Oct. 19, 1971 O. E. WENDT 3,613,388

ICEMAKER APPARATUS

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FIG.1

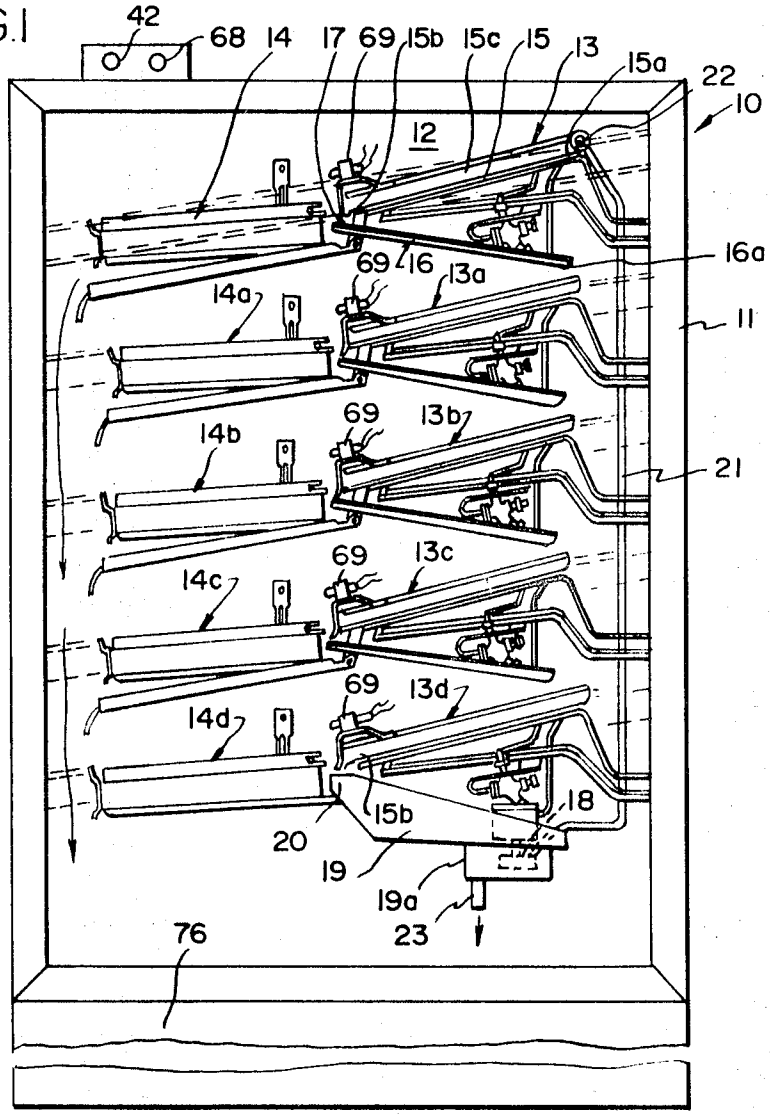
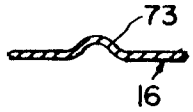


