Nov. 13, 1956 H. E. ROEDTER 2,770,102

AUTOMATIC ICE MAKER

Filed March 29, 1954 5 Sheets-Sheet 1

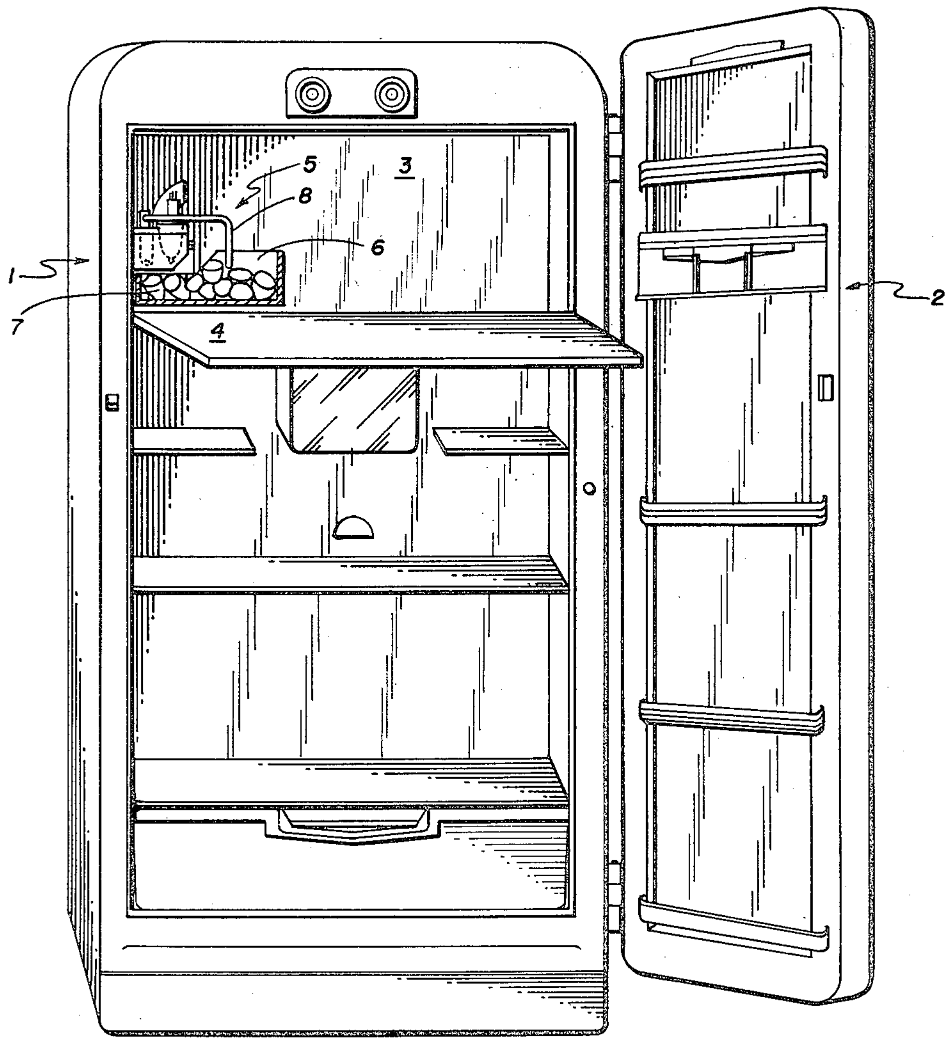

Fig 1

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5 Sheets-Sheet 2

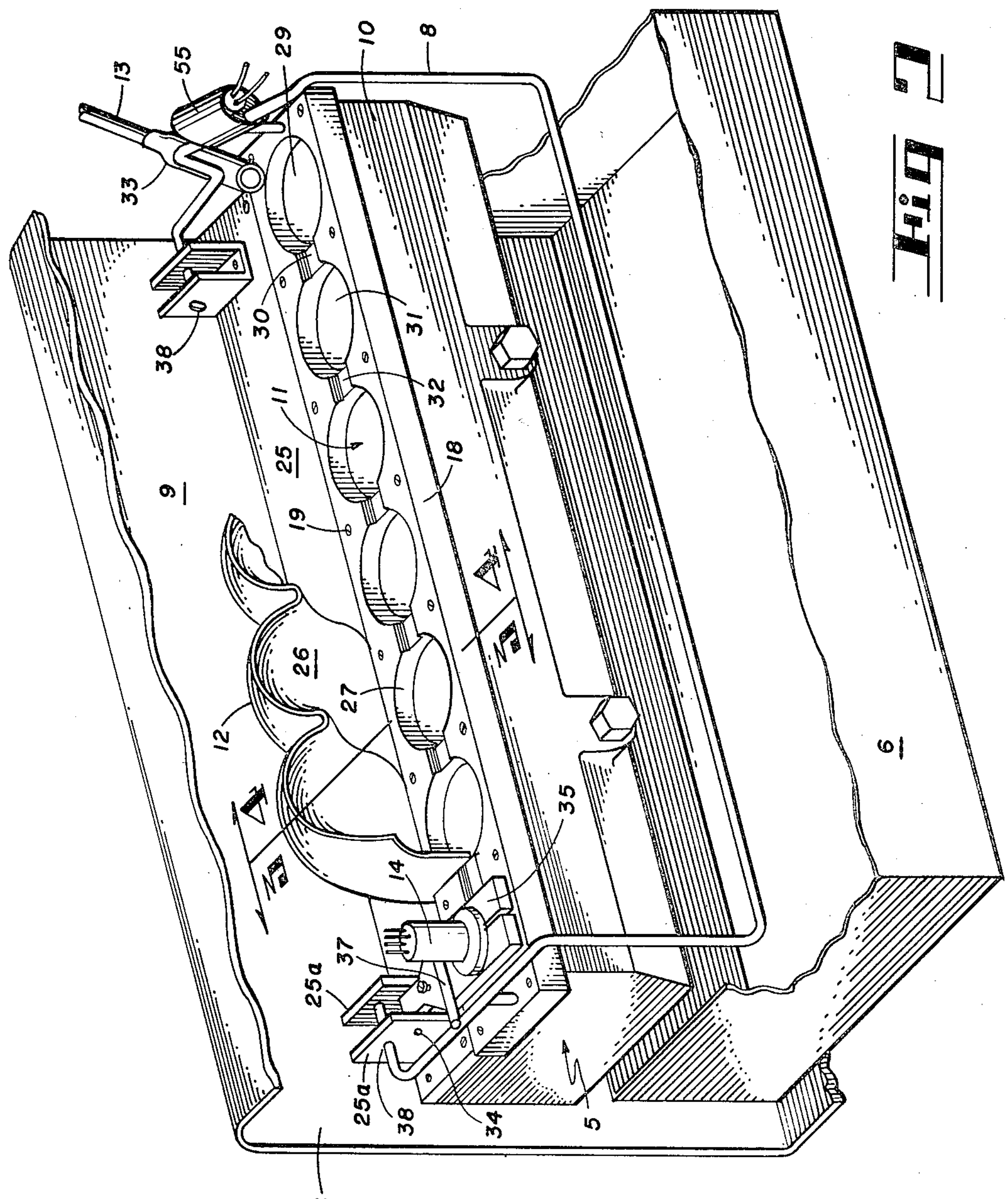

Fig. 2

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Fig 3

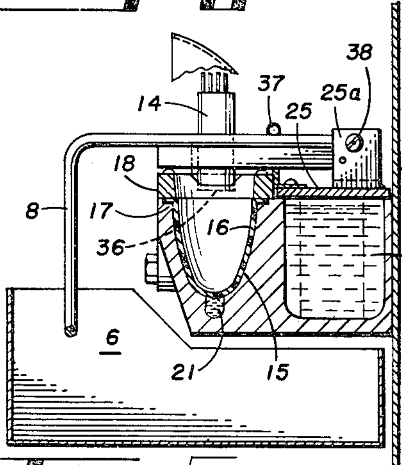


