

Dec. 27, 1960

E. W. ZEARFOSS, JR., ET AL

2,966,041

REFRIGERATION

Filed Jan. 28, 1958

2 Sheets-Sheet 1

FIG. 1

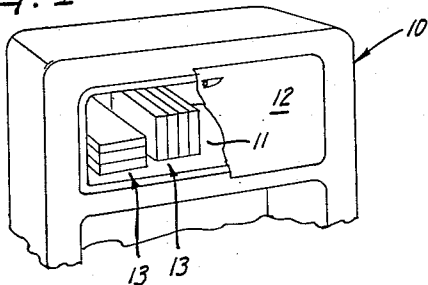


FIG. 4.

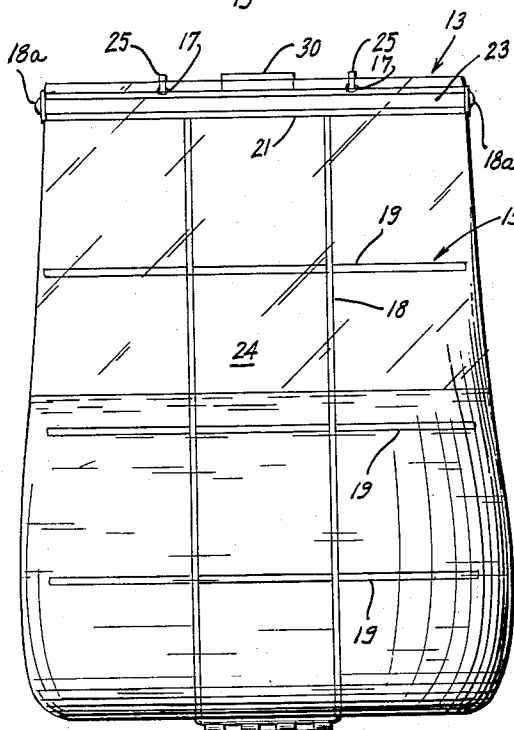
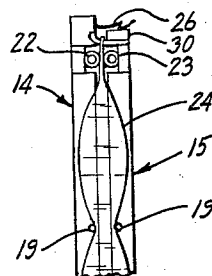


FIG. 2.

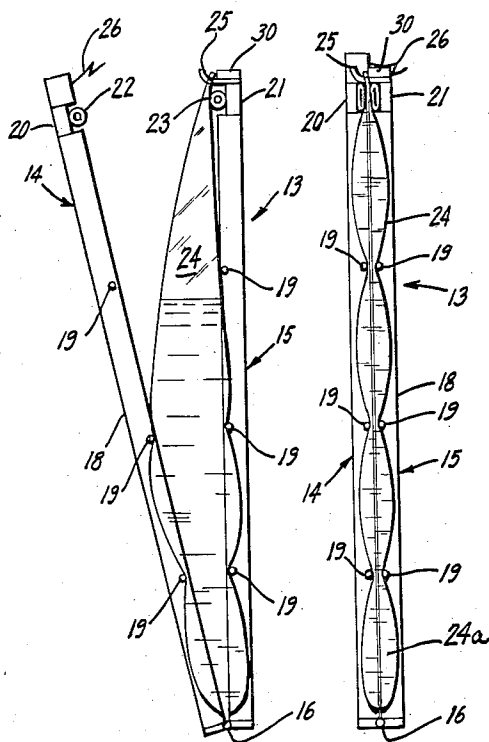


FIG. 3. FIG. 5.

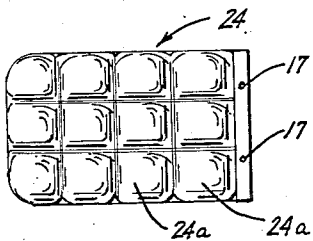


FIG. 7.

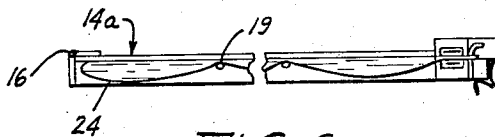


FIG. 6.

