July 6, 1948. R. M. STORER 2,444,792

MOLDS FOR FREEZING LIQUIDS AND SEMI-LIQUIDS

Filed March 31, 1936 2 Sheets-Sheet 1

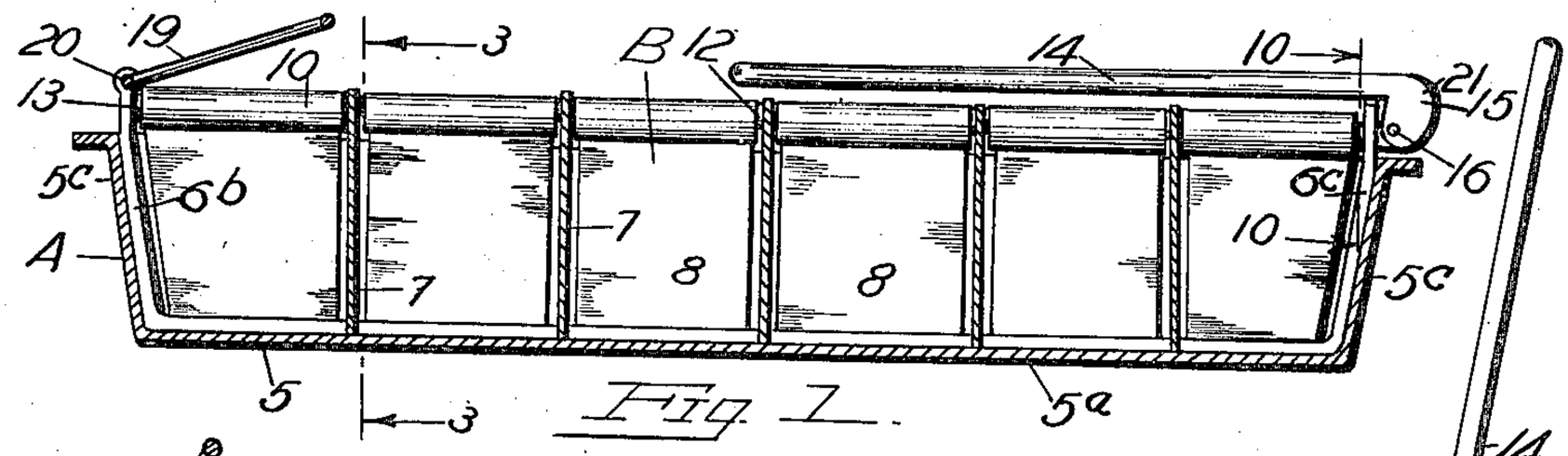

Fig. 1.

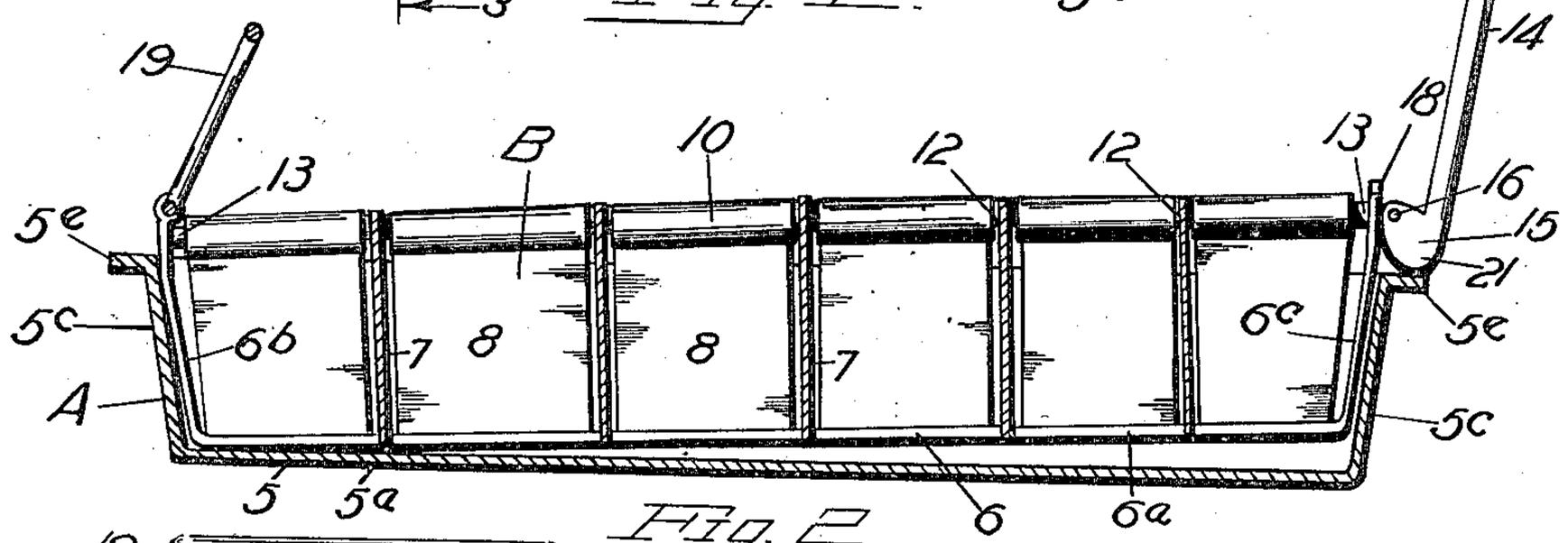

Fig. 2.