Fig 4

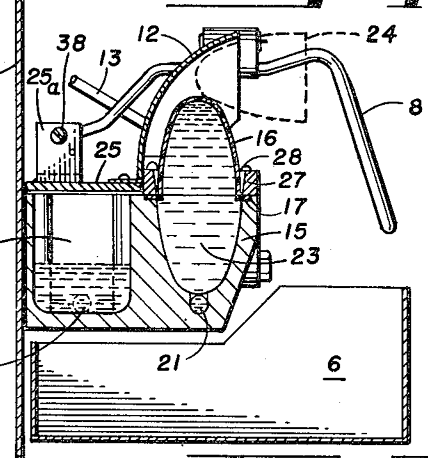


Fig 5

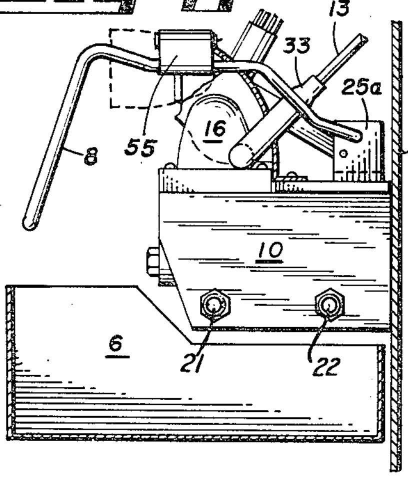
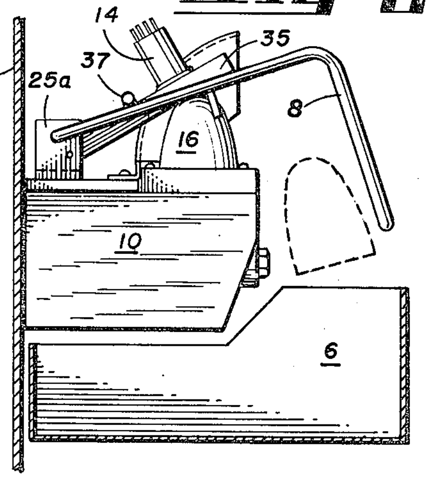


Fig 6



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AUTOMATIC ICE MAKER

Filed March 29, 1954

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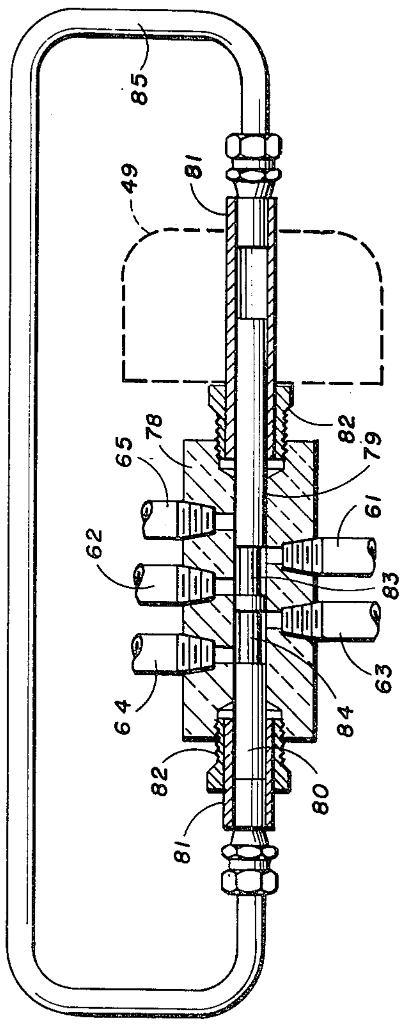