FIG.6



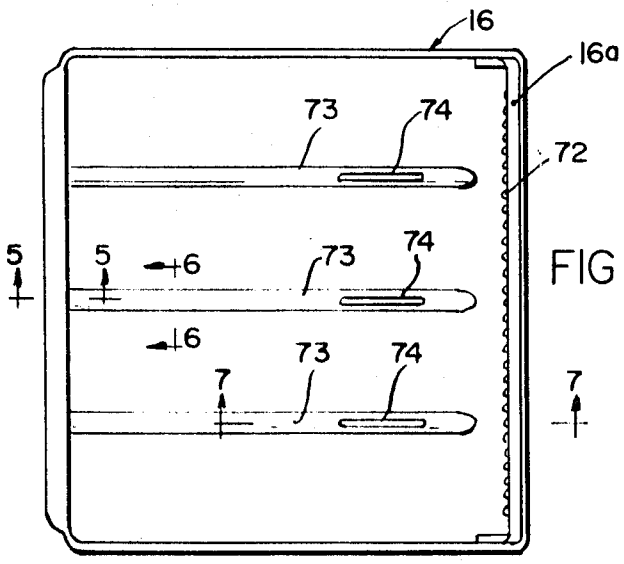


FIG 4

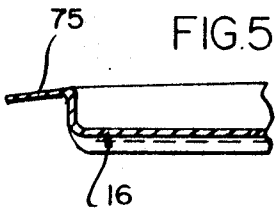


FIG.5

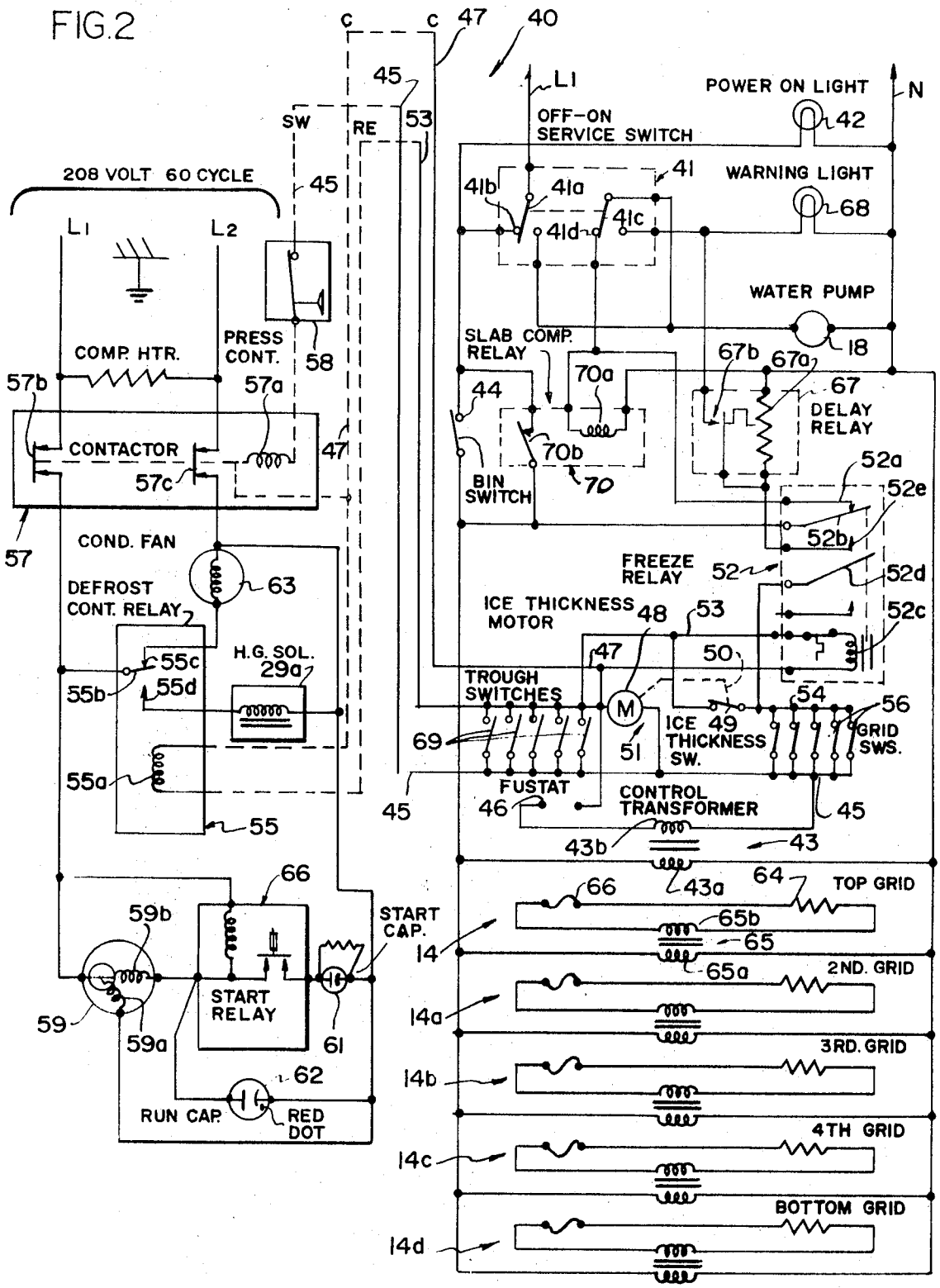
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FIG.2



