Feb. 20, 1962 R. C. VOIGTMANN 3,021,695

HIGH DENSITY POLYETHYLENE ICE MOLD

Filed March 31, 1960 2 Sheets-Sheet 1

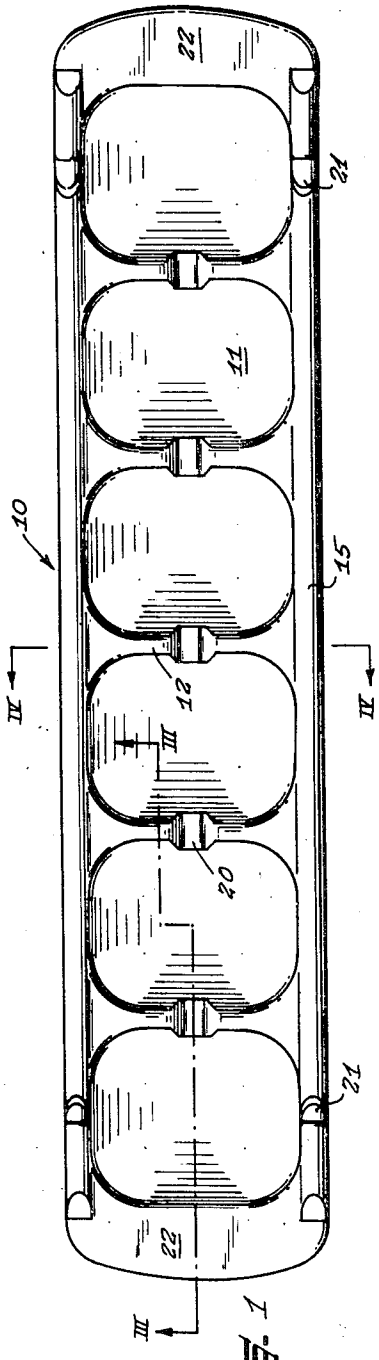


Fig. 1

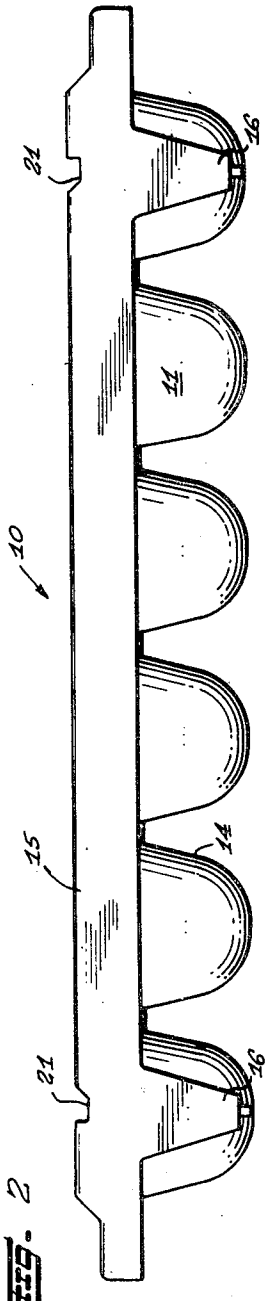


Fig. 2

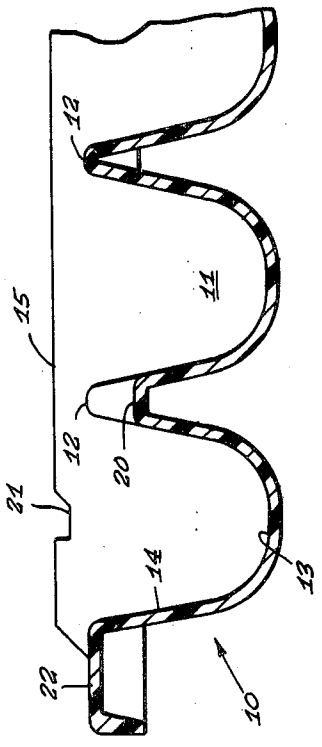


Fig. 3

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Feb. 20, 1962 R. C. VOIGTMANN 3,021,695

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Filed March 31, 1960 2 Sheets-Sheet 2

