July 31, 1962 F. CARAPICO, JR 3,046,753

APPARATUS FOR PRODUCING ICE CUBES

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Fig. 1

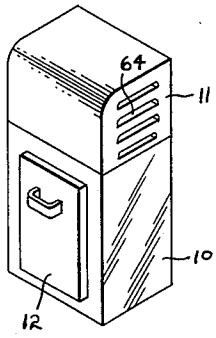


Fig. 2

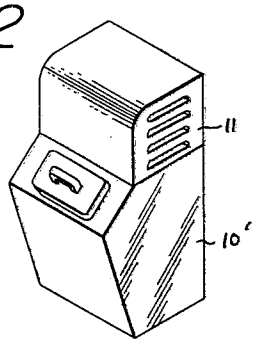


Fig. 3

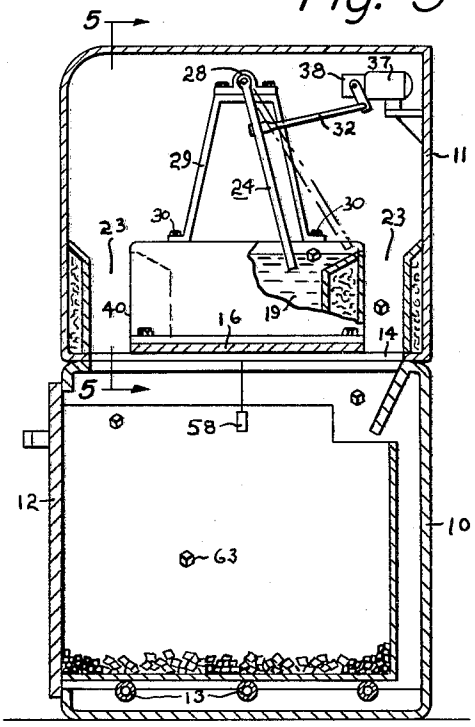
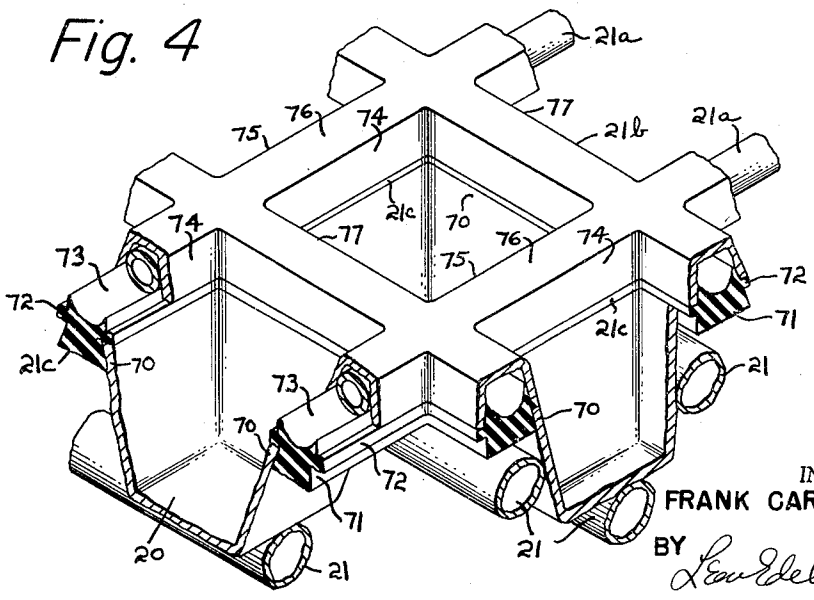