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FIG.3

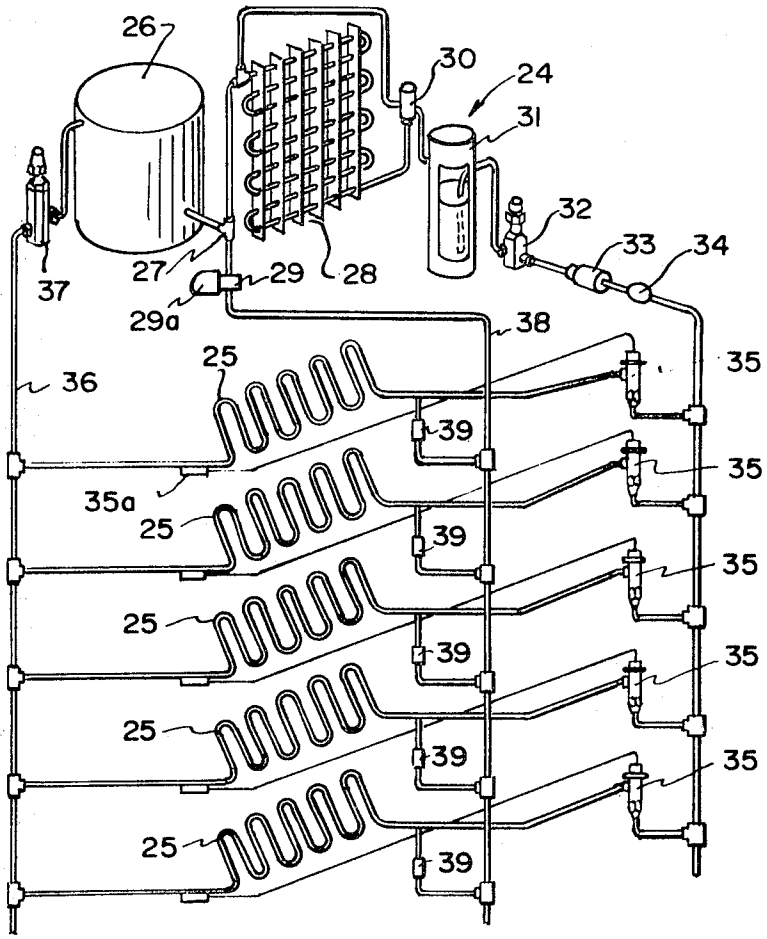


FIG.7

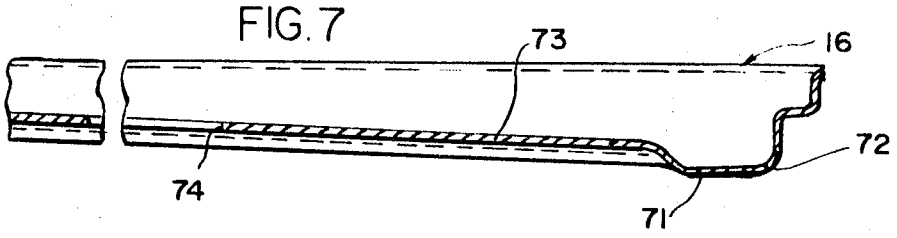
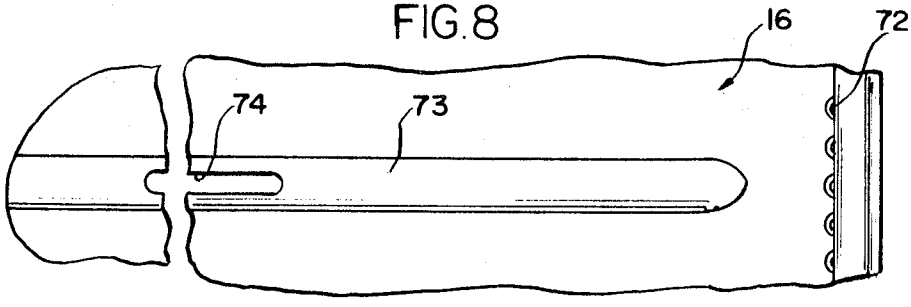


FIG.8



United States Patent Office 3,613,388 Patented Oct. 19, 1971

3,613,388

ICEMAKER APPARATUS

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Int. Cl. F25c 1/12
U.S. Cl. 62—130 10 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for forming ice in the form of slabs which may be subsequently divided into rectangular ice bodies of the desired dimensions. The apparatus includes a plurality of refrigerated plates for concurrently forming a plurality of such slabs. Means are provided for flowing water seriatim over the respective plates and recirculating the water by suitable pump means. Means are provided for freeing the ice slabs from the plates by heating the plates upon completion of the formation of the ice slabs. The apparatus includes a control having means for sensing the failure of a released ice slab to clear the lower end of the plate and thereby at least partially obstruct the means for conducting water from one plate to the subjacent plate, or reservoir, and cause a continuation of the operation of the releasing means until the slab is fully released. The control further includes means for providing a visual indication of the failure of the slab to be completely freed from the plate and delivered to the cutting means. Further, the means for conducting the water from the lower end of one plate to the subsequent plate is provided with improved means for assuring flow of water in the cascading arrangement notwithstanding a partial blocking of the outlet of the conducting means as by slush ice.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to ice forming apparatus and in particular to apparatus for forming ice slabs for subsequent division into preselected bodies such as cubes.

