

Dec. 20, 1960

L. A. STAEBLER

2,964,920

REFRIGERATION

Filed Jan. 10, 1958

2 Sheets-Sheet 1

FIG. 1.

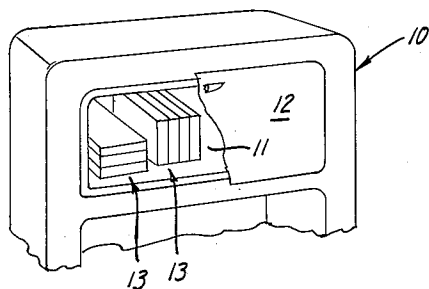


FIG. 4.

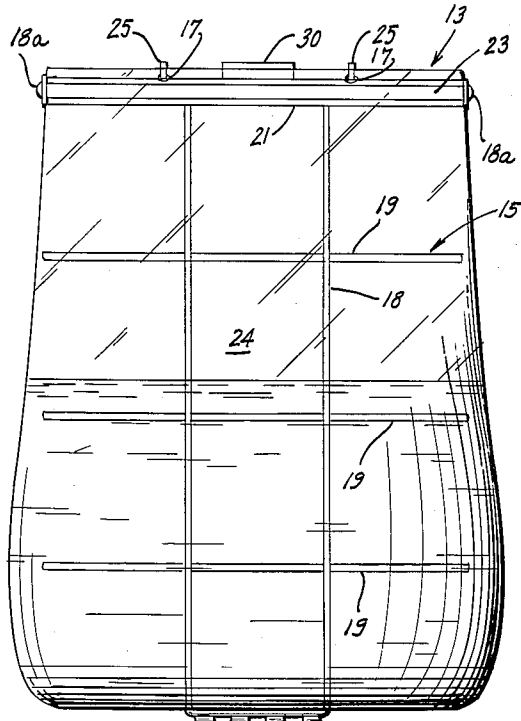
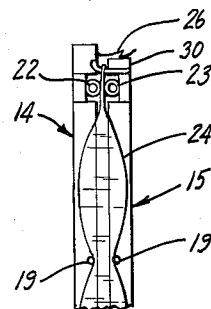


FIG. 2.

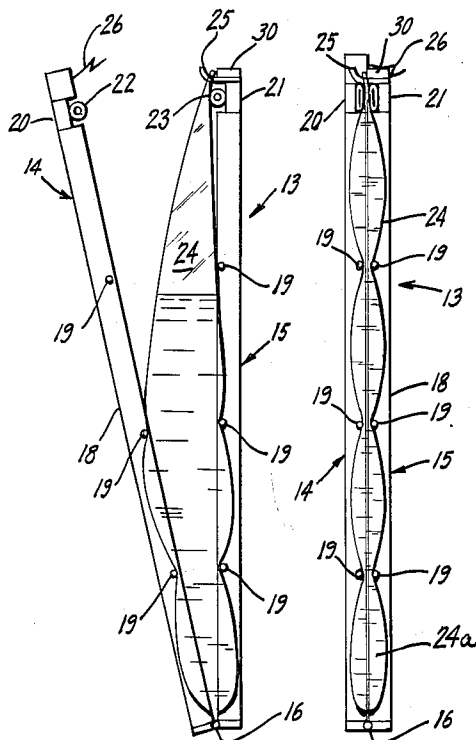


FIG. 3. FIG. 5.

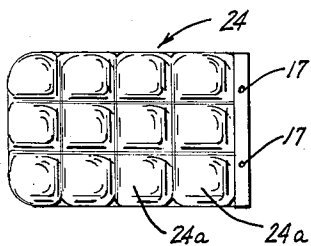


FIG. 7.

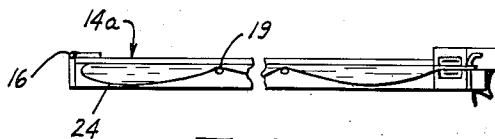


FIG. 6.

INVENTOR
LLOYD A. STAEBLER

BY *Carl H. Sprietwold*
AGENT

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L. A. STAEBLER

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2 Sheets-Sheet 2

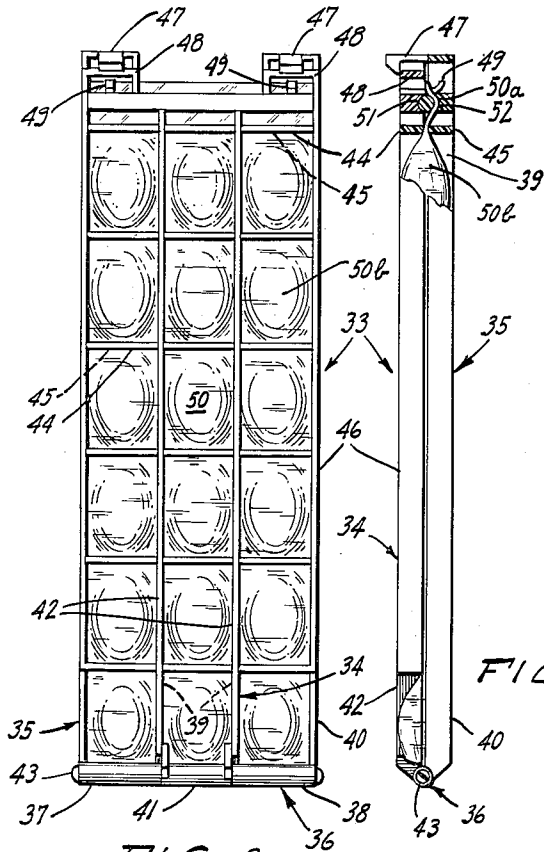


FIG. 8.