Fig. 4



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Fig. 5

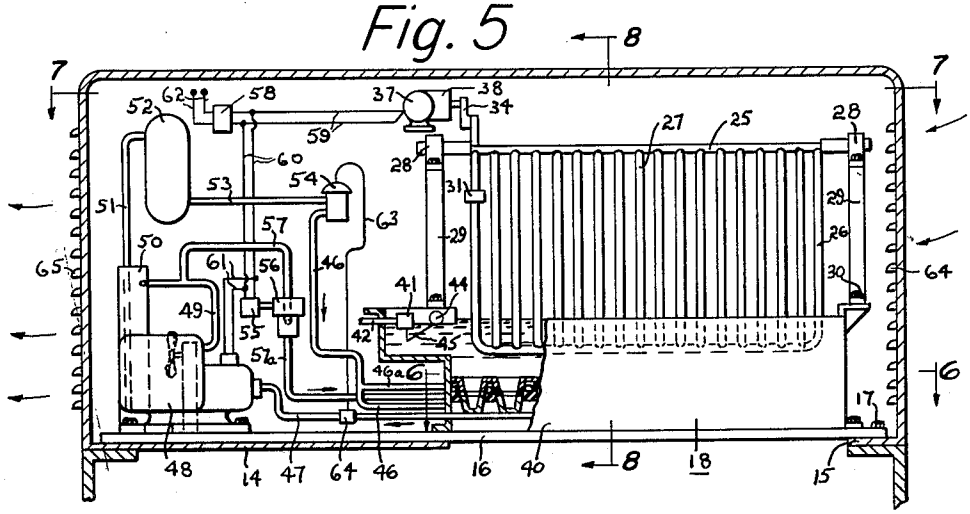
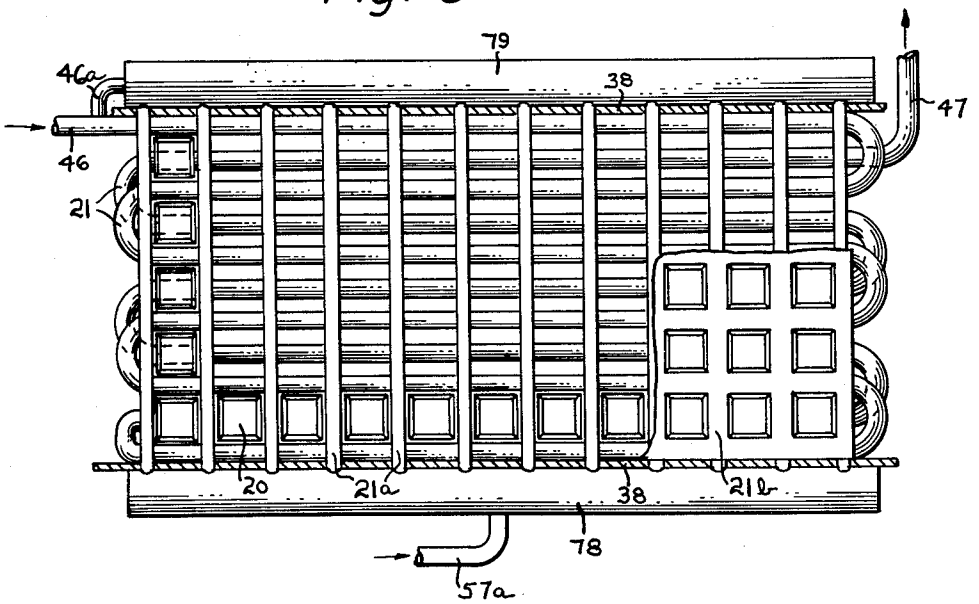


Fig. 6



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APPARATUS FOR PRODUCING ICE CUBES

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Fig. 7

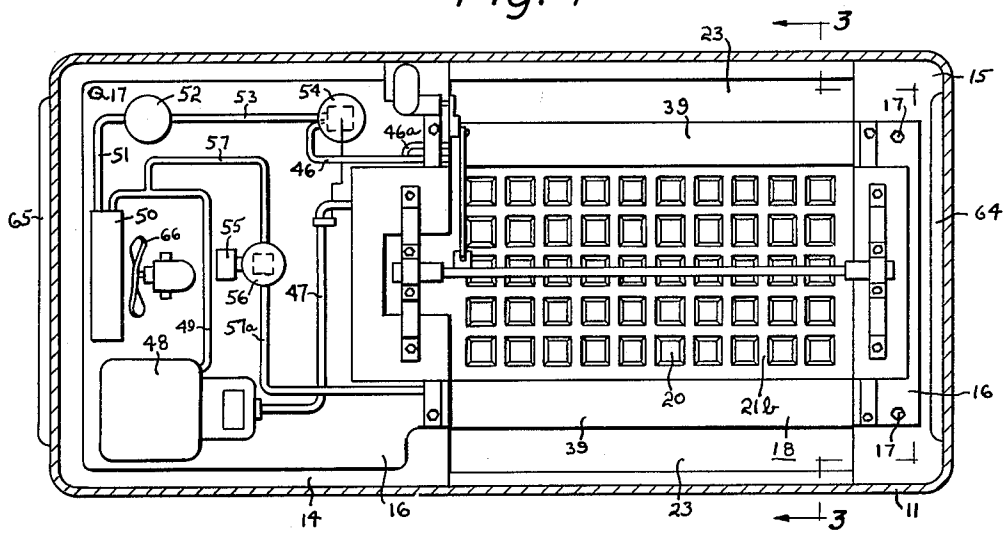
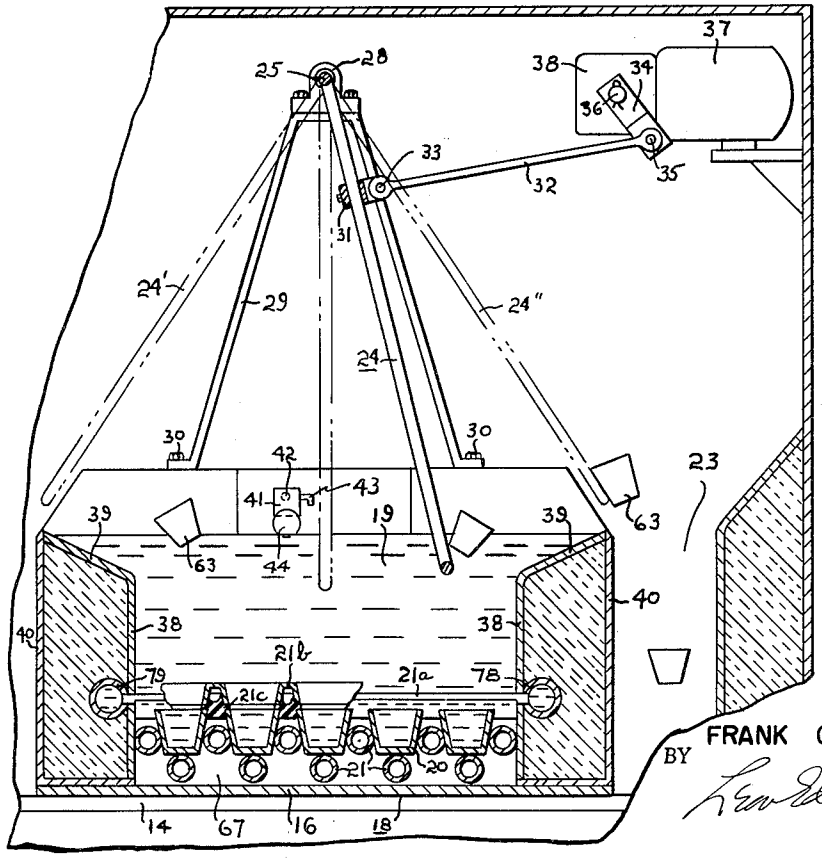


