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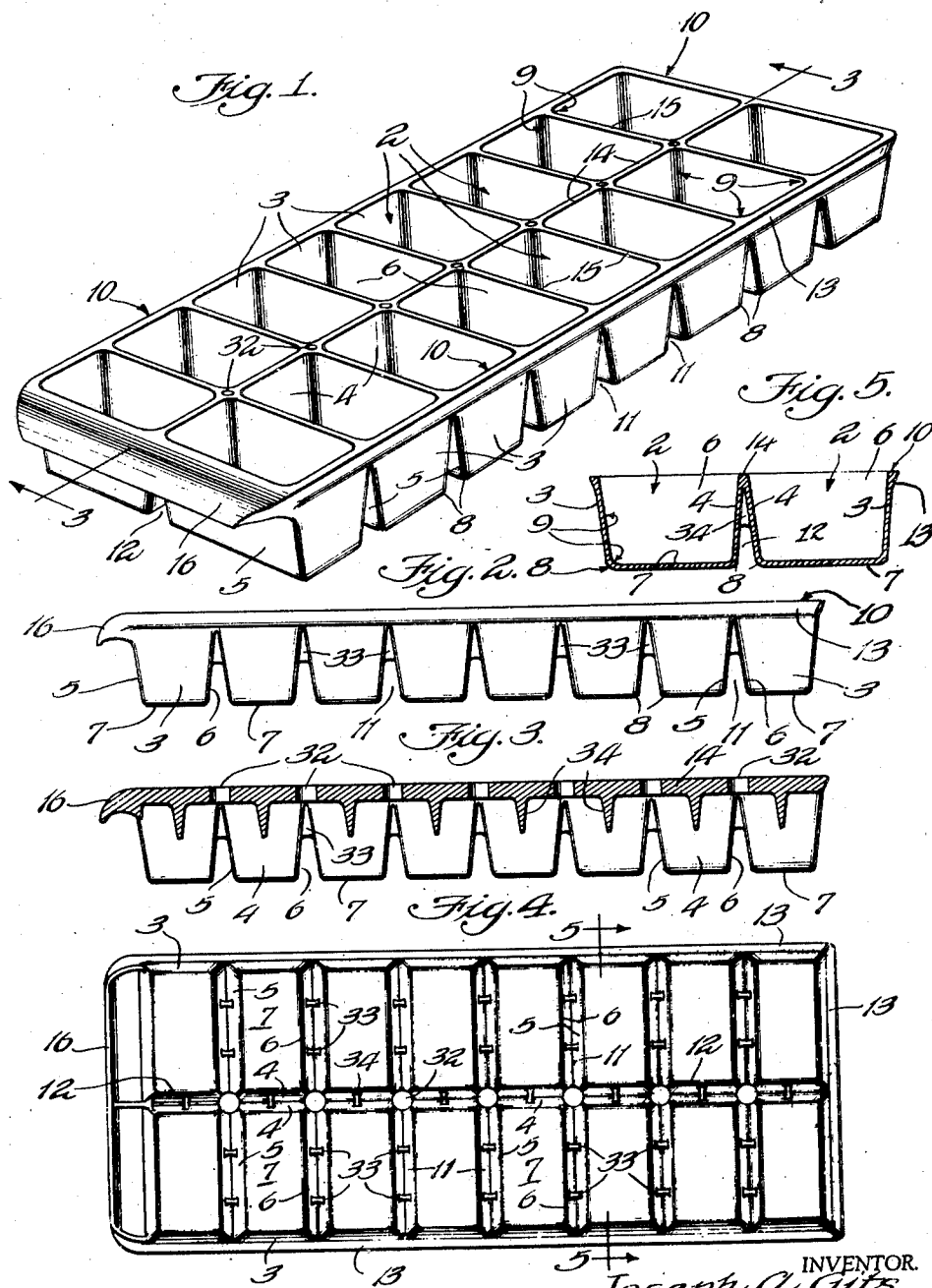
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2,433,210

