotationally in opposite directions, all the walls including the bottom are

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distorted. The shapes assumed by the compartments and their walls will be seen in Fig. 3, while Fig. 2 illustrates the tray in normal position. When the tray is twisted, the semi-rigid but flexible walls will be distorted into a spiral formation. Thus the walls are no longer planar but will be restored instantly upon being released.

Aside from providing the desired retractile force, accomplishing the purposes of the invention when the walls have a proper thickness, polyethylene is non-toxic, chemically inert and has low moisture absorption. It is extremely stable and retains its flexibility and tensile strength at low temperatures. While polyethylene may have a plasticizer added thereto, this is not necessary, and consequently, it will remain stable at very low temperatures and will not crack, fracture, or shatter.

Another advantage obtainable from tray 1 is that any number of ice cubes may be removed without disturbing the others. By confining the twisting action to one or two compartments, it is possible to eject the cubes of such compartments without disturbing the cubes in the remaining compartments. Moreover, the tray will not freeze to the walls of the refrigerating chest, nor will any substantial amount of frost accumulate about the tray, so that it is not necessary to chop or tug at the tray to remove it from the chest, nor is it necessary to defrost the refrigerating unit.

It has been found that a wall thickness of from .045 to .075 of an inch is particularly suitable in the tray disclosed herein, although, as stated, a thickness from .025 to .110 of an inch will work. Unless the wall thickness varies, the bowing due to the expansion of the ice cubes upon freezing will be uniform or substantially so in all walls. If the walls should vary in thickness, the bowing will be greater in the walls of less thickness and the ejection of the ice cubes from the compartments 2 may not occur with the same force as when all the side walls are evenly bowed.

The polyethylene ice cube tray disclosed herein overcomes all the difficulties experienced in removing ice cubes from freezing trays of the prior art. Polyethylene is tough and will not be affected by age to any appreciable extent. It is unlike other thermoplastics in that it will not crack or fracture by the freezing of water which may overflow from a compartment being refilled into an adjacent compartment having a loose ice cube therein. This overflow, when freezing between the loose cube and the walls of its compartment, will in other thermoplastics split these walls.

While the invention is particularly directed to freezing trays for freezing ice cubes, it may be adapted to freezing trays for frozen dessert cakes, etc., when substantially the same problems of removal may be involved. Tray 1 is preferably produced by injection molding, but it may also be formed out of sheet material.

Without further elaboration, the foregoing will so fully explain the gist of my invention that others may, by applying current knowledge, readily adapt the same for use under varying conditions of service, without eliminating certain features, which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:

1. An ice freezing tray comprising a body formed of individual compartments, each having tapered side walls integrally formed with each other and with a bottom wall, the side walls of adjoining compartments being joined together along their top edges, all said walls being formed of polyethylene having wax-like surfaces substantially non-wettable by water and to which ice will not adhere, said material yielding under tension to the expansion of the ice upon freezing in each compartment, said tapered walls being of a thickness ranging from .025 to .110 of an inch and being bowed outwardly by such expansion, said polyethylene wall structure due to said thickness producing a retractile force sufficient to return the bowed walls to normal condition and to eject the cubes from said compartments when the bowed walls are disturbed by manual flexing.

2. A freezing tray composed of a plurality of freezing cells integrally united at their top portions and forming a continuous integral cell-like body, each cell having a bottom wall and tapered side walls formed of polyethylene yielding to and bowed by the expansion of the ice upon freezing, said walls being of a thickness ranging from .025 to .110 of an inch and capable of producing a retractile force ejecting the ice from said cells when the bowed walls are flexed and restored to normal condition.

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