Dec. 8, 1936. R. L. TWEEDALE 2,063,208

REFRIGERATING APPARATUS

Filed Aug. 15, 1934 2 Sheets-Sheet 1

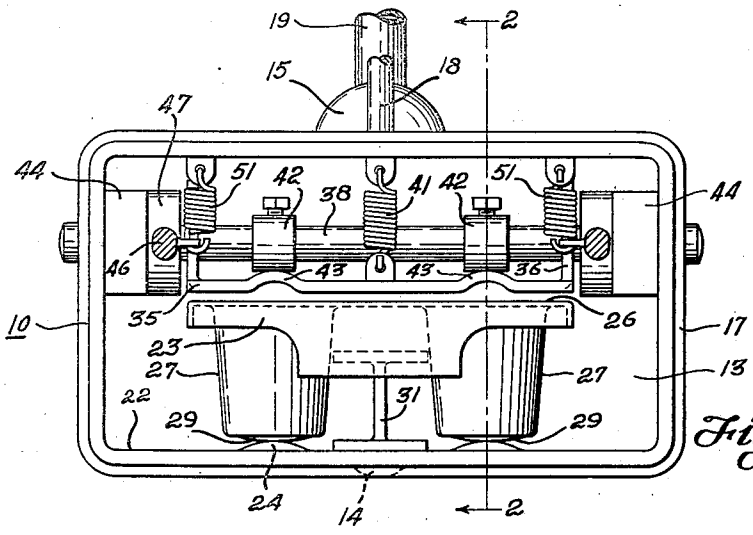


Fig. 1

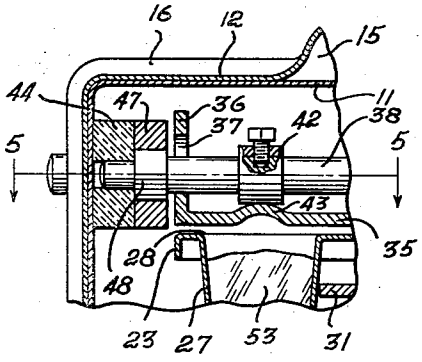


Fig. 4

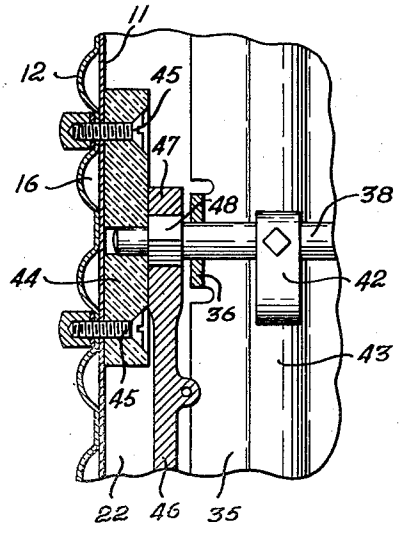


Fig. 5

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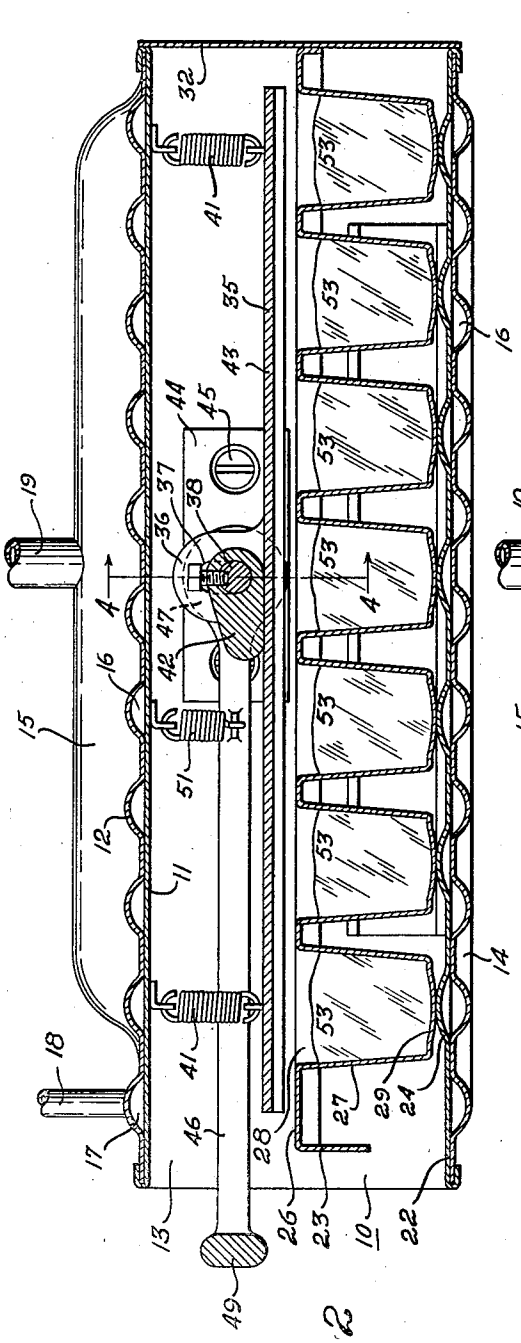