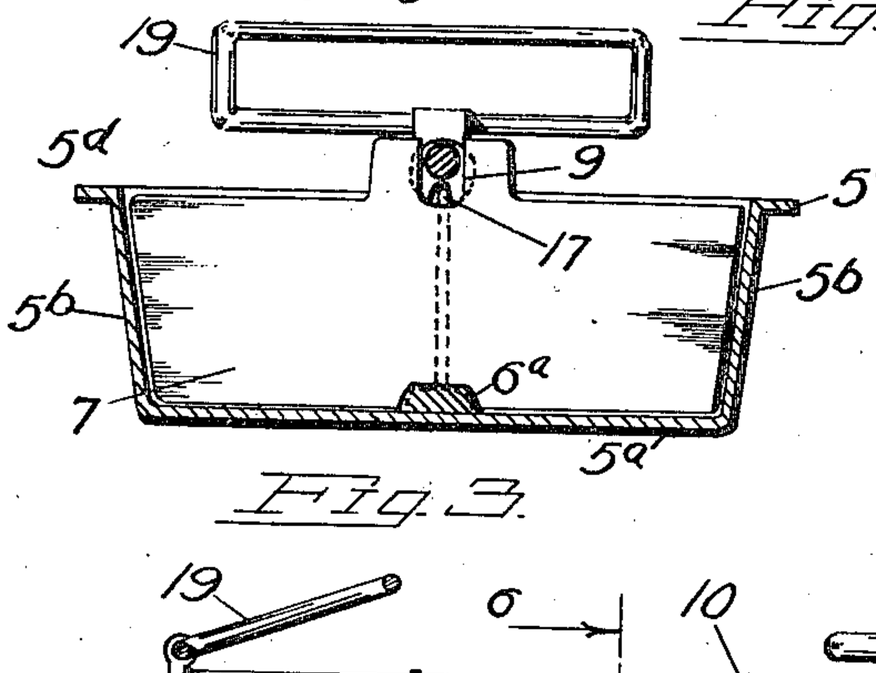

Fig. 3.

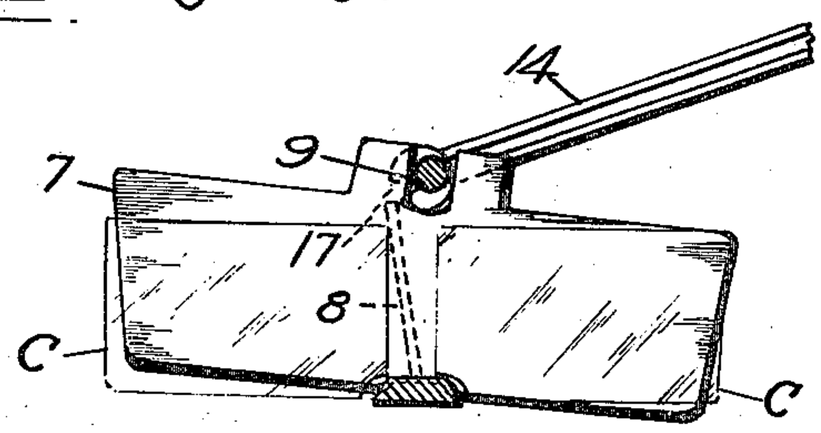

Fig. 4.

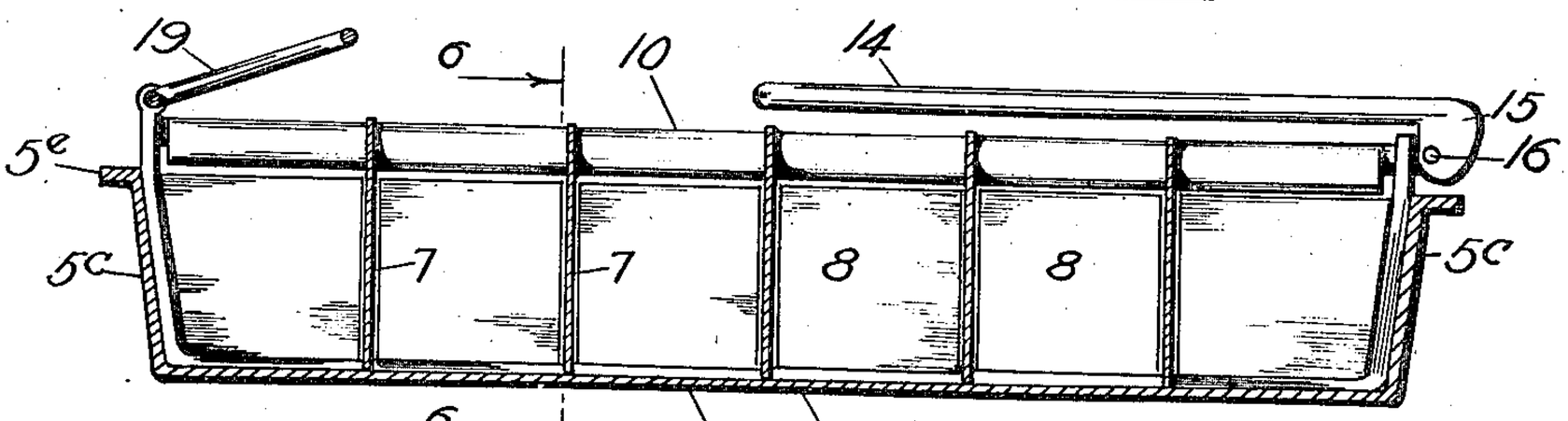

Fig. 5.