Fig. 4

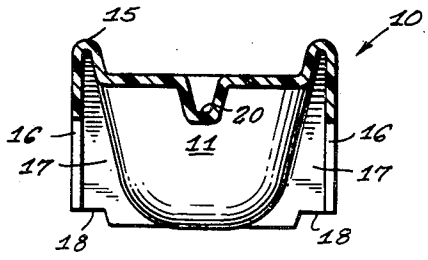


Fig. 5

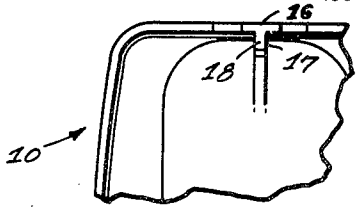


Fig. 6

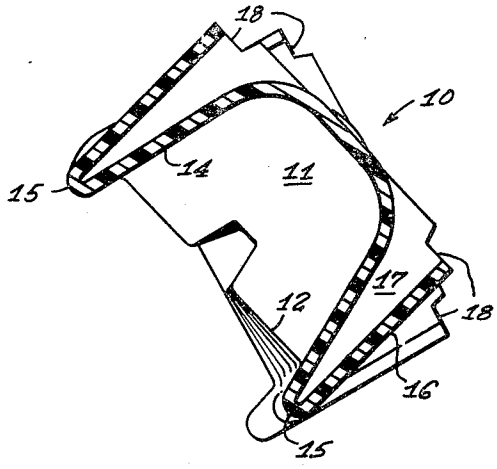


Fig. 7

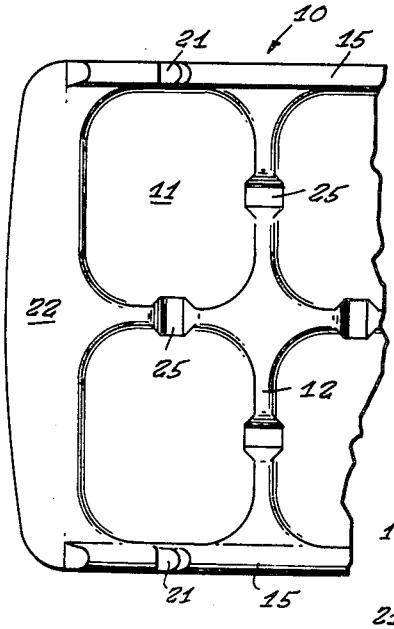
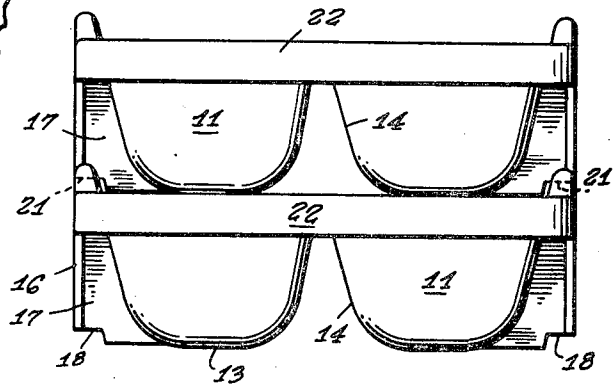


Fig. 8



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HIGH DENSITY POLYETHYLENE ICE MOLD

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1 Claim. (Cl. 62—370)

This invention relates to an ice making device and more particularly relates to a flexible plastic ice tray having a plurality of individual ice molds therein, wherein ejection of ice blocks from the mold is effected by twisting the tray.

Plastic ice trays which are adapted to be twisted or distorted in some manner have gained wide commercial acceptance recently, inasmuch as they are very lightweight, readily manufactured, easily cleaned, and inexpensive.

Prior types of flexible distortable ice trays have generally been formed with a plurality of individual ice mold wells therein which are formed integrally with one another. A plurality of connecting webs are generally disposed between the exterior surfaces of the base portions of the molds which serve to lend structural rigidity to the ice trays and which are often incorporated in the tray to aid in the molding thereof. Generally no connecting channels are formed between the molds to permit fluid flow from one mold to another.

The molds are generally formed with either two or four side walls thereof having an angle of divergence from the base thereof of five degrees or less, although in some cases the molds are formed with the side walls thereof diverging from the base at greater angles than five degrees, such, for instance, as eight degrees. However, in the latter type molds the diverging wall portions terminate part way between the base and the lips of the mold and thereafter the side walls rise vertically to the lip.