Fig 7

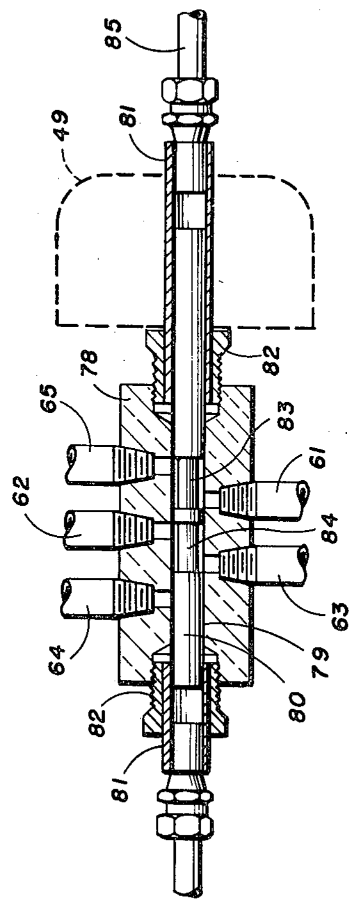

Fig 8

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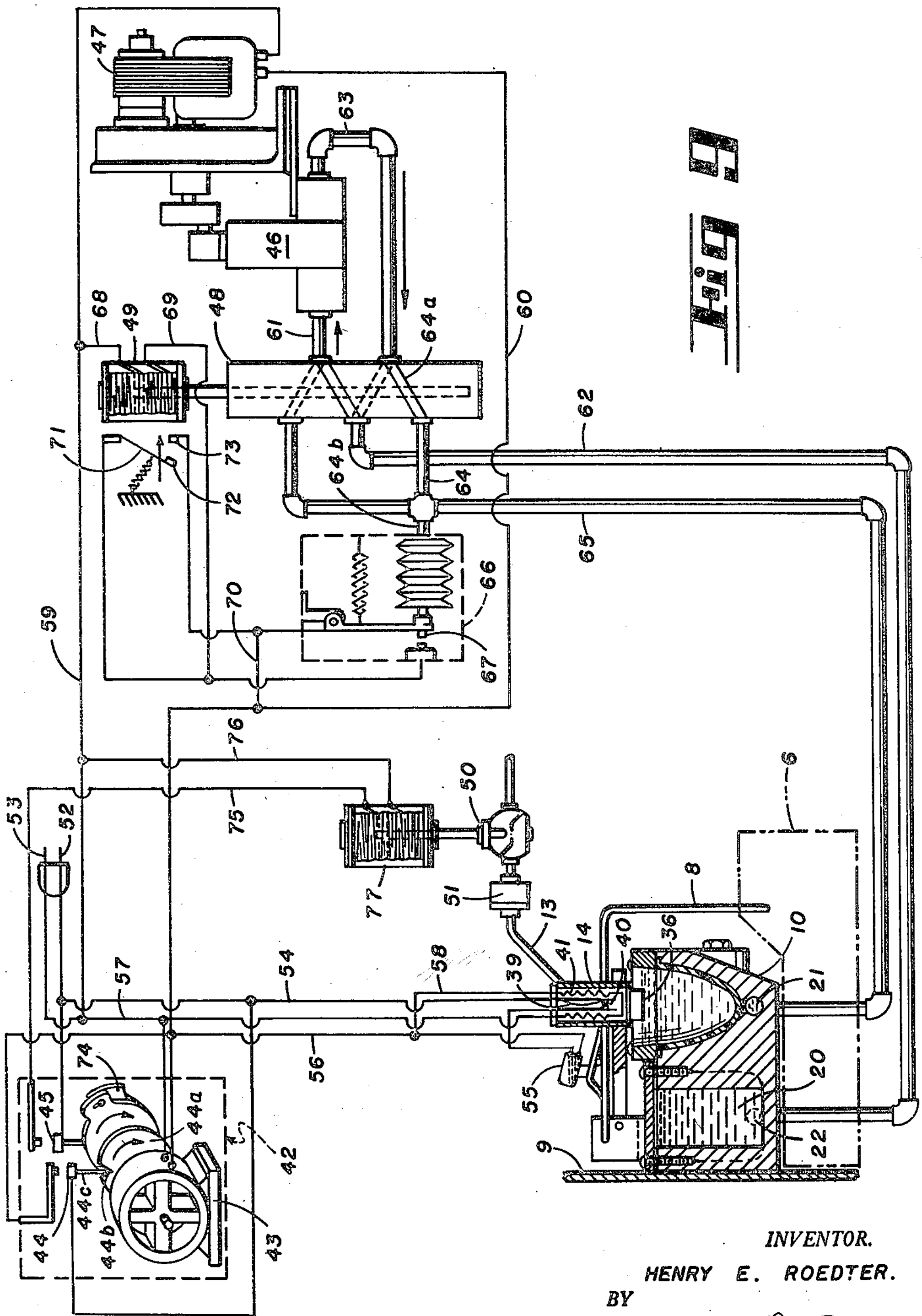

Fig. 5

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United States Patent Office

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AUTOMATIC ICE MAKER

Henry E. Roedter, Cincinnati, Ohio, assignor to Avco Manufacturing Corporation, Cincinnati, Ohio, a corporation of Delaware

Application March 29, 1954, Serial No. 419,238

6 Claims. (Cl. 62—7)

The present invention relates broadly to a mechanism for making ice, and concerns more specifically an automatic ice maker adapted for installation and use in a domestic refrigerator or home freezer.