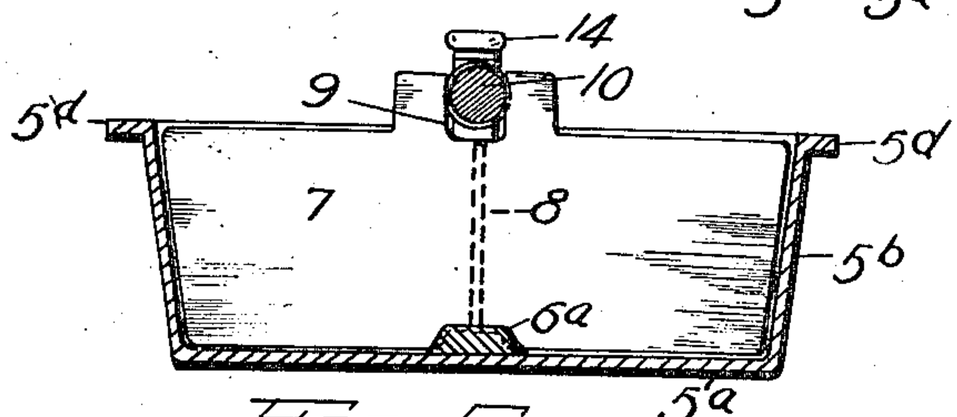

Fig. 6.

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MOLDS FOR FREEZING LIQUIDS AND SEMI-LIQUIDS

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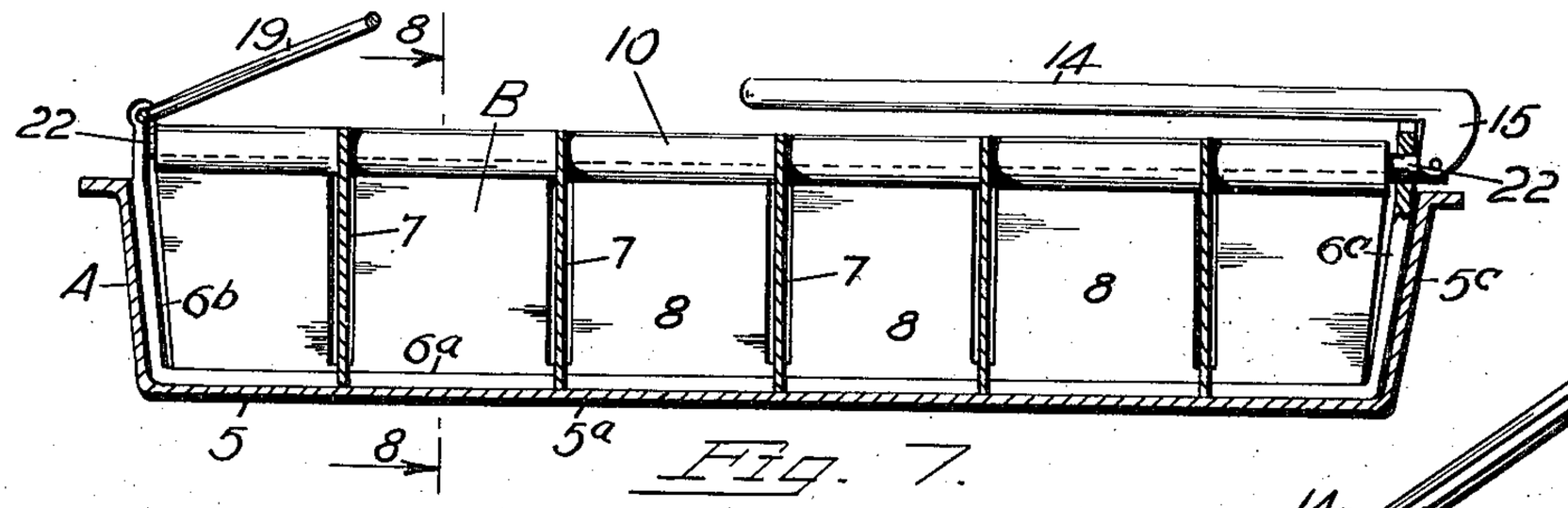


Fig. 7.

