Nov. 23, 1937. E. L. HORLACHER 2,100,288

REFRIGERATING APPARATUS

Filed June 27, 1936

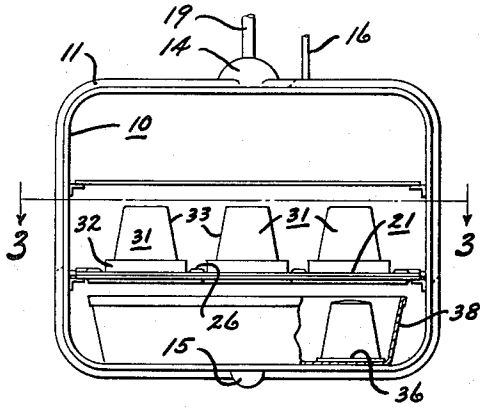


Fig. 2

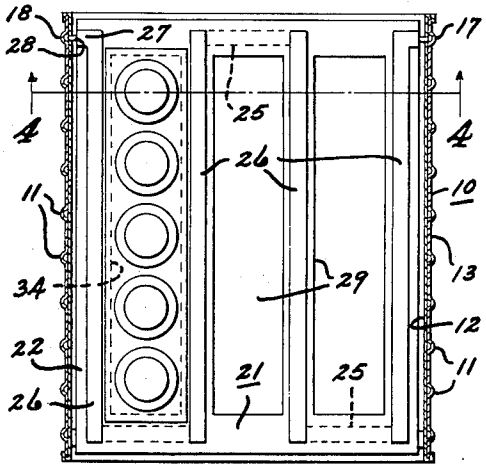


Fig. 3

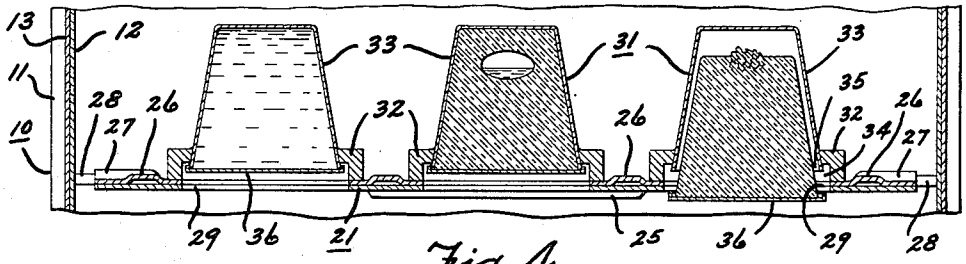


Fig. 4

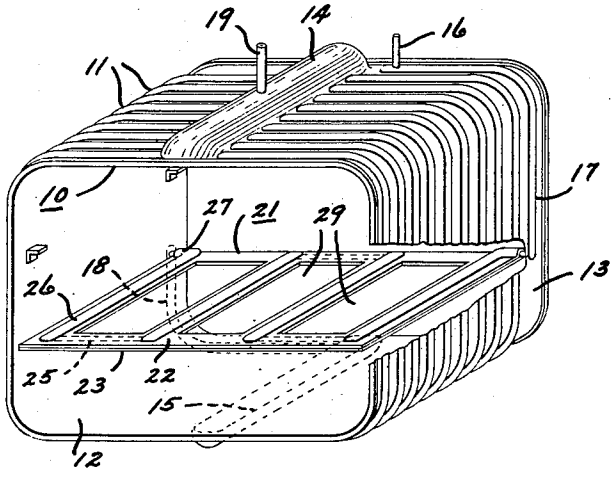


Fig. 1

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REFRIGERATING APPARATUS

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11 Claims. (Cl. 62—108.5)

This invention relates to refrigeration and particularly to a refrigerating apparatus adapted for household use having means for freezing water placed in molds into ice blocks.

One of the objects of the present invention is to provide improved means and method for releasing ice blocks from trays or molds in which they are frozen.

Another object of the invention is to utilize the force created by expansion of a body of water sealed within a container or mold during freezing thereof in the molds to release the frozen liquid therefrom.

A further object of the invention is to seal a body of liquid within a mold by placing a cover or lid on the open end of the mold and to utilize pressure created in the mold by freezing and expansion of its liquid content to move the cover away from the mold and to break the bond between the frozen liquid and the walls of the mold.