The present invention relates to that class of equipment which includes a mold for freezing masses of ice which, after being frozen, are ejected from the mold which is subsequently filled with fresh water in preparation for another harvesting cycle during which ice is removed from the mold. Ejection of ice, and filling of the mold with water, are automatically controlled in the present invention by a combined hydraulic and electrical system.

Briefly stated, the present invention comprises a mold which is secured to one wall of a cooled surface, such as an evaporator. The mold defines a plurality of cavities in which are disposed flexible liners. The liners, when within the mold cavities, are filled with water which eventually freezes solid because of heat transfer through the mold to the cooled surface. After the ice has frozen, a thermostat in contact with the ice in one of the mold spaces makes electrical contact and energizes a hydraulic system which forces fluid under pressure between the liners and the mold cavities, thereby ejecting the ice from the molds. Guides are provided adjacent the mold spaces to direct the ice into a receptacle where it accumulates until a pivoted detector arm, associated with the automatic control system, detects that the receptacle is substantially full at which time operation of the ice maker is terminated. The mechanism will resume operation as soon as the detector arm senses that ice has been removed from the receptacle.

After the masses of ice are removed from the mold spaces, the liners are restored to their receiving positions within the mold cavities and a supply of fresh water is directed into the liners within the cavities under the control of an electrical timer.

In view of the foregoing, it will be appreciated that a fundamental object of the present invention is to provide an improved automatic ice maker, particularly one which is well adapted for use in domestic refrigeration units.

A somewhat more specific object of the invention is the provision of automatically controlled means for producing discrete masses of ice which are stored within a refrigerated unit, the means automatically being energized to maintain a constant supply of ice.

Another object of the invention is the provision of a hydraulic system for ejecting ice formed in the mold of an automatic ice maker.

Another object of the invention is the provision of flexible liners for mold cavities which may be flexed to eject masses of ice frozen within the mold.

It is also an object of the present invention to provide a simple, electrical and hydraulic control system for automatically regulating the operation of an automatic ice maker which is certain in operation and easily serviced.

A specific object of the invention is the provision of hydraulic means for ejecting ice from molds which does

not require application of heat to free the ice from the molds. In this connection, it is also an advantage of the invention that the ice when ejected from the molds has a dry surface so that subsequent air drying is not required.

The novel features that I consider characteristic of my invention are set forth in the appended claims; the invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawings, in which:

Figure 1 is a front elevational view of a domestic refrigerator showing my novel ice maker installed within the evaporator;

Figure 2 is a perspective view of a section of the evaporator showing the mold assembly attached thereto;

Figure 3 is a cross sectional view taken through the mold assembly on plane 3—3 of Figure 2, the figure showing the mold in condition to receive a charge of fresh water;

Figure 4 is a cross sectional view of the mold assembly taken on plane 4—4 of Figure 2 showing component parts in the positions assumed during the time that ice is being ejected from the mold;

Figure 5 is a rear end elevational view of the mold assembly;

Figure 6 is a front end elevational view of the mold assembly;

Figure 7 is a cross sectional view of a two position solenoid operated valve which is included in the hydraulic control system;

Figure 8 is a fragmentary cross sectional view of the valve shown in Figure 7 showing the valve in its alternate position of use; and

Figure 9 is a schematic view of the hydraulic and electrical control system in association with the mold assembly.

General organization of the invention

With particular reference to Figure 1, the present invention finds utility in a domestic refrigerator, generally indicated 1, although it should be understood that the invention may also be used in a home freezer or any other type of refrigerated unit in which below freezing temperatures are attained. As illustrated in Figure 1, the refrigerator includes an access door **2** and a horizontal evaporator **3** having a separate horizontally hinged door **4** secured near its lower edge. The mold assembly of the automatic ice maker is secured to the left of the evaporator, as generally indicated at **5**. It will be noted that the ice maker is positioned above a receptacle or tray **6** which receives the discrete ice masses **7** as they are ejected from the ice maker. A detector arm **8** is provided on the ice maker for detecting that the receptacle **6** is filled with ice at which time the detector arm suspends operation of the ice maker, such operation not being again resumed until ice is withdrawn from the receptacle.

Attention is now directed to Figure 2 which shows the mold assembly **5** secured to the left wall **9** of the evaporator **3**. The ice maker includes a mold **10** defining a plurality of spaces, generally designated **11**, in which ice is frozen through heat transfer from the mold **10** to wall **9** of the evaporator. An ice guide **12** is provided above the mold to deflect ice, hydraulically ejected from the mold spaces, as will be explained, into the receptacle **6**.

After ice has been ejected, which may be conveniently termed "harvesting," a measured quantity of fresh water is introduced to the mold spaces through an incoming water line **13**.

The fact that the water has frozen is detected by a thermostat **14** which is pivotally secured, as will be explained, near the front of the mold assembly adjacent one of the mold spaces.

Structural details of the mold assembly

The structural details of the mold assembly may be best understood from a study of Figures 2 through 6. First, with reference to Figures 2 and 3, it will be noted that mold **10** defines a plurality of mold cavities **15** in each of which there is provided a flexible liner **16**. Each flexible liner, when undeformed, has substantially the shape of a conoid and includes a horizontal flange **17** which is clamped in liquid tight engagement with the top surface of the mold by means of a retainer plate **18** which is bolted to the mold at a plurality of points **19**.

The mold **10** also defines a reservoir **20** for fluid which is used in the hydraulic control system, as will be explained later in the specification.

The flexible liner **16** assumes the position shown in Figure 3 in preparation for receiving a charge of water from water line **13**. It will be appreciated that during the time the water is frozen it is retained by the liner **16** fitted within the mold cavity **15**. After the ice has been formed, the individual conoids of ice are ejected from the mold **10** by means of hydraulic pressure applied between the flexible liners **16** and the mold cavities **15** through flow channel **21**. The working fluid for ejecting the conoids of ice is withdrawn from the reservoir through flow channel **22**.

