Aug. 14, 1951 J. H. ROETHEL 2,564,235

ICE TRAY

Filed Aug. 7, 1947

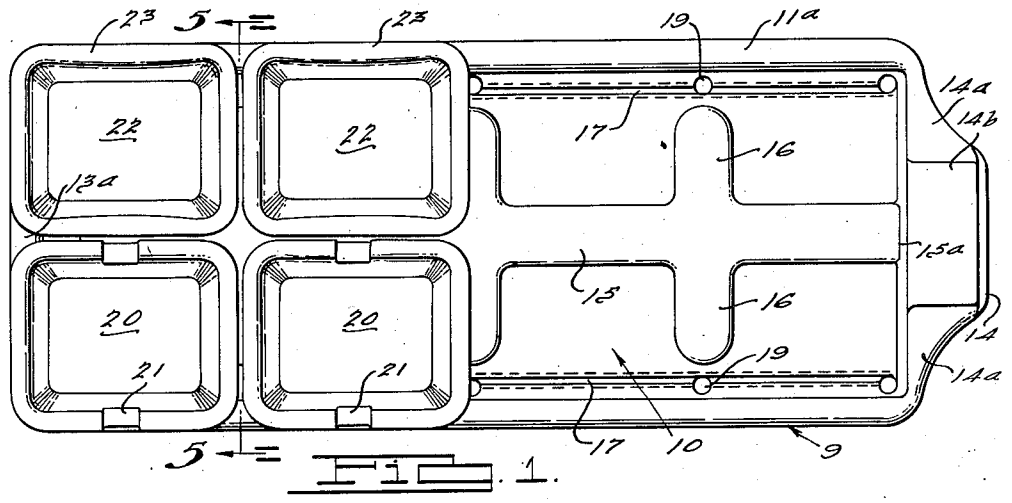


FIG. 1.

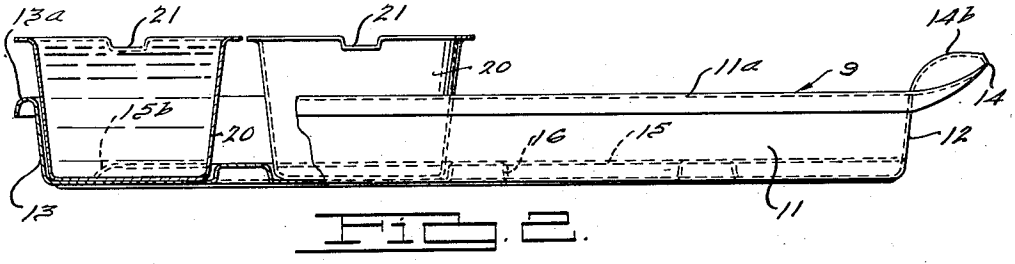
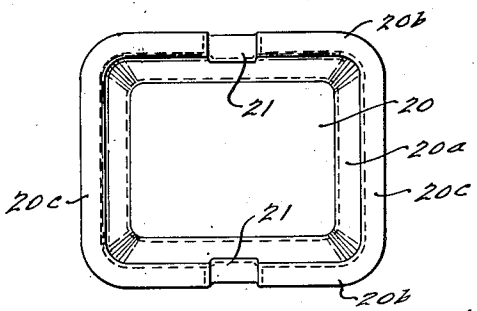


FIG. 2.

FIG. 3.



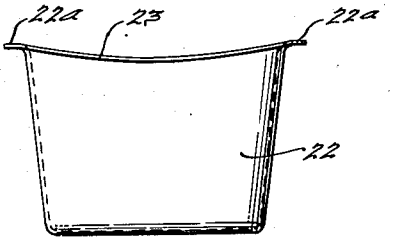


FIG. 4.

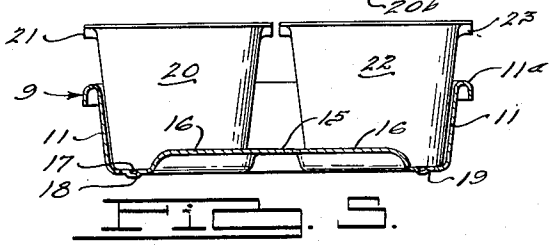


FIG. 5.

INVENTOR.
John H. Roethel.
BY
Elmer Jamison Gray
ATTORNEYS.

Patented Aug. 14, 1951

2,564,235

UNITED STATES PATENT OFFICE

2,564,235

ICE TRAY

John H. Roethel, Detroit, Mich.

Application August 7, 1947, Serial No. 766,923

6 Claims. (Cl. 62—108.5)

1

This invention relates to liquid freezing devices and particularly, although not exclusively, to ice trays of the kind having a plurality of independent or individually removable cup-like molds or receptacles useful in refrigerators for making ice cubes or other frozen substances.

