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POWER UNIT FOR FREEZING DEVICE

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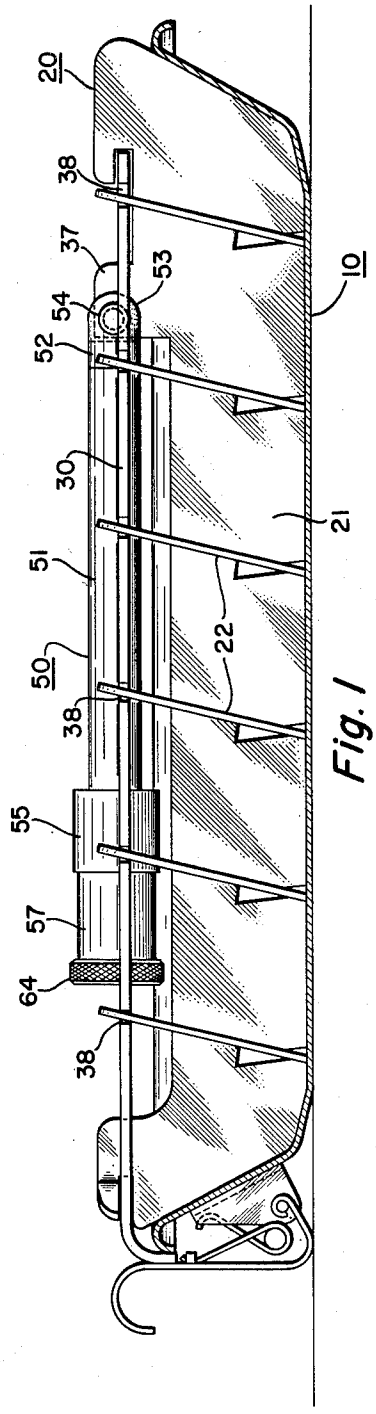

Fig. 1

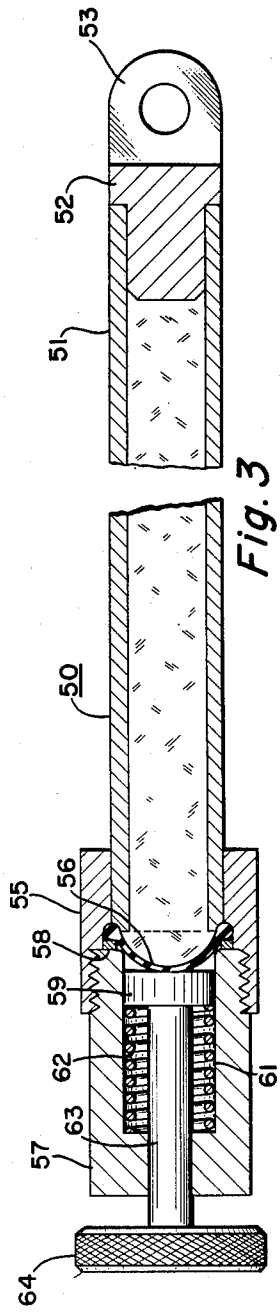

Fig. 3

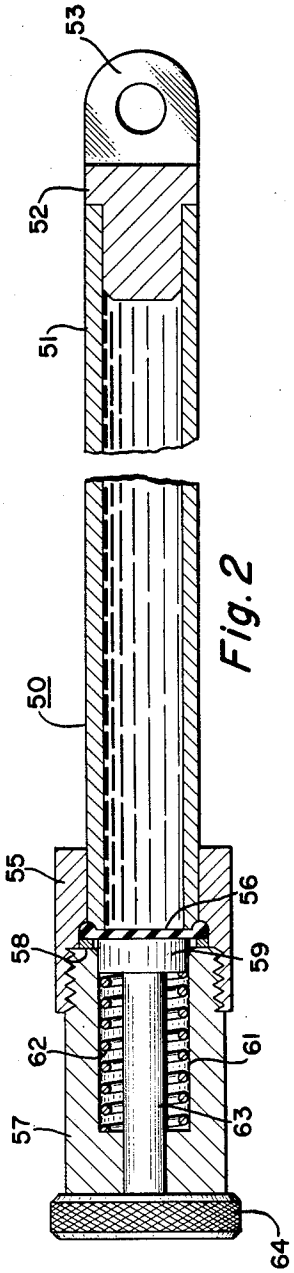

Fig. 2

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POWER UNIT FOR FREEZING DEVICE

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5 Claims. (Cl. 62—108.5)

The present invention relates to ice-operated power units or motors for automatically moving walls of a grid in a tray of a freezing device.