ICE CUBE TRAY

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2 Sheets-Sheet 1



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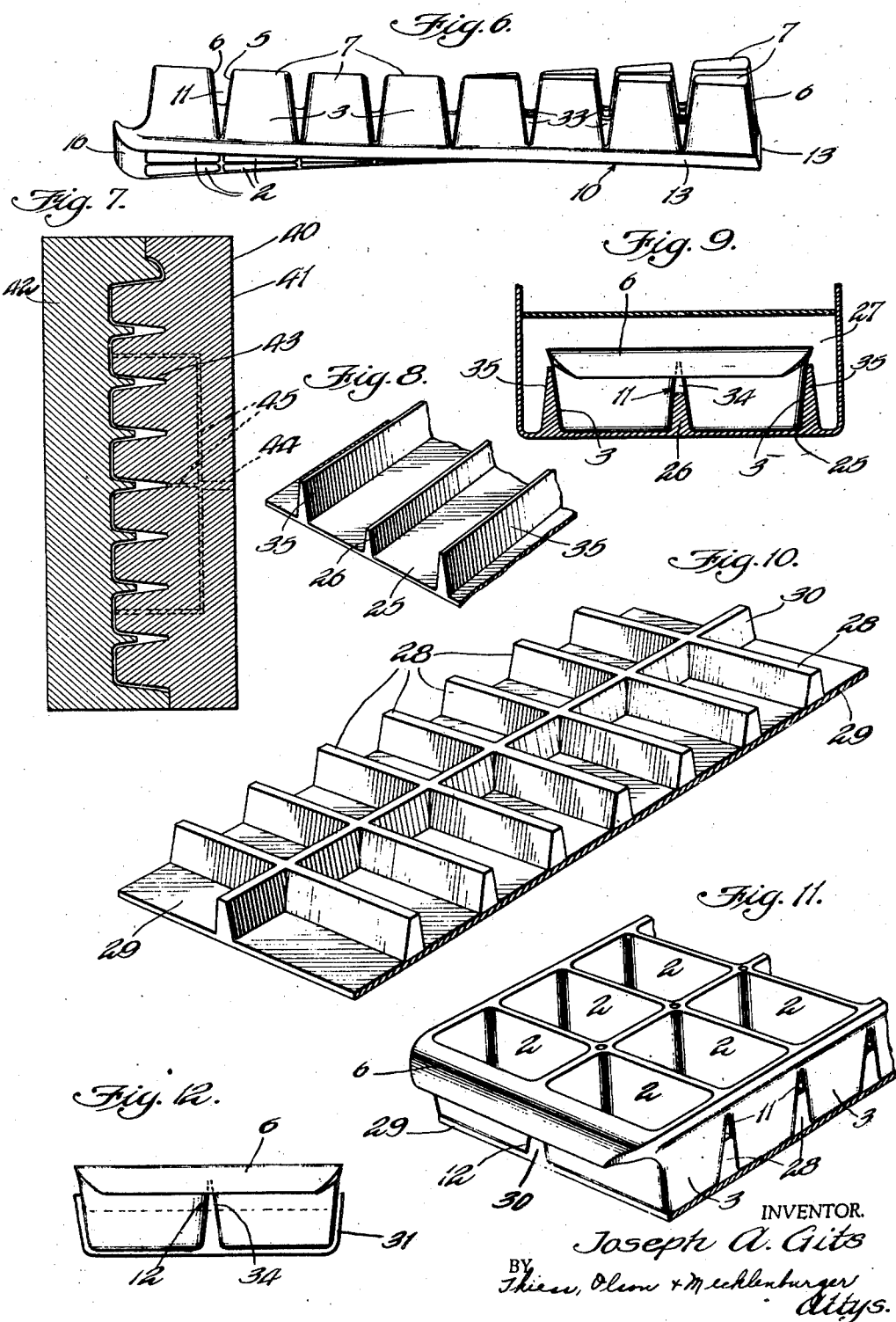
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,433,210

ICE CUBE TRAY

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14 Claims. (Cl. 62—108.5)

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This application is a continuation in part of application Serial No. 418,753, filed November 12, 1941, which has become abandoned.

This invention relates to ice freezing trays adapted for use in refrigerators or the like for freezing a plurality of ice cubes.