An object of the invention is to provide an ice tray or other liquid freezing device having an improved frame or supporting structure for a plurality of individual freezing receptacles which is relatively light, easy and economical to manufacture, and not only constructed to hold the receptacles or cups in proper positions but also to enhance the rate of freezing of liquid therein.

A further object of the invention is to provide an ice tray or the like comprising an improved frame of strong and rugged construction adapted to hold a plurality of cups or receptacles preferably formed of plastic material, such as polyethylene plastic, which cups or receptacles possess relatively thin walls and are not only highly flexible to facilitate quick release of the ice cubes but are also strong, durable and substantially unbreakable even when subjected to hard usage.

Another object of the invention is to provide an improved liquid freezing cup or receptacle, preferably of flexible thin-walled plastic material, which terminates around its upper edge in a continuous outwardly extending rim or flange readily engageable by the fingers when ejecting the ice from the receptacle, the rim being provided with a depressed portion or portions effective to level the liquid or water in the receptacle upon filling the same so as to ensure a liquid level below the normal height of the rim thereby facilitating removal of the ice cube from the receptacle.

Still another object of the invention is to provide a sturdy one-piece tray frame for holding a number of liquid freezing receptacles, the bottom of the frame being provided with intersecting ribs to position the receptacles and also having side drain grooves for carrying off water, the grooves being formed by shallow longitudinal bottom projecting ribs which facilitate removal of the frame from the refrigerator.

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 adapted to carry a number of individual liquid freezing receptacles or molds constructed in accordance with one embodiment of the present invention.

Fig. 2 is a fragmentary side elevation, partly in section, of the structure shown in Fig. 1.

Fig. 3 is a plan view of one of the receptacles or cups.

2

Fig. 4 is a side elevation of one of the receptacles or cups.

Fig. 5 is a section taken substantially through lines 5—5 of Fig. 1 looking in the direction of the arrows.

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 drawings there is illustrated, by way of example, an ice tray or the like constructed in accordance with one embodiment of the invention and comprising a frame structure adapted to receive a number of freezing receptacles, molds or cups. In the present instance the frame structure is formed from a single sheet or blank of material, such as sheet aluminum. The sheet is stamped or drawn by suitable press operations to provide a one-piece tray frame 9 having a generally flat bottom 10 terminating at opposite side edges in upright longitudinal side walls 11. The upper edges of these side walls or side members are turned or rolled into generally inverted U-shape so as to impart strength and rigidity thereto, these rolled or turned edges being indicated at 11a. The bottom of the tray frame terminates in a front upright end wall 12 and a rear upright end wall 13, these end walls being integral with the bottom 10. The rear end wall 13 terminates at its upper edge in a rolled or turned edge 13a similar to the rolled or turned edges 11a which merge integrally into the rolled or turned edge 13a. The front upright wall 12 terminates integrally in a handle 14. It will be noted that the handle 14 comprises side portions 14a which merge integrally into the rolled edges 11a, and the turned edges of these side portions 14a converge into a central handle portion which is embossed upwardly at 14b to provide an underlying recess for the reception of the fingers when grasping the tray to withdraw it from the refrigerator freezing compartment or evaporator.

The bottom 10 of the tray frame is drawn centrally to provide a longitudinally extending upstanding rib or double wall partition member 15 which is of inverted generally U-shape construction. This rib or partition member forms a longitudinal grid member dividing the tray into two sections for the reception of two rows of cups or receptacles. Thus, the central rib or grid member 15 divides the bottom 10 of the tray frame into two spaced longitudinally extending receptacle supporting bottom members at opposite sides of the grid 15. The bottom 10 of the

tray frame is also stamped or drawn to provide a number of pairs of transverse ribs or grid members 16 which merge seamlessly into the central rib or division member 15. The ribs 16 are inverted generally U-shape in cross section and the ribs of each pair extend in transverse alignment, preferably terminating short of the outer terminal edges of the tray bottom 10 and, hence, short of the side walls 11. The ribs 16 in the present embodiment have the same height as the longitudinal rib 15, and these ribs are preferably of substantially less height than the height of the side and end walls 11, 12 and 13. The rib 15 merges at 15*a* at its front end into the wall 12, and the rear end 15*b* of this rib preferably merges into the bottom wall short of the end wall 13 so as to provide a space between the end 15*b* of the rib and the end wall 13 affording communication from one side of the rib to the other for the flow of water.