Fig. 2

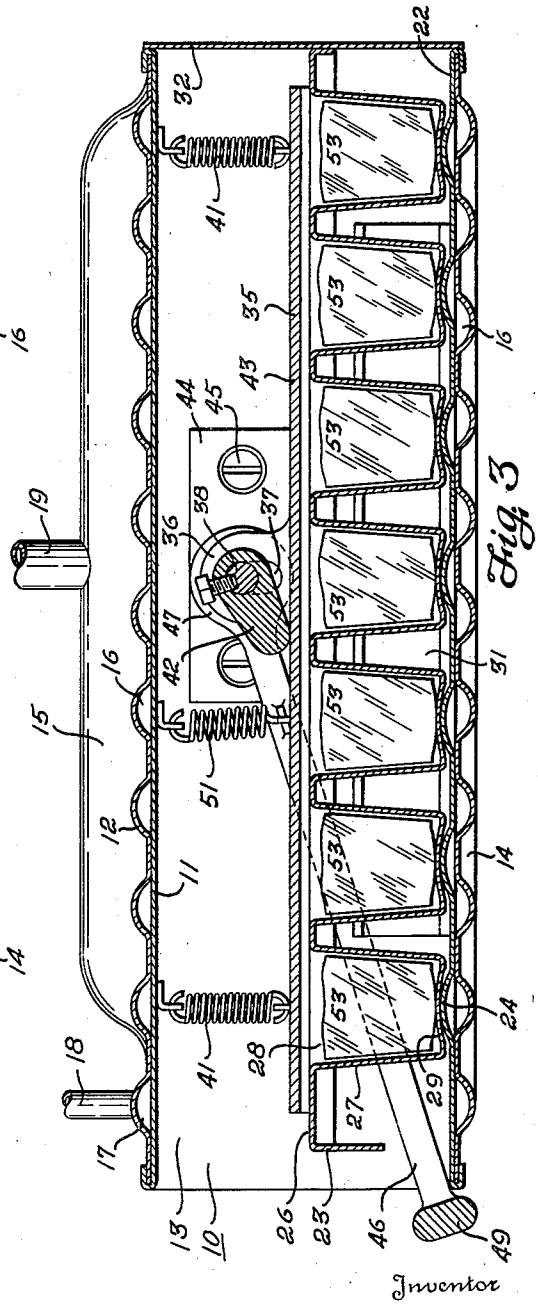


Fig. 3

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UNITED STATES PATENT OFFICE

2,063,208

REFRIGERATING APPARATUS

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Application August 15, 1934, Serial No. 739,945

15 Claims. (Cl. 62—108.5)

My invention relates to refrigeration and particularly to a device for facilitating removal of an ice tray from a cooling element of a mechanical refrigerator and removal of blocks or cubes of ice from the tray.

An object of my invention is to provide an improved method of and device for releasing an ice tray from its support in or on a cooling element of a refrigerator and for simultaneously freeing or loosening cubes or blocks of ice from all the walls of compartments provided in the tray.

Another object of my invention is to provide a device of the character described in the foregoing object which can be incorporated in a cooling element of a mechanical refrigerator in such manner that it will not interfere with the insertion or removal of a tray in or from the cooling element nor become frozen or bonded to the cooling element or tray when not in use.

A still further and more specific object of the invention is to provide an improved device for moving flexible bottom walls of compartments provided in an ice tray to simultaneously break an ice bond between the tray and its support on a cooling element or evaporator and between the ice blocks or cubes and each of the walls of the compartments.