We are aware of the fact that others have provided an ice-motor unit, containing a freezing liquid, on a grid of a freezing device of the type wherein the grid is removably disposed in a tray and which grid includes partitions dividing the interior of the tray into ice block forming compartments and are relatively movable with respect to one another. In such a freezing device the ice-motor unit functions automatically, in response to a predetermined low temperature after ice blocks are formed therein, to move or tilt certain of the grid partitions relative to others thereof and with respect to walls of the tray for loosening the ice blocks from their compartments and for elevating the grid relative to the tray whereby the grid may be removed therefrom and ice blocks harvested from the device. Due to the desirability of confining the expansion of the liquid upon freezing in such ice-operated units or motors so as to produce a longitudinal movement of parts thereof a problem exists in providing a positive seal for the liquid. Former ice-operated power units for the purpose described have not been entirely satisfactory for the reason that they develop leaks, after continuous operations thereof, thus loosing their charge and becoming ineffective or inoperative. This has been due to the fact that a proper and lasting seal for the fluid in the motor has not been provided. Our invention is therefore directed to overcoming a defect in former ice-operated power motors or units for the purpose specified and for the further purpose of rendering them suitable for installation in more frequently operated devices or apparatuses.

An object of our invention is to provide an improved ice-operated power motor which remains operative over a long period of time.

Another object of our invention is to provide an ice-operated power unit for a freezing device with a positive seal for liquid contained therein which seal does not become worn or ineffective throughout prolonged use of the unit.

Another object of our invention is to provide an ice-operated power motor unit wherein all parts thereof are located outside its freezable liquid containing expansion chamber whereby expansion of the freezing medium is not interfered with and the parts do not become deteriorated by such medium.

A further object of our invention is to provide a yieldable or flexible element for sealing liquid in an ice-operated motor of a freezing device which directly engages a yieldable piston or reaction member of the motor and reacts thereagainst to move the same.

A still further and more specific object of our invention is to provide a means for clamping a seal to one reaction member of an ice-operated motor unit in a freezing device which means also carries another yieldable reaction member in engagement with the seal and is movable thereby when liquid in the ice-operated unit freezes and expands to flex and extend the seal for causing partitions of a grid within the freezing device to move relative to one another and loosen ice blocks from their compartments therein.

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 invention is clearly shown.

In the drawings:

Figure 1 is a vertical sectional view of a tray of a freezing device having a grid structure disposed therein and equipped with an ice-operated motor having the present invention embodied therein;

Figure 2 is an enlarged longitudinal sectional view of the ice-operated motor of the present invention showing parts thereof in their normal position before expansion of liquid therein takes place; and

Figure 3 is a view similar to Figure 2 and shows parts of the motor moved after liquid confined therein has frozen and pushed the actuating piston to its outermost position.

Our invention is particularly applicable to a freezing device including a pan or tray having a movable walled grid structure therein of the type disclosed in the Harvey D. Geyer Patent No. 2,576,591, dated November 27, 1951, and assigned to assignee of the present application. Since our invention is directed specifically to an improvement in the ice-operated motor unit portion of the freezing device disclosed in the Geyer patent and since the grid structure is fully illustrated and described in this patent no detailed description of the construction and operation of the grid is necessary herein. Figure 1 of the drawings in the present disclosure is substantially a duplicate of Figure 2 in the Geyer patent with our improved ice-operated motor unit substituted for that shown by Geyer.

Referring now to the drawings the freezing device shown in Figure 1 thereof comprises a container pan or tray **10**, having a bottom and upwardly extending and outwardly diverging side and end walls, and a grid structure **20** removably disposed therein including partitions or partitioning walls dividing the interior of tray **10** into a plurality of compartments in which water placed in the device is to be frozen into ice blocks under the below freezing temperature produced by an evaporator of a refrigerating system associated with a refrigerator. Grid structure **20** comprises a main longitudinal partition or wall **21**, a series of spaced cross or transverse partitions or walls **22** each loosely mounted upon main wall **21** and an actuating bar **30** overlying partition **21** and mounted thereon. Walls or partitions **21** and **22** and bar **30** are interlocked together to provide a unitary removable structure in the manner described in the Geyer patent above referred to so that walls **22** are capable of a relative tilting movement with respect to wall **21**. The central portion of actuating bar **30** is cut away to provide an elongated opening therein having such dimensions as to suitably receive and cradle an ice-operated motor unit, generally represented by the reference character **50**, on grid **20** constructed as hereinafter described and to which the present invention is particularly directed.

