Feb. 28, 1950 J. H. ROETHEL 2,498,964

ICE TRAY

Filed April 23, 1945 2 Sheets-Sheet 1

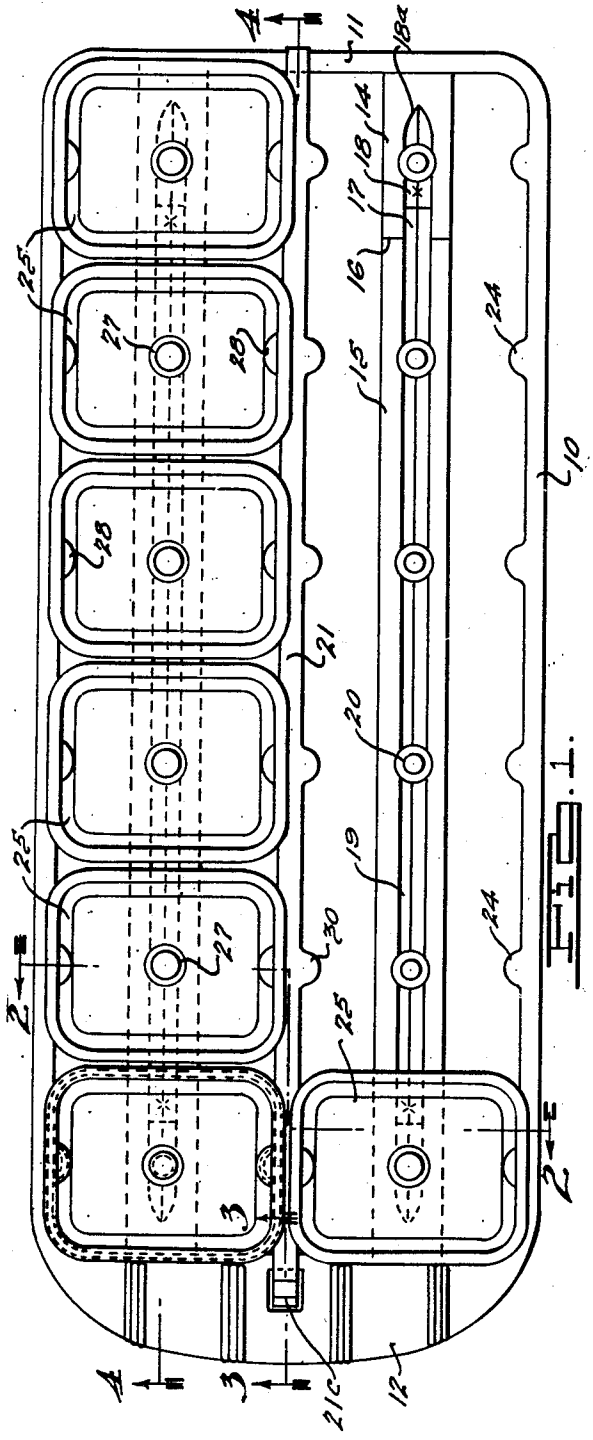

Fig. 1.

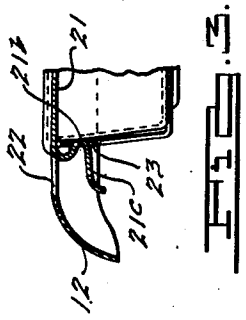

Fig. 4.

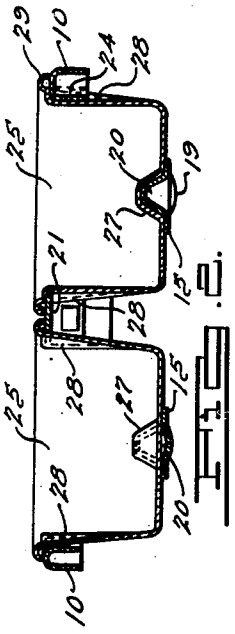

Fig. 3.

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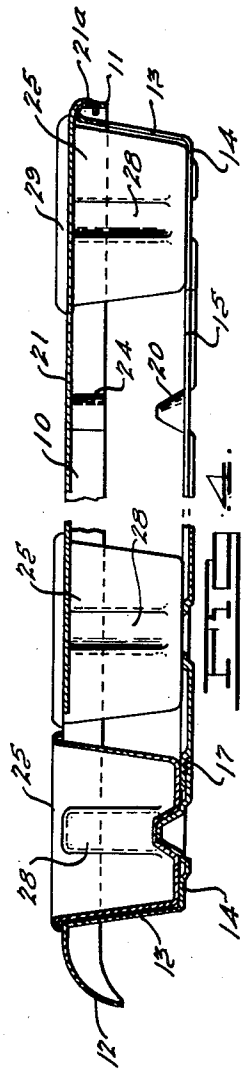