Description of the prior art

In one improved form of ice cube making apparatus as disclosed in U.S. Letters Patent 2,682,155, issued June 29, 1954 to R. W. Ayres et al., and owned by the assignee hereof, the apparatus includes an inclined refrigerated plate over which water is flowed to build up a slab of ice thereon. Upon completion of the forming of the desired slab, the water flow is discontinued and the plate is warmed to release the formed slab onto a means for dividing the slab into preselected bodies such as having ice cube configuration. The dividing means comprises a set of resistance wires which effectively cut through the slab by a melting action to form the slab into the final desired pieces.

In one improved form of such apparatus, as disclosed in U.S. Letters Patent 2,999,369, issued Sept. 12, 1961 to D. F. Swanson et al., and owned by the assignee hereof a plurality of such refrigerated plates and slab cutting devices are provided in vertically spaced relationship. Means are provided for conducting the water seriatim over the series of refrigerated plates in a cascading fashion whereby water flowed over the lower plates is effectively precooled by its previous flow over the relatively upper plates thereby providing improved efficiency in the ice making function.

In U.S. Letters Patent 2,887,852, issued May 26, 1959 to W. M. Thomas, a modified form of slab-type icemaker is disclosed wherein means are provided for separately conducting the water from the lower ends of each of the refrigerated plates to a reservoir for concurrent recirculation onto the respective refrigerated plates.

SUMMARY OF THE INVENTION

The present invention comprehends an improved slab-type icemaker wherein a plurality of plates are provided in vertically spaced relationship with means for conducting the slab forming water seriatim over the series of plates and to a subjacent reservoir for subsequent recirculation by delivery to the top plate of the series as by suitable pump means. The invention comprehends the provision in such an ice slab forming apparatus of improved control means for sensing an obstruction of the flow path as at the lower end of the respective plates as by a hang-up of a thermally released slab. The control includes means for continuing a heating of the plate to assure a complete release of the slab from the plate onto the receiving wire grid dividing means. The control includes further means for sensing the reception of the slab properly in the dividing means. Each of the means for sensing a hang-up of the slab on the lower end of the plate and the means for sensing the reception of the slab fully in the dividing means further controls an indicating means for indicating to the user a malfunctioning of the apparatus causing a continuance of the releasing operation beyond a preselected time, such as 3 minutes. Additionally, the control includes means to ensure completion of an ice slab in the event the bin control senses a full ice bin during the ice making cycle.

The invention further comprehends the provision of an improved duct means for conducting the water from the lower end of one plate to the upper end of a subjacent plate or, in the case of the lowermost plate, the reservoir. More specifically, the invention comprehends the provision in the duct means of means for precluding undesirable blocking of the water flow to the subjacent plate as by obstruction of the outlet ports by ice slush as may form during certain portions of the operation of the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary vertical cross-section of an ice forming apparatus embodying the invention;

FIG. 2 is a schematic electrical wiring diagram of the control thereof;

FIG. 3 is a schematic view of the refrigeration system thereof;

FIG. 4 is a top plan view of the water transfer duct thereof;

FIG. 5 is a fragmentary enlarged vertical section taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary enlarged vertical section taken substantially along the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary enlarged vertical section taken substantially along the line 7—7 of FIG. 4; and

FIG. 8 is a fragmentary top plan view of the portion of the water transfer duct illustrated in FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a slab-type ice making apparatus generally designated 10 is shown to comprise a cabinet 11 defining a forming space 12 in which is provided a plurality of cooperating ice slab forming devices generally designated 13 and slab dividing devices generally designated 14, in vertically spaced relationship. In the illustrated embodiment, five such pairs of devices are provided, the slab forming devices being identified successively

downwardly as devices 13, 13*a*, 13*b*, 13*c* and 13*d*, and the slab dividing devices being identified successively downwardly as devices 14, 14*a*, 14*b*, 14*c* and 14*d*. Thus, the apparatus 10 is arranged to automatically concurrently form five ice slabs, one each on the respective plates 13, 13*a*, 13*b*, 13*c* and 13*d*, and upon completion of the forming thereof, release the ice slabs onto the dividing devices respectively 14, 14*a*, 14*b*, 14*c* and 14*d*, which divide the slabs into the desired ice body configuration, herein a conventional ice cube configuration. The slab forming devices 13–13*d* and the slab dividing devices 14–14*d* are similar to the slab forming device and the wire grid slab dividing device of the above identified Ayres et al. U.S. Pat. 2,682,155 to which patent reference may be had for a detailed description thereof. Briefly, however, the slab forming devices 13–13*d* comprise inclined refrigerated plates 15 having an upper portion 15*a* and a lower portion 15*b*. The plate includes upstanding sides 15*c* which guide water flowing downwardly thereover from an upper portion 15*a* to a lower portion 15*b* for delivery onto a subjacent transfer duct, or pan, 16. Thus, the space 17 at the lower end of the plate 15 effectively defines an inlet to the transfer duct 16, which in the illustrated embodiment comprises a shallow pan inclined downwardly from inlet 17 to an outlet portion 16*a* overlying the upper end of the subjacent slab forming device.