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

In the drawings:

Fig. 1 is a front view of a cooling element or evaporator of a refrigerating system having a device constructed in accordance with my invention incorporated therein;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 showing my improved device in normal position relative to the cooling element and a tray supported therein;

Fig. 3 is a sectional view similar to Fig. 2 and shows my improved device after having been moved into a position to cause simultaneous releasing of the ice blocks from the walls of compartments provided in the tray;

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 2, showing the mounting of the device to the cooling element; and

Fig. 5 is a horizontal sectional view taken on the line 5—5 of Fig. 4.

Referring to the drawings, for the purpose of illustrating my invention, I have shown in Fig. 1 thereof a cooling element or evaporator 10. The cooling element or evaporator 10 is preferably constructed of inner and outer sheet metal portions or shells 11 and 12 respectively having certain parts thereof secured together and certain other parts thereof spaced apart to form refrigerant passages therebetween and bent or arranged to provide an elongated horizontally disposed freezing chamber 13. For example, the outer sheet metal portion or shell 12 of the evaporator is corrugated to provide a lower refrigerant distributing manifold 14, an upper gaseous refrigerant header 15 and passages 16 interconnecting or providing communication between the manifold 14 and the header 15. A passage 17 also formed by a corrugation in shell 12 extends from the top of the evaporator 10 to the lower distributing manifold 14. A refrigerant inlet pipe 18 is connected with the passage 17 at the top of the cooling element and directs liquid refrigerant entering the evaporator, under the control of any suitable means such as a restriction or expansion valve (not shown), to the distributing manifold 14. A refrigerant outlet pipe 19 communicates with the gaseous refrigerant header 15. The refrigerant pipes 18 and 19 are of course adapted to be connected in a closed refrigerant liquefying and circulating system of any conventional design for maintaining the cooling element or evaporator 10 between predetermined temperature limits.

The bottom wall 22 of the cooling element or evaporator 10 forms a support for a receptacle or tray 23 and the inner sheet metal portion or shell 11 of the evaporator is provided with a plurality of raised or arched button portions 24 extending above the flat surface of the shell 11 along the bottom wall 22 of the evaporator. The tray 23 includes a substantially flat upper surface 26 having integral depending walls 27 defining a plurality of cups or compartments 28 having tapered side walls and adapted to receive water or other substances to be frozen. Each of the cups or compartments 28 are provided with a flexible bottom wall 29 and these bottom walls are adapted to register with and rest upon the button portions 24 of the bottom wall or support 22 of the freezing chamber 13 to support the tray 23 in the evaporator. An I beam or the like element 31 is secured to the bottom wall 22 of the evaporator 10 and serves as a guide for positioning the flexible bottoms 29 of the cups or compartments 28 substantially on the top surface of the button portions 24 when the tray 23 is moved into its proper position within the freezing chamber 13 or into abutting engagement with a rear wall 32 provided on the evaporator 10.

The structure of my improved device for simultaneously breaking an ice bond between the tray 23 or bottom walls 29 and compartments 28 and the tray support 22 or button portions 24, and between water frozen into blocks or cubes in the cups or compartments 28 and each of the compartment walls 29 and 27 will now be described.

A plate 35 substantially coextensive with the top surface 26 of tray 23 has ears 36 extending upwardly therefrom at each side thereof and these ears are each provided with a vertically elongated opening or slot 37. A shaft 38 extends through the openings or slots 37 provided in the ears 36 formed on the plate 35. The slots 37 permit plate 35 to be elevated or lowered throughout the length of the slots. However, plate 35 is normally maintained in an elevated position, as shown in Fig. 2, by springs 41. The means for moving the plate 35 downwardly against the tension of springs 41 includes a pair of cams 42. Cams 42 may be secured to shaft 38 by being keyed or otherwise suitably attached thereto. Plate 35 is provided with two spaced apart corrugations 43 extending longitudinally thereof and these corrugations 43 serve to increase the structural strength of the plate 35. Cams 42 register with and are adapted to engage the upper surface of the corrugations 43 and these corrugations prevent deformation of the plate 35 when the cams are actuated. Each end of shaft 38 is journaled in an opening provided in blocks 44. The blocks 44 are secured in any suitable manner to a vertical wall of the freezing chamber 13 and in the present disclosure I have shown the blocks 44 as being secured to the side walls of the cooling element by bolts or screws 45 which pass through the cooling unit wall at a point therein where the sheet metal portions thereof are welded together. Blocks 44 may be of a metal material of low heat conductivity or they may be of any insulating material such as micarta or bakelite. Alternatively it may be desirable to form the blocks 44 of metal and to place a bushing of insulating material in the openings therein which receive the ends of shaft 38 in order to insure that the blocks will withstand the force applied thereto by operation of the device. The insulated blocks 44 isolate the elements of the device from the evaporator walls and thus prevent these elements and the device from accumulating frost thereon thereby insuring positive action of the device at all times since the plate 35 is normally held by springs 41 out of contact with the tray. A lever 46, in the form of a yoke, has its ends 47 secured to squared portions 48 formed on shaft 38 intermediate the ears 36 on plate 35 and the blocks 44 which receive the ends of the shaft 38. The connecting portion 49 of the yoke lever 46 forms a handle for manually actuating the device. Force applied to the tray 23 to move same downwardly upon movement of handle 49 is obviously multiplied by the cams 42. Springs 51 are secured to the leg portions of lever 46 and to the evaporator 10 to insure the return of lever 46 to its normal position, after being actuated.