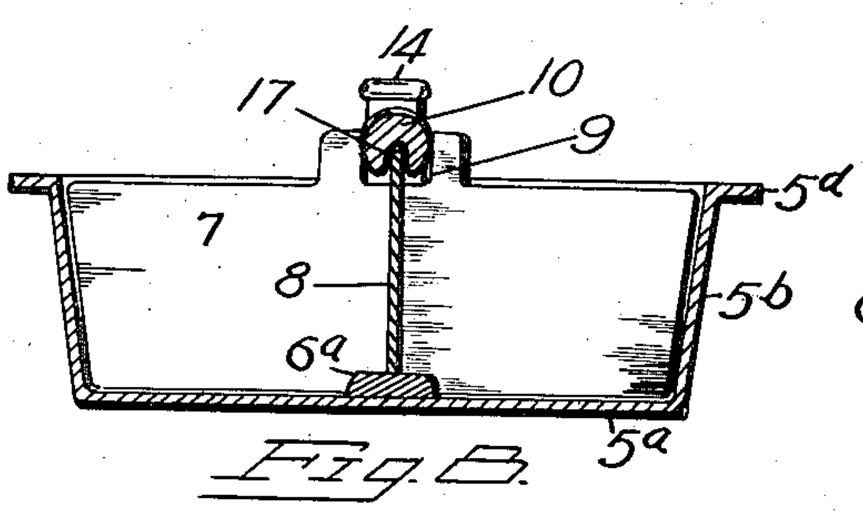


Fig. 8.

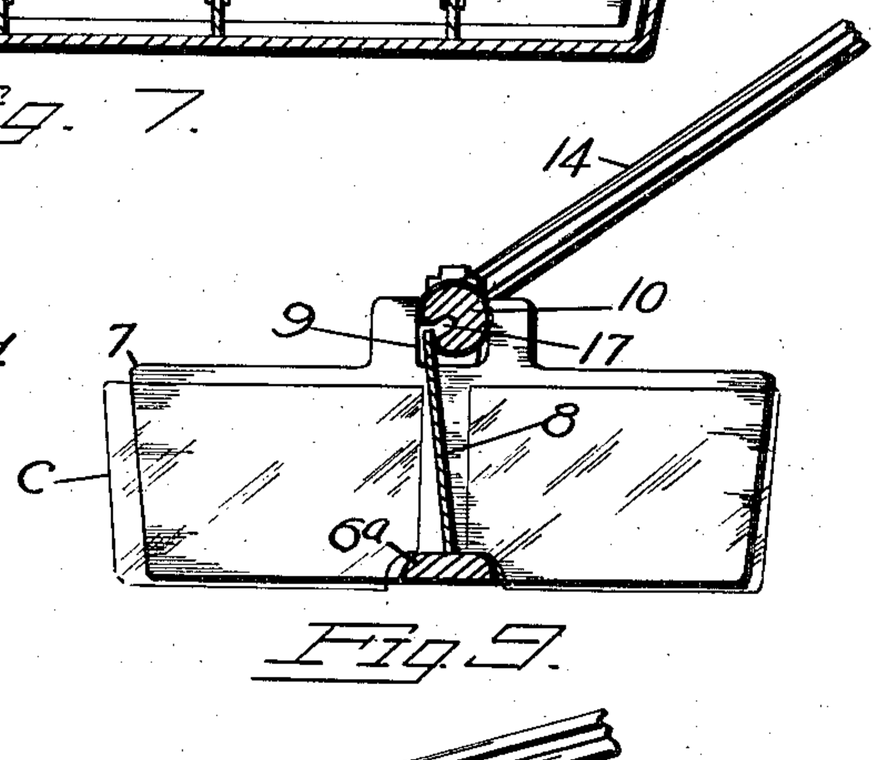


Fig. 9.

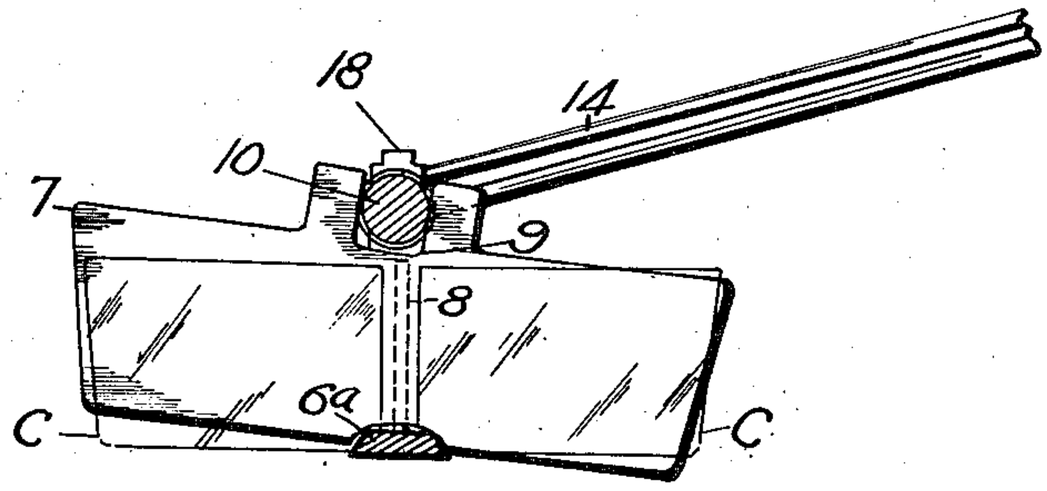
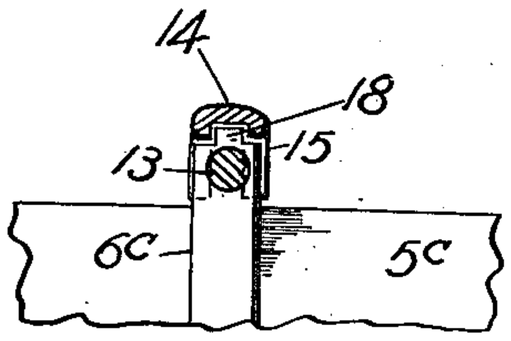


Fig. 6A.