As indicated briefly above, during operation of the apparatus 10, water is continuously circulated in cascading fashion over the respective plates 15 whereby a slab of ice builds up on the plates. As a result of this method of forming the slab, the ice is substantially freed of impurities to form a slab of high clarity. The water is circulated by a pump 18 having an inlet connected to a sump portion 19*a* of a reservoir 19. The water flowing from the lower portion 15*b* of the lowermost slab forming device 13*d* is conducted by a suitable duct 20 to the reservoir 19 and the water is delivered from the pump 18 through a duct 21 to a distributor 22 at the portion 15*a* of the uppermost plate 15. Water which is left over from a slab forming cycle is automatically disposed of through a siphon 23 at the end of the cycle so as to remove the concentrated impurities released from the water during the slab forming process. Fresh water is introduced into the system by suitable valve means (not shown) for a subsequent slab forming cycle.

The means for refrigerating the plates 15 of the slab forming devices 13–13*d* is of conventional construction. Briefly, however, as shown in FIG. 3, the refrigeration system generally designated 24 includes a plurality of evaporators 25 associated one each with the respective slab forming plates 15. Suitable refrigerant fluid is compressed by a compressor 26 and delivered through a T-connector 27 selectively to a condenser 28 when a hot gas valve 29 connected between the T-connector 27 and the evaporators 25 is closed as during normal refrigeration operation of the apparatus. The refrigerant fluid is delivered from the condenser through a low head pressure modulating valve 30, a receiver 31, a liquid service valve 32, a dryer 33, a sight glass 34, and a plurality of expansion valves 35 to the evaporators 25 associated one each with the expansion valves. The refrigerant fluid evaporates in the evaporators 25 to cool the associated plate 15 and the warm fluid is then delivered through a return conduit 36 and a suction service valve 37 to the compressor for recompression and recirculation. Each expansion valve 35 is provided with a suitable bulb 35*a* for controlling the operation of the expansion valve to maintain the evaporators properly supplied with refrigerant fluid under varying load conditions. The bulb 35*a* is in thermal transfer contact with the outlet of the evaporators 25 to control the rate of delivery of refrigerant fluid to the evaporators and thereby maintain a "superheat" temperature difference of approximately 1° to 8° across the evaporators. Upon energization of the solenoid 29*a* of the hot gas valve 29, hot refrigerant vapor is delivered directly from the compressor 26 through a bypass line 38 and suitable check valves 39 to the respective evaporators 25 for warming the slab forming plates 15 thereby to release the formed slabs permitting them to slide downwardly on the inclined plates onto the corresponding dividing devices 14–14*d*.

The operation of apparatus 10 is automatically controlled by a suitable electrical control generally designated 40 as shown in FIG. 2. Power is supplied to control 40 through power supply leads L1 and N. Operation of the apparatus is initiated by closing a double pole, single throw service switch 41 having a first movable contact 41*a* which closes with a fixed contact 41*b* when the switch is in the "On" position to connect a "Power On" light 42 between power supply leads L1 and N. A control transformer generally designated 43 has its primary winding 43*a* connected in series with a normally closed bin switch 44 between power supply lead N and power supply lead L1 through switch contact 41*a*. One side of the secondary 43*b* of the control transformer 43 is connected to a lead 45. The opposite side of the secondary 43*b* of the control transformer 43 is connected through a suitable fuse 46 to a lead 47. An ice thickness motor 48 is connected between leads 45 and 47. Motor 48 herein comprises a ¼-r.p.m. gear motor having a normally closed switch 49 which is normally maintained open by a sensing arm 50 which is revolved by the gear motor 48. The motor 48, switch 49, and sensing arm 50 define an ice thickness control which is carried on the lowermost slab forming device 13*d* so that when the ice slab builds thereon to the desired thickness, the ice prevents the sensing arm 50 from maintaining the switch 49 open whereupon the switch 49 closes to initiate a defrost cycle. The ice thickness control generally designated 51 may be adjustable to permit control of the ice slab thickness by the user.