The ice motor **50** includes an elongated metal cylinder or tube **51** closed at one end by a cap **52** which may be welded or brazed to tube **51**. Cap **52** has an integral ear **53** extending therefrom and provided with an opening. A pin or stud **54** passes through the opening in the ear **53** of cap **52** and through a suitable hole provided in an upstanding projection **37** on longitudinal wall or partition **21** of grid **20** (see Figure 1). This locks the one end of tube **51** of motor **50** to the grid wall **21**. A threaded coupling **55** is welded or brazed to the other

end of tube 51. Coupling end of tube 51 is sealed by an extendable yielding means such as a flexible disc element or diaphragm 56 or rubber-like material. Disc or diaphragm 56 is secured to tube 51 by a bored-out elongated cap member 57 fixed to tube 51 by being screw-threaded into coupling 55. A yieldable washer or the like 58 of any suitable or desirable material is disposed between cap member 57 and diaphragm 56 to prevent cutting of the flexible diaphragm while the cap member 57 is being threaded into coupling 55. A piston 59 is disposed within the round bore 61 of elongated member 57 and a coil spring 62 housed within bore 61 of cap 57 normally biases piston 59 into direct engagement with the diaphragm 56. Piston 59 has a shank portion 63 extending through an opening in the end wall of cap member 57 and a head piece 64 is secured, in any suitable or conventional manner, to the projecting end of shank 63. The sealed tube 51 forms an expansion chamber which is filled with and contains confined therein a freezing expansion fluid such as water or a mixture of water and alcohol prior to closing this chamber by the sealing means 56. Head piece 64, on shank 63 of piston 59, abuts against the forward end of the opening in bar 30. The flexible disc element or diaphragm 56 provides an effective and positive seal for the freezable content of tube 51 to thus eliminate reliance on a packing, gasket or the like about the slidable piston. Since piston 59, under the influence of spring 62, at all times engages diaphragm 56 its movement and consequently expansion of the liquid in tube 51 are yieldably opposed. The tube 51 and head piece 64 of piston 59 form reaction members in the present ice-motor 50 adapted to be moved relative to one another, when the liquid within the sealed expansion chamber or tube 51 flexes and expands preferably, after water contained in the ice block compartments of the freezing device has been frozen. Movement of reaction member or head piece 64 of piston 59 is utilized to move walls or partitions 21 and 22 of grid 20 with respect to one another for breaking the bond between ice blocks in the device and walls of the grid and tray 10 to automatically, in response to a temperature below that of the ice blocks, loosen them from their compartments and permit harvesting of same.

Water is placed in pan or tray 10 of the freezing device to such a level that motor or unit 50 will normally lie adjacent to but out of contact with this water. The freezing device is then set within a below freezing compartment, usually upon a refrigerated shelf therein, so that most of the heat transfer takes place through walls of the tray 10. The water in tray 10 will normally freeze on the bottom and sides thereof first and the last water to freeze solid will be that in the longitudinal center portion of the tray. The proximity of the ice-motor unit 50 to the last water to freeze and the limited metal-to-metal contact of unit 50 with grid 20 aids in preventing the water or water and alcohol mixture confined in unit 50 from freezing until after all the ice blocks in the device have been hard-frozen. After water in tray 10 has frozen into ice blocks the water or mixture confined in the expansion chamber of tube 51 gradually freezes and expands in volume. This expansion and increase in volume will flex and extend the yieldable flexible diaphragm 56 as shown in Figure 3 of the drawings and the diaphragm, acting directly on piston 59, will push the piston outwardly of unit 50 with a force capable of overcoming very high resistance. It is to be noted that stretching of diaphragm 56 to flex and extend the same as shown in Figure 3 of the drawings causes its wall to thin out or be reduced in thickness. Since the one end of tube or reaction member 51 of unit 50 is secured to wall 21 of grid 20, as by pin 54, and the head piece 64 on reaction member or piston 59 abuts against the end of the opening or slot in actuating bar 30, this bar 30 is forced to move with respect to the stationary portion of unit 50 as indicated in Figure 3 toward the left-hand end of the device as viewed in Figure 1 of the drawings relative to the longitudinal wall or partition 21 of grid 20. In other words the elongation of ice-motor 50, or movement of its reaction member 59 relative to its reaction member 51, causes a relative sliding movement between bar 30 and longitudinal grid wall 21. Such sliding of bar 30 causes notches provided therein and fitting over an edge portion of each of the transverse partitions 22 to engage and tilt these partitions in succession one after the other for loosening ice blocks in the compartments of the freezing device from both the tray 10 and grid 20 so that they may be readily harvested from the device as is fully illustrated and described in the Geyer patent hereinbefore identified.

From the foregoing it should be apparent that we have provided and improved an ice-operated motor unit for freezing devices and that this improvement is realized by virtue of the fact that a positive seal of long life is utilized to act directly on the motor piston thus enabling a piston yielding means such as the spring in the present disclosure to be positioned exteriorly of the fluid expansion chamber. By this arrangement a spring or other means for biasing the plunger or piston toward the expansion chamber does not have its biasing effect altered by the freezing or change in state of the fluid in the expansion chamber nor does the spring become rusted or deteriorated by being exposed to freezing liquid in the motor. While we have disclosed our improved ice-operated motor unit associated with a freezing device of the type commonly employed in household refrigerators to periodically produce ice blocks it is to be understood that the improvement of prolonging the life of such a motor renders the motor unit applicable to other devices such, for example, as intermittently or continuously operating ice making machines wherein the present ice-motor unit can be heated and quickly returned to its normal position in several different ways at the end of each freezing cycle. The motor could be heated by placing the same in an ice making machine in the path of warm incoming water to be frozen or an electric heater could be associated with the ice-operated motor unit and energized at the end of each freezing cycle of such a machine and deenergized before a subsequent freezing cycle begins.