Fig. 10.



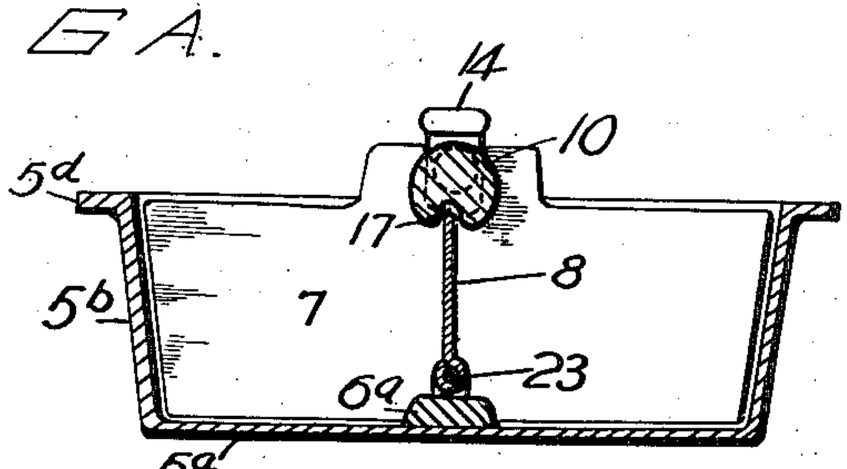


Fig. 11.

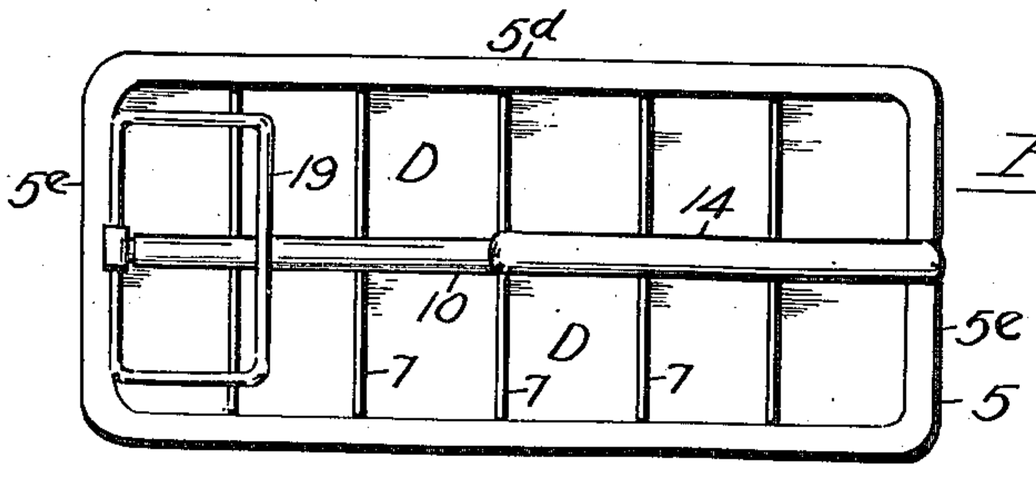


Fig. 12.

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Patented July 6, 1948 2,444,792

UNITED STATES PATENT OFFICE

2,444,792

MOLD FOR FREEZING LIQUIDS AND SEMILIQUIDS

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Application March 31, 1936, Serial No. 71,965

18 Claims. (Cl. 62—108.5)

1

This invention relates to improvements in molds or grid structures for freezing liquids and semi-liquids, of the character used in domestic and commercial refrigeration. More particularly, the invention relates to improvements in trays commonly employed in domestic refrigerators to freeze water or other liquids or semi-liquids, in a plurality of cells to provide small blocks or cubes of frozen matter which when separated from each other and from the tray in which they are formed, provide a convenient means for cooling beverages, preparing desserts, and other similar purposes.

It is an object of this invention to provide a simple, convenient and highly efficient method and mechanical means for liberating the ice-cubes from the molds in which they are formed, thereby obviating the use of warm water and other similar awkward and time-taking methods heretofore employed for the same purpose.

The structure hereinafter to be described with reference to the accompanying drawings, constitutes an improved variation of other contrivances of similar characteristics, such as that disclosed in my Patent No. 2,438,260 dated March 23, 1948.

In the drawings in the several views of which like parts are similarly designated,

Figure 1 represents a vertical, longitudinal section of a freezing tray of the type used in domestic refrigeration, inclusive of a mold constructed in accordance with the present invention;

Figure 2 is a similar section illustrative of the method of removing the mold from the tray;

Figure 3 is a transverse section taken on the line 3—3 of Figure 1; and

Figure 4 shows a transverse section of the mold-member per se, illustrating the operation of the invention in liberating the ice-cubes formed in the mold.

The invention as illustrated in Figures 1 to 4 inclusive, performs the operation of liberating the ice cubes by two cooperating forces acting upon the cubes at three sides thereof. Within the scope of the present invention, either one of these forces may be dispensed with, leaving the other force to singly perform the desired operation with satisfactory results.

In Figure 5 of the drawings, a sectional elevation similar to Figure 1, shows the tray and its mold in a form operative to liberate the ice cubes by one force only.