As discussed above, the forming of the ice slab on the respective plates 15 is effected by a continuous circulation of water over the plates by pump 18. The pump 18 is connected between power supply lead N and a second movable contact 41*c* of "Off-On" service switch 41 which, in the "On" condition, contacts a fixed contact 41*d* to connect the other side of the pump to power supply lead L1 through a first fixed contact 52*a* and a movable contact 52*b* of a freeze relay 52, bin switch 44 and service switch contact 41*a*. Freeze relay 52 includes a coil 52*c* which is connected between lead 47 and a lead 53. The freeze relay 52 further includes a single pole, single throw switch 52*d* which is connected to a lead 54. Ice thickness switch 49 is connected between leads 53 and 54.

A defrost cycle relay generally designated 55 includes a coil 55*a* which is connected between lead 47 and lead 53. Thus, when freeze relay coil 52*c* is energized to close switch 52*d* and thereby connect lead 54 to lead 53, the defrost cycle relay coil 55*a* is connected across the control transformer secondary 43*b* through a circuit from lead 53, switch 52*d*, lead 54 and through a plurality of normally closed grid switches 56 to transformer secondary lead 45, lead 47 being connected to the opposite side of the control transformer secondary. Normally, however, as the ice thickness switch 49 is maintained open during the formation of the slab, the circuit through switches 56 to lead 53 is broken, whereby the coil 52*c* is maintained de-energized thereby maintaining switch 52*d* open and preventing operation of the defrost cycle relay 55.

The operation of the refrigeration system 24 is effected by energization of the control transformer 43 as result of the secondary voltage appearing between leads 45 and 47. Thus, lead 47 is connected to one side of the coil 57*a* of a contactor generally designated 57, the other side of the coil 57*a* being connected to a normally closed pressure control switch 58 to power supply lead 45 whereby the normally open contacts 57*b* and 57*c* of contactor 57 are closed. Contact 57*b* is connected in series with power supply lead L1 and contact 57*c* is connected in series with power supply lead L2 which illustratively may

comprise 208 v. power supply leads. One side of the compressor motor **59** is connected through contact **57***b* to power supply lead **L1** and the run winding **59***a* thereof is connected through the contact **57***c* to power supply lead **L2**. The starting winding **59***b* of the motor **59** is connected through a starting relay **60** and a starting capacitor **61** to the contact **57***c* with a running capacitor **62** being connected in parallel with the series connection of the starting relay **60** and starting capacitor **61**. The defrost control relay includes a single pole, double throw switch having a movable contact **55***b* connected to contact **57***b* of contactor **57**. A first fixed contact **55***c* of the double throw switch is connected to the fan motor **63** of the condenser **28** and a second fixed contact **55***d* thereof is connected to the hot gas solenoid **29***a* which, in turn, is connected to contact **57***c*. Thus, as coil **55***a* is normally deenergized during the normal refrigeration operation of apparatus **10**, the movable contact **55***b* is arranged to cause operation of the condenser fan **63** while precluding operation of the hot gas solenoid **29***a*.

Concurrently with the energization of control transformer **43**, the grid wires **64** of the respective slab dividing devices **14–14***d* are energized by suitable transformers **65** having their primaries **65***a* connected between power supply lead N and bin switch **44**. The secondary winding **65***b* of each transformer is connected in series with the grid wires **64** and a suitable fuse **66**.

When the ice thickness switch **49** is closed as a result of the ice slab on the plate **15** of the lowermost slab forming device **13***d* reaching the preselected thickness, the freeze relay coil **52***c* becomes energized thereby moving the movable contact **52***b* from fixed contact **52***a* to a single fixed contact **52***e*. Fixed contact **52***e* is connected to a heater **67***a* of a time delay relay **67** which, in turn, is connected to power supply lead N. When switch **52***d* is closed by the energization of coil **52***c* to initiate the defrost cycle by energizing hot gas solenoid **29***a*, the time delay relay heater **67***a* is concurrently energized. Should, for any reason, the defrost cycle be continued beyond a preselected time interval, such as three minutes, the heater **67***a* closes a normally open switch **67***b* of the relay **67** which is connected between fixed contact **52***e* of freeze relay **52** and a warning light **68** which, in turn, is connected to power supply lead N thereby to provide a visual indication of the abnormal continued operation of the apparatus in the defrost mode.