Thus, with reference to Figure 4, it will be noted that fluid has been removed from the reservoir and has been forced under pressure into the volume **23** defined by the interior surface of the liner and the mold cavity. Indicated in dash lines at **24** in Figure 4 is a conoid of ice shown in a fully ejected position just prior to its falling into receptacle **6**.

It will be noted that a cover plate **25** is provided above the reservoir and to this cover plate the ice guide **12** is secured. From a study of Figures 4 and 5 it will be appreciated that the ice guide directs the conoids away from the evaporator wall so that they fall freely into the tray or receptacle **6**.

The ice guide may be made in a number of different ways and, for convenience, has been shown to be a plastic molding defining a plurality of similar individual curved guide surfaces **26**, one such surface being provided for each cavity of the mold.

After the conoids of ice are ejected from the mold, the fluid pressure is relieved from beneath the flexible linears which return to the mold cavities, as indicated in Figure 3, thereby assuming positions suitable for receiving a new charge of fresh water.

It is well to note at this time that the retainer plate **18** defines a plurality of circular openings **27**, each appropriately positioned above a mold cavity, and each being slightly enlarged to provide a clearance space indicated at **28**. This clearance space, in effect, provides what is known as "draft" which facilitates removal of the ice from the molds without interference and assures that the conoids of ice cannot freeze in a formation in which they will be locked within their mold cavities.

Attention is now directed to Figure 2 which shows the retainer plate **18** in perspective. It will be noted that the water inlet pipe **13** delivers water to the first mold space which has been designated **29**. After this space is filled, water flows through a connecting channel **30** to the next adjacent mold space **31**. As soon as the second space is filled, water flows through connecting channel **32** to the next successive mold space. In this way, each of the spaces is filled sequentially and after all of the mold spaces are filled the flow of water through line **13** is cut off.

It will be noted that a plastic tubular enlargement **33** is provided on the end of the water line **13**. This plastic enlargement prevents ice formation from plugging the end of the water line during the time that the water is freezing within the molds.

The pivotal support for thermostat **14** will now be considered. With particular reference to Figure 2, it will be noted that a pair of upstanding ears **25*a*** are provided near the forward end of the reservoir cover plate. To these upstanding ears there is pivotally secured, as at **34**, a thermostat arm **35** which clamps the thermostat **14** in upright position.

Attention should now be directed to Figures 3 and 9 showing the lower end **36** of the thermostat projecting into the forwardmost mold space in position to make contact with the water which is supplied to the space.

At the time the hydraulic system ejects the ice, the thermostat arm **35** is cammed upward by the ice as it is forced out of the mold space, as suggested in Figure 6. During this pivotal movement of the thermostat arm, it engages a horizontal projection **37** which is rigidly secured to the detector arm **8** which, in turn, is pivotally secured to the reservoir cover plate at **38** (see Figure 2). The detector arm is first lifted and then lowered by arm **35** to assure that the detector arm comes to rest substantially on the top of the ice supply within tray **6**. Thus, as the liners **16** are withdrawn into the mold cavity, as has been explained, thermostat arm **35** resumes a normal horizontal position and the detector arm **8** is dropped to a position in which it rests upon the supply of ice in the tray **6**. As will be explained later in this specification, the inclination of the detector arm resulting from the ice stored in tray **6** indicates that a suitable supply of ice has been collected and is instrumental in terminating operation of the apparatus until ice is removed from the tray and further operation of the ice maker is required.

Control system

The thermostat **14** is shown in vertical section in Figure 9 from which it will be noted that a bimetallic strip **39** is provided within the thermostat to close electrical contacts **40** when the temperature of the thermostat has been reduced to approximately 25° F. The electrical contacts will open when the temperature rises to approximately 35° F.

There is also provided within the thermostat surrounding the bimetallic element an electrical resistance type heater **41** which can be energized when necessary to raise the temperature of the bimetallic element to a value of at least 35° F. to open the electrical contacts **40**, as will be explained later.

Before considering in detail the electrical circuit of the control system, it will be well to note that it includes a motor driven timer, generally designated **42**, including a timer motor **43** and cam actuated switches **44** and **45**. The system also includes a direct displacement pump **46** which is driven by an electric motor **47**. The flow of fluid to and from the pump is under the control of a two-position valve **48** operated by solenoid **49**.

It is also well to note that a solenoid control valve **50** is included in the system to regulate the flow of water through regulator **51** to line **13** which supplies the water to the mold spaces.

Electrical energy for the system may be supplied by conventional 110 volt A. C. lines, such as found in most dwellings. The 110 volt potential is impressed across terminals **52** and **53**.

During the time that the water is freezing within the mold spaces, its temperature is gradually being reduced. Since water freezes at 32° F., the electrical contacts **40** of thermostat **14** remain open until the ice has solidified within the mold spaces and its temperature has been reduced to 25° F. At such time, contacts **40** close and current flows from terminal **52** through line **54**, electrical contacts **40**, mercury switch **55**, line **56**, timer motor **43**, and line **57** to terminal **53**. Simultaneously, current also flows from line 56 through line 58 to the heating element 41 from which the current flows to line 57. At the same time, current flows through line 59 from line 57, the current in line 59 flowing through pump motor 47 and line 60 back to line 56.

Thus, as soon as the temperature of thermostat 14 has been reduced sufficiently the electrical system is energized and the timer motor, pump motor, and thermostat heater are simultaneously placed in operation.