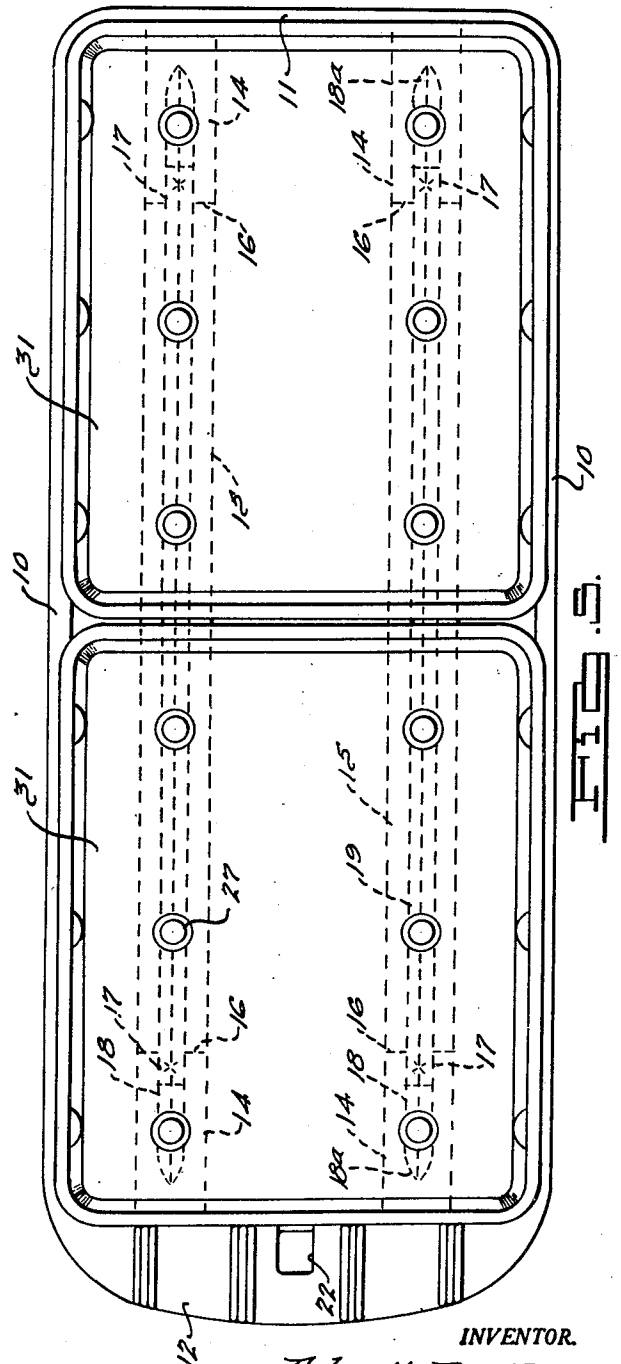

Fig. 5

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ICE TRAY

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Application April 23, 1945, Serial No. 589,764

9 Claims. (Cl. 62—108.5)

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This invention relates to liquid freezing receptacles and particularly, although not exclusively, to ice trays of the kind having a plurality of independent or individual molds or receptacles useful in refrigerators for quick freezing purposes.

An object of the invention is to provide an ice tray or other liquid freezing device having a frame structure for supporting a plurality of individual freezing receptacles and improved means for locating and positioning the receptacles with respect to the supporting frame structure.

Another object of the invention is to provide a liquid freezing device embodying an improved receptacle supporting framework.

A further object of the invention is to provide an improved freezing receptacle, preferably formed or molded from plastic material, and adapted to be mounted in a supporting frame structure or tray for convenient use in a refrigerator.

Still another object of the invention is to provide an ice tray frame of skeleton construction having a bottom provided with means cooperable with individual freezing receptacles or cups for positioning and properly maintaining the receptacles in place relatively to one another.

A further object of the invention is to provide a liquid freezing tray, such as an ice tray for use in a refrigerator, constructed in improved manner so that any suitable number of individual molds or receptacles may be used with the frame of the tray.

Another object of the invention is to improve the construction of the individual freezing receptacle or cup so as to enable the same to be easily positioned in a supporting frame or tray and keyed or anchored in place against substantial displacement.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a plan view of a tray frame carrying a number of individual liquid receiving receptacles or molds constructed in accordance with the present invention.

Fig. 2 is a section taken substantially through lines 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a section taken substantially through lines 3—3 of Fig. 1 looking in the direction of the arrows.