INVENTORS
ELMER W. ZEARFOSS, JR.
ERHART E. DEMAND

BY

Carl H. Symmetts
AGENT

Dec. 27, 1960

E. W. ZEARFOSS, JR., ET AL

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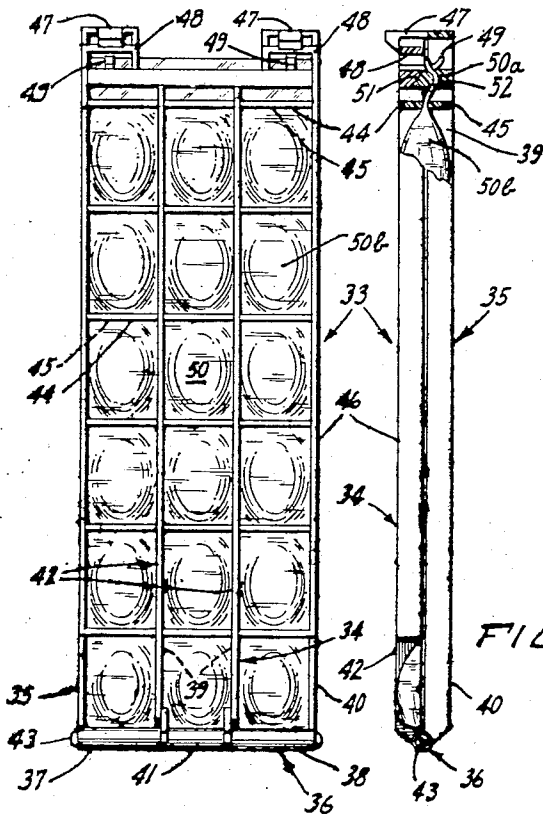


FIG. 8.

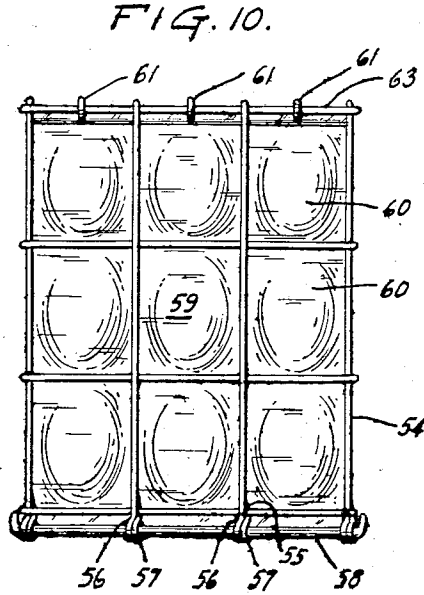


FIG. 9.

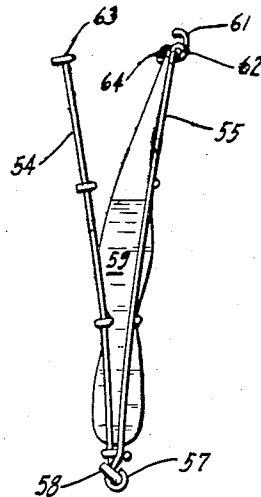


FIG. 11.

INVENTORS
ELMER W. ZEARFOSS, JR.
ERHART E. DEMAND
BY
Carl H. Symmetts
AGENT

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2,966,041

REFRIGERATION

Elmer W. Zearfoss, Jr., Philadelphia, and Erhart E. Demand, Bryn Athyn, Pa., assignors to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Filed Jan. 28, 1958, Ser. No. 711,575

9 Claims. (Cl. 62—60)

This invention relates to refrigeration and more particularly to a method and apparatus for forming ice masses or pieces. More specifically, the invention has to do with improvements in the formation of ice masses, as disclosed in the co-pending application of Lloyd A. Staebler, Serial No. 708,284, filed January 10, 1958, and assigned to the assignee of the present invention.

The apparatus of the said Staebler invention is featured by the provision of a pliant, sealed container, or bag means, in which water may be frozen in uniform pieces, or cubes, and the ice subsequently loosely stored in the container until ready for use. In the method aspect the Staebler invention contemplates confining water to be frozen within pliant bag means, followed by applying forces to the exterior of the bag means to cause it to assume a configuration in which the water is confined in discrete quantities for forming individual ice masses upon lowering the temperature of the bag means to freeze its contents.

The present invention relates to improvements in the apparatus and method of the above identified Staebler invention. Said improvements have to do particularly with means for conveniently effecting a seal for the container, as well as with features affording a novel method for forming ice masses.

It is, therefore, the broad objective of this invention to provide an improved method and means for producing ice masses.

It is an additional object of the present invention to provide novel method and means for sealing a pliant container in which water may be frozen in uniform pieces and the ice subsequently loosely stored in the container until ready for use.

In the achievement of the foregoing and other objectives, the invention, in one aspect, comprises flexible bag means for holding liquid, for example, water to be frozen, in novel combination with force producing means that engages the bag means to seal the same and form pockets of liquid to be frozen.