A still further and more specific object of the invention is to carry out the foregoing objects in a mold which is disposed in an inverted position while being subjected to cooling so that the weight of ice within the mold aids in the removal thereof therefrom and so that ice blocks can be removed from their molds automatically to thus be readily harvested from a refrigerator cabinet.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a perspective view of an evaporator of a refrigerating system;

Fig. 2 is a front view of the evaporator disclosed in Fig. 1 and showing molds or trays constructed according to the present invention positioned therein;

Fig. 3 is a sectional view of the evaporator shown in Figs. 1 and 2 and is taken on the line 3—3 of Fig. 2; and

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 3 showing certain molds filled with liquid and showing an ice block being released from a mold.

Referring to the drawing, for illustrating the present invention, I have shown in Fig. 1 thereof a cooling element or evaporator generally represented by the reference character 10 and adapted to be connected in a closed refrigerating system (not shown). The evaporator 10 is of the sheet metal type and forms walls of a sharp freezing chamber. The walls of the evaporator have a plurality of refrigerant passages or ducts 11 formed therein between superimposed and secured together sheet metal portions 12 and 13. The passages 11 communicate with an upper header 14 and a lower header 15 both formed in the outer sheet metal portion 13 of the evaporator 10. A liquid refrigerant inlet connection 16 communicates with the passage 17 which extends across the top and downwardly along a side wall of the evaporator and terminates short of the evaporator bottom wall for a purpose to be presently described. The passage 18 communicates with header 15 and extends across the evaporator bottom wall and part way up the side wall thereof opposite the side wall in which passage 17 is formed. A gaseous refrigerant outlet connection 19 communicates with the upper header 14. A refrigerated shelf 21 formed of superimposed and secured together sheet metal portions 22 and 23 is horizontally disposed between the top and bottom walls of the evaporator 10. This shelf 21 is preferably mounted within the freezing chamber in spaced relation to the side walls of evaporator 10 in any suitable and well-known manner. Shelf 21 is adapted to support trays or rack devices containing a liquid to be frozen. The upper sheet metal member 22 of shelf 21 has three short corrugations 25 formed therein and the lower sheet metal member 23 of the shelf has four relatively long spaced apart corrugations 26 formed therein and extending longitudinally with the freezing chamber. These corrugations 25 and 26 communicate with one another to form a refrigerant passage between the members 22 and 23 of shelf 21. A short corrugated part 27 formed in member 22 extends outwardly from one end of each of the side corrugations 26 and each receives a pipe 28. The one pipe 28 communicates with the passage 18 on the one side of evaporator 10 and the other pipe 28 communicates with the passage 17 on the other side of the evaporator. Thus a series flow conduit is provided between the refrigerant inlet connection 16 and header 15 through the shelf 21. Obviously liquid refrigerant entering the passages 11 of evaporator 10 is directed through passage 17 from the inlet connection 16 thence through pipe 28 and through the passage within shelf 21, formed by the corrugations 25, 26, and 27, to passage 18 and header 15. Header 15 distributes the incoming refrigerant to the plurality of passages 11 and vaporized refrigerant is withdrawn from the passages 11 and header

14 through the pipe 19. The cold incoming refrigerant to evaporator 10 is thereby first circulated through the shelf 21 to cause rapid freezing of the contents of trays or mold devices adapted to be supported upon the shelf.

It will be noted that the refrigerated shelf 21 is provided with a plurality of openings 29 and these openings are for a purpose to be presently described. The openings 29 are rectangular in form and extend longitudinally with the freezing chamber adjacent the refrigerant passages formed by the corrugations 26. A plurality of trays or racks generally represented by the reference character 31 are adapted to be placed upon the shelf 21 over the openings 29 provided therein. Each tray or rack 31 comprises a thick metallic portion 32 which has a plurality of metal cups or molds 33 soldered or welded thereto. The thick portion 32 of tray or rack 31 is hollowed out as at 34 so as to position the open bottom end 35 of cups or molds 33 above the bottom edge of portion 32 as disclosed in the drawing to thereby permit the tray or rack device 31 to be moved into or out of the freezing chamber by sliding same along the shelf 21. The shelf 21, rack portion 32 and cups 33 are all preferably constructed of a metal of high heat conductivity so as to permit rapid conduction of heat from the liquid to be frozen to the refrigerant in the evaporator. In the present showing the cups 33 are cylindrical in cross-section and the compartment formed thereby tapers outwardly toward their open bottom ends 35. The open ends 35 of cups 33 are adapted to be closed by metal lids or covers 36 in a manner and for a purpose to be presently described.