Another common feature of prior types of flexible ice trays is that the individual ice molds are formed with flat or substantially flat bottoms which meet the diverging side walls abruptly at relatively sharp angles.

A still further feature of prior types of ice trays is that the peripheral side and end rails are generally formed of the same thickness and rigidity as the partition walls which serve to divide the ice molds.

The flexible ice tray which forms a part of the present invention is preferably a one-piece molded structure having a plurality of mold wells formed therein which is formed of high density linear polyethylene. The use of high density polyethylene is desirable since this substance (1) is quite strong and durable, (2) resists cracking and tearing when twisted under low temperature conditions and (3) is relatively rigid while still permitting the desired amount of flexure of the tray. It has further been found that linear polyethylene is particularly adaptable for use in forming an ice tray since there is little tendency for ice blocks to adhere to the surface of this substance.

The ice tray is rectangular in configuration with a plurality of aligned mold wells therein and is adapted to be twisted about its longitudinal axis to effect, when in an inverted position, the ejection of ice block from the mold wells.

I have found in practice that there is a definite correlation between the ease with which ice blocks may be ejected from their respective molds and the angle of divergence of the side walls of those molds. The torque required to twist an ice tray, however, to effect such ice block ejection does not increase greatly with lessening of the angle of divergence of the side walls until the molds are formed with their side wall diverging from the bases at angles with respect to the vertical approximating 8° or less.

I have therefore found it desirable to construct an ice tray having ice molds formed with their side walls diverging from the base portions thereof at an angle of divergence with respect to the vertical of approximately 14°, as shown in the appended drawings. This angle of divergence permits the application of only a minimum amount of torque to the tray to eject ice blocks from the molds therein while still maintaining a maximum volumetric capacity within the molds.

The ice tray which I have devised has a plurality of ice molds which have rounded base portions (non-rectilinear along one dimension thereof) and which connect with the diverging side walls of the molds by portions having generous radii. In the illustrated embodiment of my invention the radius of curvature between the diverging side walls of the molds and the bases thereof is approximately one-quarter to one-half inch. I have found that this radius of curvature also permits ejection of ice blocks from the molds with a relatively small application of torque thereto while still providing a maximum volumetric capacity.

An important feature of my invention lies in the provision of relatively rigid peripheral side and end rails which function to prevent sagging of the ice tray in use and which further function to provide the desired distortion of molds within the tray.

As a result of the configuration of the ice molds within the ice tray, twisting of the ice tray along its longitudinal axis will not act to make any portion of the side walls of an individual mold overhang the interior of the mold as do most prior types of ice trays upon the application of a twisting action thereto. Ice trays which have been constructed in the past and which have vertical or nearly vertical and relatively thin walls separating the individual molds, do tend to distort to a point wherein a portion of the side walls of the molds overhangs the interior of the molds upon the application of torque to the ice tray along its longitudinal axis and this overhanging portion tends to restrict movement of an ice block from the mold. Still further, in those ice trays having relatively thin, common transverse walls, the ice blocks in adjacent molds tend to bulge or expand and compress the transverse walls to interlock with one another.

The ice tray which I have devised is also formed without any connecting webs formed intermediate the plurality of the depending ice molds, thus facilitating twisting of the ice tray. Such interconnecting webs are often molded within the ice tray to facilitate molding thereof or to reinforce the tray to prevent sagging thereof during use but such webs often rip when the tray is twisted and they are, of course, an impediment to twisting of the tray. My ice tray maintains its desired configuration and is prevented from sagging during use primarily as a result of a combination of two factors. First, the side and end rails are relatively rigid and are only made flexible enough to permit slight longitudinal flexure of the tray. Secondly, the tray is formed of high density linear polyethylene which is stronger than the low density polyethylene used in several prior types of ice trays but which may be flexed a sufficient amount to effect ejection of ice blocks from the molds within the tray.

It is therefore a principal object of the present invention to provide a flexible ice tray formed of high density linear polyethylene which has a plurality of mold wells formed therein having walls diverging from the base to the lip thereof and having generously rounded portions interconnecting the several side walls and base of each of the ice molds.