As indicated briefly above, the present invention comprehends the provision of means at the lower end of the respective slab forming devices for sensing an incomplete release of the formed slabs during the defrost, or releasing, operation whereby a portion of the slab obstructs at least a portion of the inlet **17** to the water transfer pans **16**. Thus, as shown in FIG. 1, trough switches **69** are mounted adjacent the lower end of each slab forming device for sensing a portion of the slab overlying the inlet **17** such as the trailing edge of the slab where the slab is hung-up on the plate **15** and not completely transferred to the dividing devices **14–14***d*. As shown in FIG. 2, the trough switches **69** are connected in parallel between lead **45** and lead **53**. Thus, if any one of the switches **69** is closed, the circuit is maintained from lead **45** therethrough to lead **53** notwithstanding the opened condition of the ice thickness switch **49**, thereby prolonging heating of the plate by maintaining the coil **52***c* and the hot gas solenoid **29***a* energized, thus to facilitate a complete release of the slab to unblock the inlet to the water transfer pan. Resultingly, the warning light **68** is energized in the event that the continuous heating action does not free the slab before the delay relay **67** closes its switch **67***b*.

Further, as the grid switches **56** are connected between lead **45** and switch **52***d*, all of the switches **56** must be open to indicate a complete transfer of the ice slab to the respective dividing devices **14–14***d* before the circuit through switch **52***d* maintaining the coil **52***c* energized is broken. Here, again, if all the switches **56** do not open within the preselected time delay of relay **67**, the warning light **68** is energized to indicate the malfunctioning of the apparatus **10** to the user.

In the event that the bin switch **44** is opened during a freezing cycle for any reason, the control **40** automatically maintains the refrigeration operation to the completion of the freezing cycle. For this purpose, the control includes a slab completion relay **70** having a coil **70***a* connected between power supply lead N and fixed contact **52***a* which is thusly energized through the movable contact **52***b* to close a single pole, normally open switch **70***b* connected in parallel with the bin switch **44**. Thus, the control will continue to operate the apparatus **10**, notwithstanding an opening of the bin switch **44**, until such time as the solenoid coil **52***c* is energized to break the circuit between contacts **52***a* and **52***b* of freeze relay **52**.

As indicated above, the present invention further comprehends an improved operation of the water transfer duct **16** whereby continued circulation of the water is assured notwithstanding obstruction of the normal flow path therethrough. Thus, during an initial portion of the start-up of the apparatus **10**, it has been found that some slush may form in the water as it is circulated. As best seen in FIGS. 4 and 7, the water transfer ducts, or pans, **16** are provided at their lower end **71** with a plurality of apertures **72** defining the outlet portion of the duct for delivering the circulated water onto the subjacent upper end of the next slab forming device **13**. The lower portion of the pan may be depressed, as seen in FIG. 7, to define a sump recess for facilitating transfer of the water. However, the slush formed during such initial start-up conditions, may tend to clog the apertures **72** and cause the circulating water to back up on the transfer pans whereby additional water may be automatically delivered into the system. Upon subsequent dissolution of the slush, the total volume of water being circulated in the system is greater than the desired quantity and the excess is discharged through the drain siphon **23**. As the discharged water has been previously cooled in the system, the efficiency of the system and the ice output for a given time period are decreased by the removal of this precooled water. To avoid this undesirable loss in efficiency, the pans **16** are arranged to define a plurality of upstanding ridges **73** extending lengthwise in the direction of water flow over the pans **16** and having apertures, or slots **74** opening through the upper portion thereof. The height of the ridges **73** is made to be sufficient to permit the apertures **74** to open above the level of the slush which may form and thereby permit the apertures **74** to conduct liquid water onto the subjacent slab forming plate **15** until such time as the slush is dissipated and the water made to flow over the pan and outwardly through the apertures **72** onto the upper end of the subjacent plate **15**.

The pan **16** may be formed of a suitable material, such as plastic, with the ridges **73** being integrally formed therein as shown in FIG. 6. The upper end of the pan **16** may be provided with an outturned flange **75**, as shown in FIG. 5.

As shown in FIG. 2, the portion of the control **40** associated with the condensing unit including the compressor motor **59** may comprise a portion remote from the control elements provided with the equipment in cabinet **11**. Thus, the condensing unit may be installed in an area where the temperature may provide optimum efficiency. Further, by providing for remote installation of the condenser means, an improved compact arrangement of the apparatus in cabinet **11** may be provided. As shown in FIG. 2, only three wire connections of leads **45**, **47** and **53** need be extended between the control of the ice making apparatus in cabinet **11** and the condensing unit apparatus control.