The trays or rack devices 31 are adapted to be held in an upright position so that water may be inserted into the cups or molds 33. After all the cups or molds 33 of one rack device have been filled with water the covers or lids 36 are placed over the open ends of the cups to close the liquid within the same. Before proceeding further with the description it is to be understood that the edges of the open ended cups 33 are true and devoid of variations in a horizontal plane. The lids or covers 36 are likewise flat and true so as to fit snugly against the edges of the open ends of the cups. The true fit of lids or covers 26 upon the edges of the cups 33 thereby seal the open ends thereof to confine the liquid within the cups. The rack device 31, after having placed the lids 36 upon the cups 33, is inverted and the close fit of lids 36 with cups 33 provides a fit which is air-tight. Since the interior of the cups is filled with water no air tends to enter the cups and since no air can enter the cups the body of liquid is trapped therein and will not flow therefrom. Thus the lids or covers 36 are tightly held upon the cups 33 to close their open ends when the rack is inverted to thereby prevent the flow of liquid from the cups. The racks 31 with their sealed cups 33 are placed in an inverted position within the freezing chamber formed by the evaporator and supported upon the refrigerated shelf support 21. The longitudinal corrugations 26 in the top sheet metal plate 22 of shelf 21 form tracks for guiding the rack devices 31 upon shelf 21 and space the devices 31 apart as shown in Figs. 2 and 4 of the drawing. While the rack devices 31 are positioned on shelf 21 refrigerant flowing through the refrigerant passage formed by corrugations 25 and 26 withdraws heat from the rack device 31 and from the liquid content of cups or molds 33 to cause freezing of the liquid within the molds.

Referring now to Fig. 4 of the drawing it will be noted that the cup or mold 33 of the one rack device 31 is shown as being filled with water, that the liquid content of cup 33 of the central rack device 31 is shown as being partially frozen and having a pocket formed in the ice near the permanently closed end of the cup or mold 33 and that the ice block in the cup or mold 33 of the end rack device 31 has been completely frozen to cause removal of the ice block from its mold. It is to be understood that ice forms within the cups or molds 33 continuously around their inner wall surfaces in a direction inwardly of the walls and upwardly of the cover or lid 36, and since a central part of the ice block within the molds near or adjacent the permanently closed end of the molds is the last point to freeze, due to its rather remote position from the heat removing means, a pocket similar to that shown in the mold of the center rack device 31 of Fig. 4 is formed. As the liquid and slush ice within this pocket freezes solid it causes, due to expansion thereof, the wall of ice above the pocket and adjacent the permanently closed end of mold 33 to burst. The expansion or deformation of the wall of ice above the pocket causes the ice to apply force to the permanently closed end of the cup or mold 33 and this force breaks the bond between the ice block and its mold and causes movement of the ice block relative to walls of the mold to thus move the lid or cover 36 away from the cup 33. If expansion of the ice within mold 33 against its permanently closed end tends to bulge the closed end outwardly this will increase the pressure applied upon the ice block and the closed end of the mold 33 will then aid in the removal of the block of ice from the mold. It is to be understood that the bursting or fracture of the ice wall above the pocket within the block of ice and movement of the ice block occur substantially simultaneously. The pressure created within the sealed mold by complete freezing of liquid trapped therein breaks the bond between the ice block and walls of the mold 33 and moves the ice block together with the lid or cover 36 relative to the mold. The weight of the ice block permits same to fall by gravity ino a pan or receptacle 38 disposed within the freezing chamber formed by the evaporator 10 and supported upon the bottom wall of the evaporator as disclosed in Fig. 2 of the drawing. The ice blocks may be stored within the pan or receptacle 38 until desired for use in cooling drinks or the like. The lid or cover 36 will be released from an ice block by heat absorbed from the hands of the operator during handling of the block.

From the foregoing it will be seen that I have provided an improved apparatus for and method of releasing ice blocks from molds within a mechanically refrigerated cabinet particularly of the household type. My invention provides an apparatus from which the ice blocks will be released automatically and without attention. My improved apparatus provides for the removal of one or a plurality of ice blocks as desired from an evaporator of a refrigerating system without the necessity of actuating mechanically operated or the like devices as has heretofore been the practice.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms

might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating apparatus comprising in combination, a cooling element, a support on said cooling element, a device supported on said support and provided with a mold having an open bottom and adapted to contain a liquid to be frozen, means for closing the open bottom of said mold to seal a liquid therein, said support having an opening beneath the bottom of said mold, said closure means being movable relative to said mold through the opening in said support, and the liquid within said mold upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said support.