Another object of the invention resides in the provision of an ice mold having the side walls diverging from the

base to the lip thereof at an angle with respect to the vertical approximating 14° or greater.

A still further object of the invention is the provision of an ice mold having a rounded bottom with side walls diverging from the bottom of the mold to the lip thereof at an angle with respect to the vertical of approximately 14° or greater.

An important feature of the invention is the provision of an ice tray having a plurality of molds therein wherein interlocking of ice blocks in adjacent molds is prevented as a result of the tray configuration.

Yet another object of the invention resides in the provision of an ice mold of the type described above wherein the radius of curvature of the portions of the mold interconnecting the several side walls and the base of an individual mold is approximately one-quarter inch or greater.

Another important feature of the invention is the provision of an ice tray having a plurality of ice mold wells formed therein wherein the side and end rails are relatively rigid thus resisting sagging of the tray in use; the side rails being only flexible enough to prevent cracking and tearing thereof upon the application of a twisting force to the longitudinal axis of the tray.

A further feature of the invention resides in the provision of an ice tray of the type generally described above wherein no webs are used to interconnect the depending mold wells with one another.

It will further be understood from the appended drawings and detailed description which follows that a unique feature of my ice tray resides in the construction of the tray in such a manner that no portion of an individual ice mold tends to overhang the interior of the mold when the ice tray is twisted about its longitudinal axis to effect ejection of ice blocks from the mold.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings, wherein:

FIGURE 1 is a plan view of an ice tray and its associated elements mounted in the freezing compartment of a household refrigerator;

FIGURE 2 is a side elevational view of the ice tray and its associated elements which are illustrated in FIGURE 1;

FIGURE 3 is a fragmental vertical sectional view through the ice tray taken along lines III—III of FIGURE 1;

FIGURE 4 is a transverse vertical sectional view through the ice tray taken along lines IV—IV of FIGURE 1;

FIGURE 5 is a fragmental bottom view of one corner of the ice tray;

FIGURE 6 is a view which is similar in nature to FIGURE 4 but which illustrates the ice tray in a twisted or torqued position;

FIGURE 7 is a fragmental plan view of a double-row ice tray constructed in accordance with the principles of the present invention; and

FIGURE 8 is an end view of a pair of "stacked" trays.

Referring initially to FIGURES 1 and 2 of the drawings, an ice tray **10**, constructed in accordance with the principles of the present invention, is shown as having a plurality of mold wells **11** formed therein which are integral with one another at their lips **12**.

The ice tray **10** is preferably formed of high density linear polyethylene although it may be formed of other suitable materials which will permit flexure of the tray. Linear polyethylene is particularly suited to use in an ice tray inasmuch as there is less tendency for frozen ice blocks to adhere to this material than to most other known types of flexible materials. High density polyethylene is extremely strong and yet may be flexed a sufficient degree to permit ejection of ice blocks from the tray without tearing or cracking although maintained at a relatively low temperature.

As shown most clearly in FIGURE 3, the mold wells **11** have bases which, when viewed in vertical section along lines III—III of FIGURE 1, are curvilinear. Noting FIGURE 4 in conjunction with FIGURE 3 it will be seen that the side walls **14** of the mold wells extend upwardly from the base portions **13** and diverge outwardly therefrom at an angle of approximately 14° with respect to the vertical to their interconnecting lips **12**. The angle of divergence of the side walls from the base portions of the molds is constant throughout the entire length of the side walls to the lips of the molds. Both this feature and the angle of divergence of the walls from the bottoms of the molds, are important structural characteristics of my ice tray and cooperate to permit ice blocks to be readily ejected from the ice tray by a slight twisting of the tray.

Particular attention is directed to the fact that the molds are designed with corners having a generous radius of curvature. I have found that an optimum length for the radius of curvature of the corners interconnecting the side walls and bases of the mold is approximately one-quarter inch or greater; this length permitting maximum volumetric capacity within the molds while permitting a relatively small ice tray distortion force.

As shown particularly in FIGURE 4, the side rails **15** of the ice tray are substantially U-shaped in cross section and serve to rigidify the sides of the ice tray.