Fig. 4 is a fragmentary section taken substantially through lines 4—4 of Fig. 1 looking in the direction of the arrows.

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Fig. 5 is a plan view illustrating the use of the tray frame of Fig. 1 in connection with freezing receptacles of larger size.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the embodiment of the invention herein illustrated, by way of example, the skeleton frame structure for supporting the freezing receptacles is formed from a single sheet or blank of material, such as sheet aluminum or steel. The material used in the fabrication of the frame structure is not limited to steel, aluminum, or any other metal. The frame structure could be made from a thermoplastic material either by a molding process or by drawing a sheet or blank of suitable gage or thickness in a press under heat and pressure into the desired shape. When made from sheet metal, the sheet is stamped and blanked out by suitable dies in a press to provide a generally rectangular frame comprising two parallel longitudinal side members 10 and a transverse end member 11 of inverted U-shaped construction extending continuously around three sides of the tray. The metal at the fourth side or front end of the tray frame is pressed into shape to provide a handle 12 which may be grasped for withdrawing the tray from the refrigerator.

Portions of the metal intermediate the sides of the frame are bent downwardly at 13 and thence inwardly at 14 in the same plane to provide spaced runner sections or bottom supporting portions. Two of such sections or portions, spaced transversely, are thus provided at each end of the tray frame as clearly seen in Figs. 1 and 5. Portions of the metal of the blank intermediate the portions 14 are preferably blanked out to provide strips forming the remaining sections of the runners or bottom supporting members of the tray. Thus, each opposed pair of runner sections 14 are connected longitudinally by a strip or section 15 of similar width formed out of the same metal blank. Opposite ends of each runner section 15 abut at 16 against the adjacent sections 14 and are coplanar therewith. The connection between each runner strip and adjacent

section 14 at each locality comprises an integral tongue 17 on the section or strip 15 fitting into a downwardly embossed groove 18 in the section 14, the overlapping portions being spot-welded together. With this construction it will be seen that a pair of spaced sectionally formed runners or bottom supporting members are provided which connect the opposite end members of the frame and have flush top surfaces at the junctures of the sections adapted to smoothly contact the bottom of the freezing receptacles.

The grooves 18, which receive and have interlocking engagement with the tongues 17, form continuations of similar relatively narrow shallow grooves or depressions 19 extending the length of the runner strips 15. These grooves provide narrow bottom ribs 20 (Fig. 2) on the runners which taper upwardly to nothing at their opposite ends at 18a and which facilitate sliding the tray into and out of the evaporator or freezing compartment of the refrigerator especially where the bottom of the compartment is rough on account of ice or frost accumulations. The ribs also facilitate loosening the tray from the bottom of the freezing compartment.

Struck up from the metal of each runner 14—15 at equally spaced intervals are a suitable number of tapered or wedge shaped lugs or embossments 20 which extend in line longitudinally and centrally of the runner. Where the tray frame is of a size to receive two rows of six receptacles, as in the present instance, each runner is provided with six such lugs or embossments, one for each receptacle. For the purpose of dividing the space within the framework into separate spaces to receive the molds or receptacles there is provided in the present embodiment of the invention a central longitudinal grid member or partition bar 21 which may be in the form of a relatively narrow flat metal strip. In the present instance this partition bar is partially coiled at its rear terminal end to provide a hook portion 21a adapted to embrace the upper rounded or crowned edge of the frame member 11 and to be hooked into a slot pierced in the outer side thereof. The opposite end of the bar, see Fig. 3, has a downwardly extending portion return bent to form a spring catch 21b extended outwardly to provide a finger piece 21c. This end portion of the bar may be passed through a slot 22 in the handle 12 and forced into the position shown in Fig. 3 by snap action with the catch 21b releasably anchored in an aperture in a down bent tongue 23 struck from the metal of the handle in forming the slot 22. It will be readily seen that by inserting the finger beneath the handle 22 and exerting upward pressure on the finger piece 21c the end of the partition bar may be sprung out of fastened position and lifted through the slot 22, after which the opposite hooked end of the bar may be uncoupled thereby detaching the bar from the frame.

The inner vertical flange of each side frame member 10 is pressed inwardly at intervals to form vertical keys or lugs 24. These are spaced apart in the same manner as the bottom embossments or lugs 20 and correspond in number to the number of small individual cups or receptacles used in the trays.

The tray frame herein illustrated is adapted to receive one or more freezing receptacles, cups or molds 25 of varying sizes to suit individual requirements. For ice freezing purposes the illustrated tray is designed to receive twelve cups or molds arranged in two rows in the spaces formed

at opposite sides of the grid or partition member 21. The molds or receptacles 25 are preferably formed from thermoplastic material of suitable gage or thickness and, hence, are capable of being molded or drawn in a press under heat and pressure from a blank or sheet of this material.