Figure 6 is a section along the line 6—6 of Figure 5;

Figure 6*a* is a transverse view of the mold-

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element of Figure 6, after its removal from the tray, illustrating the mode of operation in liberating the ice-blocks from the component parts thereof;

Figure 7 is a view similar to those of Figures 1 and 5 showing the liberating mechanism as intended to perform its function by the exercise of the second of the two forces above mentioned, exclusive of the other;

Figure 8 is a transverse section taken in the plane indicated by the line 8—8 of Figure 7;

Figure 9 is a similar section of the mold element of Figure 7 illustrative of its mode of operation;

Figure 10 is a fragmentary section on the line 10—10 of Figure 1, showing the method of locking the lever-member of the mechanism, against transverse displacement, when not in use;

Figure 11 is a transverse section of the construction shown in Figure 1 or 7, illustrating a modified form thereof; and

Figure 12 shows a top-view of the tray and the therein contained mold-element drawn to a reduced scale.

Referring further to the drawings, the reference character A designates the tray member of a freezing-unit of the type commonly used in domestic or commercial refrigeration, B denotes the grid structure or mold-element which normally is loosely fitted in the tray and in which the distinctive features of the present invention are embodied, and C designates in light lines, the ice-blocks formed in the tray, to be removed in the operation of the liberating mechanism of the grid or mold-element subsequent to its removal from the tray.

The tray element does not differ in construction from those in ordinary use. It comprises a shallow pan 5 having a flat bottom-member 5*a* and flaring side-members 5*b* and end-members 5*c* terminating at their upper edges in outwardly projecting flanges 5*d* and 5*e*.

The grid structure or mold-element consists of a longitudinal base- or carrier-member 6 upon which the cell-forming parts and the cube liberating mechanism, comprised in the invention, are assembled. The base-member is of substantially U-shaped form comprising a narrow longitudinal part 6*a*, and therewith integrally formed upright end-parts 6*b* and 6*c*.

The cells or compartments in which the ice-blocks or cubes are frozen, are formed by a plurality of transverse partitions 7 equidistantly spaced from each other to form the side-walls of the compartments, and a series of longitudi-

nally alined partitions 8 fixed at their lower edges to the longitudinal member 6*a* of the base element, to extend vertically, intermediate of the ends of the transverse partitions 7 to form the end-walls of the compartments indicated at D in Figure 12. Thus when the mold-element is in place in the tray-element, the latter is divided into two series of cells or compartments D at opposite sides of a central longitudinal plane.

The transverse partitions have at their upper edges, central slots 9, the edges of which are engaged by cams 12 formed by the bottom-surfaces of peripheral grooves of a cam shaft 10. The parallel side portions of the slots 9 of the partitions, extend loosely in the grooves of the camshaft, to guide the partitions during their movement by rotation of the shaft. The shaft 10 is by means of trunnions 13 at its ends, rotatably mounted in suitable bearings at the upper ends of the upright members 6*c* and 6*b* of the base-element 6, the trunnions being eccentric to the cams 12. The trunnion at one end of the shaft projects beyond the respective bearing for the application of an operating lever 14, which preferably is made in channel shape and terminates in ears 15 which straddle the end-portion of the trunnion and are pivotally connected therewith by means of a pin 16.

The cam shaft 10 furthermore has a longitudinal groove 17 to receive the upper edges of the alined longitudinal partitions 8 forming the end-walls of the cells at opposite sides thereof.

The partitions fit loosely in the groove 17 of the shaft, so that when the latter is rotated, the partitions may follow its rotary movement through a limited arc.

At the extremity of the upwardly extending member 6*c* of the base-element at which the lever 14 is pivotally connected therewith, is an upwardly ranging lug 18, which when the lever is in its normal position of rest in substantially parallel relation to the shaft 10, projects into the channel of the lever thereby holding the latter against lateral displacement. The lug 18, retains the lever 14 in place thus holding all parts of the grid assembly in their normal freezing position. When the lever 14 is raised, it is released from its retained position and is free to operate the movable grid members to impart ice-dislodging movement thereto.

At the upper end of the opposite upwardly extending end-portion of the base-member is a bail-like handle 19 pivoted as at 20 and functioning in the operation as a convenient means for holding the mold-element while by movement of the lever, the ice-blocks are removed therefrom.

Having thus described the construction of the device as it is shown in Figure 1 and 2 of the drawings, its operation will be readily apparent.

The tray carrying the mold as shown in Figure 1, is filled with the liquid or semi-liquid to be frozen, and placed within the refrigerator.

The mold-element, as constructed, forms a grid having two series of cells D at opposite sides of its longitudinal axis, which divide the substance to be frozen so that in the solidified conditions thereof, it will present a number of separated blocks or cubes indicated at C in the drawings. The expansion to which the liquid substance is subjected during the freezing process, causes these blocks or cubes to firmly adhere to the walls of the cells or compartments D with the result that when the mold or grid is subsequently removed from the tray, the ice-blocks remain in place therein. The method of liberating the

blocks in accordance with the present invention is as follows.