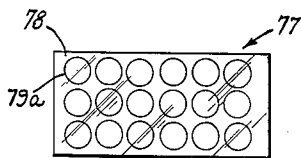


FIG. 12a

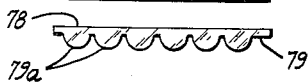


FIG. 12b

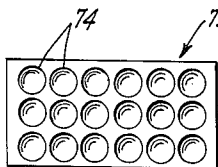


FIG. 12c

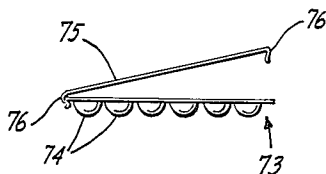


FIG. 12d

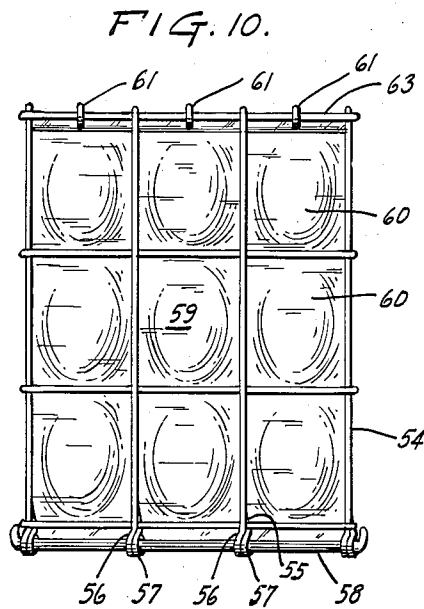


FIG. 10.

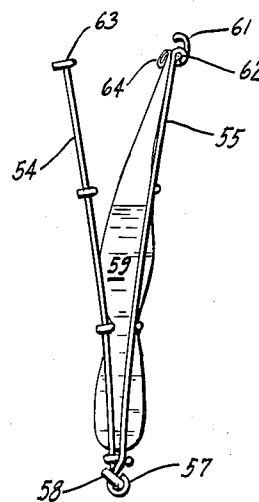


FIG. 11.

INVENTOR
LLOYD A. STAEBLER

BY *Carl H. Symon*
AGENT

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REFRIGERATION

Lloyd A. Staebler, Oreland, Pa., assignor to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

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8 Claims. (Cl. 62—60)

This invention relates to refrigeration and more particularly to a method of and apparatus for forming ice masses or pieces. While of broader applicability, the present invention has particular utility in the field of household refrigerators.

Heretofore in the manufacture of ice pieces, generally known as ice "cubes," open metal trays have been equipped with removable cube-forming grid structure, and in providing for removal of the ice cubes somewhat costly mechanisms have been resorted to for breaking the relatively strong bond between the ice cubes and the metal tray and grid structure. Also, in providing optimum storage space within a freezer compartment, it is often necessary to stack horizontally disposed ice trays atop one another, and inadvertent tilting of these unsealed trays often occurs, resulting in undesirable spillage of water onto the evaporator.

It is, therefore, a broad objective of this invention to provide method and means for producing and storing ice masses, whereby the aforementioned difficulties are overcome.

It is an additional object of this invention to provide a pliant sealed container 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.

An important feature of this invention resides in the provision of a sealed ice container providing sanitary manufacture of ice pieces while inhibiting penetration of odors into the ice.

In the achievement of the foregoing and other objectives, the apparatus of the invention in one aspect, comprises flexible or pliant bag means for holding liquid, for example water, to be frozen. In the method aspect, the 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.

Apparatus for carrying out the above described method comprises, preferably, an ice mold adapted for forcible engagement with a water charged bag means to cause the liquid to bulge the bag means into cavities formed in the mold, thereby providing distributed pockets of liquid to be frozen into ice pieces.

From another point of view, it is contemplated that the mold means may comprise grid structure forcibly engageable with external wall portions of a pliant water-charged bag to cause the latter to be bulged by the water into the grid openings. The water so contained is then frozen, followed by stripping the grid structure from the frozen bag of water and separating the individual ice masses while contained in the bag, for storage therein.

It is an additional feature of the invention that the sealed bag and mold may be placed in the freezer com-

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partment of a refrigerator, in any desired orientation, without spillage.