Thus, the ribs or grid members 15 and 16 not only serve to divide the tray frame into individual receptacle receiving spaces but also to strengthen and reinforce the bottom of the frame against bending, buckling or distortion in any direction. It will be noted that a space is left between the outer end of each transverse rib 16 and the adjacent side wall 11 of the tray frame. Extending longitudinally through these spaces at each side of the tray frame intermediate the ends of the ribs 16 and the side walls 11 are two shallow drain grooves 17. By pressing these shallow grooves into the bottom of the tray frame there are provided, as shown in Fig. 5, two shallow longitudinally extending ribs 18 which extend substantially the full length of the bottom of the tray adjacent the bases of the side walls 11. These shallow ribs 18, which produce the drain grooves 17, facilitate release or loosening of the tray frame from the bottom of the refrigerator freezing compartment. The bottom of the tray frame is pierced to provide a number of drain holes 19. As illustrated, each drain groove 17 communicates at each end with a drain hole 19, there being preferably a suitable number of additional drain holes 19 intermediate the ends of the drain grooves. The location and arrangement of the drain grooves 17 and drain holes 19 are such as to facilitate the drainage of water from the bottom of the tray frame during and after the receptacles have been filled.

From the foregoing it will be seen that the central grid or partition member 15 divides the interior of the tray into two longitudinal spaces for the reception of two rows of individually removable freezing receptacles and also divides the base into two longitudinally extending runners or bottom supporting members which support the freezing receptacles and provide heat exchange contact with the bottoms of the receptacles over substantially the entire areas thereof. In addition, the transverse ribs or grid members 16 divide each longitudinal space into a number, such as eight, of individual receptacle receiving spaces. Although eight such spaces are shown in the present embodiment it will be understood that a larger or less number may be provided.

For freezing purposes the tray frame of the present embodiment is designed to receive eight receptacles, cups or molds 20 arranged in two rows of four each at opposite sides of the grid or partition member 15. Preferably each mold or receptacle is formed into a generally rectangular shape and the receptacles may either be spaced as shown with their longer dimensions

extending longitudinally of the tray frame or the latter may be formed to permit the receptacles to be arranged with their longer dimensions extending transversely of the tray frame at opposite sides of the partition member 15. Each cup or receptacle 20 is preferably formed from plastic material. Although various kinds of thermoplastic materials may be used I have found that polyethylene plastic possesses important advantages when used in the fabrication of the cups or receptacles. The individual receptacles are, therefore, preferably produced from polyethylene material and this is accomplished by the process of injection molding. These cups have marked advantages in respect to flexibility, toughness and strength within a wide range from low freezing temperatures to temperatures approximating that of boiling water. The cups or receptacles formed from polyethylene plastic are not only highly flexible even at very low temperatures, permitting the quick release of ice cubes, but are characterized by surfaces of wax or paraffin-like nature, which have little or no appreciable adherence to the ice cubes. The toughness and flexibility of these receptacles are such as to render them extremely durable and unbreakable, so that the cups are long-lived even under conditions of hard usage.

Each cup or receptacle 20 is provided with upwardly flaring side walls 20*a* terminating in a continuous laterally extending rim flange comprising opposed portions 20*b* and opposed portions 20*c*. In the embodiment illustrated in Fig. 3 the opposed portions 20*b* of the rim flange are formed during the injection molding operation with notches or depressed portions 21, the depth thereof being predetermined as desired in order to govern the level of liquid remaining in the receptacle after filling thereof. The remaining portions of the rim flange including the ends 20*c* are preferably left flat in this embodiment so as to extend in a common plane. With this construction it will be seen that the cup or receptacle 20 may be filled to overflowing, yet the excess liquid will flow through the notched or depressed portions 21 bringing the final level of liquid to a height corresponding to the height of the bottom of the notched or depressed portions 21. The expansion of the water when freezing will as a result prevent the ice from forming above the level of the normal plane of the rim flange.

In the embodiment illustrated in Fig. 4 the cup or receptacle 22 is generally similar to the receptacle 20 and is preferably formed of the same material. In this case, however, two opposite sides 22*a* of the continuous rim flange remain flat in the same plane, whereas the remaining two sides are depressed at 23 on a shallow curve or arc extending preferably from one end to the other of the flange. The same results will be accomplished by this construction, where the rim flange is concave, as by the use of the notched or depressed portions 21 in the embodiment of Fig. 3, since when filling the cup 22 the water will always find a level corresponding to the lowest point in the depressed portion 23.