Fig. 8



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United States Patent Office 3,046,753 Patented July 31, 1962

3,046,753

APPARATUS FOR PRODUCING ICE CUBES

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Filed Apr. 27, 1961, Ser. No. 106,046
5 Claims. (Cl. 62—132)

This invention relates to an automatic ice making machine. More particularly, this invention relates to an ice making machine which when turned on begins producing ice cubes and constantly delivers the same to a storage bin until the bin is full, at which time the machine shuts itself down until the supply of cubes in the bin is decreased to a given level whereupon it resumes operation to again fill the storage bin.

In general the apparatus operates in a two-stage cycle. During the first stage of the operating cycle a refrigerant is passed through an evaporator structure which rapidly cools the ice forming structure, freezing the water in each individual ice form, the form itself being located at the bottom of a water reservoir so that a head of water extends upwardly above the top of the forms. During the second stage of the operating cycle circulation of the cooling refrigerant is terminated and a hot gas is circulated through the evaporator to melt the ice faces which are in contact with each ice form, thus freeing the ice and allowing it to rise to the surface of the water. The floating ice is then swept over the top edges of the reservoir by an oscillating sweeper structure whereupon the ice drops downwardly into the storage bin. When the level of ice in the storage bin rises to a predetermined height a thermostatically operated switch shuts down the entire apparatus and maintains it inactive until the ice level drops to a predetermined point below the thermostatic switch element.

It has been found that the most desirable form of ice is that of a cube as opposed to other forms such as annular rings, annular cylinders or flat fragments, all of these latter forms having too high a ratio of surface to volume resulting in rapid melting and dilution of the drink being cooled. Attempts have been made in the past to produce substantially cube-like ice, but prior to the present invention, unsuccessfully. While it has been generally possible to freeze ice into the form of a cube, all known attempts to maintain the cubic form during the defrosting cycle until release of the ice from the forms has occurred have been unsuccessful. The usually occurring result is that a substantial portion of the cube bottom and lower side regions is melted away prior to release of the ice from its form, resulting in an irregularly shaped non-cubic piece of ice. This undesirable result is a consequence of the evaporator constructions used which carry out both freezing and defrosting with the same set of coils. The evaporator construction according to the present invention does not operate in the usual manner, but instead employs one set of coils for the freezing cycle and brings into play an auxiliary set of coils during defrosting. By so doing, the formed ice cubes are rapidly released from their forms before any significant lower region melting can occur, and the ice maintains its cubic form.

Moreover, in the past, ice making machines have been known which employ a conventional evaporator structure utilizing a two-stage operating cycle for the production of ice below the surface of a water reservoir, which ice was subsequently freed and floated to the top. Generally, these known devices have caused the floating ice to be harvested from the reservoir by what may be termed the overflow method. This overflow method requires the use of a water recirculation pump which maintains a head of water above the gate of a weir. The water flowing

over the weir gate carries with it the floating ice which is shunted to a storage bin while the water passes downward to a lower reservoir from which it is pumped upward to the upper reservoir by the recirculation pump. In practice it has been found that malfunctionings of the recirculating water pump account for approximately fifty percent of the entire maintenance required by the apparatus. Moreover, ice making machines of this type are subject to jamming even under conditions where the water recirculation pump is apparently functioning properly. Jamming can be brought about by the production of an oversized piece of ice which obstructs the passage over the weir gate by virtue of the fact that the normally maintained head of water is of insufficient depth to float the ice over the gate, the lower edge of the floating ice extending below the top of the weir gate. Also, a relatively slight loss of pump efficiency can cause a lowering of the water head above the weir gate so that even properly sized pieces of ice may not pass thereover, and hence block up the flow passage.

Difficulties of the foregoing type associated with ice making apparatus embodying the overflow principle may be tolerable in a large ice making plant having supervisory and maintenance personnel constantly on duty. However, most installations of ice making machines are such that the need for supervisory or maintenance personnel is highly undesirable, as for example when such ice making machines are employed in unattended automatic vending applications or in restaurants and bars. Accordingly, it is a primary object of this invention to provide novel ice making apparatus which delivers substantially cubic pieces of ice.