Assuming that the device or means described is in its normal or elevated position as shown in Fig. 2 of the drawings and a tray containing water, in the molds or compartments 28 thereof, is placed into position in the evaporator as shown in Fig. 2 so as to bring the bottoms 29 of the compartments 28 into registering or abutting relation with the button portions 24 provided on the bottom wall or support 22 of the evaporator. The cooling action of the evaporator 10 reduces the temperature of the water in compartments 28 of tray 23 and this water is frozen therein in the form of blocks or cubes 53. During this freezing action the bottoms 29 of the compartments 28 of tray 23 become bonded to the evaporator support or button portions 24 as is inherent of such apparatus and the ice 53 also bonds to walls of the compartments 28. I am aware that devices have been provided to break the ice bond between a tray and its support on a cooling element so that the tray may readily be removed from the element and that other devices have been provided for elevating the ice blocks relative to the tray after the tray has been removed from the cooling element. However, no device of the prior art known to me, when actuated, simultaneously breaks an ice bond between the tray and its support and between each of the walls of the ice block compartments to loosen the ice blocks from the compartment walls and to render the blocks freely removable from the tray and the compartments formed therein without applying force thereto or without running water over the blocks to melt them from certain walls of a grid removed along with the ice from the tray. Therefore my invention insures that all of the latent heat stored within an ice cube or block and removed from my improved device may be used in cooling drinks, etc. In other words the maximum cooling capacity of blocks of ice removed from my improved device is not destroyed by the necessity of running water thereover to free the blocks from certain walls of a grid associated with a tray.

After the blocks or cubes of ice have been formed in my device the handle portion 49 of yoke lever 46 is moved downwardly. This movement of lever 46 causes shaft 38 to rotate about its pivotal mounting and the cams 42 are brought into engagement with the top surface of the corrugations 43 on plate 35 and the plate 35 is thereby moved into engagement with the top of the tray 23. Further downward movement of lever 46 causes the plate 35 to move the tray 23 downwardly. It is to be understood that there is sufficient clearance between the edges of the tray guiding and positioning I-beam 31 to permit the tray to move downwardly as described without causing permanent deformation of the tray. This downward movement of the tray relative to its support on the cooling element deforms the flexible bottoms 29 of the compartments 28 due to their registration and engagement with the button portions 24. A slight movement of the flexible bottoms 29 of the compartments 28, by the manually actuated force multiplying means described, loosens the ice blocks or cubes 53 from each of the walls 27 and 29 of the compartments 28. The movement of the flexible bottoms 29 of the compartments 28 simultaneously breaks the ice bond between the tray 23 or the compartment bottoms 29 and the tray support 22 or button portions 24 and between the ice blocks 53 and all walls of the compartments 28, due to the taper or "draw" of the side walls 27. The tray 23 is thereby rendered freely removable from the cooling element 10 and the ice cubes or blocks 53 will, due to their being freed from all the walls of the compartments 28, fall from the compartments upon turning the tray in an inverted position. Thus no artificial heat of any description is required to remove or harvest the ice blocks 33 from my device.