Freezing trays used in refrigerators for producing ice cubes have been largely made of metal and of rubber, but the shortage of these materials has presented a real problem to the manufacturer. While metal is a good conductor of heat and permits freezing to be effected in a minimum period of time and rubber may be distorted to effect quick emptying of the cubes, both materials are of a character that is known as frost forming and permit frost to build up rapidly along the sides of the trays and cause the same to be solidly frozen in the freezing chamber if left for a considerable period of time. On the other hand, these devices have been built as single trays which merely divide the interior into compartments by partitions, thereby exposing the outer and bottom sides only of the outer compartments and the bottom side of the inner compartments. The freezing action was accordingly delayed and the removal of the ice cubes made difficult.

An object of the present invention is to provide an improved, simple and efficient form of structure for freezing trays, which may be advantageously made of a thermoplastic material capable of being molded in a single operation and providing maximum heat conducting surfaces for each compartment in which an ice cube is frozen.

A further object of the invention is to provide a freezing tray of improved structure that may be made of a thermoplastic material which tends to retard frost formation upon the exposed outer surfaces and to which the ice does not necessarily tend to adhere so that the ice cubes may be readily dislodged or removed.

A still further object of the invention is to provide a freezing tray of thermoplastic material that is somewhat resilient so that the tray may be twisted slightly to loosen the ice cubes within the various compartments and thereby be removed without imparting heat to the outer surfaces before the cubes can be removed.

It is also an object of this invention to provide an improved, simple and efficient form of thermoplastic structure which may be twisted slightly to loosen the ice cubes in the compartment and which is provided with a simple means of limiting this twisting action whereby to prevent permanent distortion of the tray.

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

5 In the drawings:

Figure 1 is a perspective view of a tray embodying the invention;

Fig. 2 is a side elevational view of this tray;

Fig. 3 is a longitudinal sectional view taken 10 along line 3—3 of Fig. 1;

Fig. 4 is a bottom view of the tray;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a view illustrating how the tray may 15 be twisted to dislodge the ice cubes from the compartments;

Fig. 7 is a sectional view through the die employed to mold the tray disclosed herein;

Fig. 8 is a fragmentary perspective view of the 20 floor or bottom of the freezing chamber which may be used in connection with the tray to effect rapid freezing of the liquid in the tray;

Fig. 9 is a transverse sectional view of the cooling chamber but shown diagrammatically for 25 illustration purposes only, together with the tray in end elevation to illustrate the use of the bottom plate shown in Fig. 8;

Fig. 10 is a modified form of this bottom plate of the cooling chamber that may also be used in 30 connection with the tray disclosed herein;

Fig. 11 is a fragmentary perspective view illustrating the tray seated upon this modified form of bottom plate; and

Fig. 12 illustrates a further modification wherein the tray is associated with a separate 35 dish-like member embodying the principle disclosed in connection with the use of the bottom plates shown in Figs. 8 and 10, this dish-like member being adapted for removal from the cooling chamber with the tray.

For the purposes of illustration, I have shown one form of embodiment of the invention. It is to be understood that this structure merely illustrates the invention herein disclosed so that 45 those skilled in the art will be readily taught how to practice the invention.

The ice cube or freezing tray 1 comprises a plurality of individual compartments 2 which may be arranged in any cell-like pattern, for example, as shown, in two rows, and may be of any desirable shape, say, square, so as to produce 50 true cubes of ice if they are of the same depth, or rectangular in cross section so as to produce small pieces of ice, which, while not true cubes, are considered as such in the art and will be con-

sidered as such for the purposes of this disclosure. Each compartment 2 is defined by four side walls 3, 4, 5 and 6, and a bottom wall 7. The inner side walls may be designated 4 and the outer side walls may be designated 3. These side walls and the bottom merge into slightly rounded outside corners 8 which effect rounded inside corners 9 at the bottom and the top and along the sides of each compartment. These rounded corners have been found to facilitate removal of the cubes and also to enhance the appearance of the tray.