Since the heater in the thermostat immediately begins to raise its temperature, it is necessary to provide an electrical switch in parallel with the electrical contacts 40 so that operation of the system will continue despite the gradually changing temperature of the thermostat. For this reason, the cam controlled switch 44 has been included in the system and it will be noted that it is in parallel across the series connected contacts 40 and mercury switch 55. More will be said about the importance and operation of the mercury switch and thermostat later in this specification. It is sufficient to understand at this time that as soon as the timer motor is energized switch 44 is closed and remains closed until the cam 44*a* makes a full revolution. At the end of the revolution, a V-shaped notch 44*b* will permit operating stem 44*c* of switch 44 to drop, thereby breaking the electrical circuit and terminating operation of the control system.

Attention should now be turned to the fluid connections associated with pump 46. As soon as motor 47 begins operation, fluid is drawn into pump 46 through conduit 61. This conduit receives its fluid from conduit 62 which is connected to flow channel 22 of reservoir 20. Flow of fluid from conduit 62 to conduit 61 is controlled by the two-position valve 48. The connection between conduits 61 and 62 is indicated diagrammatically by full lines in Figure 9. The specific structural details of the two-position valve will be described later.

Fluid under pressure is delivered by pump 46 to conduit 63, the fluid flowing through the channel 64*a* of the two-position valve, indicated by full lines in Figure 9, to conduit 64 from which the fluid flows through conduit 65 to flow channel 21. As has been mentioned, the fluid introduced through channel 21 inflates and gradually inverts the mold liners 16 thereby ejecting the conoids of ice from the mold spaces.

During the time that the conoids are being ejected the thermostat 14 is cammed vertically out of the way and contacts 40 gradually open under the influence of the heating element 41.

It has been found from actual experiments that the ice can be ejected with pressures ranging from 15 to 30 p. s. i. g. While the mold liners are inverted, as indicated in Figures 4, 5, and 6, the fluid pressure continues to rise as a result of the continued operation of pump 46. The pressure of the fluid is directed into a pressure switch 66 which is set to close electrical contacts 67 as soon as a pressure of 75 p. s. i. g. has been attained. The fluid under pressure is supplied to the electrical switch through conduit 64*b*.

When the contacts 67 of the pressure switch close, current flows through lines 68, 69, 70, and solenoid 49. Energization of the solenoid shifts the position of the valve 48 thereby interconnecting conduit 61 with conduit 65 and interconnecting conduit 63 with conduit 62, as indicated schematically by dash lines in Figure 9. With this change of valve position fluid is no longer drawn from reservoir 20 and pumped into the mold cavities, but instead is withdrawn from the mold cavities and pumped back into the reservoir. This reversed of operation gradually restores the mold liners to the position shown in Figure 3 and returns all of the operating fluid to reservoir 20. The mold spaces are then conditioned to receive a fresh charge of water.

In view of the fact that the pressure in conduits 65 and 64*b* immediately subsides as soon as valve 48 changes its position, it is necessary to provide an electrical interlock 71 in parallel with contacts 67 of the pressure switch. The electrical interlock comprises a movable spring-loaded switch contact 72 which is attracted towards fixed contact 73 by the magnetic field of solenoid 49. Thus, as soon as the solenoid is energized the electrical connection between contacts 72 and 73 is established and current will continue to flow through the solenoid regardless of the opening of contacts 67 as pressure is relieved from the pressure switch 66.

At approximately the time that solenoid 49 shifts the position of valve 48, cam lobe 74 closes electrical switch 45 and completes the circuit through lines 75 and 76 to solenoid 77 of water control valve 50. Energization of solenoid 77 opens the water valve and permits flow of water to the mold spaces through line 13. It will be noted that flow of water will continue as long as switch 45 is maintained in a closed position by cam lobe 74. In other words, the flow of water to the mold spaces is made a function of time. It is therefore desirable to compensate for variations of pressure at the outlet of the valve 50. For this reason, a flow regulator 51 has been provided. Since this flow regulator does not constitute any part of the present invention, its details will not be described and it will be sufficient to understand that it is arranged to establish a relatively constant rate of flow regardless of variations of pressure at its inlet. Valves of this type are commercially available.

Because of clearance spaces 28 (see Figure 4), it is possible to begin feeding water to the mold spaces as soon as valve 48 has changed its position. The first water to reach the mold assembly fills spaces 28. By the time additional water reaches the mold spaces, the mold liners are retracted within the mold cavities.

The flow of fresh water to the mold spaces is terminated when switch 45 opens as a result of being by-passed by cam lobe 74. Pump motor 46 continues to operate and partially evacuates the mold cavities beneath the mold liners until switch 44 is opened by the timer motor, as has been explained. At such time, the entire control system comes to rest, being fully de-energized, and the two-position valve 48 resumes its initial position under the effect of gravity since its movable element is arranged vertically. At the same time, the electrical interlock 71 is interrupted and the electrical connection between contacts 72 and 73 is broken.

The system remains inactive until the water supplied to the mold spaces freezes and reduces the temperature of thermostat 14 to approximately 25° F., at which time the entire cycle is repeated. It will be noted that the repetition of the cycle is dependent upon two factors: The temperature of the thermostat must be reduced sufficiently to close its electrical contacts; mercury switch 55 must be in a closed circuit position which is established when the mercury switch is in the position indicated in Figures 2 and 9. From what has been said, it will be recognized that detector arm 8, to which the mercury switch is attached, is raised by thermostat arm 35 once during each cycle of operation and that, as a result, the detector arm falls to a position of rest on top of the ice accumulated within tray 6. When sufficient ice has accumulated to hold the detector arm in a raised position, the mercury switch is tilted sufficient to break circuit and it is not possible to energize the system to harvest the conoids of ice despite the fact that the temperature of the thermostat may fall to 25° F. or less. As long as the mercury switch is in a raised open circuit position, it is impossible to initiate harvesting of the ice. Only by removal of some of the accumulated ice from tray 6 and the lowering of the detector arm 8 can the circuit through mercury switch 55 again be established so that harvesting of the ice can be effected.