In the method aspect, the invention contemplates disposing water to be frozen within pliant bag means followed by applying forces to the exterior of the bag means to cause excess water to flow outwardly through an opening in the bag means, the continued applying of said forces being effective to actuate means for sealing the opening in the bag means and to cause the latter, after sealing, to assume a configuration in which the water is confined in discrete quantities for forming individual ice masses upon lowering the temperature of the bag means to freeze its contents.

It is contemplated that the mold means may comprise grid structure, including sealing means, forcibly engageable with external wall portions of a pliant, water-charged bag to actuate the sealing means and to cause the bag to be bulged by the water into the grid openings. The water so contained is then frozen, after which, in normal use, the grid structure is stripped from the frozen

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bag of water and the individual ice masses are contained in the bag for storage therein.

It is a feature of the invention that a minimum of effort is required to remove the grid structure from the container means due to the minimal area of contact between the grid structure and the walls of the container. To this end, the mold means comprises open grating or grid structure defined by rod-like members extending transversely to one another. Said members alone engage a charged bag to support pockets of the latter containing the discrete quantities of liquid to be frozen, said pockets extending through the openings in the grid structure. Due to the fact that the entire lower portion of the mentioned pockets is not in contact with grid or other supporting structure, the grid may be very readily separated from the container or bag.

The manner in which the foregoing as well as other objects and advantages of the invention may best be achieved will be more fully understood from a consideration of the following detailed description, taken in light of the accompanying drawing, in which:

Figure 1 is a somewhat diagrammatic fragmentary showing, in perspective, of refrigerator cabinet structure, and illustrating apparatus of the invention in use therein;

Figure 2 is a view, in elevation, with parts removed, showing an embodiment of the invention which can be used in the manner shown in Figure 1, and on a somewhat larger scale;

Figures 3, 4 and 5 are operational elevational views, partly in section, of apparatus shown in Figure 2;

Figure 6 is similar to Figure 3, and shows a modified embodiment;

Figure 7 is an elevational view, on a somewhat reduced scale, of bagged ice pieces molded in accordance with the invention;

Figure 8 is a view similar to Figure 2, and illustrating another modified embodiment of the invention;

Figure 9 is an elevational showing of apparatus seen in Figure 8;

Figure 10 is a view similar to Figure 8, and showing another modified embodiment of the invention; and

Figure 11 is an operational showing, in elevation, of apparatus seen in Figure 10.

Now making more detailed reference to the drawings, and more particularly to Figure 1, there is seen refrigerator cabinet structure 10 including a freezer compartment 11 provided with a conventional door 12. Ice molds embodying the invention and designated generally by the numeral 13, are disposed within the freezer compartment 11. In particular accordance with a novel feature of the invention, these molds are shown, somewhat diagrammatically, in side-by-side vertical positions, as well as in conventional stacked horizontal positions. It will of course become more apparent from the ensuing description that each of the molds 13 may, to advantage, be variously positioned in accordance with space available within the freezer compartment, and without spilling the molds' contents.

Referring to Figures 2 to 5, an ice mold 13 may comprise grid elements 14 and 15 hinged together, as seen at 16. However, the apparatus of the invention may take other forms, as will be more fully understood from a consideration of the modifications shown in Figures 6 to 11, and to be hereinafter described in detail. For purposes of clarity, the grid element 14 is not shown in Figure 2, although grid element 15 appears therein. Each grid element comprises a generally U-shaped bar 18 having rods 19 extending transversely therethrough; also, cross members 20 and 21 span the free ends of grid members 14 and 15, respectively. As seen to advantage in Figure 3, each cross member 20 and 21 includes sealing means

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for the water charged bag structure 24, said means comprising parallel resilient tubes 22 and 23 held in place by suitable end clamps 18a (Figure 2). The liquid charged bag structure is suspended by eyelets 17 from the hooks 25 provided on the aforesaid cross member 21, said bag structure being shown in Figure 2 just after charging, or filling, and prior to clamping, which will be hereinafter described. The material from which the bag structure 24 is made both waterproof and pliant. Materials found to exhibit the aforementioned qualities include, for example, polyethylene film, as well as rubber. Tubing formed from a plastic material known commercially as "Tygon," and manufactured by U.S. Stoneware has been found suitable for sealing tubes 22 and 23. A latching spring 26 is mounted upon cross member 20 and engages flange 30 of the opposite cross member 21 to lock free ends of the grid together.