The upper portion of the side walls 3 to 6, inclusive, merge into what may be called an upper wall or ledge 10 that extends about all sides of the tray as well as between rows longitudinally of the tray and crosswise of the tray between adjacent compartments 2 of each row. The walls are designed to slant inwardly from the top to give an inward taper to each compartment and to further provide air spaces 11 crosswise of the tray between adjacent compartments of each row and an air space 12 that runs longitudinally of the tray between the two rows and separates inner walls 4, this being illustrated in Figs. 3 to 5, inclusive. The upper outer surface of wall 3 is given a slightly greater slant at 13 which merges with the upper face 10 to form in effect a substantial rim-like shoulder or ledge, as before mentioned, that extends along the outer top edges of the tray. The slanting inside walls 4 merge at 14 to form the central part or ledge separating the two rows of compartments. The slanting side walls 5 and 6 also merge at 15 to form the part of the upper wall 10 or cross ledge between adjacent compartments of the same row, and, if the compartments of these rows are in alignment, as shown, the cross ledge extends from one to the other side of the tray. The general design effects a very substantial structure across the top face of the tray which accomplishes certain advantages in the type of construction shown, as will be presently described.

The effect to be given by the arrangement described is that each compartment presents the appearance of an individual relatively small tray suspended from a top plate having holes cut therein that define the various compartments. I preferably extend one end of the tray at the upper wall or ledge 10 to form a forwardly curved handle portion 16, the same being of relatively substantial thickness at the juncture and tapering toward the outer edge so that a substantial mass of material is provided along this front edge for a purpose also to be presently described.

I find that any suitable synthetic resin that is thermoplastic may be used and mention specifically ethyl and acetate cellulose because, within certain limits, they are slightly springy in character, will not soil when handled and may be made in different colors. Although the latter two features are not considered essential with respect to the present invention, it is desirable to use a plastic that will not be frost forming and to which ice will not freeze. Consequently, the material being resilient or springy in character, the tray may be twisted as shown in Fig. 6 and the ice cubes will be immediately freed from the compartments 2. I find that a plastic material is particularly desirable because it may be gripped without causing cold burns which occur in the case of metal trays.

Although thermoplastic material has certain desirable characteristics making the material particularly desirable for use in the construction of an ice cube tray and although difficulties hereto-

fore experienced in its use and handling have been overcome, this material does not conduct heat as rapidly as metal. For this reason, it is found that the individual arrangement of compartments 2 and providing separate side walls for each compartment assures maximum heat conducting surfaces whereby the freezing period is reduced to a minimum. Also, it is found that slanting the side walls additionally provides not only air spaces between the walls of adjacent compartments but allows these air spaces to be increased in size without materially decreasing the capacity of the compartments. When the tray is placed in a cooling chamber, the heat is rapidly conducted from the walls so that the liquid in the compartments may be brought to a freezing temperature as rapidly as possible.

In Figs. 8 to 12, inclusive, various forms of bottom plates for the cooling chamber are illustrated, which may be used with the tray shown herein for the purpose of still further reducing the freezing time if desired. In Fig. 8, bottom plate 25 is illustrated with a tapered rib 26 adapted to act not only as a guide for the tray when it is slid back and forth in cooling chamber 27, but also as a heat conducting element in direct contact with the inside walls 4 of compartments 2 to facilitate a rapid cooling action. The tapering of air space 12 permits this rib 26 to be tapered, if so desired. Tapered ribs 28 may be provided transversely upon the bottom plate 29, shown in Fig. 10, for lying, if so desired, in the air spaces extending crosswise of the tray between the compartments. A tapered rib 30 disposed longitudinally upon plate 29 is also provided in this instance to lie in this air space 12 extending lengthwise of the tray between the two rows of compartments 2. The manner in which the tray will seat upon this type of bottom plate is illustrated in Fig. 11. Transverse tapered ribs 28 are nested in transverse air spaces 11 in substantially the same manner as the longitudinal rib 30. These ribs are also tapered so as to engage side walls 5 and 6, as well as the walls 4. In this instance, it will be necessary to lift the tray up in order to clear these ribs before it may be removed from the cooling chamber. However, the cooling chamber may be of a depth permitting such lifting of the tray. Either bottom plate 25 or 29 may be provided with side ribs 35 shown in Figs. 8 and 9, which embrace the outer surfaces of walls 3 to increase the heat conducting action therealong. These ribs 35 may be higher than ribs 26, 28 and 30, which can extend into spaces 11 and 12 only to the height of the webs or partitions 33 and 34.