Each receptacle or mold 25 is formed with a substantially flat bottom and upright side walls which may taper or incline somewhat upwardly and outwardly in order to facilitate removal of the frozen contents. The molds or receptacles are preferably generally rectangular in shape and are of a size and depth so as to produce ice cubes or blocks of desired size. Each mold or receptacle 25 is molded or drawn from a blank of sheet material preferably in a hydraulic press by means of dies heated to a suitable temperature, such as approximately 260° F., which renders the material sufficiently soft and flowable to enable it to be drawn by the dies to the proper depth and shape. During this molding operation the bottom of each receptacle or container 25 is embossed to provide a notch or recess 27 having tapering walls preferably corresponding substantially to the shape of the lugs or embossments 20 and preferably constructed so that when the receptacle is placed in the tray one of the lugs or embossments 20 will substantially fit in the notch or recess 27 in the bottom of the cup, thus keying or restraining the receptacle against longitudinal displacement. Each receptacle 25 during the molding operation is also embossed or formed at opposite sides thereof with notches or vertically extending grooves or keyways 28 adapted to receive the lugs or embossments 24 when the receptacle is inserted in the tray. The grooves or keyways 28 preferably have a cross-sectional curvature corresponding substantially to the curvature of the lugs or keys 24 and decrease in depth from the upper flanged edge of the receptacle toward the bottom thereof as clearly illustrated in Fig. 2. Thus, when the receptacle or mold 25 is placed in the tray frame the lug or key 24 will be received in the keyway 28 and the lug or embossment 20 on the bottom runner will be received in the notch or recess 27. Hence, with this construction the receptacle or mold will be properly located in position within the tray frame and will be restrained against any substantial displacement in either direction longitudinally of the frame and will also be restrained against turning. By providing grooves or keyways 28 in opposite end walls of the receptacle it will be seen that the receptacle may be inserted in the tray frame in either position so that one of the keyways will cooperate with one of the keys 24 on the longitudinal side frame member of the tray. If it is desired to key or connect the receptacle to the tray frame at three points instead of at two points, the grid or partition bar 21 may be formed at opposite sides with projecting lugs or keys 30, similar to the keys 24 in cross-sectional shape, which will fit into keyways 28 in the receptacles when inserted into the tray frame as illustrated in Fig. 1.

The upper marginal edge of each receptacle 25, during the molding operation, is turned outwardly and thence downwardly to provide a rolled edge 29 extending continuously around the receptacle and which, due to its rib or channel construction, strengthens and reinforces the edge of the receptacle and reduces the tendency of the plastic material to tear or fracture when the walls are spread outwardly slightly in order to remove the ice block therefrom.

As illustrated in Figs. 2 and 4, the rolled edge 29 of each receptacle with its outer depending flange, has the advantage of providing only line contact with the frame members 10 and 21 in any case where the cup is partially supported upon these members when placed in the tray. Moreover, the rolled edges 29 of the receptacles will abut against each other and prevent the edges from overlapping where some play exists between the receptacles and the keying members, permitting a slight amount of longitudinal displacement of the receptacles. Such small amount of play will frequently occur owing to manufacturing inaccuracies and tolerances permitting shifting of the receptacles slight distances in a longitudinal direction. In such cases if the flanged edges of the receptacles were flat, these edges would shift into overlapping relation and would often freeze together rendering it difficult to separate the receptacles. By constructing the receptacles with marginal turned-down or rolled edges as shown at 29, any lengthwise shifting of the receptacles, due to the existence of play in the interlocking keying parts, will merely result in the edges abutting without any danger of their overlapping. The rolled edges 29 of the cups, therefore, assist in keeping the receptacles in proper positions and in separated relation.

As previously stated, the present tray frame is capable of accommodating freezing receptacles of varying sizes. For example, as illustrated in Fig. 5, the tray frame may be readily converted by removing the grid or partition bar 21 so as to accommodate two large generally rectangularly shaped receptacles 31. These receptacles are preferably formed from the same material and in the same manner as the receptacles 25 excepting that each of the receptacles 31 will be formed on its bottom with six notches or recesses 27 in order to accommodate the corresponding number of keys or lugs 20 on the bottom supporting members and will also be provided on each of two opposite side walls with three keyways or grooves 28 so as to receive the corresponding number of keys 24 on the side frames 10 of the tray frame. It will be apparent that by removing the partition bar 21 varying numbers of receptacles may be accommodated by the tray frame, each being formed with the required number of recesses 27 and grooves or keyways 28. For example, the tray frame after removing the partition bar may accommodate a single large receptacle or three or six transversely extending receptacles. Although it is desirable to use the partition bar 21 where individual receptacles are used as shown in Fig. 1, it will be apparent that the individual receptacles 25 or any desired number of receptacles of larger sizes may be mounted in the tray frame and keyed against displacement through the medium of the keys or lugs 20 and 24 when the partition bar is removed. The use of the partition bar is much preferred, however, where a large number of individual receptacles is used, since it assists materially in holding the receptacles in proper positions during use.