Initially the grid with the frozen ice-blocks in place, is lifted from the tray by moving the lever 14 upwardly in a vertical plane. At the extremity of the lever, adjacent its pivot, is a cam-member 21, which during the rotary movement of the lever, bears against the adjacent flange 5*e* of the tray, thereby exerting a leverage which causes the mold or grid to move upwardly as shown in Figure 2. The ice-blocks in the cells of the mold are thus forcibly freed from the bottom of the tray, and the mold with the blocks in place, is readily removed from the tray by the use of the lever and the handle at opposite ends thereof.

The mold is subsequently placed upon a flat surface and while holding the mold in place by means of the handle, the lever raised to a substantially vertical position or at right angles to the cam shaft, is now moved through a limited arc in a plane at right angles to the axis of the shaft alternately in opposite directions.

The consequent rotation of the cam shaft causes the alined partitions 8, which are made of a suitable flexible material, to be bent laterally and alternately in opposite directions about their connections with the body part of the base-element, by reason of their pivotal connections with the shaft through the medium of the longitudinal groove or slot 17 thereof.

By virtue of these lateral movements of the partitions, a thrust upon the ice-blocks within the respective cells or compartments of the grid, is effected with the result that the blocks not only are liberated from the end-walls of the cells but at the same time are forced toward the open ends of the same.

Owing to the eccentric movement of the shaft about its trunnions, the normally floating transverse partitions 7 are caused to tilt in their planes as clearly shown in Figure 4 of the drawings, first in one direction and then in the other. This movement of the transverse partitions separates them from the ice-blocks in the respective cells, with the result that the blocks are entirely freed from the walls between which they were formed, and the mold can be removed leaving the blocks separately in place on the surface upon which the mold was placed, ready for immediate use.

It will thus be observed that the operation of the lever produces two forces, one of which separates the end walls of the cells from the ice-blocks and thrusts the latter outwardly toward the open ends of the cells, while the other breaks the coherence between the blocks and the side-walls of the cells.

While this result is effectively obtained by moving the lever alternately in opposite directions, movement of the same in one direction only will under favorable conditions, produce a similar result by liberating the ice-blocks simultaneously in both series of cells at opposite sides of the longitudinally alined central partitions.

Furthermore, while the two forces produced in the operation of the device cooperatively cause the ice-blocks to be quickly and completely liberated from the walls of their cells, a similar and satisfactory result may be produced under favorable conditions by either force per se, independent of the other force.

Thus in Figure 5 of the drawings, the connection of the alined partitions 8 with the shaft through the intermediary of its longitudinal groove 17 are eliminated and the operation of liberating the ice-cubes is effected by the here-

inabove described tilting movements of the transverse partitions 7 alone.

The shaft 10 is peripherally grooved merely for the purpose of bracing the transverse partitions 7, when the eccentric cams are omitted.

In Figs. 7, 8 and 9 of the drawings the shaft 10 is shown as being longitudinally grooved to receive the upper edge-portions of the longitudinal partitions 8, in consequence of which the latter will be moved laterally as disclosed in Fig. 9 of the drawings while the transverse partitions 7 remain at rest in their original positions. In this form of the invention, the ice-blocks are liberated by movement of the end-walls of the cells alone and independent of any movement of the side-walls of the same. The ice-blocks on the left side of the grid are released when the lever is moved to the right, and those on the right side are moved when the lever is moved to the left.

The alined partitions 8 forming the end-walls of the cells are in the forms hereinbefore explained, connected at their lower edges with the body-member 6*a* of the carrier or base-element 6, by means of welding, soldering or other similar means. The connections may also be made by the use of hinge-pins as shown at 23 in Figure 11 of the drawings.

Other modifications and variations in the form, construction and relative arrangement of the elements and parts comprised in the device as herein described, may be resorted to without departing from the scope and spirit of the invention as defined in the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. In a device of the character described, a mold-element comprising an end-wall member and movable side-wall members, providing a freezing-cell open at one end, and leverage mechanism for effecting a positive tilting movement of the side-wall members independent of the end-wall member, to disrupt their cohesion with ice-blocks in the freezing cell.

2. In a device of the character described, a mold-element comprising longitudinally extending end-wall members, and movable side-wall members, transverse thereto, to provide a series of freezing-cells, and leverage mechanism for simultaneously effecting tilting movements of the side-wall members independent of the end-wall members, to disrupt their cohesion with ice-blocks in the freezing cells.

3. In a device of the character described, a mold-element comprising longitudinally extending end-wall members, and movable side-wall members, transverse thereto, to provide a series of freezing-cells, and a rotary shaft having cam-members acting upon the side-wall members to effect a substantially angular movement thereof.

4. In a device of the character described, a mold-element comprising pivotally movable end-wall members and angularly movable side-wall members to provide a series of freezing-cells, and mechanism to effect simultaneous movements of the walls of the cells whereby to liberate ice-blocks in the cells.

5. In a device of the character described, a mold-element comprising single thickness end-wall members pivotally supported at their lower ends, and side-wall members to provide a series of freezing-cells, and mechanism to effect a pivotal movement of the end-wall members whereby to liberate ice-blocks in the cells.

6. In a device of the character described, a mold-element comprising end-wall members pivotally supported at their lower ends, and side-wall members to provide a series of freezing-cells, and a rotary shaft having a longitudinal groove containing upper end-portions of the end-wall members whereby to effect a pivotal movement thereof.