Fig. 12 illustrates a further embodiment of the bottom plates 25 and 29, illustrated in Figs. 8 and 10. In this instance, the tray is adapted to be first seated in a dish-like member or pan 31 before it is inserted in the cooling tray. Member 31 may have either the single longitudinal rib 26, or the combination of transverse ribs 28 and a longitudinal rib 30, as illustrated in Fig. 10. Member 31 may be provided in instances where the bottom plate of the cooling chamber is not furnished with these tapered ribs and it is desired to secure the reduced cooling period afforded by the use of such ribs in direct contact with the walls of compartments 2.

The structure herein provided also permits the provision of openings or air passages 32 at the juncture of adjoining pairs of compartments so that it is possible to assure a relatively uniform thickness of wall for each compartment and

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eliminate thereby any uneven freezing action where the conduction of heat may not be as rapid. As previously mentioned, the tray may be twisted to dislodge the ice cubes from the compartments, as shown in Fig. 6. This may be accomplished because plastic material is somewhat resilient in character and is susceptible to deflection, but I have found that plastic material may be permanently distorted when twisted in this manner. The individual construction of the compartments permits a certain resiliency in the structure shown but to prevent this structure from being permanently distorted when the tray is flexed, particularly from being distorted transversely between compartments where wall 5 of one compartment connects at 15 to wall 6 of the adjacent compartment or longitudinally along the line 14 where the inside walls 4 of opposing compartments connect, I provide a series of webs or partitions 33 extending downwardly a limited distance and spanning the transverse air spaces 11 and similar webs or partitions 34 in the air space 12 extending longitudinally of the tray. These webs or partitions 33 and 34 function in connection with the top face or rim-like shoulder 13 that extends about the tray to provide a very substantial structure and aid in conducting heat from compartments 2. They will also prevent a twisting action that is apt to cause distortion. I find that these webs or partitions 33 and 34 novelly cooperate in the general design herein disclosed to provide a very efficient type of tray made of plastic material. They permit the individual construction of each compartment with separate walls for each compartment and still prevent excessive flexing that would otherwise result in permanent set or breakage of the tray. They also provide a substantially solid top portion from which the walls of each compartment extend so that the tray is made sufficiently rigid to retain its shape even though subjected to abuse and rough handling that is apt to occur in the normal use of an ice cube tray. Ledges 10, 14 and 15 function to transmit the torsional twist through the entire body of the tray. As stated, connecting webs 33 and 34 tend to limit this torsional twist transmitted by the ledges, and further, by this limiting action they distribute the torsional twist to flex the side walls 3, 4, 5 and 6 individually, and, of course, the bottom wall 7 by the flexing of these side walls. In other words, the webs 33 and 34 serve a dual function, and therefore, novelly cause the side and bottom walls of each compartment 2 to flex, thereby releasing, or aiding in releasing, the ice cubes.

Thermoplastic material permits the handling of the tray with cubes frozen therein without the freezing of the hands to the outside surfaces of the tray walls. Moreover, the tray may be handled with greater facility. It will not scratch or chip porcelain bodies and highly finished surfaces when dropped thereon. If dropped, the tray will not break nor become dented and will not cut a linoleum covered surface as in the case of metal. Moreover, these desirable features are augmented in the present case because the construction permits ready gripping to free the cubes by a slight twisting of the tray without danger of permanent distortion or cracking.

A further advantage resides in the fact that this unique construction may be made in a single operation, preferably by injection molding under relatively high pressures which assures the production of a perfect article wherein the strains, if any, are uniformly distributed. Fig. 7 illus-

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trates somewhat diagrammatically a die 40 which may be used. This die 40 comprises two separable parts 41 and 42 between which a cavity 43 is provided. This cavity 43 is of a shape corresponding to that of the tray and communicates with the sprue 44 by any suitable number of passages 45. The finished product may be formed in this manner by a single operation which reduces the cost of manufacture by an appreciable margin over metal formed trays requiring a number of operations, both in the forming and in the assembling.

From the foregoing description it will be apparent that a simple, practical and improved form of ice cube or freezing tray is provided that embodies and provides for features of advantage not heretofore obtained. The use of thermoplastic material permits making a structure which is highly desirable, while the structure itself accomplishes advantages as to the time required to freeze and thereafter as to the ease of removal of the cubes. The ice cubes do not tend to adhere to the thermoplastic material while the resilient characteristic of this thermoplastic material can be used in connection with the design of the construction to free the ice cubes quickly without permitting the use of excessive twisting that will crack or permanently destroy the tray.