Another principal object of this invention is to provide ice making apparatus capable of delivering substantially cubic pieces of ice by incorporating a novel evaporator structure which includes an auxiliary set of coils used only during the defrost portion of the operating cycle.

An additional object of this invention is to provide novel automatic ice cube making apparatus which is reliable in operation, requiring substantially no supervision and very little maintenance.

It is another object of this invention to provide novel automatic ice cube making apparatus employing a two-stage operating cycle in which the ice cubes are formed below the surface of a water reservoir and floated to the top, thereafter being swept out of the reservoir and collected in a storage bin.

Still another object of this invention is to provide novel automatic ice cube making apparatus which completely eliminates the use of a water recirculation pump and thus minimizes the amount of maintenance required to maintain the apparatus in proper functioning order.

A further object of this invention is to provide novel automatic ice cube making apparatus which does not employ the so-called overflow method for carrying the formed ice cubes to the storage bin and hence eliminates the weir structure commonly employed in overflow systems.

Another object of this invention is to provide novel automatic ice cube forming apparatus which is relatively simple to construct and inexpensive to manufacture and which provides uninterrupted trouble-free operation over extended periods of time.

The foregoing and other objects of the invention will become apparent from a careful reading of the following specification in conjunction with an examination of the appended drawings, wherein:

FIGURES 1 and 2 are external perspective views of the apparatus according to the invention and illustrating alternate case designs, FIGURE 1 illustrating a roll-out storage bin type of arrangement whereas FIGURE 2 illus-

trates a storage bin formed integrally with the casework and being accessible by means of a door;

FIGURE 3 is an end view of the ice making apparatus of FIGURE 1 with the casework sectioned away to reveal certain details of the internal construction, as would be seen when viewed along the lines 3—3 of FIGURE 7;

FIGURE 4 is an enlarged fragmentary perspective view of the improved evaporator structure of the ice making apparatus according to the invention showing details of the freezing coils and auxiliary defrosting tubes together with their organization relative to the cube forms;

FIGURE 5 is a front elevational view of the ice making apparatus above the storage bin as would be seen when viewed along the lines 5—5 of FIGURE 3, some parts of the structure being sectioned away to show internal constructional details;

FIGURE 6 is a plan view of the ice cube forms and the associated freezing coils of the evaporator as would be seen when viewed along the lines 6—6 of FIGURE 5;

FIGURE 7 is a plan view of the ice making apparatus illustrated in FIGURE 5 as would be seen when viewed from the top along the lines 7—7 of FIGURE 5;

FIGURE 8 is an enlarged fragmentary sectional view showing the relative form and organization of the ice cube forms, the evaporator freezing coils, the water reservoir and the ice cube collecting sweeper mechanism as would be seen when viewed along the lines 8—8 of FIGURE 5.

In the several figures, like elements are denoted by like reference numerals.

Considering first FIGURES 1 and 3, it will be seen that the apparatus housing includes a lower part **10** and an upper part **11** seated upon the lower housing portion and secured thereto by means not shown. The lower housing **10** carries the roll-out storage bin **12** which moves in and out of the housing on the rollers **13** journalled in opposite sides of the housing. As most clearly is seen in the showings of FIGURES 5 and 7, the upper housing portion **11** is formed at its bottom edge with a pair of inwardly turned shelves **14** and **15** upon which are seated a supporting plate **16** which carries the ice making apparatus, the supporting plate **16** being secured to the shelves **14** and **15** by means of a plurality of bolts **17**.

Referring to FIGURES 4, 5 and 8, disposed vertically above the storage bin **12** is the freezing tank structure **18** which includes the water reservoir **19**, a plurality of cup-shaped ice cube forms **20** disposed at the bottom of the reservoir **19**, the evaporator freezing coils **21** running between and below the cup-shaped ice cube forms **20** and in contact therewith, the auxiliary defrost tubes **21***a* running between the forms **20** proximate the tops thereof and oriented transversely to the freezing coils **21**, the cube forms top web **21***b* enclosing the tubes **21***a* and in sidewall contact therewith, and the thermal barrier **21***c* intervening the tops of the cube forms **20** and the combined defrosting structure including the tubes **21***a* and top web **21***b*. The ice cube forms **20**, the freezing coils **21**, the auxiliary defrost tubes **21***a* and cube form top web **21***b* are preferably made from a material of high thermal conductivity such as copper so that maximum rate of heat transfer may be obtained between the ice cube forms and the freezing coils on the one hand and between the top web and defrosting tubes on the other hand. The walls of the reservoir **19** may be made of any convenient material. The diameter of the copper tubing from which the freezing coils are formed is of the proper size to provide the desired spacing between adjacent ones of the ice cube forms **20** as is most clearly seen in the showings of FIGURES 4, 6 and 8, and the cube forms are soldered thereto to provide physical support for the forms and a good metal to metal contact for best thermal transfer therebetween. Surrounding the freezing coils **21** is a mass of insulating material **67**, which insulation effectively confines heat transfer into the refrigerant in the freezing coils to that extracted from the walls and bottom of the ice cube forms **20**. By means of this structure, heat is rapidly extracted from the water in the ice cube forms **20**, passing through the side and bottom walls thereof and into the refrigerant flowing through the freezing coils **21**. Thus, the ice cubes **63** are formed by freezing the water in the forms **20** firstly on the sides and along the bottom thereof and extending inwardly and upwardly until a complete cube is formed.