It is still another feature of the invention that, inasmuch as the mold does not become entrapped in the frozen ice, the same mold may be used during freezing of the contents of a succession of flexible containers.

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;

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

Figures 12a to 12d are elevational showings of still another modification of the invention and comprise, respectively, top and side views of frozen bag means and top and side views of an ice mold.

While the present disclosure is generic in nature, illustrating a number of embodiments contemplated by the invention, it is in order to point out that the embodiments illustrated in Figures 2 to 11 are claimed, as individual species, in the co-pending application of Elmer W. Zearfoss and Erhart E. Demand, filed January 28, 1958, bearing Serial No. 711,575, and assigned to the assignee of the present invention.

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 with initial reference to preferred arrangements claimed as species in said co-pending application—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 12d, 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 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 is 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 parallelly 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 showing of Figure 5 substantial clearance is shown between opposed rods 19, and only enough space to accommodate the walls of the bag means 24 is shown between bars 18. However, 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.

10 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 15 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. 30 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. 50

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.

In the embodiment shown in Figures 12a to 12d, the ice mold means includes mold tray 73, preferably of aluminum, having mold pockets 74 provided therein, and a flat cover 75 of substantially rigid material for the same. The cover is provided at each end with resilient means 76 that clamp the cover to the tray 73. A plastic bag 77 is shown after freezing and includes membranous wall portions 78 and 79, the latter portion being shown after freezing, and shaped into molded pockets 79a. 70

In practicing the invention with apparatus of this latter type, the bag is charged with liquid and the pockets 79a bulge downwardly into mold pockets 74, the cover 75 75 being clamped onto the tray and against the flat wall

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78 of the bag 77. In this embodiment, the bag walls in effect form an inner liner for the ice tray, or mold, said walls being non-adherent to the latter, thereby affording ice masses that are readily freed from the mold, while contained in the bag. Sealing of the bag may be accomplished by any of the means already described, or by suitable means provided as part of the bag structure itself.

Thus, in the embodiment shown in Figures 12a to 12d, the ice mold assembly comprising the clamped bag may be positioned in any desired orientation, without spilling its contents.

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.

I claim:

1. Freezing apparatus comprising flexible bag means for containing a charge of liquid to be frozen, and mold means including frame structure movable into forcible clamping engagement with the charged bag means and having a plurality of openings for receiving portions of said bag means when the latter is engaged, the arrangement being such that, in response to said forcible clamping engagement of the bag means by said frame structure, liquid is operative to bulge the bag means into said openings thereby forming pockets of liquid to be frozen.

2. In combination, flexible bag means for containing a charge of liquid to be frozen, and mold means including a plurality of spaced hollow portions, said mold means being movable into forcible clamping engagement with said bag means when the latter is charged, liquid contained within the bag means, in response to such engagement, being disposed to force walls of the latter into the hollow portions thereby forming pockets of liquid to be frozen.

3. In combination, flexible bag means for containing a charge of liquid to be frozen, mold means having pockets provided therein, and a flat sheet member movable relative to said mold means to overlie said pockets, liquid in the charged bag means when the latter is engaged by said mold means and flat member being effective to force walls of the bag means into the pockets of the mold means to form individual bodies of liquid to be frozen.

4. The method of producing and storing ice masses, which comprises: forcibly engaging a pliant bag or mem-

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brane, containing water to be frozen, by mold structure having a plurality of openings, thereby bulging the water filled bag into the openings; and freezing the water while so confined.

5. The method of producing and storing ice masses, which comprises: forcibly engaging a pliant bag, or membrane, containing water to be frozen, by mold structure having a plurality of openings, thereby bulging the water filled bag into the said openings; freezing the water while so confined; stripping the bag containing the frozen water from the mold structure; and separating the individual ice masses while contained in the bag for storage therein.

6. Apparatus for producing and storing ice masses, comprising: pliant container means for liquid to be frozen; and mold means, including a plurality of openings movable into forcible clamping engagement with external portions of said container means when the latter is charged with liquid to cause the liquid to bulge walls of the container into said openings, thereby forming discrete masses of liquid to be frozen.

7. Ice mold means comprising pliant container means for liquid to be frozen, and a mold, having a plurality of openings, movable into forcible clamping engagement with the liquid-filled container means to cause the liquid to bulge the container means into said openings thereby forming discrete masses of liquid to be frozen.

8. Apparatus for forming masses of congealed liquid, which comprises: means including pliant and resilient walls for containing liquid to be congealed; and mold means having a plurality of adjacent openings, said mold means being movable into clamping engagement with said containing means and, as a result of such engagement, being operative to cause the contained liquid to force portions of said pliant walls into said adjacent openings thereby forming pockets of liquid to be congealed, portions of said mold means engaging said containing means being so spaced from one another that bodies of liquid of relatively small cross-sectional area are disposed between said closely spaced portions of said mold, said bodies interconnecting the liquid contained in adjacent pockets, and upon congealing of the liquid, said bodies constituting readily frangible web sections bridging the congealed masses.

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