The need for electric heater 41 of thermostat 14 can now be considered. As has been mentioned, ice harvesting is initiated by a decrease of thermostat temperature to 25° F. It is obviously necessary that the before-described cycle of operation of the control system not be repeated until the conoids of ice are solidly frozen. In view of the fact that the detector arm usually restores the mercury switch to a closed circuit position, it will be appreciated that it is imperative that the thermostat temperature be raised above 35° F. by the time that switch **44** is opened. If the temperature of the thermostat is not above 35° F. at such time, the entire cycle of operation of the control system will be repeated. Thus, by providing electrical heater **41** in the thermostat, the temperature of the thermostat is raised sufficiently to preclude faulty operation of the system and assurance is given that ice harvesting will only again be initiated when the temperature of the thermostat is again reduced to the requisite low value specified. It will be obvious now why it is necessary to provide timer operated switch **44** during the time that the mercury switch **55** is raised to an open circuit position, during which time the thermostat is also being electrically heated.

Two-position valve

The structural details of the two-position valve **48** are illustrated in Figure 7. As indicated in this figure, valve housing **78** defines a cylindrical bore **79** in which is slidably retained a cylindrical valve element **80**. The valve element extends beyond housing **78** into tubular extensions **81** which are sealed by gland nuts **82** to the housing.

Since the two-position valve is assembled in the control system in a vertical position, as indicated in Figure 9, cylindrical valve **80** tends to drop under gravity to the position indicated in Figure 7. The valve **80** includes by-pass portions **83** and **84** and in the lowered position by-pass **83** establishes fluid connection between the conduits **61** and **62**. The by-pass **84** establishes fluid connection between conduits **63** and **64**.

When the solenoid **49** is energized, cylindrical valve element **80** is raised and by-pass portion **83** then establishes fluid connection between conduit **61** and conduit **65** while by-pass portion **84** establishes connection between conduits **62** and **63**. The significance of these interconnections will be appreciated with reference to the description of the control system operation discussed with reference to Figure 9.

It will be noted that a tube **85** interconnects the distal ends of tubular extensions **81**. This tube permits fluid present at one end of valve **80** due to leakage to be displaced to the opposite end of the valve when the valve is moved to its alternate position. In this way, free movement of the valve is assured.

Miscellaneous

The fluid stored in reservoir **20** and used for ejecting the ice conoids obviously must not freeze at the temperatures encountered within the evaporator of the refrigerator. It has been found convenient to use a 50% solution of glycerin and water.

It will be noted that the reservoir is formed directly in the mold **10**. In this way, the operating fluid for the system is always maintained at below freezing temperatures and the mold is never subjected to fluid at an elevated temperature which would introduce undesirable heat into the system.

Since the conoids of ice are ejected hydraulically and the shape of the mold space facilitates ejection of the conoids, it is not necessary to heat the mold in order to free the ice. Release of the ice is also greatly facilitated through the use of flexible elastic materials in the mold liners. It has been found that the liners may be made from synthetic rubber compounds such as neoprene, silicone rubber compounds, or rubber impregnated fabrics. These materials all have suitable flexibility at the temperatures encountered and have sufficient mechanical strength to withstand the normal usage in the ice maker.

It will be noted that the mold assembly, as shown in Figure 2, is mounted within the refrigerator unit. It will be understood by those skilled in the art that the elements of the control system, such as the timer motor, pressure switch, and pump, may be secured inside or outside of the refrigerator as may be desired. In most installations it will probably be found most convenient to secure these control units to the rear exterior face of the cabinet.

In this connection, it is interesting to note that through use of the present invention an ice maker can be disposed within a refrigerator without the need for passing shafts through the rear wall of the cabinet as required in other prior art devices. In other words, all of the connections between the control system and the mold assembly are fluid conduits and electrical wires and no mechanical interconnections of any sort are required. Release and ejection of the entire contents of the mold are effected solely by means of hydraulic pressure.

The freezing time for forming a plurality of ice conoids varies in accordance with the heat transfer properties of the evaporator and the capacity of the refrigerant system. Experiments indicated, however, that typical time requirements in a domestic refrigerator range between thirty and forty minutes. The operation of the timer and other control elements during the harvesting period requires an additional seven minutes. Obviously, these times are not critical and are merely supplied for purposes of illustration.

It will be noted from a study of Figure 2 that no ice guide has been provided adjacent the mold space with which the thermostat **14** is associated. Although this is an optional feature, an ice guide in this location is not considered necessary in view of the fact that the thermostat arm **35** acts much as a deflector for the ice conoid and urges it toward the tray **6** during its ejection.

From the foregoing description of my invention, it will be appreciated that there is provided a novel form of ice maker which is simple to construct and efficient in operation. By the use of this invention, a supply of ice can be readily kept on hand in a domestic refrigerator or home freezer and the need for conventional ice trays is eliminated. The ice maker delivers a plurality of ice conoids of pleasing shape and attractive appearance. Since no heat is applied to the mold to liberate the conoids, they need not be dried and fall into the receiving tray in a substantially dry condition. Hence, there is no tendency for the conoids to fuse during storage.

It should be recognized that the values of temperature and pressure mentioned in this specification are given merely for the purposes of illustration and do not constitute limitations on the invention.