As also best seen in FIGURES 4, 6 and 8, the top edges **70** of adjacent ones of the cube forms **20** which have been soldered to the freezing coils **21** are bridged between by a web of thermal insulating material **21***c*. The thermal insulating material **21***c* includes a lower portion **71** extending downward between the outside faces of the cube forms and in surface contact therewith, an intermediate portion **72** extending laterally outward from the lower portion **71** and overlying the upper edges **70** of the cube forms **20**, and an upper portion **73** the edges of which are recessed back from the laterally projecting intermediate portion **72** to provide a seating shoulder for the lower edges of the sidewalls **74** of the thermally conductive top web **21***b*.

The thermally conductive top web **21***b* is unitarily made in the form of a plurality of spaced parallel channels **75** having top walls **76** and downwardly diverging sidewalls **74**, the channels **75** being interconnected by similarly formed spaced parallel channel segments **77** oriented at right angles to the channels **75** to form a web structure. Extending through the channels **75** are the defrosting tubes **21***a* which are soldered to the inside faces of the channel sidewalls **74** but which are spaced below and out of contact with the channel top walls **76**. The upper portion **73** of the thermal barrier web **21***c* is contoured to receive the undersurface of the defrost tubes **21***a* and to extend upward about the defrost tubes sides in the space laterally thereof to the inside surfaces of the channels sidewalls **74** lower region, that is, below the solder joints of the defrost tubes **21***a* and channel sidewalls **74**.

The outer edges of the thermal barrier intermediate portions **72** lie in plane with the inside surfaces of the cube forms **20** and also in plane with the outer surfaces of the channel sidewalls **74**, so that effectively continuous plane surfaces result. The function of the thermal barrier **21***c* is to provide a thermal discontinuity between the thermally highly conductive cube forms **20** and top web **21***b*. During the freezing portion of the cycle when the freezing coils **21** are active and the defrost tubes **21***a* are inactive, the top web **21***b* does not extract significant heat from the water in the forms **20**. Nevertheless, by the time the water in the upper center region of the form **20** has frozen into ice, additional ice has also formed along the sidewalls due to the action of the freezing coils **21** and tends to bridge upward past the thermal barrier intermediate portion **72** onto the faces of the lower sidewalls **74** of the top web **21***b*. In the usual type of evaporator, which does not include the defrost tubes **21***a* and top webs **21***b*, this bridging ice prevents release of the cubes from the forms during defrosting by exerting an outward wedging action against the usually employed thermal barrier located at the top of the forms.

In the usual evaporator, by the time this wedging top ice has been melted by the hot gas passing through the coils **21** during defrost, the entire bottom region and sides of the cubes have also been melted and the cubic form is completely destroyed. However, in the evaporator according to the present invention this destruction of the cubic form is eliminated by means of the defrost tubes **21***a* and top web **21***b*. As will be subsequently described, during defrost the hot gas is first passed through the defrost tubes **21***a* to rapidly melt the top edge ice and is thereafter passed into the normal freezing coils **21** so that the residual heat in the gas may melt merely the cube faces, there being insufficient residual heat to deformingly melt the cubes prior to release thereof from the forms.

It will be observed that each of the ice cube forms **20** is in the shape of an inverted truncated square pyramid which form insures that the bottom portion of the cube

will freeze prior to freezing of the upper portion so that no unfrozen water will be trapped internally within the cube volume. More importantly, however, this shape form insures that the ice cube will be enabled to readily free itself from the form during the second stage of the operating cycle when the defrost tubes 21*a* are activated to melt the top edge ice. The ready freeing of the cubes and their easy rise to the surface of the water in the reservoir occurs because, as is seen, there are no undercuts to prevent dislodgement of the individual ice cubes from their associated forms and the top ice wedging action is eliminated. Once freed, the lower density of the ice as compared to the water accomplishes the rise to the surface of the reservoir.

It will, of course, be understood that the ice cube forms 20 may be made in a variety of shapes and need not be restricted to the shape illustrated. In this regard, it will be appreciated that the forms 20 could take the shape of an inverted truncated cone, the important feature to be retained being that of the upwardly outward taper of the ice cube form walls. The particular form adopted may require alteration in the convoluted form of the freezing coils 21 and in defrost tubes 21*a* and top web 21*b*, in order to provide efficient freezing and defrosting.

As best seen in FIGURES 8 and 3, the floating ice cubes 63 are removed from the reservoir 19 by means of an oscillating sweeper grille 24 which lifts the cubes over the side edges of the reservoir 19 causing them to fall by gravity into the delivery chutes 23 and downward into the storage bin 12 in the lower housing 10. As best seen in FIGURE 5, the sweeper grille 24 includes a shaft 25 horizontally extending above the reservoir 19, a U-shaped frame 26 which depends from and forms with the shaft 25 a generally rectangular structure, and a plurality of vertically extending ribs 27 secured at opposite ends to the shaft 25 and the U-shaped frame 26 and parallel spaced sufficiently close to one another to prevent a floating ice cube from passing between adjacent ones of the ribs. The shaft 25 is journalled at opposite ends in bearings 28 mounted on vertically extending angle brackets 29, which latter are secured at their lower ends to the end walls of the reservoir 19 as by the bolts 30.