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 as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a freezing device of the type including a tray, a grid removably disposed in the tray having a plurality of relatively movable partitions dividing the interior thereof into compartments in which water is to be frozen into ice blocks and a unitary ice motor carried by said grid having reaction members forced to move in opposite directions at a predetermined temperature for reacting between said grid partitions to move the same with respect to one another and loosen ice blocks from said compartments, one of the reaction members of said ice motor having an open end and containing a freezing liquid, a diaphragm disposed between the reaction members of said motor clamped to and extending across the open end of said one reaction member for sealing said liquid therein out of contact with the other of said reaction members, said other of said reaction members of said motor engaging said diaphragm, and said diaphragm being flexed in response to freezing and expanding of said liquid to shift said other reaction member in a direction away from said one reaction member for causing said movement of said grid partitions.

2. In a freezing device of the type including a tray, a grid removably disposed in the tray having a plurality of relatively movable partitions dividing the interior thereof into compartments in which water is to be frozen into ice blocks and a unitary ice motor carried by said grid having reaction members forced to move in opposite

directions at a predetermined temperature for reacting between said grid partitions to move the same with respect to one another and loosen ice blocks from said compartments, one of the reaction members of said ice motor having an open end and containing a freezing liquid, a diaphragm disposed between the reaction members of said motor and extending across the open end of said one reaction member, means for clamping said diaphragm to the open end of said one reaction member for sealing said liquid therein out of contact with the other of said reaction members, said other of said reaction members of said motor engaging said diaphragm and being carried by said clamping means, and said diaphragm being flexed in response to freezing and expanding of said liquid to shift said other reaction member relative to said one reaction member for causing said movement of said grid partitions.

3. In a freezing device of the type including a tray, a grid removably disposed in the tray having a plurality of relatively movable partitions dividing the interior thereof into compartments in which water is to be frozen into ice blocks and a unitary ice motor carried by said grid having reaction members forced to move in opposite directions at a predetermined temperature for reacting between said grid partitions to move the same with respect to one another and loosen ice blocks from said compartments, one of the reaction members of said ice motor containing a freezing liquid, a diaphragm disposed between the reaction members of said motor, means for clamping said diaphragm to an end of said one reaction member for sealing said liquid therein out of contact with the other of said reaction members, said other of said reaction members of said motor engaging said diaphragm and being carried by said clamping means, said diaphragm being flexed in response to freezing and expanding of said liquid to shift said other reaction member relative to said one reaction member for causing said movement of said grid partitions, and a coiled tension spring interposed between said clamping means and said other reaction member for returning the latter to its normal position when the temperature of said liquid increases above freezing.

4. In a freezing device of the type including a tray, a grid removably disposed in the tray having a plurality of relatively movable partitions dividing the interior thereof into compartments in which water is to be frozen into ice blocks and a unitary ice motor carried by said grid having reaction members forced to move in opposite directions at a predetermined temperature for reacting between said grid partitions to move the same with respect to one another and loosen ice blocks from said compartments, one of the reaction members of said ice motor containing a freezing liquid, a flexible element disposed between the reaction members of said motor, said flexible element being confined in said motor and sealing all of th liquid in said one member out of contact with the other reaction member, an end of said other reaction member lying over and engaging said flexible element, and said flexible element being movable in response to freezing and expanding of said liquid to shift said other reaction member relative to said one reaction member for causing said movement of said grid partitions.

5. In a freezing device of the type including a tray, a grid removably disposed in the tray having a plurality of relatively movable partitions dividing the interior thereof into compartments in which water is to be frozen into separated ice blocks and an ice motor carried by said grid having reaction members forced to move relative to one another at a predetermined temperature for reacting between said grid partitions to move same with respect to one another and loosen ice blocks from said compartments, one of said reaction members of said motor having a chamber containing a freezing liquid, yieldable means between the reaction members of said motor for sealing said liquid in the chamber of said one reaction member out of contact with the other of said reaction members, said other of the reaction members of said motor engaging said yieldable means, said yieldable means being flexed in response to freezing and expanding of said liquid for shifting one of said reaction members from a normal position away from the other to cause said movement of said grid partitions, and said ice motor including spring means exteriorly of said liquid chamber for forcing the shifted reaction member to return to its said normal position when the temperature of said liquid increases above freezing.

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