7. In a device of the character described, a mold-element comprising end-wall members pivoted at their lower ends, and therewith intersecting transverse side-wall members, to provide series of freezing cells at opposite sides of the end-wall members, and mechanism to effect a pivotal movement of the end-wall members in opposite directions whereby to disrupt their cohesion with ice-blocks in the cells.

8. In a device of the character described, a mold-element comprising transverse movable side-wall members, and an end-wall member intermediate the ends thereof to provide two opposite freezing cells, the end-wall member consisting of a single plate movably supported, and mechanism to effect a movement of the end-wall member to liberate ice-blocks in the cells.

9. In a device of the character described, a mold-element comprising transverse side-wall members, and an end-wall member intermediate the ends thereof to provide two opposite freezing cells, the end-wall member consisting of a single plate pivotally supported at its lower end, and mechanism acting upon the upper end of the plate to effect a pivotal movement thereof whereby to liberate ice-blocks in the cells.

10. In a device of the character described, a mold element comprising an end wall member and movable side wall members, providing a freezing cell open at one end, and leverage mechanism for effecting a movement of the side wall members independently of the end wall member in substantially a vertical plane to disrupt their cohesion with ice blocks in the freezing cell.

11. In a device of the character disclosed, a freezing tray, a grid assembly comprising a longitudinal wall member, and independently movable transverse wall members extending to either side thereof and cooperating therewith, to provide freezing cells in the tray, and leverage mechanism for raising the grid from the tray and operatively engaging the transverse wall members for imparting ice-dislodging movement to the transverse wall members relative to the longitudinal wall.

12. A metallic unitary grid structure for disposition in a freezing tray and removable therefrom as a unit, said grid structure including a longitudinal partition wall and a plurality of separate cross walls spaced lengthwise along said longitudinal wall, said cross walls being movably mounted upon and interlocked with the longitudinal wall and extending continuously in a straightline plane on both sides of said longitudinal wall through the plane of said longitudinal wall, said cross walls and said longitudinal wall cooperating with each other to form a plurality of ice block compartments on opposite sides of said longitudinal wall, said mounting of the cross walls on said longitudinal wall permitting angular movement of said cross walls relative to the longitudinal wall within the plane of said longitudinal wall, and means carried by the grid structure for so moving the cross walls.

13. A metallic grid structure for disposition in a freezing tray and removable therefrom as a unit, said grid structure comprising a longitudinal wall structure and a plurality of separate cross

walls extending through the plane of said longitudinal wall on both sides thereof to form rows of ice block compartments on opposite sides of said longitudinal wall structure, said cross walls being carried by and interlocked with said longitudinal wall structure, and means for removing all or less than all of the ice blocks from the grid structure, said last-named means moving a wall of each ice block compartment relative to the remaining walls of each compartment.

14. In a tray of the character described, a grid removably disposed therein for dividing the tray into a plurality of freezing cells, said grid including an upright longitudinal partition and a plurality of upright cross members spaced at intervals along said longitudinal partition on both sides thereof and movable angularly about the same, a manually-actuated element carried by the grid and disposed to impart said angular movement to the cross members to break the bond between the grid and tray, and means for mechanically raising said grid from the tray.

15. A grid adapted to be disposed within a freezing tray for dividing the interior thereof into a plurality of ice block compartments open at their tops and bottoms, said grid comprising a longitudinal partition and a plurality of separate upright single thickness transverse partitions disposed in spaced apart relation along the length of said longitudinal partition, said partitions being movably interlocked together to form a removable unitary grid structure, said longitudinal partition consisting of a single thickness member forming a common end wall for compartments on opposite sides thereof, said transverse partitions each forming a common side wall for compartments on opposite sides thereof, mechanism for moving certain of said common compartment walls relative to certain other of said walls in said unitary structure, and said mechanism forming a part of said grid structure and being carried thereby.

16. A grid adapted to be disposed within a freezing tray for dividing the interior thereof into a plurality of ice block compartments, said grid comprising a longitudinal wall member and independently movable transverse wall members extending to either side of said longitudinal wall member and interlocked therewith to form a permanent unitarily removable grid structure, and mechanism operatively engaging said transverse wall members for moving same relative to said longitudinal wall member to break a bond between said transverse wall members and ice blocks adhering thereto.

17. A grid adapted to be disposed in a freezing tray for dividing the interior thereof into a plurality of ice block compartments, said grid comprising a longitudinal wall having a series of cross wall receiving openings therein spaced apart along its length, a single thickness cross wall in each of said openings extending to opposite sides of said longitudinal wall to form a removable unitary grid structure, and each of said cross walls having an upper portion engageable for tilting the same to facilitate the removal of ice blocks from said grid structure.

18. A grid for partitioning the interior of a tray into rows of ice block compartments comprising, a longitudinal member and a plurality of spaced apart rigid walls carried by and extending laterally from said longitudinal member to form a unitary removable grid structure, said longitudinal member having a part thereof divided longitudinally to provide a movable partition intermediate each of the spaced apart rigid walls, means on said grid structure for engaging and moving said partitions in an arcuate path laterally between said rigid walls, and said means being rotatable in one direction relative to said grid for swinging said partitions toward a longitudinal side of said grid structure and being rotatable in another direction relative to said grid for swinging said partitions toward the opposite longitudinal side of said grid structure.

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