As best seen in FIGURE 8, secured to one arm of the frame member 26 is the block 31 which is pivotally connected to a rocker arm 32 as by means of the pivot 33. The rocker arm 32 is pivotally connected at its opposite end to a crank 34 by means of the pivot connection 35, the opposite end of the crank 34 being fixedly secured upon a shaft 36 which is rotatably driven by the motor 37 through the speed reducer 38. As the crank 34 is rotated the rocker arm 32 causes the sweeper grille to oscillate back and forth across the width of the reservoir 19 between the extreme positions designated as 24′ and 24″. The lower edge of the sweeper grille 24 thus oscillates back and forth along a circular arc, the major portion of which lies below the surface of the water in the reservoir 19, emerging therefrom at the extreme ends of the arc.

In order to prevent jamming of the floating ice cubes against the inner surface of the reservoir walls by the sweeper grille, the vertically extending side walls 38 of the reservoir do not extend upwardly above the water surface but instead are turned outwardly and upwardly as at 39 at a particular depth below the reservoir water surface. The depth at which the reservoir walls 38 are turned outwardly is chosen to be somewhat greater than the maximum below-surface vertical extent of a floating ice cube and also to lie below the arc traversed by the lower edge of the frame member 26 of the sweepr grille. Thus, the sloping walls 39 of the reservoir are never contacted by the sweeper grille as it traverses its oscillating path, and the floating ice cubes are provided with a skidway or ramp along which they may be readily moved by the sweeper grille 24 outwardly over the upper edge of the outside walls 40 of the freezing tank structure 18 and into the chutes 23. In practice, it has been found that the sweeper grille 24 may conveniently be driven through approximately 15 oscillatory cycles per minute which is sufficiently slow to avoid splashing of water out of the reservoir 19 but which is yet sufficiently fast to provide the degree of reservoir water agitation needed to produce crystal clear ice cubes.

The remainder of the apparatus consists of a conventional float valve arrangement for maintaining the water level in the reservoir 19, the refrigeration system for supplying cold refrigerant to the coils 21 and hot gas to the defrost tubes 21*a* and coils 21 on alternate stages of the operating cycle, and a thermostatic switch for controlling the operation of the apparatus as determined by the level of the ice cubes in the storage bin 12. The reservoir float valve system is best seen in the showings of FIGURES 5 and 8 and is seen to include the valve 41 connected at its inlet end to a water supply by means of the inlet pipe 42 and having a discharge spout 43 which empties into the reservoir 19. The opening and closing of the valve 41 is controlled by the float ball 44 which is coupled thereto through the mechanical link 45. As the floating ice cubes are swept out of the reservoir 19 by the sweeper grille 24, the reservoir water level drops, thus lowering the float ball 44 and opening the valve 41 to admit more water to the reservoir. As the reservoir water level rises, it carries with it the float ball 44 which shuts down the valve 41 and cuts off the flow of additional water into the reservoir.

The refrigeration equipment associated with the coils 21 and defrost tubes 21*a* of the evaporator is best seen in the showings of FIGURES 5 and 7 to which reference should be now made. As will be recalled, the ice cube making cycle includes two stages, the first stage being a refrigeration or freezing stage during which the ice cube is formed, and the second stage being a freeing stage during which the ice cubes are released from their forms and pop to the surface of the reservoir. During the first stage the cold refrigerant flows through the coils 21 of the evaporator but not through the defrost tubes 21*a*, and during the second stage a hot gas is circulated first through the defrost tubes 21*a* and then through the coils 21. In both stages the flow through the coils 21 of the evaporator is in the same direction, that is into the evaporator coils 21 through an inlet line 46 and out of the evaporator coils 21 through the outlet line 47, although during defrost the coils 21 are fed from the defrost tubes 21*a*.

During the first or freezing stage of the operating cycle the refrigerant emerging from the evaporator coils 21 through line 47 is conducted to a compressor 48 from which it emerges into the line 49 as a hot gas. The compressed hot gas in line 49 flows therethrough to the condenser 50 where it is cooled to a saturated vapor by fan 66 and emerges in line 51. The saturated vapor in the line 51 empties into a receiver 52 where the liquid phase of the vapor accumulates and flows outwardly therefrom along the line 53 to an expansion valve 54. As the liquid in the line 53 passes through the expansion valve 54 it is atomized into a cold vapor which passes to the inlet line 46 and thence to the coils 21 of the evaporator. As the cold vapor entering the evaporator traverses the coils 21, it absorbs the heat required to freeze the water in the ice cube forms 20 and emerges from the evaporator along the outlet 47 as a warm gas flowing toward the compressor 48. This stage of the operating cycle continues for a predetermined length of time sufficient to form the ice cubes as previously described.