The flexible bottoms 29 of the compartments

28 of my improved device may be of the type which when moved or flexed beyond dead center of their flexing limits they will snap into the position shown in Fig. 3 of the drawings. If the compartment bottoms 29 are of the snap acting type as described any suitable means may be employed for snapping the bottoms back into their normal position as shown in Fig. 2 of the drawings after the ice blocks have been removed from the compartments and before the compartments are again filled with water. It may be desirable, however, to construct the flexible compartment bottoms 29 so that after they are flexed or moved upwardly as shown in Fig. 3 they will automatically move downwardly into their normal position as shown in Fig. 2 after the device has been actuated to free the ice blocks from the compartment walls and thereafter returned to normal position by the springs 41 and 51. Although the flexed compartment bottoms may be of the type which will automatically assume their normal position after being moved upwardly it is to be understood that the ice blocks or cubes 53 will freely fall from the compartments 28 upon inverting the tray 23 after its removal from the cooling element 10. It is also to be understood that the tray may be divided into a plurality of ice cube or block forming compartments by a grid permanently positioned or secured in a tray, if desired, instead of forming the substantially round moulds or compartments 28 therein as disclosed in the present illustration.

From the foregoing it will be apparent that I have provided an improved device for facilitating removal of a tray from a cooling element of a refrigerating apparatus which device also completely frees or loosens ice blocks from all the walls of the compartments forming the box simultaneously with the removal or separation of the tray from its support. The simultaneous operations afforded by actuation of my improved device eliminates the necessity of providing separate means for breaking an ice bond between a tray and its support and between the ice blocks and the tray or its grid after the tray has been removed from the cooling element. My improved device insures easy and quick removal of ice blocks from a tray in which they are frozen without application of artificial heat thereto and renders the ice blocks more efficient in cooling drinks, etc. by utilizing the latent heat or low temperature stored in the blocks instead of wasting this low temperature as is the case in prior devices known to me, for example, in devices wherein the ice blocks must be removed from a grid after the grid together with ice bonded thereto, has been removed from a tray.

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 member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and means associated with and movable relative to one of said members for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments.

2. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a tray positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and force multiplying means movable relative to said tray for simultaneously breaking a bond between said tray and its support and between the frozen substance and each of the walls of the compartments.

3. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a tray positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means carried by the cooling element for simultaneously breaking a bond between said tray and its support and between the frozen substance and each of the walls of the compartments.

4. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a tray positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means carried by the cooling element for simultaneously breaking a bond between said tray and its support and between the frozen substance and each of the walls of the compartments, said means being normally out of contact with said tray and insulated from said cooling element.

5. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a tray positioned on said support and containing a substance to be frozen, means carried by said cooling element for simultaneously breaking a bond between said tray and its support and between the tray and substance frozen therein, means for insulating said first named means from said cooling element, and means for normally maintaining said first named means out of contact with said tray and for returning same to normal position after having been actuated to break said bonds.

6. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a tray positioned on said support and divided into a plurality of moulds, said moulds containing a substance to be frozen and having flexible bottoms engaging said support, and means for flexing the flexible bottoms of said moulds to simultaneously break a bond between said moulds and their support and between the moulds and the substance frozen therein.

7. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, a metallic tray positioned on said support and divided into a plurality of moulds, said moulds containing a substance to be frozen and having flexible metallic bottoms engaging said support, and means for flexing the flexible bottoms of said moulds to simultaneously break a bond between said moulds and their support and between the moulds and the substance frozen therein.

8. A refrigerating apparatus comprising in combination, a cooling element having a support for a tray, said support including a plurality of raised portions, a tray divided into a plurality of moulds, said moulds having flexible bottoms and containing a substance to be frozen, said tray being positioned on said support so that the flexible bottoms of the moulds thereof register with and abut the raised portions on said support, and means for flexing the flexible bottoms of said moulds to simultaneously break a bond between said tray and its support and between the moulds and the substance frozen therein.

9. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and means associated with one of said members for moving the tray member toward said support on said cooling member for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments.

10. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and means associated with one of said members for moving the tray member toward said support on said cooling member for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments, said means being normally out of contact with one of said members and insulated from the other of said members.

11. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and means associated with and movable relative to one of said members for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments, said means being normally out of contact with one of said members and insulated from the other of said members.

12. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments.

13. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means carried by and movable relative to one of said members for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments.

14. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments, said manually actuable means being normally out of contact with one of said members and insulated from the other of said members.

15. A refrigerating apparatus comprising in combination, a cooling member having a support for a tray member, a tray member positioned on said support and having walls defining a plurality of compartments containing a substance to be frozen, and manually actuable means carried by and movable relative to one of said members for simultaneously breaking a bond between said members and between the frozen substance and each of the walls of the compartments, said manually actuable means being insulated from the member carrying same and being normally out of contact with the other of said members.

RALPH L. TWEEDALE.