Having described a preferred embodiment of my invention, I claim:

1. Automatic means for freezing liquid into a discrete mass of definite shape designed for installation and use in a refrigerated environment having means for absorbing heat comprising a mold in heat transfer relationship with said heat absorbing means, said mold defining a mold cavity, a non-metallic flexible liner flexibly disposed within the mold cavity and secured to said mold in sealing engagement therewith adjacent the top edges of the cavity, said liner being fitted closely within the cavity by evacuation thereof, means for supplying a measured quantity of liquid to said liner when disposed within the mold cavity, a reservoir in heat transfer relationship with the refrigerated environment, working fluid in the reservoir at least equal in volume to the volume of the mold cavity, and pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavity beneath said liner for flexing and inverting said liner and ejecting from said liner frozen liquid having substantially the shape of the mold cavity, said pumping means comprising the sole means for ejection of the frozen liquid.

2. Automatic means for freezing liquid designed for installation and use in a refrigerator having an evaporator for absorbing heat, a mold secured in heat transfer rela-

tionship with the evaporator, said mold defining a mold cavity and a reservoir, a flexible liner flexibily disposed within the mold cavity and secured to said mold, means for supplying a measured quantity of liquid to be frozen to said liner when disposed within the mold cavity, working fluid in the reservoir at least equal in volume to the volume of the mold cavity, pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavity beneath said liner whereby said liner is flexed and the frozen liquid is ejected from said liner, a receptacle for receiving the frozen liquid as it is ejected from said liner, detector means pivotally secured to said mold for movement into said receptacle for detecting the presence of a predetermined quantity of frozen liquid, and means associated with said liquid supply means controlled by said detector means for precluding further supply of liquid to said liner when a predetermined accumulation is present in said receptacle.

3. In combination in an automatic ice maker for use in a refrigerated environment, a mold defining a plurality of mold cavities, flexible liners disposed within each of the cavities, a retainer plate for clamping said liners to said mold, means for supplying water to said liners when disposed within the mold cavities where the water freezes into ice by virtue of heat transfer to the refrigerated environment, a reservoir, working fluid within the reservoir, pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavities beneath said liners whereby said liners are flexed to eject therefrom ice formed therein, a thermostat associated with one of the mold cavities for detecting through temperature change the formation of ice therein and for actuating said pumping means, and a pressure switch subjected to the pressure of the working fluid generated by said pumping means for terminating its effectiveness in delivering fluid to the mold cavities.

4. An automatic ice maker for use within a refrigerated unit comprising a mold defining conoid shaped mold cavities, a flexible cup-shaped liner disposed within each of the cavities, a retainer plate clamping said liners in liquid-tight engagement with said mold, means for supplying water to said liners when disposed within the mold cavities, a reservoir, working fluid within the reservoir, pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavities beneath said flexible liners whereby they are flexed to eject conoids of ice formed therein by heat transfer to the refrigerated unit, a receptacle adjacent said mold for receiving ice ejected from said liners, a thermostat associated with one of the mold cavities to detect thermally the formation of ice within its associated liner, said thermostat initiating operation of said pumping means, a pressure sensitive device subjected to the pressure of working fluid within the mold cavities, said pressure sensitive device terminating effectiveness of said pumping means in supplying working fluid to the mold cavities when a preselected pressure has been attained, a detector arm pivotally secured to said mold for movement into and out of said receptacle for detecting the pressure therein of a predetermined quantity of ice at which time said detector arm terminates operation of the ice maker.

5. An automatic ice maker for use within a refrigerated unit comprising a mold defining conoid shaped mold cavities, a flexible cup-shaped liner disposed within each of the cavities, a retainer plate clamping said liners in liquid-tight engagement with said mold, means for supplying water to said liners when disposed within the mold cavities, a reservoir, working fluid within the reservoir, pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavities beneath said flexible liners whereby they are flexed and inverted to eject conoids of ice formed therein by heat transfer to the refrigerated unit, a receptacle adjacent said mold for receiving ice ejected from said liners, a thermostat associated with one of the mold cavities to detect thermally the complete formation of ice within its associated liner, said thermostat initiating operation of said pumping means, a solenoid controlled two-position valve in one position of which the working fluid is directed from the reservoir through said pumping means to the mold cavities and in the other position of which the working fluid is directed from the mold cavities through said pumping means to the reservoir, and a pressure sensitive device subjected to the pressure of working fluid within the mold cavities, said pressure sensitive device energizing the solenoid of said two-position valve when a preselected pressure has been attained whereby said valve is shifted from its first-mentioned to its second-mentioned position.

6. An automatic ice maker for use within a refrigerated unit comprising a mold defining conoid shaped mold cavities, a flexible cup-shaped liner disposed within each of the cavities, a retainer plate clamping said liners in liquid tight engagement with said mold, means for supplying water to said liners when disposed within the mold cavities, a reservoir, working fluid within the reservoir, pumping means for withdrawing working fluid from the reservoir and forcing it under pressure into the mold cavities beneath said flexible liners whereby they are flexed and inverted to eject conoids of ice formed therein by heat transfer to the refrigerated unit, a receptacle adjacent said mold for receiving ice ejected from said liners, an electric timer, a thermostat associated with one of the mold cavities to detect thermally the complete formation of ice within its associated liner, said thermostat initiating operation of said timer and pumping means, a solenoid controlled two-position valve in one position of which the working fluid is directed from the reservoir through said pumping means to the mold cavities and in the other position of which the working fluid is directed from the mold cavities through said pumping means to the reservoir, a pressure sensitive device subjected to the pressure of the working fluid within the mold cavities, said pressure sensitive device energizing the solenoid of said two-position valve when a preselected pressure has been attained whereby said valve is shifted from its first-mentioned to its second-mentioned position, a switch operated by said timer for controlling said means for supplying water to said liners, and detector means for detecting the presence of a predetermined quantity of ice in said receptacle at which time said detector terminates continuous operation of the ice maker.

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