Additional structural features of the invention will be better understood from a consideration of the operational showings of Figures 4 and 5 illustrating the clamping engagement of the grids 14 and 15 with the water charged bag 24.

Figure 4 illustrates the manner in which the open upper end of the bag 24 is clamped between the parallel disposed tubes 22 and 23, and thereby sealed just prior to complete clamping and latching of the grid structure, as seen in Figure 5.

By thus sealing the bag means 24 just prior to clamping grid elements 14 and 15 together, there is insured optimum liquid pressure for forcing the bag into the open spaces between bars 18 and rods 19 to form substantially uniform pockets 24a of liquid to be frozen. By suspending bag 24 from the free end of the hinged grids 14 and 15, there is afforded substantially uniform water distribution throughout all pockets 24a, inasmuch as excess water, as well as air, is forced upwardly through the open end of the bag, and this overflow continues until sealing engagement of the latter with resilient tubes 22 and 23 occurs, in the region below the eyelets 17. Suspending the bag in this manner also affords a convenient mode of filling the bag, wherein for example, an empty bag is first suspended by eyelets of a single wall engaging the hooks of a supported grid, followed by pouring in the liquid to be frozen. When the bag has been filled to a suitable level, for example to an extent causing the lower half of the bag to bulge in the manner seen in Figure 2, the eyelets of the free bag-wall are then placed over the hooks and clamping of the grids follows, as outlined above.

While the grids 14 and 15 may be individually molded from suitable materials, it is to be noted that the main body portions of said grid elements include U-shaped bars 18 advantageously adapted for fabrication by bending-up suitably configured metal stock. Suitable apertures, which may be provided before or after bending accommodate forcible insertion of transversely extending rods 19, to frictionally retain the latter.

The above described mold 13 may be modified in accordance with the showing of Figure 6, by replacing grid 14 with a flat metal plate 14a. Thus, freezing time of the liquid may be minimized by placing the relatively flat surface presented by 14a in direct contact with an evaporator surface.

To freeze the contents of the bag, the apparatus may be placed in the freezer compartment of a refrigerator, or in any other suitable low temperature region. After freezing the contents of the bag, the grids are unlatched and removed from the bag by pivotally separating the opposing grid structures, and there remains a flexible bag 24 of ice masses ready for use, as best seen in Figure 7.

In the fully clamped condition as shown in Figure 5, substantial clearance is shown between opposed rods 19, and only enough space to accommodate the walls of the bag means 24 is provided between bars 18. However,

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any desired small spacing may be resorted to which will provide a relatively thin frangible web of ice between adjoining ice pieces. Thus is afforded ease of separation of the ice pieces, one from the other, while within the bag following removal of the grids. If practical tolerance values permit, it is possible to eliminate the webs between adjacent pieces.

A modified embodiment particularly adapted for fabrication from suitable plastics by injection molding techniques is shown in Figures 8 and 9. In this embodiment, ice mold means 33 comprises grid elements 34 and 35 hinged together, by means seen at 36. Hinging means 36 comprises axially aligned tubes 37 and 38 disposed at the lower end of grid elements 35 and a single tube 41 disposed at the lower end of grid element 34. A hinge pin 43 extends through the aforesaid tubes, the construction and arrangement being such that the grid assembly 34, including cross bars or rods 44 supporting side rails 46, is pivotally mounted and movable with respect to grid assembly 35.

A pair of resilient latches 47 is carried by grid assembly 35 and engages keeper means 48 carried by grid assembly 34. Hooks 49 carried by grid assembly 34 extend through eyelets (not shown) in bag means 50 and provide support for the latter. Sealing means for the bag 50 includes resilient bead 51, carried by grid assembly 34, which urges a flattened portion 50a of the bag, to seal the latter, into a groove 52 disposed in grid assembly 35. Bulging of the bag 50 into uniform pockets 50b is effected in the manner described in connection with the embodiment of Figures 2 to 5. However, unlike the embodiment shown in Figures 2 to 5, the seal in the present embodiment is effected just at or after full clamping and latching of the grid assemblies 34 and 35 against the bag 50.

Figures 10 and 11 illustrate another embodiment of the invention characterized somewhat by its simplicity and ease of fabrication. This embodiment comprises wire grids 54 and 55 hinged together at one end by loops 56 and 57 formed, respectively, in longitudinally extending wires of each grid, said loops engaging a common hinge pin 58. As best seen in Figure 11 latch means for holding the grids 54 and 55 against the bag means 59, to form pockets of liquid 60 (Figure 10), comprises wire loops or hooks 61 pivotally mounted upon wire 62 of grid 55 and releasably engageable with wire 63 of grid 54. Sealing of the bag is effected merely by clamping a folded portion 64 thereof between wires 62 and 63.