The degree to which the expansion valve 54 is allowed to open and hence the rate at which the refrigerant is admitted to the inlet line 46 of the evaporator, is controlled by a capillary tube 63 connected at its upper end to the expansion valve 54 and at its lower end to a bulb 64 placed in physical contact with the evaporator outlet line 47. The bulb 64 contains a gas which ex-

pands and contracts as a function of temperature. When the freezing stage of an operating cycle is first initiated a maximum amount of heat is absorbed by the refrigerant as it passes through the evaporator coils so that the temperature of the gas in the outlet line **47** is highest at this time. This relatively higher temperature in the outlet line **47** causes the gas in the bulb **64** to expand which in turn results in an increase in pressure in the capillary tube **63**. This increased gas pressure in the capillary **63** is applied to the diaphragm of the expansion valve **54** causing it to open to a larger extent and resulting in a relatively large volume delivery of refrigerant to the inlet line **46** of the evaporator.

As the freezing stage of the operating cycle progresses, the heat absorbed by the refrigerant in passing through the evaporator coils **21** steadily decreases so that the temperature of the gas in the outlet line **47** also decreases. The decrease of gas temperature in the outlet line **47** causes a contraction of the gas in the bulb **64** and results in a lowering of the pressure in the capillary tube **63**. As a consequence, less opening pressure is exerted on the diaphragm of the expansion valve **54** and the valve throttles back under the urging of a diaphragm biasing spring. The capillary **63** and bulb **64** thus provide a regulatory mechanism for the expansion valve **54** and prevents frosting of the evaporator outlet line **47**.

Referring now to FIGURES 5 through 8, when the freezing stage has been completed as determined by the timer **55**, the timer opens a solenoid controlled valve **56** so that the hot gas in line **49** coming from the compressor may bypass the condenser **50** and instead flow through the line **57**, through the solenoid valve **56**, outlet line **57***a* and into the evaporator defrost inlet manifold **78**. The hot gas entering the inlet manifold **78** travels in both directions from the inlet line **57***a* and into the defrost tubes **21***a*, through the defrost tubes to the outlet manifold **79** and then into the freezing coils **21** via the line **46***a* which exhausts into the line **46**, through the coils **21** and back to the compressor through the outlet line **47**. In this manner, the condenser **50**, receiver **52** and expansion valve **54** are effectively bypassed so that the hot gas from the compressor may be directly routed through the evaporator and free the cubes **63** from their forms **20** by melting the top wedging ice and the ice cube faces. When this second stage has continued for a predetermined time as also determined by the timer **55**, the timer automatically closes the solenoid valve **56** by deenergizing the controlling solenoid, thus shutting off the flow of hot gas to the defrost inlet manifold **78** and reestablishing the conditions of the first stage of the cycle during which the next batch of ice cubes will be formed. The condenser fan **66** draws cool air into the upper housing **11** through the horizontal side louvers **64**, around and across the freezing tank **18**, ultimately exhausting out of the housing through the side louvers **65**.

The apparatus operates continuously in the foregoing described cycle until the level of the ice cubes in the storage bin **12** rises to a predetermined level. As the level of the ice cubes rises, the ambient temperature surrounding the thermostatic switch **58** (FIGURE 3) decreases, and when the ice cube level has risen to the predetermined point the thermostatic switch **58** responds to the lowered temperature and shuts down the entire apparatus. As ice cubes are withdrawn from the storage bin **12** so that the level therein drops, a point is reached where the thermostatic switch **58** is again actuated to turn on the apparatus and reinstitute the production of ice cubes. FIGURE 5 illustrates in general diagrammatic form the manner in which the thermostatic switch **58** turns the apparatus on and off by selectively energizing and deenergizing the electrical conductor lines **59**, **60** and **61** with respect to a source of current **62**.

Having now described my invention in conjunction with a particularly illustrated embodiment thereof, it will be understood that variations and modifications thereof may occur from time to time to those persons normally skilled in the art without departing from the essential spirit or scope of the invention, and, accordingly, it is desired to claim the same broadly as well as specifically as indicated by the appended claims.

What is claimed as new and useful is:

1. An ice making machine adapted to operate in a two part cycle consisting of a freezing period followed by a defrosting period, comprising in combination, a walled water reservoir having disposed at the bottom thereof a plurality of open-topped spaced individual metal pockets the open tops of which are in free communication with the reservoir, means operative during the freezing period for freezing water in said pockets into ice including a coil of metal tubing secured in good metal-to-metal contact with the side and bottom walls of said pockets, principal means operative during the defrosting period for releasing from said pockets the ice formed therein so that the released ice may float upward to the surface of the water in said reservoir including a plurality of defrost tubes positioned proximate the top edges of and between the sidewalls of adjacent ones of said spaced pockets, said coil having an inlet and an outlet and said defrost tubes having an inlet and an outlet, the defrost tubes outlet being connected to the coil inlet, and control means operative during the freezing period to close the inlet to said defrost tubes and render them inoperative by preventing any refrigerant flow therethrough while permitting cold refrigerant from a supply source to pass through said coil to freeze the water in said pockets, and said control means being further operative during said defrosting period to effectively cut off the supply of cold refrigerant to said coil and open the inlet to said defrost tubes to permit a hot medium to pass first through said defrost tubes and then through said coil by means of the connection between the defrost tubes outlet and coil inlet whereby said coil is converted into an auxiliary defrosting means.