Various kinds of thermoplastic materials may be used in the fabrication of the molds or receptacles due to the fact that this material enables the cups to be drawn or molded under heat and pressure and will retain its molded shape during usage. Of the various thermoplastic materials I prefer to use a material composed of or containing ethyl cellulose as its principal ingredient. This material, as in the case of other plastic materials, has good properties in respect to low temperature flexibility and toughness, low flammability, stability to heat and inertness to alkalies. Not only is there is distinct advantage in the use of thermoplastic material, since it may be readily formed or molded, but this material lessens materially the tendency of the ice or frozen contents to adhere to the side walls of the receptacle.

I prefer to fabricate the receptacles or containers with relatively thin walls so as to obtain faster freezing and also increased flexibility of the sides and bottom of the containers. I prefer wall thicknesses of ten to fifteen thousandths gage. Satisfactory receptacles have been made using a gage of approximately fifteen thousandths of an inch. Receptacles having wall thicknesses on this order have been found to give relatively fast freezing time as well as enabling the ice block to be removed very easily where metallic powder or grains have been dispersed throughout the thermoplastic material. Satisfactory results have been obtained by dispersing powdered aluminum in the plastic material in quantities up to ten to fifteen percent of the weight of the sheet.

I claim:

1. A liquid freezing device, comprising a framework having side frame members forming the four sides thereof and bottom supporting members connected to certain of said side frame members, a plurality of liquid freezing receptacles located within said framework, and means for keying each receptacle to the framework including a lug on one of the members extending into a recess in a wall of the receptacle.

2. A liquid freezing device, comprising a framework having side frame members forming the four sides thereof and bottom supporting members connected to certain of said side frame members, a plurality of liquid freezing receptacles located within said framework, and means for keying each receptacle to the framework including a lug on a bottom supporting member extending into a recess in the bottom wall of the receptacle.

3. A liquid freezing device comprising a tray having a bottom, a liquid freezing receptacle, and cooperating keying means carried by the tray bottom and receptacle bottom including a projection on one received in a recess in the other for positioning and holding the receptacle in place within the tray.

4. A generally rectangular tray frame formed from a single metal blank, comprising integral side frame members forming the four sides thereof and bottom supporting members extending from two opposite side frame members intermediate the other side frame members, said members forming a space to receive liquid freezing receptacles and certain thereof having integrally formed projections engageable in recesses in the receptacles to hold them in place within the frame.

5. A liquid freezing device, comprising a frame including bottom supporting means, a plurality of individually removable liquid freezing receptacles on said supporting means, and an interlocking connection between the bottom of each receptacle and said supporting means comprising a projection on one extending into a recess in the other.

6. A liquid freezing device comprising a generally rectangular framework, grid means dividing the space within the framework into separate mold receiving spaces, individually removable liquid freezing molds each having a recess in its bottom, and lugs on the framework ex-

tending into said recesses for restraining displacement of the molds within said spaces.

7. A liquid freezing device, comprising an open top tray frame having side frame members forming the four sides thereof and bottom supporting means, a plurality of liquid freezing receptacles on said supporting means, and an interlocking connection between each receptacle and said supporting means to restrain longitudinal displacement of the receptacle comprising a projection on one extending into a recess in the other.

8. A liquid freezing device, comprising a tray frame open at its top from front to rear and having side frame members forming the four sides thereof and bottom supporting means, a plurality of liquid freezing receptacles within said framework, and means for keying each receptacle to the framework against longitudinal displacement including a projection on a side frame member extending into a recess in the side wall of the receptacle.

9. For use with a supporting tray frame constructed and arranged to support a plurality of individual flexible, plastic, liquid freezing molds and having a bottom provided with an upstanding projection, a flexible, plastic, individual, liquid freezing mold having a bottom provided centrally thereof with a preformed recess having materially less cross-sectional area than the area of the mold bottom and into which recess said projection is adapted to extend, said mold having surrounding upright walls inclined upwardly and outwardly, and said recess providing with said projection an interlocking connection whereby the mold is restrained against displacement when positioned on said bottom.

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