The operational showing of Figure 11 illustrates the manner in which wall portions of the charged bag are successively clamped. Charging of the bag of the present embodiment is best accomplished by filling to a level below the open end to compensate for raising of the liquid surface level by clamping. Also, it is to be noted that in order to ensure positive clamping of wire grids against bag 59, a permanent slight outward bow is given to the grids 54 and 55. It will be therefore appreciated that the grid elements of this embodiment may be fabricated from suitable heavy gage wire, using simple hand tools.

From the foregoing description it will be appreciated that among the more important advantages of this invention is the provision of a method for both forming and storing discrete ice pieces in the same pliant container means, wherein the pieces are shaped prior to freezing by easily removable shaping means applied to external portions of the container.

While the invention has been described with reference to several preferred embodiments thereof, it is to be understood that the disclosed apparatus is susceptible to various changes and modifications without departing from the essential spirit of the invention.

We claim:

1. In combination, pliant bag means for receiving a measured charge of liquid to be frozen, means for sealing

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said bag means, and grid means including a plurality of spaced rib portions movable into clamping engagement with said bag means when the latter is charged, the construction and arrangement being such that the means for sealing is actuated in response to such clamping engagement and liquid contained within the bag means forces walls of the latter between the rib portions thereby forming uniform pockets of liquid to be frozen.

2. In combination, flexible bag means for containing a charge of liquid to be frozen, and open grid means including a pair of rib-carrying portions interconnected by hinge means and movable into forcible engagement with opposite sides of said bag means when the latter is charged, the construction and arrangement being such that liquid contained within a bag means, in response to such engagement, forces walls of the latter between the rib portions thereby forming pockets of liquid to be frozen.

3. In combination, flexible bag means for receiving a measured charge of liquid to be frozen, means for sealing said bag means, and open grid means including a plurality of spaced rod-like portions and a flat plate movable toward said portions to clamp said bag means when the latter is charged, the construction and arrangement being such that clamping of the grid means actuates the seal and causes liquid contained within a bag to force walls of the latter between the rod-like portions thereby forming pockets of liquid to be frozen.

4. In the production of ice masses, the steps which comprise: bringing a pliant bag having an upwardly presented opening, and containing water to be frozen, into forcible contact with mold means, progressively from the bottom toward the top of the bag, to effect initial bulging of the bag into the mold means and overflow of excess water; sealing the opening of the bag; and continuing the aforesaid forcible contact to effect final bulging of the water-filled bag into the mold means to be confined therein; and freezing the water while so confined.

5. In the production of ice masses, the steps which comprise: disposing water in a flexible container having an opening; applying forces to the exterior of the container progressively toward the opening, to cause excess water to overflow the same; sealing the said opening; and applying additional forces to the exterior of the container to cause it to assume a configuration in which the water is confined in discrete pockets to be frozen.

6. Apparatus for forming masses of liquid to be frozen,

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said apparatus comprising: a pliant bag having an upwardly presented opening for containing liquid to be frozen; mold means forcibly engageable with said bag, progressively, from its bottom toward its top and means for sealing the bag, said means being carried by the mold means and clamping the bag in the region of its opening to seal the same.

7. Apparatus in accordance with claim 6 being further characterized in that said means for sealing clamps the bag just prior to full forcible engagement by the mold means thereby affording liquid pressure to bulge the bag into the mold means.

8. In combination, a pliant bag having an opening for receiving a charge of liquid to be frozen, mold means forcibly engageable with said bag, said mold means comprising a pair of grids hinged together along an edge thereof, and resilient means disposed along opposed free edges of said grids, the construction and arrangement being such that a charged bag engaged by said mold means is clamped between said grids and said resilient means clamps the opening of the bag to seal the latter, thereby affording positive liquid pressure to bulge the bag into the grid openings.

9. In combination, a pliant bag having an opening for receiving a charge of liquid to be frozen, mold means comprising a pair of grid elements hinged together along edge portions thereof, said grid elements being forcibly engageable with a liquid charged bag, each of said grid elements having free edge portions, the said free edge portion of one element being movable toward and away from the said free edge portion of the other element, the construction and arrangement being such that a charged bag engaged by said grid elements has a portion in the region of its opening clamped between said free edge portions, to seal the bag, thereby affording liquid pressure to bulge the bag into the grid openings.

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