At or adjacent to each of the four corners of the icetray, a leg **16** depends from the lower longitudinal edge of the side rails **15** and has a support **17** formed integrally therewith which extends from the exterior surface of the mold well adjacent that leg. A recess **18** is formed on each of the supports **17** which serves to support the ice tray when one tray is stacked upon another. The recesses **18** are adapted to receive the upstanding side rails **15** of an ice tray when two or more ice trays are stacked as illustrated in FIGURE 7. As illustrated, the side rails **15** rise above the level of the lips **12** a considerable distance so that the bases of the mold wells in the upper ice tray will be spaced from the level of liquid within the lower ice tray when the trays are stacked. The side rails **15** are also stepped as indicated at **21** with the distances between the upstanding portions being only slightly less than the distances between the legs **16** and may be notched to positively secure the tray in proper stacked position. This configuration prevents the upper tray from sliding off the lower tray when the trays are stacked.

As shown most clearly in FIGURE 2, channel grooves **20** are formed in the lips of adjacent ice molds and serve to communicate fluid from one to the other of the molds. Thus, when water is poured into one of the molds the channel grooves will communicate that water to each of the other molds until they are all filled to the same level. Water will, of course, be disposed within the channel grooves during freezing of water within the molds. The ice pieces that are formed within the channel grooves may aid in the ejection of ice blocks from the mold but they will generally break when a number of interconnected ice blocks fall into the collection tray. However, since ice pieces will be formed within the grooves **20**, these grooves are also formed with side walls diverging from the bottoms thereof at an angle of approximately 14° with respect to the vertical, although curvilinear type channel grooves might satisfactorily be employed.

Referring now especially to FIGURE 5 of the drawings, ejection of ice blocks from their respective molds is effected subsequent to freezing thereof within the molds by twisting the ice tray about its longitudinal axis. It will be noted that the angle of divergence of the side walls of the molds from the bases thereof is great enough so that no portion of the side walls of the molds over-

hangs the interior of the molds. Ice block ejection is therefore not impeded as has generally been true in prior types of ice trays wherein the side walls are formed perpendicular to or substantially perpendicular to the flat bases of the molds.

It is also well known in the ice making art that when water freezes it tends to expand in every direction. When vertical or nearly vertical walled molds are employed to contain water to be frozen into ice blocks this freezing characteristic impedes removal of the ice blocks from their molds inasmuch as the liquid expansion often tends to bow the mold walls outwardly. Such action is equivalent to under-cutting the walls of the molds and results in a mold lip perimeter smaller than the perimeter about the girth of the ice block.

It will here also be understood that the end rails **22** of the ice tray are L-shaped in cross section and that, due to their relatively short length, they are relatively rigid so that they substantially retain their rectilinear configuration even during twisting of the ice tray. This constructional feature is significant inasmuch as it serves to maintain the ice molds in a substantially parallelogram-like configuration (as viewed in plan) even when the opposite ends of the ice tray are moved through differential arcs approximating 40°. The parallelogram-like configuration of the molds assures that no portion of the side walls of the molds will overhang the interiors of the molds to restrict ejection of ice blocks from the respective molds.

The ice blocks sticking to the confining walls of their respective molds will be broken away therefrom and dropped from the ice tray upon inversion of the ice tray and the subsequent application of a slight longitudinal twist thereto, by shear. While I have illustrated the tray **10** in FIGURE 5 as being subjected to a substantial twist, in fact a very slight twist is all that is generally required to effect ejection of the ice blocks from the tray; the twist required often approximating only 5 to 10°.

As heretofore discussed, it is important to note that no interconnecting webs are provided intermediate the depending mold wells **11** so that the tray may be quite readily twisted. The cross section U-shape of the side rails is employed to prevent sagging of the ice tray when it is held in a horizontal position.

The embodiment of the invention illustrated in FIGURE 6 is a double-row tray which functions on principles identical to that of the single row tray. Here too it is noted that channel grooves **25** are formed in the lips of each of several adjacent ice molds to facilitate ejection of all of the ice blocks from the tray upon twisting of the tray in the manner described above.

It will be understood that these embodiments of the invention have been used for illustrative purposes only and that various modifications and variations of the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

A flexible ice tray comprising a plurality of ice mold wells formed integrally with one another and including outwardly rounded bottom portions and side walls diverging upwardly therefrom, wherein said ice tray is formed entirely of high density polyethylene.

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