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 molded body of thermoplastic material characterized by a resiliency permitting flexing to free the ice, separately formed compartments having their walls integrally formed and integrally united along their top edges to the walls of adjacent compartments, the walls between adjacent compartments below their top edges being separated by air spaces to provide for individually exposed heat conducting surfaces for each compartment, said molded body being twistable to flex said walls, and integrally formed transverse ribs bridging said air spaces and connecting the walls of adjacent compartments to limit the flexing of said walls when said molded body is twisted to free the bodies of ice in said compartments.

2. An ice freezing tray comprising a molded body of thermoplastic material characterized by a resiliency permitting flexing to free the ice, separately formed compartments having their walls integrally formed and integrally united along their top edges to the walls of adjacent compartments, the walls between adjacent compartments below their top edges being separated by air spaces to provide for individually exposed heat conducting surfaces for each compartment, said molded body being twistable to flex said walls to free the bodies of ice in said compartments, a row of segments of said thermoplastic material disposed in a plane parallel to the longitudinal center line of said tray and connecting opposing walls of adjoining compartments for a portion of the depth of said compartments.

3. An ice freezing tray comprising a body of thermoplastic material having a plurality of compartments, each compartment having side walls and a bottom wall that are of continuous forma-

tion with respect to each other, the side walls being united adjacent their top edges to the side walls of adjacent compartments, certain of the side walls tapering inwardly to provide tapered air spaces between the opposing side walls of adjacent compartments, and bracing means bridging said air spaces between the opposing side walls of adjacent compartments to interlock all of said compartments at said side walls as well as adjacent the top edges thereof.

4. An ice freezing tray comprising a body of thermoplastic material formed into a plurality of compartments, each compartment having individual walls, the side walls of adjoining compartments being joined together along their upper edges, said material and said walls being flexible to cause the walls temporarily to deform and thereafter to return to their normal condition whereby to release the frozen mass in each compartment when said body is gripped at opposite ends and torsionally twisted, the material along the upper edges where said walls are joined transmitting said torsional twist through the entire body, and limiting ribs between walls of adjoining compartments restricting said torsional twist so as to distribute the same throughout the body to secure flexure of the individual walls of each compartment without a distortion of the material that will cause a permanent set or fracture of the material.

5. A freezing tray comprising a body of thermoplastic material formed into a plurality of compartments, the side walls of adjoining compartments being joined together along one edge, said material and said walls being flexible to cause the walls temporarily to deform and thereafter to return to their normal condition whereby to release the frozen mass in each compartment when said body is gripped at opposite ends and torsionally twisted, the material where joining the side walls of adjoining compartments transmitting said torsional twist through the entire body, and limiting ribs between walls of adjoining compartments restricting said torsional twist so as to distribute the same throughout the body to secure flexure of the walls of the compartments without distortion of the material that will cause a permanent set or fracture of the material.

6. An ice freezing tray comprising a body of thermoplastic material formed into a plurality of compartments, each compartment having individual walls including side and bottom walls, the side walls of adjoining compartments being joined together along their upper edges, said material and said walls being flexible to cause the walls temporarily to deform and thereafter to return to their normal condition whereby to release the frozen mass in each compartment when said body is gripped at opposite ends and torsionally twisted, the material along the upper edges where said walls are joined transmitting said torsional twist through the entire body, and segments connecting certain of said walls of said compartments tending to distribute the torsional twist throughout the body to assure a flexing of the walls of said compartments without distortion of the material that will cause a permanent set or fracture of the material.

7. An ice freezing tray comprising a body of thermoplastic material characterized by a resiliency permitting flexing to free the ice, separately formed compartments having their walls integrally formed and integrally united along their top edges to the walls of adjacent compartments, the walls between adjacent compartments

below said top edges being separated by air spaces to provide for individually exposed heat conducting surfaces for each compartment, said body being twistable to flex said walls sufficiently to free the bodies of ice in said compartments, and means connecting certain of said walls of said compartments, said means limiting the twisting and tending thereby to prevent distortion or fracture of said body.