Previously in the use of ice freezing cups or molds of this general character where the upper marginal rim or flange of the receptacle is continuously flat around the top of the receptacle, it frequently happens that the user fills the receptacles to the rims with water and then places the tray in the refrigerator with the cups substantially full to the brims thereof. Upon freezing the water, expansion in an upward direction

occurs and the ice not only bulges upwardly above the level of the rim but also spreads laterally and overlies the rim flange. This condition renders it difficult to eject the ice cubes in the normal manner at the time the tray is removed from the refrigerator. The preferred method of quickly removing the cubes when thoroughly frozen and unmelted is as follows. The user places the tips of several fingers of both hands on the rim flanges at opposed sides and the thumbs upon the bottom of the cup. He then inverts the cup and by exerting moderate pressure with the thumbs against the cup bottom readily moves or forces the ice cube out of the cup into a glass or other receptacle. It will thus be seen that if the ice forms solidly over the rim flange difficulty will be encountered in using the foregoing method to eject the ice cube from the cup since the fingers, instead of engaging over the rim flange will engage over the edges of the ice cube and no amount of pressure of the thumbs upon the cup bottom will move the ice cube out of the cup since the cube will be held by the fingers. In other words, the ice cube in effect will be squeezed between the fingers and thumbs and will remain within the cup.

The foregoing difficulties are overcome by virtue of the present invention in which the rim flange is depressed or provided with a depressed portion at one or more localities, such as indicated at **21** and **23** in the embodiments of Figs. 3 and 4. Where the cup is rectangular I prefer to depress the rim at two opposite sides, leaving the rim flat at the other two sides for engagement by the finger tips when ejecting the frozen contents. However, the depressions in the rim flanges of the cups may be located as desired so as to leave portions of the rim flange of the cup higher than other portions so that the ice will always form below these higher portions thereby ensuring portions of the rim flanges free of overlying ice for engagement by the finger tips.

The depressed portions **21** or **23** have the additional advantage of imparting increased flexibility to the rim, thereby rendering it easier to eject the ice cube from the cup. Thus, if the tips of the fingers are engaged over the rim portions **20***c* in Fig. 3 or the rim portions **22***a* in Fig. 4 and pressure is applied with the thumbs against the cup bottom, the cup will tend to bend or flex somewhat on a line across the notches **21** or across the centers of the concave depressions **23**, thereby quickly freeing the adjacent walls from the ice cube.

I claim:

1. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, grid means pressed into the said bottom to provide recesses to receive a plurality of individual receptacles, longitudinal downwardly extending shallow ribs formed in said bottom adjacent opposite side walls thereof, said ribs forming shallow drain grooves in the upper face of said bottom, said bottom having drain holes communicating with said grooves.

2. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, grid means pressed into the said frame to provide spaces to receive a plurality of individual receptacles, longitudinal downwardly extending shallow ribs formed in said bottom adjacent opposite

side walls thereof, said ribs forming shallow drain grooves in the upper face of said bottom, said bottom having drain holes communicating with said grooves.

3. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, grid means pressed into the said bottom to provide recesses to receive a plurality of individual receptacles, longitudinal downwardly extending shallow ribs formed in said bottom adjacent opposite side walls thereof, said ribs being spaced inwardly from the juncture of the bottom and the said opposite side walls and forming shallow drain grooves in the upper face of said bottom, the latter having drain holes communicating with said grooves.

4. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, longitudinal and transverse intersecting upwardly projecting ribs pressed into said bottom to provide spaces to receive a plurality of individual receptacles, and grooves formed in said bottom between the ends of the transverse ribs and the adjacent side walls, said grooves providing shallow exterior ribs on said bottom.

5. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, longitudinal and transverse intersecting upwardly projecting ribs pressed into said bottom to provide spaces to receive a plurality of individual receptacles, a plurality of receptacles adapted to fit into said spaces, and grooves formed in said bottom between the ends of the transverse ribs and the adjacent side walls, said grooves providing shallow exterior ribs on said bottom.

6. A liquid freezing device including a pan shaped frame having a bottom and upstanding side walls extending upwardly from the bottom continuously around the four sides of the frame, grid means pressed into the said frame to provide spaces to receive a plurality of individual receptacles, a plurality of receptacles adapted to fit into said spaces, longitudinal downwardly extending shallow ribs formed in said bottom adjacent opposite side walls thereof, said ribs forming shallow drain grooves in the upper face of said bottom, said bottom having drain holes communicating with said grooves.

JOHN H. ROETHEL.

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
1,717,974	Heinrichs	June 18, 1929
1,886,171	Dodge	Nov. 1, 1932
2,367,098	Cole	Jan. 9, 1945
2,415,451	Synnesyvedt	Feb. 11, 1947
2,433,211	Gits	Dec. 23, 1947
2,447,170	Dunmire	Aug. 17, 1948
2,459,168	Jocelyn	Jan. 18, 1949

OTHER REFERENCES

"Polyethylene," on pages 11 and 39 to 43 of Magazine "Plastics," September, 1944.