2. A refrigerating apparatus comprising in combination, a cooling element, a support on said cooling element, a device supported on said support and provided with a mold having an open bottom and adapted to contain a liquid to be frozen, means for closing the open bottom of said mold to seal a liquid therein, said support having an opening beneath the bottom of said mold, said closure means being movable relative to said mold through the opening in said support, the liquid within said mold upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said support, and means for catching and supporting the frozen block.

3. A refrigerating apparatus comprising in combination, a cooling element, a support on said cooling element, a device supported on said support and provided with a mold having an open bottom and adapted to contain a liquid to be frozen, means for closing the open bottom of said mold to seal a liquid therein, said support having an opening beneath the bottom of said mold, said closure means being movable relative to said mold through the opening in said support, the liquid within said mold upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said support, and means carried by said cooling element for catching and supporting the frozen blocks.

4. A refrigerating apparatus comprising in combination, a cooling element, a support on said cooling element, a device supported on said support and provided with a plurality of mold members each having open bottoms and adapted to contain a liquid to be frozen, means for closing the open bottoms of said mold members to seal a liquid therein, said support having an opening beneath the bottoms of said mold members, said closure means being movable relative to said mold members through the opening in said support, the liquid within said mold members upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said support, and means carried by said cooling element for catching and storing the frozen blocks in thermal contact with said cooling element.

5. The method of freezing which consists in, filling a mold having a permanently closed end and an open end with a liquid adapted to expand upon freezing, placing a cover over the open end of said mold and inverting the mold to thereby cause the cover to confine the liquid within the mold, freezing the liquid within the mold and applying the expansive force of freezing to the permanently closed end of the mold for removing the cover from the mold to thereby cause the frozen liquid to fall by gravity from the mold.

6. A refrigerating apparatus comprising in combination, a cooling element, a support on said cooling element, a metallic device supported on said support and provided with a plurality of mold members each having open bottoms and side walls converging outwardly toward the open bottoms thereof and adapted to contain a liquid to be frozen, means for closing the open bottoms of said mold members to confine a body of liquid therein, said support having an opening beneath the bottoms of said mold members, said closure means being movable relative to said mold members through the opening in said support, the liquid within said mold members upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said support, and a receptacle removably carried by said cooling element for catching and supporting the frozen blocks.

7. A freezing device comprising in combination, a support member, a mold member adapted to contain a substance to be frozen carried by said support member and having closed top and side walls and an open bottom, said support member being constructed and arranged so as not to obstruct the open bottom of said mold member carried thereby, means associated with one of said members for closing the open bottom of said mold to seal a substance therein, said closure means being separate from said members and movable relative to the member with which it is associated, and the substance within said mold member upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall by gravity from said freezing device through the open bottom of said mold.

8. A freezing device comprising in combination, a support member, a mold member carried by said support member and having an open end and adapted to contain a substance to be frozen, said support member being constructed and arranged so as not to obstruct the open end of said mold member carried thereby, means associated with one of said members for closing the open end of said mold to seal a substance therein, said closure means being separate from said members and movable relative to the member with which it is associated, and the substance within said mold member upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall by gravity from said freezing device through the open end of said mold.

9. In combination, a freezing support, a mold supported on said freezing support and having an open bottom and adapted to contain a substance to be frozen, means for closing the open bottom of said mold to seal a substance therein, said freezing support having an opening beneath the bottom of said mold, said closure means being movable relative to said mold through the opening in said freezing support, and the substance within said mold upon freezing and expanding therein being released therefrom and moving said closure means to thereby fall through the opening in said freezing support.

10. The method of freezing which consists in, filling a mold having a permanently closed end and an open end with a substance which expands upon being frozen, placing a cover over the open end of said mold and inverting the mold to

thereby cause the cover to seal the substance within the mold, freezing the substance within the mold and applying the expansive force of freezing to the mold for releasing the frozen substance therefrom and for removing the cover from the mold to thereby cause the frozen substance to fall by gravity from the mold.

11. A freezing device comprising in combination, a support member, a mold member adapted to contain a substance to be frozen carried by said support member and having closed top and side walls and an open bottom, said support member being constructed and arranged so as not to obstruct the open bottom of said mold member carried thereby, means associated with one of said members for closing the open bottom of said mold to seal a substance therein, said closure means being movable relative to the member with which it is associated, and the substance within said mold member upon freezing therein moving said closure means and being released from said mold through the open bottom thereof.

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