The operation of the ice forming apparatus **10** is fully automatic. When the service switch **41** is thrown to the "On" position, the apparatus will commence a freeze cycle (assuming that there is a requirement for ice cubes as sensed by the bin switch **44**). The control will cause the apparatus to concurrently form five ice slabs in the respective slab forming devices **13–13***d* by circulating water seriatim over the plates **15** thereof which are suitably refrigerated by the evaporators **25** of the refrigeration system **24**. When the slabs build up to the preselected thickness as sensed by the ice thickness switch **49** associated with the bottommost slab forming device **13***d*, the control automatically terminates the freezing operation and energizes the hot gas solenoid **29***a* to initiate a slab releasing, or defrosting, operation. When all of the slabs are fully released from the plates **15** and delivered onto the slab dividing devices **14–14***d*, the slabs are automatically cut by the devices **14–14***d* into the desired ice body configuration to fall into the subjacent collecting bin **76**. Concurrently with the cutting operation, the apparatus **10** is caused to initiate another ice forming cycle. In the event that the ice bodies collected in bin **76** cause an opening of the bin switch **44** as a result of the bin becoming full, the control will continue the freezing operation by virtue of the holding circuit provided by relay **70** to form the completed ice slabs.

The control **40** provides an improved control of the delivery of the ice slabs to the dividing devices **14–14***d* by means of the trough switches **69** which assure that the inlets **17** to the transfer duct pan **16** are unobstructed before initiation of a subsequent freeze-cycle. The control includes a signal light **68** for indicating to the user a failure of the apparatus to fully release the ice slabs from the freezing plates after a preselected period of time.

Further, the water circulating means includes improved means for preventing undesirable flooding thereof as by blocking of the normal flow path by slush as may form during portions of the freezing cycle. Thus, the apparatus **10** provides an improved, highly efficient, low maintenance ice forming apparatus which, while being simple and economical of construction, provides the highly desirable features discussed above.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an apparatus for forming ice slabs having an inclined refrigerated plate and means for flowing water over said plate to form an ice slab thereon, means for releasing a formed ice slab therefrom to move from said plate, and means responsive to a failure of said releasing means to release the ice slab suitably to permit said slab to move fully from said plate within a preselected time interval for indicating said failure and causing a continued operation of said releasing means.

2. The ice slab forming apparatus of claim **1** wherein said indicating means comprises means providing a visual signal of said failure.

3. The ice slab forming apparatus of claim **1** further including means for receiving said released ice slab, means for sensing the reception of said slab on said receiving means, and means including a portion of said indicating means responsive to a failure of said released ice slab to be fully received on said receiving means within said preselected interval for indicating said failure.

4. In an apparatus for forming ice slabs vertically spaced upper, intermediate and lower inclined refrigerated plates, duct means having an inlet adjacent a lower portion of said upper plate for receiving water flowed over said upper plate and conducting it onto an upper portion of said intermediate plate, and having an inlet adjacent a lower portion of said intermediate plate for receiving water flowed over said intermediate plate and conducting it onto an upper portion of said lower plate, means for heating said plates to release formed ice slabs therefrom to move from said plates, and control means including switch means adjacent said lower portion of said plates responsive to at least a partial blocking of said inlet by an ice slab only partially released from at least one of said plates for prolonging heating the plates to facilitate a complete release of said partially released ice slab therefrom to unblock the blocked inlet and prevent further water flow over said plates until said complete release is effected.

5. The ice slab forming apparatus of claim **4** including a reservoir and pump means for pumping water from said reservoir to said upper plate and second duct means having an inlet adjacent a lower portion of said lower plate for receiving water flowed over said lower plate from said upper plate and conducting it to said reservoir, and means responsive to at least a partial blocking of said second conducting means inlet by an ice slab partially released from said lower plate for prolonging heating said lower plate to facilitate a complete release of said ice slab from said lower plate to unblock said second duct means inlet.

6. In an apparatus for forming ice slabs, an upper, inclined refrigerated plate, a lower, inclined refrigerated plate, and duct means having an inlet adjacent a lower portion of said upper plate for receiving water flowed over said upper plate, said duct means including a lower outlet portion defined by a plurality of small spaced apertures for directing the water onto said upper portion of said lower plate, and means for bypassing said outlet portion apertures to conduct water from said duct means onto said lower plate in the event said outlet portion is blocked sufficiently as by collection of ice slush at said outlet portion apertures to cause a preselected abnormal rise in the level of water at said lower outlet portion being conducted by said duct means.

7. The ice slab forming apparatus of claim **6** wherein said duct means comprises a pan and said bypassing means comprises an elevated, apertured portion of said pan.

8. The ice slab forming apparatus of claim **6** wherein said duct means comprises a pan and said bypassing means comprises a ridge extending in the direction of flow of water over said pan and having an aperture in an upper portion thereof.

9. The ice slab forming apparatus of claim **6** wherein said duct means comprises a pan and said outlet portion is defined by a plurality of apertures.

10. The ice slab forming apparatus of claim **6** wherein said duct means comprises an inclined pan having a lower recessed sump portion provided with a plurality of apertures defining said outlet portion.

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U.S. Cl. X.R.

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