2. An ice making machine adapted to operate in a two part cycle consisting of a freezing period followed by a defrosting period, comprising in combination, a walled water reservoir having disposed at the bottom thereof a plurality of parallel rows of open-topped spaced individual metal pockets the open tops of which are in free communication with the reservoir, means operative during the freezing period for freezing water in said pockets into ice including a convoluted coil of metal tubing extending between the sidewalls of pockets in adjacent rows and under the bottom walls of pockets in each row and being secured in good metal-to-metal contact with said pockets side and bottom walls to provide good thermal transfer between said coil and pockets and physical support for said pockets, principal means operative during the defrosting period for releasing from said pockets the ice formed therein so that the released ice may float upward to the surface of the water in said reservoir including a plurality of defrost tubes at least a portion of which extend in substantially parallel spaced alignment between the side walls and proximate the top edges of pockets in adjacent ones of said parallel rows of pockets, said coil having an inlet and an outlet, and said plurality of defrost tubes each being connected to one end to an inlet manifold and being connected at the other end to an outlet manifold, said outlet manifold being also connected to the said coil inlet, and control means operative during the freezing period to close the defrost tubes inlet manifold and render the defrost tubes inoperative by preventing any refrigerant flow therethrough while permitting cold refrigerant from a supply source to pass through said coil to freeze the water in said pockets, and said control means being further operative during said defrosting period to effectively cut off the supply of cold refrigerant to said coil and open the defrost tubes inlet manifold to permit a hot medium to pass first through said defrost tubes and then through said coil by means

of the outlet manifold connection to the latter, whereby said coil is converted into an auxiliary defrosting means.

3. An evaporator structure adapted for use in an ice making machine designed to operate in a two part cycle consisting of a freezing period followed by a defrosting period, comprising in combination, a plurality of parallel rows of open-topped spaced individual metal pockets, a convoluted coil of metal tubing extending between the sidewalls of pockets in adjacent rows and under the bottom walls of pockets in each row, said tubing being secured in good metal-to-metal contact with said sidewalls and bottom walls of said pockets to provide good thermal transfer between said coil and pockets and physical support for said pockets, a plurality of defrost tubes at least a portion of which extend in substantially parallel spaced alignment between the sidewalls and proximate the top edges of pockets in adjacent ones of said parallel rows of pockets, conduit means interconnecting said coil and defrost tubes, and control means effective during the said freezing period to cause cold refrigerant to flow through said coil but not through said defrost tubes and effective during the said defrost period to cause a warm medium to pass in series first through said defrost tubes and then through said coil while preventing any cold refrigerant flow therethrough.

4. An evaporator structure adapted for use in an ice making machine designed to operate in a two part cycle consisting of a freezing period followed by a defrosting period, comprising in combination, a plurality of parallel rows of open-topped spaced individual metal pockets, a convoluted coil of metal tubing extending between the sidewalls of pockets in adjacent rows and under the bottom walls of pockets in each row, said tubing being secured in good metal-to-metal contact with said sidewalls and bottom walls of said pockets to provide good thermal transfer between said coil and pockets and physical support for said pockets, and a plurality of defrost tubes at least a portion of which extend in substantially parallel spaced alignment between the sidewalls and proximate the top edges of pockets in adjacent ones of said parallel rows of pockets, said coil having an inlet and an outlet, said plurality of defrost tubes each being connected at one end to an inlet period, comprising in combination, a walled water reservoir having disposed at the bottom thereof a plurality of parallel rows of open-topped spaced individual metal pockets the open tops of which are in free communication with the reservoir, means operative during the freezing period for freezing water in said pockets into ice including a convoluted coil of metal tubing extending between the sidewalls of pockets in adjacent rows and under the bottom walls of pockets in each row and being secured in good metal-to-metal contact with said pockets side and bottom walls to provide good thermal transfer between said coil and pockets and physical support for said pockets, principal means operative during the defrosting period for releasing from said pockets the ice formed therein so that the released ice may float upward to the surface of the water in said reservoir including a plurality of defrost tubes at least a portion of which extend in substantially parallel spaced alignment between the sidewalls and proximate the top edges of pockets in adjacent ones of said parallel rows of pockets, thermal barrier means engagingly overlying the top edges of said pockets and spacing the latter from said defrost tubes, a defrost tube enclosing metal web comprising inverted U-shaped channel segments having interconnected top walls and sidewalls which define web openings of the same shape as the open tops of said pockets, the lower edges of said web sidewalls being seated upon the upper surface of said thermal barrier means portion which overlies the top edges of said pockets, the outer surfaces of said web sidewalls and thermal barrier means portion which overlies said pockets extending upward in smooth continuation of the inside surfaces of said pockets, means for harvesting manifold and being each connected at the other end to an outlet manifold, which outlet manifold also connects to said coil inlet.

5. An evaporator structure adapted for use in an ice making machine designed to operate in a two part cycle consisting of a freezing period followed by a defrosting period, comprising in combination, a plurality of open-topped spaced individual metal pockets, a coil of metal tubing secured in good metal-to-metal contact with selected regions of the sidewalls and bottom walls of said pockets to provide good thermal transfer between said coil and pockets, a defrost tube structure at least a portion of which is disposed proximately above the top edges of and between the sidewalls of adjacent ones of said spaced pockets, and thermal barrier means intervening said defrost tube structure and the top edges of said pockets, said coil and said defrost tube structure each having its own inlet and its own outlet, and the defrost tube structure outlet being connected to the coil inlet.

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