8. A non-frost forming and non-ice adhering freezing tray comprising individual cube-forming compartments arranged in parallel rows, said compartments having individual but integrally connected walls and having their upper edges common with one another, said walls being entirely of a resilient thermoplastic material, the opposing walls of adjacent compartments of each row being spaced from each other with air spaces therebetween, said tray walls and said thermoplastic material being of such character as to effect substantially complete release of the frozen material individually from each compartment or from all of the compartments at one time by manually gripping the ends of the tray and torsionally twisting the tray to flex said walls, and portions of flexible thermoplastic material disposed on each side of the longitudinal center line of the tray and bridging said air spaces for connecting certain of the walls of adjacent compartments, said portions tending to transmit said torsional twist of the tray when flexed manually without distortion of the material that will cause a permanent set or fracture of the material.

9. A non-frost forming and non-ice adhering freezing tray comprising individual cube-forming compartments having individual but integrally connected walls spaced from each other on all sides but having their upper edges common with one another, said walls being entirely of a resilient thermoplastic material and being self-sustaining when said compartments are filled with water, said tray walls and said thermoplastic material being of such character as to effect substantially complete release of the frozen material individually from each compartment or from all of the compartments at one time by manually gripping the ends of the tray and torsionally twisting the tray to flex said walls, and a row of segments of said thermoplastic material disposed in a plane parallel to the longitudinal axis of said tray and connecting opposing walls of adjoining compartments for a portion of the depth of said compartments.

10. A non-frost forming and non-ice adhering freezing tray comprising individual cube-forming compartments having individual but integrally connected walls spaced from each other on all sides but having their upper edges common with one another, said walls being entirely of a resilient thermoplastic material and self-sustaining when said compartments are filled with water, said tray walls and said thermoplastic material being of such character as to effect substantially complete release of the frozen material individually from each compartment or from all of the compartments at one time by manually gripping the ends of the tray and torsionally twisting the tray to flex said walls, and segments of said thermoplastic material disposed on each side of and substantially parallel to the longitudinal center line of said tray and connecting opposing walls of adjoining compartments for a portion of the depth of the compartments.

11. An ice freezing tray comprising a body of thermoplastic material characterized by a resili-

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lency permitting flexing to free the ice, separately formed compartments having their walls integrally formed and integrally united along their top edges to the walls of adjacent compartments, the walls between adjacent compartments below their top edges being separated by air spaces to provide for individually exposed heat conducting surfaces for each compartment, said body being twistable by a manual gripping of the tray at its ends to flex said walls to free the bodies of ice in said compartments, and portions of thermoplastic material disposed on each side of the longitudinal center line of said tray and bridging said air spaces for connecting certain of the walls of adjoining compartments, said portions of thermoplastic material tending to transmit a torsional twist to flex said walls when said tray is manually gripped at the ends and torsionally twisted.

12. A freezing tray comprising compartments each composed of upwardly tapered side walls and a bottom wall and all of flexible thermoplastic material to which ice and frost will not adhere, side walls of each compartment integrally joining side walls of adjacent compartments at their upper edges to form a continuous cell-like body made entirely of said flexible thermoplastic material, said walls of adjacent compartments being spaced from each other on all sides by said tapered formation and being form-sustaining

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when said compartments are filled with liquid, the top portions of said compartments where said walls are joined cooperating to produce a formation that will transmit an endwise torsional twist of the tray through all of said walls to distort the normal shape cross sectionally of each compartment whereby to loosen frozen material in each compartment.

13. The freezing tray of claim 12 wherein the material is an ethyl cellulose composition.

14. The freezing tray of claim 12 wherein the material is a cellulose acetate composition.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,407,614	Wicks	Feb. 21, 1922
1,803,734	Scherer	May 5, 1931
1,868,070	Newman	July 19, 1932
1,923,522	Whitehouse	Aug. 22, 1933
2,035,679	Thompson	Mar. 31, 1936
2,145,719	Geyer	Jan. 31, 1939
2,193,342	Price	Mar. 12, 1940
2,323,486	Pizarro	July 9, 1943
2,386,979	Rundell	Oct. 16, 1945